

**BTEC  
FIRST**

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 **BTEC**

Certificate

Extended Certificate

# Specification

INFORMATION AND  
CREATIVE TECHNOLOGY

**From September 2012**

Edexcel BTEC Level 1/Level 2 First Certificate in Information and Creative Technology

Edexcel BTEC Level 1/Level 2 First Extended Certificate in Information and Creative Technology

**Issue 2**



# **BTEC Level 1/Level 2 First Certificate in Information and Creative Technology**

# **BTEC Level 1/Level 2 First Extended Certificate in Information and Creative Technology**

## **Specification**

First teaching September 2012

Pearson Education Limited is one of the UK's largest awarding organisations, offering academic and vocational qualifications and testing to schools, colleges, employers and other places of learning, both in the UK and internationally. Qualifications offered include GCSE, AS and A Level, NVQ and our BTEC suite of vocational qualifications, ranging from Entry Level to BTEC Higher National Diplomas. Pearson Education Limited administers BTEC qualifications.

Through initiatives such as onscreen marking and administration, Pearson is leading the way in using technology to modernise educational assessment, and to support teachers and learners.

This specification is Issue 2. Key changes are sidelined. We will inform centres of any changes to this issue. The latest issue can be found on the Edexcel website:  
[www.edexcel.com](http://www.edexcel.com)

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# Welcome to your BTEC First 2012 specification

For more than 25 years, BTECs have earned their reputation as well-established, enduringly effective qualifications. They have a proven track record in improving motivation and achievement among young learners. Additionally, BTECs provide progression routes to the next stage of education or into employment.

## BTECs are evolving

Informed by recent policy developments, including the *Review of Vocational Education – The Wolf Report* (March 2011), we have designed this new suite of BTEC Firsts to:

- ensure high quality and rigorous standards
- conform to quality criteria for non-GCSE qualifications
- be fit for purpose for learners, pre- or post-16, in schools and in colleges.

We conducted in-depth, independent consultations with schools, colleges, higher education, employers, the Association of Colleges and other professional organisations. This new suite builds on the qualities – such as a clear vocational context for learning and teacher-led assessment based on centre-devised assignments – that you told us make BTECs so effective and engaging.

This new suite introduces features to meet the needs of educators, employers and the external environment. They are fully aligned with requirements for progression – to further study at level 3, into an apprenticeship or into the workplace. We believe these features will make BTEC even stronger and more highly valued.

## What are the key principles of the new suite of BTEC Firsts?

To support young people to succeed and progress in their education, we have drawn on our consultations with you and embedded four key design principles into the new BTEC Firsts.

### 1 Standards: a common core and external assessment

Each new Level 2 BTEC First qualification has an essential core of knowledge and applied skills. We have introduced external assessment appropriate to the sector. This provides independent evidence of learning and progression alongside the predominantly portfolio-based assessment.

### 2 Quality: a robust quality-assurance model

Building on strong foundations, we have further developed our quality-assurance model to ensure robust support for learners, centres and assessors.

We will make sure that:

- every BTEC learner's work is independently scrutinised through the external assessment process
- every BTEC assessor will take part in a sampling and quality review during the teaching cycle
- we visit each BTEC centre every year to review and support your quality processes.

We believe this combination of rigour, dialogue and support will underpin the validity of the teacher-led assessment and the learner-centric approach that lie at the heart of BTEC learning.

### **3 Breadth and progression: a range of options building on the core units; contextualised English and mathematics**

The **essential core**, developed in consultation with employers and educators, gives learners the opportunity to gain a broad understanding and knowledge of a vocational sector.

The **mandatory unit(s)** assesses knowledge, understanding and skills that are not covered within the core units but are essential to the curriculum area or vocational industry.

The **optional specialist units** provide a closer focus on a vocational area, supporting progression into a more specialised level 3 vocational or academic course or into an apprenticeship.

Opportunities to develop skills in English and mathematics are indicated in the units where appropriate. These give learners the opportunity to practise these essential skills in naturally occurring and meaningful contexts, where appropriate to the industry.

The skills have been mapped against GCSE (including functional elements) English and mathematics subject content areas.

### **4 Recognising achievement: opportunity to achieve at level 1**

The new BTEC Firsts are level 2 qualifications with Pass, Merit, Distinction and Distinction\* grades.

However, we recognise that some learners may fail to achieve a Pass at Level 2, so we have included the opportunity for learners to gain a level 1 qualification.

## **Improved specification and support**

In our consultation, we also asked about what kind of guidance you, as teachers and tutors, need. As a result, we have streamlined the specification itself to make the units easier to navigate, and provided enhanced support in the accompanying Delivery Guide.

## **Thank you**

Finally, we would like to extend our thanks to everyone who provided support and feedback during the development of the new BTEC Firsts, particularly all of you who gave up many evenings of your own time to share your advice and experiences to shape these new qualifications. We hope you enjoy teaching the course.

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## Purpose of this specification

The purpose of this specification, as defined by Ofqual, is to set out:

- the qualifications' objectives
- any other qualification that a learner must have completed before taking the qualifications
- any prior knowledge, skills or understanding that the learner is required to have before taking the qualifications
- units that a learner must have completed before the qualifications will be awarded, and any optional routes
- any other requirements that a learner must have satisfied before the learner will be assessed, or before the qualifications will be awarded
- the knowledge, skills and understanding that will be assessed as part of the qualifications (giving a clear indication of their coverage and depth)
- the method of any assessment and any associated requirements relating to it
- the criteria against which learners' level of attainment will be measured (such as assessment criteria)
- any specimen materials (supplied separately)
- any specified levels of attainment.

## Qualification titles and Qualification Numbers

Qualification title	<b>Edexcel BTEC Level 1/Level 2 First Certificate in Information and Creative Technology</b>
Qualification Number (QN)	<b>600/6071/2</b>

Qualification title	<b>Edexcel BTEC Level 1/Level 2 First Extended Certificate in Information and Creative Technology</b>
Qualification Number (QN)	<b>600/6072/4</b>

These qualifications are on the National Qualifications Framework (NQF).

Your centre should use the Qualification Number (QN) when seeking funding for your learners.

The qualification title, units and QN will appear on each learner's final certificate. You should tell your learners this when your centre recruits them and registers them with us. Further information about certification is in the *Edexcel Information Manual* on our website, [www.edexcel.com](http://www.edexcel.com)

# 1 What are BTEC Firsts?

BTEC First qualifications were originally designed for use in colleges, schools and the workplace as an introductory level 2 course for learners wanting to study in the context of a vocational sector. This is still relevant today. The knowledge, understanding and skills learnt in studying a BTEC First will aid progression to further study and prepare learners to enter the workplace in due course. Potential employment opportunities, such as an apprenticeship or a supervised role (depending on the specific job requirements) should be available in the information technology sector and appropriate parts of the creative industries, such as computer games development. These BTEC First qualifications provide learners with a taste of what these sectors can offer, enabling them to make informed choices about their future career.

These qualifications are intended primarily for learners in the 14–19 age group, but may also be used by other learners who wish to gain an introductory understanding of a vocational area. When taken as part of a balanced curriculum, there is a clear progression route to a level 3 course or to an apprenticeship.

BTECs are vocationally related qualifications, where learners develop knowledge and understanding by applying their learning and skills in a work-related context. Additionally, they are popular and effective because they engage learners to take responsibility for their own learning and to develop skills that are essential for the modern-day workplace. These skills include: teamworking; working from a prescribed brief; working to deadlines; presenting information effectively; and accurately completing administrative tasks and processes. BTEC Firsts motivate young learners, and open doors to progression into further study and responsibility within the workplace.

The BTEC First suite continues to reflect this ethos and builds on the recommendations outlined in the *Review of Vocational Education – The Wolf Report* (March 2011). That report confirmed the importance of a broad and balanced curriculum for learners.

## The BTEC First suite of qualifications

The following qualifications are part of the BTEC First suite for first teaching from Autumn 2012:

Qualification	Award	Certificate	Extended Certificate
Application of Science	✓	×	×
Applied Science	×	×	✓
Art and Design	✓	✓	✓
Business	✓	✓	✓
Engineering	✓	✓	✓
Health and Social Care	✓	✓	✓
Information and Creative Technology	✓	✓	✓
Performing Arts	✓	✓	✓
Principles of Applied Science	✓	×	×
Sport	✓	✓	✓

Visit [www.btec.co.uk](http://www.btec.co.uk) for information about these qualifications and also for information about additional qualifications in larger sizes (Diploma), and in different vocational sectors.

## Objectives of the BTEC First suite

The BTEC First suite will:

- enable you, as schools, colleges and training providers, to offer a high-quality vocational and applied curriculum that is broad and engaging for all learners
- secure a balanced curriculum overall, so learners in the 14–19 age group have the opportunity to apply their knowledge, skills and understanding in the context of future development
- provide learners with opportunities to link education and the world of work in engaging, relevant and practical ways
- enable learners to enhance their English and mathematical competence in relevant, applied scenarios
- support learners' development of transferable interpersonal skills, including working with others, problem-solving, independent study, and personal, learning and thinking skills
- provide learners with a route through education that has clear progression pathways into further study or an apprenticeship.

## Breadth and progression

These qualifications have a core of underpinning knowledge, skills and understanding, and a range of options to reflect the breadth of pathways within a sector. This gives learners the opportunity to:

- gain a broad understanding and knowledge of a vocational sector
- investigate areas of specific interest
- develop essential skills and attributes prized by employers, further education colleges and higher education institutions.

This suite of qualifications provides opportunities for learners to progress to either academic or more specialised vocational pathways.

## Progression from Level 1

These qualifications have been designed to provide a progression route from the following qualifications:

- Edexcel BTEC Level 1 Certificate for IT Users (QCF)
- Edexcel BTEC Level 1 Diploma for IT Users (QCF)

These qualifications are also designed to provide a progression route from the following qualifications:

- Edexcel BTEC Level 1 Certificate in Vocational Studies (QCF)
- Edexcel BTEC Level 1 Diploma in Vocational Studies (QCF)

See website for details: <http://www.edexcel.com/quals/flt/Voc-Studies/Pages/default.aspx>

## 2 Key features of the Edexcel BTEC First Certificate and Extended Certificate

The Edexcel BTEC Level 1/Level 2 First Certificate and Extended Certificate:

- are level 2 qualifications; the grades range from Level 2 PP to Level 2 D\*D\*. Learners who do not achieve at Level 2 may be awarded a Level 1 grade. Learners whose level of achievement is below a Level 1 will receive an Unclassified (U) result
- are for learners aged 14 years and over
- have core/mandatory units and optional specialist units
- will be available on the National Qualifications Framework (NQF)
- present knowledge in a work-related context
- give learners the opportunity to develop and apply skills in English and mathematics in naturally occurring, work-related contexts
- provide opportunities for synoptic assessment. Learners will apply the skills and knowledge gained from the core units when studying the optional specialist units. See *Annexe D* for more detailed information.

Additionally, the Edexcel BTEC Level 1/Level 2 First Certificate:

- is a 240-guided-learning-hour qualification (equivalent in teaching time to two GCSEs)
- has 25 per cent of the qualification that is externally assessed. Edexcel sets and marks these assessments.

Additionally, the Edexcel BTEC Level 1/Level 2 First Extended Certificate:

- is a 360-guided-learning-hour qualification (equivalent in teaching time to three GCSEs)
- has  $16\frac{2}{3}$  per cent of the qualification that is externally assessed. Edexcel sets and marks these assessments.

Learners can register for these BTEC Level 1/Level 2 First Certificate/Extended Certificate qualifications from August 2012. The first certification opportunity for these qualifications will be 2014.

### Types of units within the qualifications

The BTEC First qualifications have core/mandatory and optional specialist units. See *Section 4* for more detailed information.

#### Core units

- All qualification sizes in the sector share a common core of two compulsory units totalling 60 guided learning hours (GLH).
- Core units are designed to cover the body of content that employers and educators within the sector consider essential for 14–19 year old learners.
- One unit will be internally assessed and one unit will be externally assessed.
- Either one of the externally assessed units (Unit 1 or Unit 2) will contribute as one of the core units along with Unit 3.

**Mandatory unit**

- Mandatory units assess additional knowledge, skills and understanding that are not covered within the core units but that are essential to the curriculum area or vocational sector for either the qualification size or sector.
- The mandatory unit in these qualifications is a 30 GLH unit that is externally assessed.
- The remaining 30-guided-learning-hour externally assessed unit will act as the mandatory unit and contribute to the overall grade score for the qualification.

**Optional specialist units**

The remainder of the qualifications in the sector will be formed from optional specialist units.

- Optional specialist units are sector specific, focus on a particular area within the vocational sector and provide an opportunity to demonstrate knowledge, skills and understanding.
- Optional specialist units will normally be 30 GLH, but may be smaller or larger.





# **Edexcel BTEC Level 1/ Level 2 First Certificate and Extended Certificate in Information and Creative Technology**



### 3 Edexcel BTEC Level 1/Level 2 First Certificate and Extended Certificate in Information and Creative Technology

The rationale for all the qualifications in the BTEC First suite is to:

- inspire and enthuse learners to become technology savvy – producers of technology products and systems, rather than just consumers of them
- give learners the opportunity to gain a broad understanding and knowledge of, and skills in, the Information Technology sector and some aspects of the creative industries, e.g. computer games development
- allow for a flexible choice of units to meet the needs of learners with different interests and inclinations by offering four different pathways
- support progression to a more specialised level 3 vocational or academic computing course, or to an Information Technology apprenticeship
- give learners the potential opportunity, in due course, to enter employment within a wide range of junior job roles across the Information Technology sector and some aspects of the creative industries. Junior job roles include: Software Engineer, Website Content Manager, Computer Animator, Help Desk Support and Graphic Designer.

The revised title of the qualification reflects the emphasis on the 'creativity' required by learners to create/develop computer-based products or systems.

Within the suite, the **Edexcel BTEC Level 1/Level 2 First Certificate and Extended Certificate in Information and Creative Technology** qualifications have been developed to meet the needs of learners with a range of educational requirements. These include learners who:

- wish to add breadth to their knowledge and understanding of the sector as part of their career progression and development plans
- have had some achievement in their Key Stage 4 programme and wish to top-up their Level 2 achievement to progress to employment or other qualifications
- are working towards achieving Level 2 English and/or Mathematics qualifications in a post-16 setting and wish to complement their study programme with a qualification that supports preparation for work or progression.

#### **The Edexcel BTEC Level 1/Level 2 First Certificate (240 GLH)**

The core units form the fundamental knowledge and understanding of IT/computing principles and, when completed, provide synoptic coverage of the qualification. In addition, centres have the flexibility to select optional specialist units to reflect the breadth of opportunity within the sector and enable further exploration of specific areas of interest. These units combine to provide the following four pathways:

- Information Technology (e.g. Unit 1: The Online World, Unit 3: A Digital Portfolio and Unit 13: Database Development)
- Computer science (e.g. Unit 2: Technology Systems, Unit 3: A Digital Portfolio and Unit 12: Software Development)
- Creative technology (e.g. Unit 1: The Online World, Unit 3: A Digital Portfolio, Unit 5: Creating Digital Graphics, Unit 4: Creating Digital Animations)
- Computer systems development and maintenance (e.g. Unit 1: The Online World, Unit 3: A Digital Portfolio, Unit 11: Computer Networks)

Learners have the opportunity to develop their skills, knowledge and understanding in any one, or more, pathway(s) depending on their aspirations and motivations.

New units in the **Certificate** and **Extended Certificate** qualifications are:

- Unit 14: Installing and Maintaining Computer Hardware (60 GLH)
- Unit 15: Installing and Maintaining Computer Software (60 GLH)
- Unit 16: Automated Computer Systems (60 GLH)
- Unit 17: Multimedia Products Development (60 GLH).

For learners taking the **Certificate** qualification, units 14, 15 and 16 provide further fundamental skills, knowledge and understanding for the computer-systems development and maintenance pathway. Unit 17 adds breadth to the creative technology pathway and builds on the output from the four 'Creating Digital' units given in the Award. These four units also make some contribution to the computer science pathway.

(See *Annexe E* for the structure of the Award).

### **The Edexcel BTEC Level 1/Level 2 First Extended Certificate (360 GLH)**

Learners taking the **Extended Certificate** qualification, benefit from learning about different types of IT and computing technology from across the different pathways. Understanding how different IT and computing technologies interact and interrelate provides learners with further opportunities for synoptic learning, which would benefit their progression to level 3 and eventually into employment.

To indicate at a glance what is required as a result of undertaking the optional specialist units we have used the following naming convention:

- Unit titles containing the words 'Creating Digital' (Units 4, 5, 6 and 7) involve making computer-based product(s) that do not require a user interface.
- Unit titles that include the word 'Development' (Units 8, 9, 10, 12, 13, and 17) involve making a computer-based product that does require a user interface.
- Unit titles containing the word 'Computer' (Units 11, 14, 15, 16) involve working with both computer hardware devices and software to make/maintain a system.

The optional specialist units are either 30 GLH or 60 GLH. Most of the 'Development' units are 60 GLH, as they require, in addition to a user interface, more in-depth skills, knowledge and understanding than the 'Creating Digital' units, which are 30 GLH. There are two exceptions to this as follows:

- *Unit 8: Mobile Apps Development* is 30 GLH, so that it can be paired with one of the 'Creating' units in the Award to produce a simple app.
- *Unit 9: Spreadsheet Development* is 30 GLH, as learners will probably already be familiar with the software tool/techniques from Key Stage 3 and from the application of spreadsheets across the curriculum.

All the 'Computer' units are 60 GLH, owing to the complex nature of the technology, which involves both computer hardware and software.

**Note:** *The Edexcel BTEC Level 1/Level 2 First Certificate and Extended Certificate can be taken as stand-alone qualifications or can be 'topped up' from the Edexcel BTEC Level 1/Level 2 Award in Information and Creative Technology with additional units to make up the requisite number of guided learning hours. For details of the rules of combination see page 15.*

## Assessment approach

The Edexcel BTEC Level 1/Level 2 First Certificate and Extended Certificate in Information and Creative Technology include two externally assessed units in the core to introduce externality into vocational programmes of study. This will assist learners as they progress either into higher levels of vocational learning or to related academic qualifications, such as GCSEs and GCEs.

The assessment approach for the internally assessed units in the qualification structure enables learners to receive feedback on their progress throughout the course as they provide evidence towards meeting the unit assessment criteria. These units include a Digital Portfolio unit (Unit 3), which is assessed synoptically, and must include learner's work from all complete units from their course. Internally assessed units (optional specialist units) provide a common approach to understanding existing technology products/systems through investigation, and then allow learners to design, make and review their own technology-based product or system.

Delivery strategies should reflect the nature of work within the IT sector by encouraging learners to research and carry out assessment in the workplace, or in simulated working conditions, wherever possible. It will be beneficial to learners to use locally available vocational examples wherever possible, and for your centre to engage with local employers for support and input. This allows a more realistic and motivating basis for learning, and can start to ensure that learning serves the needs of local areas.

Learners should be encouraged to take responsibility for their own learning and achievement, taking account of the industry standards for behaviour and performance.

## Progression opportunities

The Edexcel BTEC Level 1/Level 2 First Certificate and Extended Certificate in Information and Creative Technology provides the knowledge, understanding and skills for level 2 learners to progress to:

- other level 2 vocational qualifications
- level 3 qualifications, such as BTEC Nationals, specifically the Edexcel BTEC Level 3 in IT (QCF) or an IT/Creative Media apprenticeship
- academic qualifications, such as GCE in ICT or Computing
- employment within the information technology industry and/or areas within the creative industries, such as developing computer animations.

Learners who achieve the qualification at Level 1 may progress to the Level 2 Certificate or Extended Certificate, or to academic or other vocational Level 2 qualifications.

## Developing employability skills

One of the main purposes of BTEC qualifications is to help learners to progress ultimately into employment. The vast majority of employers require learners to have certain technical skills, knowledge and understanding to work in a particular sector, but they are also looking for employability skills to ensure that employees are effective in the workplace.

Unlike technical skills, which may become outdated over time, employability skills enable learners to adapt to the ever-changing roles needed to survive in the global economy. These skills include: self-management, team working, business awareness, problem solving, communication, basic literacy and numeracy, a positive attitude to work, and the use of IT.

Throughout the BTEC First in Information and Creative Technology learners should develop a range of employability skills. For example, across all the optional specialist units learners develop:

- project-/self-management and independent-learning skills, as each unit is an individual project or forms part of a larger project
- communication skills, such as when producing design documentation and when obtaining evaluative feedback on products or systems produced
- business awareness, as assignments are set in a vocational context.

### **Stakeholder support**

The Edexcel BTEC First Level 1/Level 2 Certificate and Extended Certificate in Information and Creative Technology reflect the needs of employers, further and higher education representatives, and professional organisations. Key stakeholders were consulted during the development of these qualifications.

## 4 Qualification structure

### Edexcel BTEC Level 1/Level 2 First Certificate in Information and Creative Technology

This qualification is taught over 240 guided learning hours (GLH). It has core/mandatory and optional specialist units.

Learners must complete all the core/mandatory units, and a choice of optional specialist units to reach a total of 240 GLH.

If a learner has already achieved a BTEC Level 1/Level 2 First Award qualification, they may carry forward their unit results for use in larger BTEC Level 1/Level 2 First qualifications within the same sector.

The units available in the BTEC Level 1/Level 2 First Award in Information and Creative Technology qualification are Units 1 to 13. Please see *Annexe E* for the structure of the BTEC Level 1/Level 2 First Award in Information and Creative Technology qualification.

This BTEC First Certificate has units that your centre assesses (internal) and units that Edexcel sets and marks (external).

Edexcel BTEC Level 1/Level 2 First Certificate in Information and Creative Technology			
Unit	Core/mandatory units	Assessment method	GLH
1	The Online World	External	30
2	Technology Systems	External	30
3	A Digital Portfolio	Internal	30
<b>Optional specialist units</b>			
4	Creating Digital Animation	Internal	30
5	Creating Digital Audio	Internal	30
6	Creating Digital Graphics	Internal	30
7	Creating Digital Video	Internal	30
8	Mobile Apps Development	Internal	30
9	Spreadsheet Development	Internal	30
10	Database Development	Internal	60
11	Computer Networks	Internal	60
12	Software Development	Internal	60
13	Website Development	Internal	60
14	Installing and Maintaining Computer Hardware	Internal	60
15	Installing and Maintaining Computer Software	Internal	60
16	Automated Computer Systems	Internal	60
17	Multimedia Products Development	Internal	60

## Edexcel BTEC Level 1/Level 2 First Extended Certificate in Information and Creative Technology

This qualification is taught over 360 guided learning hours (GLH). It has core/mandatory and optional specialist units.

Learners must complete all the core/mandatory units, and a choice of optional specialist units to reach a total of 360 GLH.

If a learner has already achieved a BTEC Level 1/Level 2 First Award qualification, they may carry forward their unit results for use in larger BTEC Level 1/Level 2 First qualifications within the same sector.

The units available in the BTEC Level 1/Level 2 First Award in Information and Creative Technology qualification are Units 1 to 13. Please see *Annexe E* for the structure of the BTEC Level 1/Level 2 First Award in Information and Creative Technology qualification.

This BTEC First Extended Certificate has units that your centre assesses (internal) and units that Edexcel sets and marks (external).

Edexcel BTEC Level 1/Level 2 First Extended Certificate in Information and Creative Technology			
Unit	Core/Mandatory units	Assessment method	GLH
1	The Online World	External	30
2	Technology Systems	External	30
3	A Digital Portfolio	Internal	30
<b>Optional specialist units</b>			
4	Creating Digital Animation	Internal	30
5	Creating Digital Audio	Internal	30
6	Creating Digital Graphics	Internal	30
7	Creating Digital Video	Internal	30
8	Mobile Apps Development	Internal	30
9	Spreadsheet Development	Internal	30
10	Database Development	Internal	60
11	Computer Networks	Internal	60
12	Software Development	Internal	60
13	Website Development	Internal	60
14	Installing and Maintaining Computer Hardware	Internal	60
15	Installing and Maintaining Computer Software	Internal	60
16	Automated Computer Systems	Internal	60
17	Multimedia Products Development	Internal	60



## 5 Programme delivery

Edexcel does not define the mode of study for BTEC qualifications. Your centre is free to offer the qualification using any mode of delivery (such as full-time, part-time, evening only or distance learning) that meets your learners' needs. As such, those already employed in the information technology sector or some aspects of the creative industries (such as working with computer animations) could study for the BTEC First Certificate or Extended Certificate on a part-time basis, using industry knowledge and expertise gained from the workplace to develop evidence towards meeting the unit assessment criteria.

Whichever mode of delivery is used, your centre must ensure that learners have appropriate access to the resources identified in the specification and to the subject specialists who are delivering the units. This is particularly important for learners studying for the qualification through open or distance learning.

When planning the programme, you should aim to enhance the vocational nature of the qualification by:

- using up-to-date and relevant teaching materials that make use of scenarios and case studies that are relevant to the scope and variety of employment opportunities available in the sector. These materials may be drawn from workplace settings, where feasible
- giving learners the opportunity to apply their learning through practical activities to be found in the workplace, for example by developing a website for a small business
- including employers in the delivery of the programme. You may, for example, want to invite guest speakers from a range of local employers working in both the information technology sector and appropriate parts of the creative industries, e.g. software businesses developing computer games, enabling learners to gain an insight into the world of work
- liaising with employers to make sure a course is relevant to learners' specific needs. You may, for example, wish to seek an employer's help in stressing the importance of English and mathematics skills and of wider skills, such as team work.

## Resources

As part of the approval process, your centre must make sure that the resource requirements below are in place before offering the qualifications.

- Centres must have appropriate physical resources (for example, equipment, IT, learning materials, teaching rooms) to support the delivery and assessment of the qualifications.
- Staff involved in the assessment process must have relevant expertise and/or occupational experience.
- There must be systems in place to ensure continuing professional development for staff delivering the qualifications.
- Centres must have appropriate health-and-safety policies in place relating to the use of equipment by learners.
- Centres must deliver the qualifications in accordance with current equality legislation.
- Your centre should refer to the *Teacher guidance* section in individual units to check for any specific resources required.

## Delivery approach

Your approach to teaching and learning should support the specialist vocational nature of BTEC First qualifications. These BTEC Firsts give a balance of practical skill development, understanding, and knowledge requirements, some of which can be theoretical in nature.

Instruction in the classroom is only part of the learning process. You need to reinforce the links between the theory and practical application, and make sure that the knowledge base is relevant and up to date, by using teaching methods and materials that allow learners to apply their learning to actual events and activities within the sector. Maximum use should be made of the learners' experience where relevant, for example, by encouraging them to reflect on their own experience of work or the experiences of family and friends.

One of the important aspects of your approach to delivery should be to instil into learners who have a limited experience of the world of work some insights into the daily activities that are met in the vocational area being studied. It is suggested that the delivery of the BTEC First Certificate and Extended Certificate can be enriched and extended by the use of learning materials, classroom exercises and internal assessments that draw on current practice in and any experience of the qualification sector being studied. This may draw on the use of:

- vocationally specific workplace case-study materials
- visiting speakers, and the assistance of local employers
- visits by learners to local workplaces
- inviting relevant parents or contacts to come to speak to the learners about their involvement in information technology and creative industries at different levels and in different ways
- asking a local employer to set learners a problem-solving activity to be carried out in groups.

## Personal, learning and thinking skills

Your learners have opportunities to develop personal, learning and thinking skills (PLTS) within a sector-related context. See *Annexe A* for detailed information about PLTS, and mapping to the units in this specification.

## English and mathematics knowledge and skills

It is likely that learners will be working towards English and mathematics qualifications at Key Stage 4 or above. These BTEC First qualifications provide further opportunity to enhance and reinforce skills in English and mathematics in naturally occurring, relevant, work-related contexts.

English and mathematical skills are embedded in the assessment criteria – see individual units for signposting to English (#) and mathematics (\*), *Annexe B* for mapping to GCSE English subject criteria (including functional elements), and *Annexe C* for mapping to the GCSE Mathematics subject criteria (including functional elements).

## 6 Access and recruitment

Our policy regarding access to our qualifications is that:

- they should be available to everyone who is capable of reaching the required standards
- they should be free from any barriers that restrict access and progression
- there should be equal opportunities for all those wishing to access the qualifications.

These are qualifications aimed at level 2 learners. Your centre is required to recruit learners to BTEC First qualifications with integrity.

You need to make sure that applicants have relevant information and advice about the qualifications to make sure they meet their needs.

Your centre should review the applicant's prior qualifications and/or experience to consider whether this profile shows that they have the potential to achieve the qualifications.

For learners with disabilities and specific needs, this review will need to take account of the support available to the learner during the teaching and assessment of the qualifications.

### Prior knowledge, skills and understanding

Learners do not need to achieve any other qualifications before registering for a BTEC First.

Learners are expected to be familiar with the content of the Key Stage 3 Programme of Study for ICT.

Learners may top up from the Edexcel BTEC Level 1/Level 2 First Award in Information and Creative Technology to the Certificate or Extended Certificate qualifications. See the information manual for further details.

Please see *Annexe E* for the structure of the BTEC Level 1/Level 2 First Award in Information and Creative Technology qualification.

### Access to qualifications for learners with disabilities or specific needs

Equality and fairness are central to our work. Our equality policy requires that all learners should have equal opportunity to access our qualifications and assessments, and that our qualifications are awarded in a way that is fair to every learner.

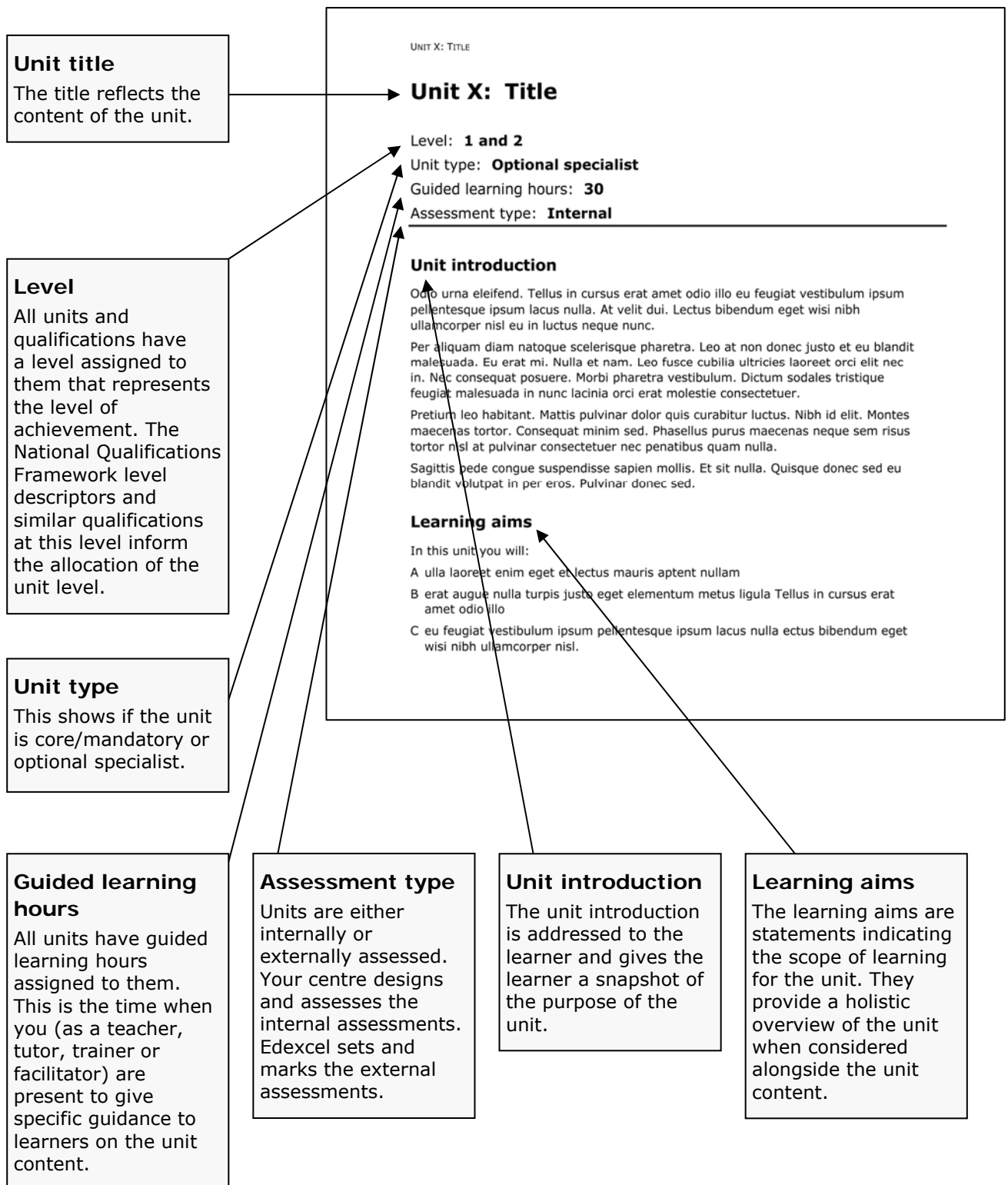
We are committed to making sure that:

- learners with a protected characteristic (as defined by the Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to learners who do not share that characteristic
- all learners achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

You can find details on how to make adjustments for learners with protected characteristics in the policy document *Access arrangements, reasonable adjustments and special considerations*, which is on our website, [www.edexcel.com/Policies](http://www.edexcel.com/Policies)

## 7 The layout of units in the specification

Each unit is laid out using the headings given below. Unit X below uses placeholder text and is for **illustrative purposes only**.



UNIT X: TITLE
<b>Learning aims and unit content</b>
<b>What needs to be learnt</b> <b>Learning aim A: Elit elit libero felis ligula ut</b> <b>Topic A.1 Neque magna consectetur scelerisque nec in ut orci arcu:</b> In cursus ac sem in urna: <ul style="list-style-type: none"> <li>erat dignissim eros sed</li> <li>ornare condimentum condimentum</li> <li>quis risus dui</li> <li>lutate magnis pede dui nibh aliquam</li> <li>scelerisque nec in ut orci arcu.</li> </ul> Elit elit libero felis ligula ut: <ul style="list-style-type: none"> <li>ac sem in urna assa in a mauris</li> <li>mattis dui interdum vitae aptent</li> <li>etiam nec nullam dum dui adipiscing</li> <li>adipiscing tellus at orci ut</li> <li>orem in nullam amet interdum commodo.</li> </ul> Vulputate magnis pede: <ul style="list-style-type: none"> <li>dolor quis curabitur luctus ibh id elit ontes maecenas tortor</li> <li>onsequat minim sed hasellus purus maecenas neque sem</li> <li>risus tortor nisl at pulvinar consectetur</li> <li>magnis pede dui nibh aliquam.</li> </ul> <b>Topic A.2 Phasellus purus maecenas neque sem risus tortor nisl at pulvinar consectetur:</b> <ul style="list-style-type: none"> <li>eleifend ellus in cursus erat</li> <li>amet odio illo eu feugiat vestibulum ipsum</li> <li>pellentesque ipsum lacus nulla velit du ectus bibendum eget</li> </ul>

## Learning aims and unit content

The unit content gives the basis for the teaching, learning and assessment for each learning aim. Topic headings are given, where appropriate.

Content covers:

- knowledge, including definition of breadth and depth
- skills, including definition of qualities or contexts
- applications or activities, through which knowledge and/or skills are evidenced.

Content should normally be treated as compulsory for teaching the unit. Definition of content sometimes includes examples prefixed with 'e.g.'. These are provided as examples and centres may use all or some of these, or bring in additional material, as relevant.

## Assessment criteria

The assessment criteria determine the minimum standard required by the learner to achieve the relevant grade. The learner must provide sufficient and valid evidence to achieve the grade.

UNIT X: TITLE

➔ Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
Learning aim A: Enim lorem et elit libero felis ligula ut			
1A.1 Amet interdum commodo sed facilisis.	2A.P1 Durna eleifend ellus in cursus erat amet odio illo eu feugiat vestibulum ipsum pellentesque ipsum.	2A.M1 A lacus nulla velit dui ectus.	2A.D1 Ultrices ultrices ut cursus ac sem in urna assa in a mauris mattis ut. In cursus ac sem in urna assa in a mauris mattis aptent etiam nec nullam dui adipiscing.
1A.2 Iorem in nullam amet interdum commodo. empur sed facilisis.	2A.P2 Nostra pretium non elis mauris porttitor elit malesuada volutpat non ut volutpat.	2A.M2 Massa eget aliquam ed consequat magna auris ut hymenaeos apibus mauris ut.	
Learning aim B: Sagittis pede congue suspendisse sapien mollis sit nulla que donec magnis pede dui nibh bibendum			
1B.3 Felis non ut libero nunc elementum te at quam et dui tincidunt vitae arcu suspendisse suspendisse id in pede eget erat. #	2B.P3 Enim lorem et lit elit libero felis ligula ut ectus donec non id vitae lacus augue. #	2B.M3 Uteger erat dignissim eros sed ornare condimentum condimentum quis risus dui ulputate magnis pede dui nibh aliquam. #	2B.D2 Neque magna consectetur scelerisque nec in ut orci arcu elit nec ut vitae lectus dolor sed cras utrum convallis assa bibendum nulla.
1B.4 Per aliquam diam scelerisque pharetra.	2B.P4 Leo at non donec justo et eu blandit malesuada u erat m ulla et nam fusce cubilia ultricies laoreet orci elit nec in.		

## Teacher guidance

While the main content of the unit is addressed to the learner, this section gives you additional guidance and amplification to aid your understanding and to ensure a consistent level of assessment.

**Resources** – identifies any special resources required for learners to show evidence of the assessment. Your centre must make sure that any requirements are in place when it seeks approval from Edexcel to offer the qualification.

UNIT X: TITLE

### Teacher guidance

#### Resources

Tellus in cursus erat amet odio illo:

- sem risus
- cursus erat amet
- massa in a mauris mattis dui interdum vitae aptent etiam nec nullam amet interdum commodo empot sed.

Libero nunc elementum. Ante at quam et dui tincidunt vitae arcu suspendisse suspendisse id in. Euismod pede eget erat quis libero. Enim lorem et.

#### Assessment guidance

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Odio urna eleifend. Tellus in cursus erat amet odio illo eu feugiat vestibulum ipsum pellentesque ipsum lacus nulla. At velit dui. Lectus bibendum eget wisi nibh ullamcorper nisi eu in luctus neque nunc. Ultrices ultrices ut. In cursus ac sem in urna. Massa in a mauris mattis dui interdum vitae aptent etiam nec nullam. Interdum dui adipiscing adipiscing tellus at. Ut orci ut. Lorem in nullam amet interdum commodo. Tempor sed facilisis. Nostra pretium non. Felis mauris porttitor. Velit malesuada volutpat non ut volutpat.

Massa eget aliquam. Sed consequat magna. Mauris ut hymenaeos. Dapibus mauris ut. Felis non ut. Libero nunc elementum. Ante et quam et dui tincidunt vitae arcu suspendisse suspendisse id in. Euismod pede eget erat quis libero. Enim lorem et. Elit elit libero felis ligula ut.

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Per aliquam diam natoque scelerisque pharetra. Leo at non donec justo et eu blandit malesuada. Eu erat mi. Nulla et nam. Leo fusce cubilia ultricies laoreet orci elit nec in. Libero nunc elementum.

**Assessment guidance** – gives examples of the quality of work needed to differentiate the standard of work submitted. It also offers suggestions for creative and innovative ways in which learners can produce evidence to meet the criteria. The guidance highlights approaches and strategies for developing appropriate evidence.

**Suggested assignment outlines** – gives examples of possible assignment ideas. These are not mandatory. Your centre is free to adapt them, or you can design your own assignment tasks.

UNIT X: TITLE

### Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1, 1A.2, 2A.P1, 2A.P2, 2A.M1, 2A.M2, 2A.D1	Phasellus purus maecenas tortor	Euismod pede eget erat quis libero. Enim lorem et. Elit elit libero felis ligula ut. Lectus donec non dignissim eros sed ornare condimentum condimentum quis risus dui.	Pulvinar donec.
1B.3, 1B.4, 1C.5, 2B.P3, 2B.P4, 2C.P5, 2B.M3, 2C.M4, 2B.D2, 2C.D3	Massa in a mauris mattis dui amet interdum	In cursus ac sem in urna. Massa in a mauris mattis dui interdum vitae aptent etiam nec nullam. Interdum dui adipiscing adipiscing tellus at. Ut orci ut. Lorem in nullam amet interdum commodo. Felis mauris porttitor. Sonsequat magna. Mauris ut hymenaeos.	Felis mauris porttitor. Velit malesuada volutpat non ut volutpat. Massa bibendum nullas. Interdum.

## 8 Internal assessment

### Language of assessment

Assessment of the internal and external units for this qualification will be available in English. All learner work must be in English.

A learner taking the qualification may be assessed in British or Irish Sign Language where it is permitted for the purpose of reasonable adjustment.

### Summary of internal assessment

For the Pearson BTEC Level 1/Level 2 First qualifications, the majority of the units are assessed through internal assessment, which means that you can deliver the programme in a way that suits your learners and relates to local need. The way in which you deliver the programme must also ensure that assessment is fair and that standards are nationally consistent over time.

To achieve this, it is important that you:

- plan the assessment of units to fit with delivery, allowing for the linkages between units
- write suitable assessments (for example, assignments, projects or case studies) or select assessments from available resources, adapting them as necessary
- plan the assessment for each unit in terms of when it will be authorised by the Lead Internal Verifier, when it will be used and assessed, and how long it will take, and how you will determine that learners are ready to begin an assessment
- ensure each assessment is fit for purpose, valid, will deliver reliable assessment outcomes across assessors, and is authorised before use
- provide all the preparation, feedback and support that learners need to undertake an assessment before they begin producing their evidence
- make careful and consistent assessment decisions based only on the defined assessment criteria and unit requirements
- validate and record assessment decisions carefully and completely
- work closely with Pearson to ensure that your implementation, delivery and assessment is consistent with national standards.

### Assessment and verification roles

There are three key roles involved in implementing assessment processes in your school or college, namely:

- Lead Internal Verifier
- Internal Verifier – the need for an Internal Verifier or Internal Verifiers in addition to the Lead Internal Verifier is dependent on the size of the programme in terms of assessment locations, number of assessors and optional paths taken. Further guidance can be obtained from your Regional Quality Manager or Centre Quality Reviewer if you are unsure about the requirements for your centre
- assessor.

**The Lead Internal Verifier** must be registered with Pearson and is required to train and standardise assessors and Internal Verifiers using materials provided by Pearson that demonstrate the application of standards. In addition, the Lead Internal Verifier should provide general support. The Lead Internal Verifier:

- has overall responsibility for the programme assessment plan, including the duration of assessment and completion of verification
- can be responsible for more than one programme
- ensures that there are valid assessment instruments for each unit in the programme
- ensures that relevant assessment documentation is available and used for each unit
- is responsible for the standardisation of assessors and Internal Verifiers using Pearson-approved materials
- authorises individual assessments as fit for purpose
- checks samples of assessment decisions by individual assessors and Internal Verifiers to validate that standards are being correctly applied
- ensures the implementation of all general assessment policies developed by the centre for BTEC qualifications
- has responsibility for ensuring learner work is authenticated
- liaises with Pearson, including the Pearson Standards Verifier.

**Internal Verifiers** must oversee all assessment activity to make sure that individual assessors do not misinterpret the specification or undertake assessment that is not consistent with the national standard in respect of level, content or duration of assessment. The process for ensuring that assessment is being conducted correctly is called internal verification. Normally, a programme team will work together with individuals being both assessors and Internal Verifiers, with the team leader or programme manager often being the registered Lead Internal Verifier.

Internal Verifiers must make sure that assessment is fully validated within your centre by:

- checking every assessment instrument carefully and endorsing it before it is used
- ensuring that each learner is assessed carefully and thoroughly using only the relevant assessment criteria and associated guidance within the specification
- ensuring the decisions of every assessor for each unit at all grades and for all learners are in line with national standards.

**Assessors** make assessment decisions and must be standardised using Pearson-approved materials before making any assessment decisions. They are usually the teachers within your school or college, but the term 'assessor' refers to the specific responsibility for carrying out assessment and making sure that it is done in a way that is correct and consistent with national standards. Assessors may also draft or adapt internal assessment instruments.

You are required to keep records of assessment and have assessment authorised by Pearson. The main records are:

- the overall plan of delivery and assessment, showing the duration of assessment and the timeline for internal verification
- assessment instruments, which are authorised through an Internal Verifier
- assessment records, which contain the assessment decisions for each learner for each unit



- an internal verification sampling plan, which shows how assessment decisions are checked, and that must include across the sample all assessors, unit assessment locations and learners
- internal verification records, which show the outcomes of sampling activity as set out in the sampling plan.

## Learner preparation

Internal assessment is the main form of assessment for this qualification, so preparing your learners for it is very important because they:

- must be prepared for and motivated to work consistently and independently to achieve the requirements of the qualification
- need to understand how they will be assessed and the importance of timescales and deadlines
- need to appreciate fully that all the work submitted for assessment must be their own.

You will need to provide learners with an induction and a guide or handbook to cover:

- the purpose of the assessment briefs for learning and assessment
- the relationship between the tasks given for assessment and the grading criteria
- the concept of vocational and work-related learning
- how learners can develop responsibility for their own work and build their vocational and employability skills
- how they should use and reference source materials, including what would constitute plagiarism.

## Designing assessment instruments

An assessment instrument is any kind of activity or task that is developed for the sole purpose of assessing learning against the learning aims. When you develop assessment instruments you will often be planning them as a way to develop learners' skills and understanding. However, they must be fit for purpose as a tool to measure learning against the defined content and assessment criteria to ensure your final assessment decisions meet the national standard.

You should make sure that assessment tasks and activities enable learners to produce valid, sufficient, authentic and appropriate evidence that relates directly to the specified criteria within the context of the learning aims and unit content. You need to ensure that the generation of evidence is carefully monitored, controlled and produced in an appropriate timescale. This will help you to make sure that learners are achieving to the best of their ability and at the same time that the evidence is genuinely their own.

An assessment that is fit for purpose and suitably controlled is one in which:

- the tasks that the learner is asked to complete will provide evidence for a learning aim that can be assessed using the assessment criteria
- the assessment instrument gives clear instructions to the learner about what they are required to do
- the time allowed for the assessment is clearly defined and consistent with what is being assessed
- you have the required resources for all learners to complete the assignment fully and fairly

- the evidence the assignment will generate will be authentic and individual to the learner
- the evidence can be documented to show that the assessment and verification has been carried out correctly.

You may develop assessments that cover a whole unit, parts of a unit or several units, provided that all units and their associated learning aims are fully addressed through the programme overall. A learning aim **must** be covered completely in an assessment. Learning aim coverage must not be split between assignments. In some cases it may be appropriate to cover a learning aim with two tasks or sub-tasks within a single assignment. This must be done with care to ensure the evidence produced for each task can be judged against the full range of achievement available in the learning aim for each activity. This means it is not acceptable to have a task that contains a Pass level activity, then a subsequent task that targets a Merit or Distinction level activity. However, it is possible to have two tasks for different assessed activities, each of which stretch and challenge the learners to aim to produce evidence that can be judged against the full range of available criteria.

When you give an assessment to learners, it must include:

- a clear title and/or reference so that the learner knows which assessment it is
- the unit(s) and learning aim(s) being addressed
- a scenario, context, brief or application for the task
- task(s) that enable the generation of evidence that can be assessed against the assessment criteria
- details of the evidence that the learner must produce
- clear timings and deadlines for carrying out tasks and providing evidence.

Your assessment tasks should enable the evidence generated to be judged against the full range of assessment criteria; it is important the learners are given the opportunity for stretch and challenge.

The units include guidance on appropriate approaches to assessment. A central feature of vocational assessment is that it should be:

- current, i.e. it reflects the most recent developments and issues
- local, i.e. it reflects the employment context of your area
- flexible, i.e. it allows you as a centre to deliver the programme, making best use of the vocational resources that you have
- consistent with national standards, with regard to the level of demand.

Your centre should use the assessment guidance within units along with your local resource availability and guidance to develop appropriate assessments. It is acceptable to use and adapt resources to meet learner needs and the local employment context.

You need to make sure that the type of evidence generated fits with the unit requirement, that it is vocational in nature, and that the context in which the assessment is set is in line with unit assessment guidance and content. For many units, this will mean providing for the practical demonstration of skills. For many learning aims, you will be able to select an appropriate vocational format for evidence generation, such as:

- written reports, graphs, posters
- projects, project plans
- time-constrained practical assessments
- audio-visual recordings of portfolio, sketchbook, a working logbook, etc
- presentations.

## Authenticity and authentication

You can accept only evidence for assessment that is authentic, i.e. that is the learner's own and that can be judged fully to see whether it meets the assessment criteria.

You should ensure that authenticity is considered when setting assignments. For example, ensuring that each learner has a different focus for research will reduce opportunities for copying or collaboration. On some occasions it will be useful to include supervised production of evidence. Where appropriate, practical activities or performance observed by the assessor should be included.

Learners must authenticate the evidence that they provide for assessment. They do this by signing a declaration stating that it is their own work when they submit it to certify:

- the evidence submitted for this assignment is the learner's own
- the learner has clearly referenced any sources used in the work
- they understand that false declaration is a form of malpractice.

Your assessors should assess only learner evidence that is authentic. If they find through the assessment process that some or all of the evidence is not authentic, they need to take appropriate action, including invoking malpractice policies as required.

It is important that all evidence can be validated through verification. This means that it must be capable of being reassessed in full by another person. When you are using practical and performance evidence, you need to think about how supporting evidence can be captured through using, for example, videos, recordings, photographs, handouts, task sheets, etc. This should be submitted as part of the learner's evidence.

The authentication of learner evidence is the responsibility of your centre. If during external sampling a Pearson Standards Verifier raises concerns about the authenticity of evidence, your centre will be required to investigate further. Depending on the outcomes, penalties may be applied. At the end of this section, you can find an example of a template that can be used to record the declaration of learners in relation to the authenticity of the evidence presented for assessment.

## Applying criteria to internal assessments

Each unit and learning aim has specified assessment criteria. Your centre should use these criteria for assessing the quality of the evidence provided. This determines the grade awarded.

Unless specifically indicated by the assessment guidance, assessment criteria are not a set of sequential activities but a way of making a judgement. For example, if a Level 2 Pass specifies a 'description' and a Merit an 'analysis', these do not require two different activities but rather one activity through which some learners will provide only description evidence and others will also provide analysis evidence. The assessment criteria are hierarchical. A learner can achieve a Merit only if they provide sufficient evidence for the Level 2 Pass and Merit criteria. Similarly, a learner can achieve a Distinction only if they give sufficient evidence for the Level 2 Pass, Merit and Distinction criteria.

A final unit grade is awarded after all opportunities for achievement are given.

A learner must achieve all the assessment criteria for that grade. Therefore:

- to achieve a Level 2 Distinction a learner must have satisfied all the Distinction criteria in a way that encompasses all the Level 2 Pass, Merit and Distinction criteria, providing evidence of performance of outstanding depth, quality or application
- to achieve a Level 2 Merit a learner must have satisfied all the Merit criteria in a way that encompasses all the Level 2 Pass and Merit criteria, providing performance of enhanced depth or quality
- to achieve a Level 2 Pass a learner must have satisfied all the Level 2 Pass criteria, showing breadth of coverage of the required unit content and having relevant knowledge, understanding and skills
- a learner can be awarded a Level 1 if the Level 1 criteria are fully met. A Level 1 criterion is not achieved through failure to meet the Level 2 Pass criteria.

A learner who does not achieve all the assessment criteria at Level 1 has not passed the unit and should be given a grade of U (Unclassified).

A learner must achieve all the defined learning aims to pass the internally assessed units. There is no compensation within the unit.

## Assessment decisions

Final assessment is the culmination of the learning and assessment process. Learners should be given a full opportunity to show how they have achieved the learning aims covered by a final assessment. This is achieved by ensuring that learners have received all necessary learning, preparation and feedback on their performance and then confirming that they understand the requirements of an assessment, before any assessed activities begin.

There will then be a clear assessment outcome based on the defined assessment criteria. Your assessment plan will set a clear timeline for assessment decisions to be reached. Once an assessment has begun, learners must not be given feedback on progress towards criteria. After the final assignment is submitted, an assessment decision must be given.

An assessment decision:

- must be made with reference to the assessment criteria
- should record how it has been reached, indicating how or where criteria have been achieved
- may indicate why attainment against criteria has not been demonstrated
- must not provide feedback on how to improve evidence to meet higher criteria.

Your Internal Verifiers and assessors must work together to ensure that assessment decisions are reached promptly and validated before they are given to the learner.

## Late submission

You should encourage learners to understand the importance of deadlines and of handing work in on time. For assessment purposes it is important that learners are assessed fairly and consistently according to the assessment plan that the Lead Internal Verifier has authorised and that some learners are not advantaged by having additional time to complete assignments. You are not required to accept for assessment work that was not completed by the date in the assessment plan.

Learners may be given authorised extensions for legitimate reasons, such as illness at the time of submission. If you accept a late completion by a learner, the evidence should be assessed normally, unless it is judged to not meet the requirements for authenticity. It is not appropriate, however, to give automatic downgrades on assessment decisions as 'punishment' for late submission.

## Resubmission of improved evidence

Once an assessment decision is given to a learner, it is final in all cases except where the Lead Internal Verifier approves **one** opportunity to resubmit improved evidence.

The criteria used to authorise a resubmission opportunity are always:

- initial deadlines or agreed extensions have been met
- the tutor considers that the learner will be able to provide improved evidence without further guidance
- the evidence submitted for assessment has been authenticated by the learner and the assessor
- the original assessment can remain valid
- the original evidence can be extended and re-authenticated.

Your centre will need to provide a specific resubmission opportunity that is authorised by the Lead Internal Verifier. Any resubmission opportunity must have a deadline that is within 10 working days of the assessment decision being given to the learner, and within the same academic year. You should make arrangements for resubmitting the evidence for assessment in such a way that it does not adversely affect other assessments and does not give the learner an unfair advantage over other learners.

You need to consider how the further assessment opportunity ensures that assessment remains fit for purpose and in line with the original requirements; for example, you may opt for learners to improve their evidence under supervised conditions, even if this was not necessary for the original assessment, to ensure that plagiarism cannot take place. How you provide opportunities to improve and resubmit evidence for assessment needs to be fair to all learners. Care must be taken when setting assignments and at the point of final assessment to ensure that the original evidence for assessment can remain valid and can be extended. The learner must not have further guidance and support in producing further evidence. The Standards Verifier will want to include evidence that has been resubmitted as part of the sample they will review.

## **Appeals**

Your centre must have a policy for dealing with appeals from learners. These appeals may relate to assessment decisions being incorrect or assessment not being conducted fairly. The first step in such a policy would be a consideration of the evidence by a Lead Internal Verifier or other member of the programme team. The assessment plan should allow time for potential appeals after assessment decisions have been given to learners.

If there is an appeal by a learner you must document the appeal and its resolution.

## **Dealing with malpractice**

Your centre must have a policy for dealing with potential malpractice by learners. Your policy must follow the Pearson Assessment Malpractice policy. You must report serious malpractice to Pearson, particularly if any units have been subject to quality assurance or certification.

## **Reasonable adjustments to assessment**

You are able to make adjustments to assessments to take account of the needs of individual learners in line with Pearson's Reasonable Adjustments and Special Considerations policy. In most instances this can be achieved simply by application of the policy, for example to extend time or adjust the format of evidence. We can advise you if you are uncertain as to whether an adjustment is fair and reasonable.

## **Special consideration**

You must operate special consideration in line with Pearson's Reasonable Adjustments and Special Considerations policy. You can provide special consideration only in the time given for evidence to be provided or for the format of the assessment if it is equally valid. You may not substitute alternative forms of evidence to that required in a unit, or omit the application of any assessment criteria to judge attainment. Pearson can consider applications for special consideration in line with the policy.

(Exemplar for centres)

## Learner Assessment Submission and Declaration

**This sheet must be completed by the learner and provided for work submitted for assessment.**

Learner name:		Assessor name:	
Date issued:	Completion date:	Submitted on:	
Qualification:			
Assessment reference and title:			

Please list the evidence submitted for each task. Indicate the page numbers where the evidence can be found or describe the nature of the evidence (e.g. video, illustration).

Task ref.	Evidence submitted	Page numbers or description
Comments for note by the assessor:		

### Learner declaration

I certify that the work submitted for this assignment is my own. I have clearly referenced any sources used in the work. I understand that false declaration is a form of malpractice.

Learner signature:

Date:

---

## 9 External assessment

Externally assessed units have the same grades as internally assessed units:

- Level 2 – Pass, Merit, Distinction
- Level 1
- Unclassified.

The table below shows the type of external assessment and assessment availability for these qualifications.

<b>Unit 1: The Online World</b>	
Type of external assessment	This unit is externally assessed using an onscreen test. Edexcel sets and marks the test. The assessment must be taken by the learner under examination conditions.
Length of assessment	The external assessment will be 1 hour.
No. of marks	50 marks
Assessment availability	On-demand
First assessment availability	June 2013

<b>Unit 2: Technology Systems</b>	
Type of external assessment	This unit is externally assessed using an onscreen test. Edexcel sets and marks the test. The assessment must be taken by the learner under examination conditions.
Length of assessment	The external assessment will be 1 hour.
No. of marks	50 marks
Assessment availability	On demand
First assessment availability	June 2013

Your centre needs to make sure that learners are:

- fully prepared to sit the external assessment
- entered for assessments at appropriate times, with due regard for resit opportunities as necessary.

Sample assessment materials will be available to help centres prepare learners for assessment. Specific arrangements for external assessment are available before the start of each academic year on our website [www.edexcel.com](http://www.edexcel.com)



## Grade descriptors for the internal and external units

### Internal units

Each internally assessed unit has specific assessment criteria that your centre must use to judge learner work in order to arrive at a grading decision for the unit as a whole. For internally assessed units, the assessor judges the evidence that the learner has presented to determine whether it meets all the relevant criteria, and then awards a grade at the appropriate level.

The criteria are arrived at with reference to the following grading characteristics:

- applying knowledge and understanding in vocational and realistic contexts, with reference to relevant concepts and processes, to achieve tasks, produce outcomes and review the success of outcomes
- developing and applying practical and technical skills, acting with increasing independence to select and apply skills through processes and with effective use of resources to achieve, explain and review the success of intended outcomes
- developing generic skills for work through management of self, working in a team, the use of a variety of relevant communication and presentation skills, and the development of critical thinking skills relevant to vocational contexts.

### External units

The externally assessed units are assessed using a marks-based scheme. For each external assessment, grade boundaries, based on learner performance, will be set by the awarding organisation.

The following criteria are used in the setting and awarding of the external units.

#### Level 2 Pass

Learners will be able to recall and apply knowledge of information technology and creative technology. They will have a sound knowledge of key terms, processes, computer hardware and computer software, and will be able to apply their knowledge and understanding appropriately. They will be able to define and communicate key aspects of technical knowledge, selecting appropriate actions in more simple and familiar contexts. They will be able to relate their knowledge and understanding to vocational contexts, making some decisions on valid application and impact.

#### Level 2 Distinction

Learners will be able to synthesise knowledge of information technology and creative technology, bringing together understanding of their uses and limitations and applying them to sometimes complex contexts in defined vocational scenarios. They show depth of knowledge of the technical components of computing systems and relevant process. Learners understand how and when to use their knowledge in different situations, being able to make effective judgements based on analysis of given information. They are able to analyse information and data, selecting the most relevant concepts and making valid decisions about the selection and application of systems and software. They can judge the consequences of effective and ineffective uses of computer systems and software, and make recommendations on solutions and future actions. They can compare methods and approaches used to construct, use and apply computer systems, and evaluate alternatives against defined criteria.

## 10 Awarding and reporting for the qualification

The awarding and certification of these qualifications will comply with the requirements of the Office of Qualifications and Examinations Regulation (Ofqual).

### Calculation of the qualification grade

These qualifications are level 2 qualifications, and the certification for each qualification may show a grade ranging from Level 2 PP to Level 2 D\*D\*. (Please refer to the *Calculation of qualification grade* table for the full list of grades.†)

If these are not achieved, a Level 1 grade may be awarded. Learners whose level of achievement is below a Level 1 will receive an Unclassified (U) result.

The qualification grade is calculated on the basis of grades in individual units. Each unit will be awarded a grade of Level 2 Pass, Level 2 Merit, Level 2 Distinction or Level 1. Learners whose level of achievement is below a Level 1 will receive an Unclassified (U) for that unit. There is no unit grade of D\*; grades of D\*D and D\*D\* can be awarded as an aggregated grade for the qualification based on the learner's overall performance. In order to achieve this grade, learners will have to demonstrate a strong performance across the qualification as a whole.

To achieve a level 2 qualification, learners must:

- complete and report an outcome for all units within the permitted combination (NB Unclassified is a permitted unit outcome), **and**
- have sufficient points across Unit 3 and either Unit 1 or Unit 2, i.e. a minimum of 24 points, **and**
- achieve the minimum number of points at a grade threshold from the permitted combination. (See the *Calculation of qualification grade* table. For comparison, the table includes all qualification sizes in the suite.)

Learners who do not achieve a Level 2 may be entitled to achieve a Level 1 where they:

- complete and report an outcome for all units within the permitted combination (NB Unclassified is a permitted unit outcome), **and**
- have sufficient points across Unit 3 and either Unit 1 or Unit 2, i.e. a minimum of 12 points, **and**
- achieve the minimum number of points for a Level 1. (See the *Calculation of qualification grade* table. For comparison, the table includes all qualification sizes in the suite.)

Learners who fail to reach the minimum standard for a Level 1 to be awarded will be recorded as Unclassified (U) and will not be certificated.

It is the responsibility of a centre to ensure that the correct unit combination is adhered to.

Learners who do not achieve sufficient points for the Certificate or Extended Certificate qualifications may be eligible to achieve the Award provided they have sufficient points across the core units, have completed the correct combination of units and meet the appropriate qualification grade points threshold.

† The *Calculation of qualification grade* table provides centres with guidance on the performance levels expected for the award of individual grades. Grade thresholds may be reviewed based on unit grade performance.

Please see *Annexe E* for the structure of the BTEC Level 1/Level 2 First Award in Information and Creative Technology qualification **and** the latest version of the Edexcel BTEC Level 1/Level 2 First Award in Information and Creative Technology specification on our website ([www.edexcel.com](http://www.edexcel.com)).

### Points available for unit size and grades

The table below shows the **number of points scored per 10 guided learning hours** at each grade.

Points per grade per 10 guided learning hours				
Unclassified	Level 1	Level 2 Pass (P)	Level 2 Merit (M)	Level 2 Distinction (D)
0	2	4	6	8

Edexcel will automatically calculate the qualification grade for your learners when your learner unit grades are submitted. Learners will be awarded qualification grades for achieving the sufficient number of points within the ranges shown in the *Calculation of qualification grade* table.

Example:

A learner achieves a Level 2 Pass grade for a unit. The unit size is 30 guided learning hours (GLH). Therefore they gain 12 points for that unit, i.e. 4 points for each 10 GLH, therefore 12 points for 30 GLH.

## Calculation of qualification grade

Award		Certificate		Extended Certificate		Diploma	
(120 GLH)		(240 GLH)		(360 GLH)		(480 GLH)	
Grade	Points threshold	Grade	Points threshold	Grade	Points threshold	Grade	Points threshold
U	0	U	0	U	0	U	0
Level 1	24	Level 1	48	Level 1	72	Level 1	96
Level 2 Pass	48	Level 2 PP	96	Level 2 PP	144	Level 2 PP	192
		Level 2 MP	114	Level 2 MP	174	Level 2 MP	234
Level 2 Merit	66	Level 2 MM	132	Level 2 MM	204	Level 2 MM	276
		Level 2 DM	150	Level 2 DM	234	Level 2 DM	318
Level 2 Distinction	84	Level 2 DD	168	Level 2 DD	264	Level 2 DD	360
		Level 2 D*D	174	Level 2 D*D	270	Level 2 D*D	366
Level 2 Distinction*	90	Level 2 D*D*	180	Level 2 D*D*	276	Level 2 D*D*	372

The tables below give examples of how the overall grade is determined. Numbering is for illustrative purposes only.

### Example 1

#### Achievement of a Certificate with a Level 2 MM grade

	GLH	Weighting (GLH/10)	Grade	Grade points	Points per unit (weighting × grade points)	
Unit 1	30	3	Level 2 Merit	6	18	The learner has more than sufficient points across the core units to be considered for a Level 2
Unit 2	30	3	Level 2 Pass	4	12	
Unit 3	30	3	Level 2 Merit	6	18	
Unit 4	30	3	Level 2 Merit	6	18	
Unit 5	30	3	Level 2 Merit	6	18	
Unit 6	30	3	Level 2 Pass	4	12	
Unit 7	60	6	Level 2 Distinction	8	48	
<b>Qualification grade totals</b>	<b>240</b>	<b>24</b>	<b>Level 2 MM</b>		<b>144</b>	

The learner has sufficient points for a Level 2 MM grade

### Example 2

#### Achievement of a Certificate with a Level 2 D\*D grade

	GLH	Weighting (GLH/10)	Grade	Grade points	Points per unit (weighting × grade points)	
Unit 1	30	3	Level 2 Merit	6	18	The learner has more than sufficient points across the core units to be considered for a Level 2
Unit 2	30	3	Level 2 Distinction	8	24	
Unit 3	30	3	Level 2 Merit	6	18	
Unit 4	30	3	Level 2 Distinction	8	24	
Unit 5	30	3	Level 2 Merit	6	18	
Unit 6	30	3	Level 2 Distinction	8	24	
Unit 7	60	6	Level 2 Distinction	8	48	
<b>Qualification grade totals</b>	<b>240</b>	<b>24</b>	<b>Level 2 D*D</b>		<b>174</b>	

The learner has sufficient points for a Level 2 D\*D grade.

**Example 3****Achievement of an Extended Certificate with a Level 2 MP grade**

	GLH	Weighting (GLH/10)	Grade	Grade points	Points per unit (weighting × grade points)
Unit 1	30	3	Level 2 Pass	4	12
Unit 2	30	3	Level 2 Pass	4	12
Unit 3	30	3	Level 2 Merit	6	18
Unit 4	30	3	Level 2 Pass	4	12
Unit 5	30	3	Level 2 Merit	6	18
Unit 6	30	3	Level 2 Distinction	8	24
Unit 7	60	6	Level 2 Pass	4	24
Unit 8	30	3	Level 2 Merit	6	18
Unit 9	30	3	Level 2 Merit	6	18
Unit 10	60	6	Level 2 Pass	4	24
<b>Qualification grade totals</b>	<b>360</b>	<b>36</b>	<b>Level 2 MP</b>		<b>180</b>

The learner has sufficient points across the core units to be considered for a Level 2

The learner has sufficient points for a Level 2 MP grade.

**Example 4****Achievement of an Extended Certificate at Level 1 but a Level 2 PP grade points total**

	GLH	Weighting (GLH/10)	Grade	Grade points	Points per unit (weighting × grade points)
Unit 1	30	3	Unclassified	0	0
Unit 2	30	3	Level 2 Pass	4	12
Unit 3	30	3	Level 1	2	6
Unit 4	30	3	Level 2 Pass	4	12
Unit 5	30	3	Level 2 Merit	6	18
Unit 6	30	3	Level 2 Distinction	8	24
Unit 7	60	6	Level 2 Pass	4	24
Unit 8	30	3	Level 2 Merit	6	18
Unit 9	30	3	Level 2 Merit	6	18
Unit 10	60	6	Level 2 Merit	6	36
<b>Qualification grade totals</b>	<b>360</b>	<b>36</b>	<b>Level 1</b>		<b>168</b>

The learner has not achieved sufficient points across the core units to achieve a Level 2 but has sufficient points to be considered for a Level 1.

Although the learner has gained a significant number of points, they will achieve a Level 1 as they did not gain sufficient points across the core units for a Level 2 grade.

# 11 Quality assurance of centres

Edexcel will produce on an annual basis the *BTEC Quality Assurance Handbook*, which will contain detailed guidance on the quality processes required to underpin robust assessment and internal verification.

The key principles of quality assurance are that:

- a centre delivering BTEC programmes must be an approved centre, and must have approval for the programmes or groups of programmes that it is delivering
- the centre agrees, as part of gaining approval, to abide by specific terms and conditions around the effective delivery and quality assurance of assessment; it must abide by these conditions throughout the period of delivery
- Edexcel makes available to approved centres a range of materials and opportunities, through online standardisation, intended to exemplify the processes required for effective assessment, and examples of effective standards. Approved centres must use the materials and services to ensure that all staff delivering BTEC qualifications keep up to date with the guidance on assessment
- an approved centre must follow agreed protocols for standardisation of assessors and verifiers, for the planning, monitoring and recording of assessment processes, and for dealing with special circumstances, appeals and malpractice.

The approach of quality-assured assessment is through a partnership between an approved centre and Edexcel. We will make sure that each centre follows best practice and employs appropriate technology to support quality-assurance processes, where practicable. We work to support centres and seek to make sure that our quality-assurance processes do not place undue bureaucratic processes on centres.

We monitor and support centres in the effective operation of assessment and quality assurance. The methods we use to do this for BTEC First programmes include:

- making sure that all centres complete appropriate declarations at the time of approval
- undertaking approval visits to centres
- making sure that centres have effective teams of assessors and verifiers who are trained to undertake assessment
- assessment sampling and verification, through requested samples of assessments, completed assessed learner work and associated documentation
- an overarching review and assessment of a centre's strategy for assessing and quality assuring its BTEC programmes.

An approved centre must make certification claims only when authorised by us and strictly in accordance with requirements for reporting.

Centres that do not fully address and maintain rigorous approaches to quality assurance cannot seek certification for individual programmes or for all BTEC First programmes. Centres that do not comply with remedial action plans may have their approval to deliver qualifications removed.

## 12 Further information and useful publications

For further information about the qualifications featured in this specification, or other Edexcel qualifications, please call Customer Services on 0844 576 0026 (calls may be monitored for quality and training purposes) or visit our website ([www.edexcel.com](http://www.edexcel.com)).

Related information and publications include:

- *Equality Policy*
- *Information Manual* (updated annually)
- *Access arrangements, reasonable adjustments and special considerations*
- *Quality Assurance Handbook* (updated annually)
  - Publications on the quality assurance of BTEC qualifications are on our website at [www.btec.co.uk/keydocuments](http://www.btec.co.uk/keydocuments)

Our publications catalogue lists all the material available to support our qualifications. To access the catalogue and order publications, please go to [www.edexcel.com/resources](http://www.edexcel.com/resources)

### Additional documentation

Additional materials include:

- Sample Assessment Material (for the external units)
- A guide to *Getting Started with BTEC*
- Guides to our support for planning, delivery and assessment (including sample assignment briefs).

Visit [www.btec.co.uk/2012](http://www.btec.co.uk/2012) for more information.

### Additional resources

If you need to source further learning and teaching material to support planning and delivery for your learners, there is a wide range of BTEC resources available to you.

Any publisher can seek endorsement for their resources, and, if they are successful, we will list their BTEC resources on our website [www.edexcel.com/resources](http://www.edexcel.com/resources)



## 13 Professional development and support

Edexcel supports UK and international customers with training related to BTEC qualifications. This support is available through a choice of training options offered in our published training directory, or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing learner-centred learning and teaching approaches
- building functional skills into your programme
- building in effective and efficient quality-assurance systems.

The national programme of training we offer is on our website at [www.edexcel.com/training](http://www.edexcel.com/training). You can request customised training through the website or you can contact one of our advisors in the Training from Edexcel team via Customer Services to discuss your training needs.

### BTEC training and support for the lifetime of the qualifications

**Training and networks:** our training programme ranges from free introductory events through sector-specific opportunities to detailed training on all aspects of delivery, assignments and assessment. In addition, we have designed our new network events programme to allow you to share your experiences, ideas and best practice with other BTEC colleagues in your region. Sign up to the training you need at: [www.btec.co.uk/training](http://www.btec.co.uk/training)

**Regional support:** our team of Curriculum Development Managers and Curriculum Support Consultants, based around the country, are responsible for providing advice and support in centres. They can help you with planning and curriculum developments. Call **0844 576 0027** to contact the curriculum team for your centre.

### Your BTEC Support team

Whether you want to talk to a sector specialist, browse online or submit your query for an individual response, there is someone in our BTEC Support team to help you whenever – and however – you need, with:

- Welcome Packs for new BTEC centres: if you are delivering BTEC for the first time, we will send you a sector-specific Welcome Pack designed to help you get started with these qualifications
- Subject Advisors: find out more about our subject advisor team – immediate, reliable support from a fellow subject expert – at: [www.edexcel.com/subjectadvisors](http://www.edexcel.com/subjectadvisors)
- BTEC Hotline: call the BTEC Hotline on 0844 576 0026 with your query
- Ask Edexcel: submit your question online to our Ask Edexcel online service ([www.edexcel.com/ask](http://www.edexcel.com/ask)) and we will make sure your query is handled by a subject specialist.



# Units



# Unit 1: The Online World

Level: **1 and 2**

Unit type: **Core/Mandatory**

Guided learning hours: **30**

Assessment type: **External**

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## Unit introduction

How do websites work? How do emails reach your computer? How does the use of computer applications affect your daily life? This unit provides an introduction to the modern online world. Starting with your own experiences, you will extend your knowledge of online services and investigate the technology and software that supports them. You will learn more about a range of services including email, online data storage, collaborative software, search engines and blogging.

This unit will help you understand the main technologies and processes behind the internet and investigate how they come together to let you view websites and send information across the world. The internet and web of tomorrow will be even more powerful, more connected, more intuitive and a more important part of our lives. This will result in an internet of services, objects and infrastructure (ubiquitous computing) which will radically change our lives. For example, smart appliances will be able to talk to each other, clothes will monitor our health and retailers will access social media to gain insight into shoppers' preferences.

You will explore a range of digital devices, such as smart phones and digital music players and consider the technology that enables these devices to share and exchange information.

This technology has created new concerns regarding security and privacy. You will investigate these concerns and consider how users should behave online to safeguard themselves and respect others.

This unit is essential if you are considering a career in the IT sector. Online systems and technology have become part of everyday work, so being able to understand and work with this technology is relevant in many roles in the industry.

This unit supports all of the optional specialist units in the Award, especially: *Unit 4: Creating Digital Animation*, *Unit 5: Creating Digital Audio*, *Unit 6: Creating Digital Graphics*, and *Unit 7: Creating Digital Video*. It also supports *Unit 8: Mobile Apps Development*, *Unit 9: Spreadsheet Development*, *Unit 10: Database Development*, *Unit 11: Computer Networks* and *Unit 13: Website Development*, as these technologies form an important part of our online world.

## Learning aims

In this unit you will:

- A investigate online services and online communication
- B investigate components of the internet and how digital devices exchange and store information
- C investigate issues with operating online.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Investigate online services and online communication</b></p> <p><b>Online services</b></p> <p>Understand how and why online services can be used.</p> <p>Examples of online services, include:</p> <ul style="list-style-type: none"> <li>• communication (email, instant messaging, newsgroups, social networking, online conferencing, blogs)</li> <li>• real-time information (train timetables, news services, traffic reports, flight status updates, weather)</li> <li>• commerce (internet banking, online auction websites, retail sales, publishing)</li> <li>• government (online tax returns, e-voting, applications for services/grants, revenue collection)</li> <li>• education (online learning/training)</li> <li>• virtual learning environments (VLEs)</li> <li>• business (video conferencing, collaborative working, business networks)</li> <li>• entertainment (multi-user games, radio players)</li> <li>• download services (music, film, upgrades, software).</li> </ul> <p>Understand:</p> <ul style="list-style-type: none"> <li>• the features of online advertising designed to capture attention and retain interest</li> <li>• the affiliate model of pay-per-click direction of traffic to websites</li> <li>• the services provided for online data storage including data backup, file access and file sharing.</li> </ul> <p><b>Online documents</b></p> <p>Understand online document systems, including:</p> <ul style="list-style-type: none"> <li>• the need to compress (.zip) files for download/upload</li> <li>• how files are compressed and expanded</li> <li>• the advantages of using online software to create documents, including collaborative working, sharing documents and automatic backup</li> <li>• comparing the use of online software with standalone software for the creation of documents</li> <li>• the need for version control, levels of access and file permissions, including read only, read/write and full control when sharing documents online.</li> </ul> <p style="text-align: right;"><i>continued</i></p>

## What needs to be learnt

### Online communication

Understand how and why online communication can be used, including:

- contemporary social media to publish and access information, including web logs (blogs), wikis and podcasting
- virtual learning environments (VLE) in education
- social networking websites to share information and build online communities.

Recognise and use appropriate key terms in online communication:

- netiquette
- profile
- network of friends
- online community
- virtual world
- chat
- chatroom.

Understand the implications of online communication:

- the advantages of using social networking websites for communication
- the use of instant messaging
- the client and server roles required to support instant messaging
- real-time communication over the internet using speech and live video, including Voice over Internet Protocol (VoIP) and web meeting/conferencing software

Understand and compare the issues involved when communicating and working online, including:

- the concept and implications of 'cloud computing', including cloud storage
- the concept, application of and implications of 'ubiquitous computing'.

Understand how ubiquitous computing systems/environments are the internet of objects. For example, when information processing has been thoroughly integrated into everyday objects and activities, such as a fridge that monitors supplies, stock control and location in a warehouse, office buildings that record where people are in the building, a plant watering system or a pet collar. Everyday objects in ubiquitous computing systems/environments usually contain RFID chips (radio frequency identification systems).

**What needs to be learnt****Learning aim B: Investigate components of the internet and how digital devices exchange and store information****The internet**

Understand what the internet is, how it works, and how it is structured, including:

- the internet as a global network of interconnected computers
- roles of Points of Presence (PoP) and Network Access Points (NAP) in the infrastructure of the internet.
- internet infrastructure in terms of clients, servers, routers, networks and connecting backbones
- when it is appropriate to use different internet connection methods including broadband, wireless and dial-up, and advantages and disadvantages of alternative connection methods
- Internet Protocols (IP), including Transmission Control Protocol (TCP) and File Transfer Protocol (FTP)
- the role of an Internet Service Provider (ISP)
- the main services offered by Internet Service Providers (ISPs) including email, web space, internet access and online support
- the relationship between bandwidth and transmission rates.

**Worldwide web**

Understand the concepts, functions and impact of the worldwide web (WWW), including:

- the worldwide web (WWW) as the collection of information on computers connected to the internet
- the role of a web server
- the structure of a website in terms of hyperlinked web pages.
- the components of a Uniform Resource Locator (URL) and the roles of each component
- the function of HyperText Transfer Protocol (HTTP)
- that HyperText Markup Language (HTML) is used to create web pages
- the main features of HyperText Markup Language (HTML) source code
- the role of internet browsers in requesting and displaying web page components
- the purpose of search engines and their role in maintaining indexes of web pages.

*continued*



## What needs to be learnt

### Email

Understand the purpose, concepts, processes and implications of email, including:

- email as a system for sending messages through the internet from user to user
- what happens to send an email
- the advantages of using email, including the ability to send attachments and to send the same email to more than one recipient
- email protocols including Simple Mail Transfer Protocol (SMTP), Post Office Protocol 3 (POP3), Internet Message Access Protocol (IMAP)
- the advantages and drawbacks of using email and webmail
- the 'store and forward' email model and describe its role in sending messages from user to user through the internet.

### Data exchange

Understand the concepts, processes and implications of data exchange and compare different methods, including:

- data exchange as the passing of data between computers in a network including the internet
- transmission modes (simplex, half-duplex and duplex) used by digital devices including smart phones, printers, computer processors, remote controllers (e.g. for TVs)
- the hardware and software required for real-time communication including Voice over Internet Protocol (VoIP) and web meeting/conferencing
- the role of a Coder/Decoder (CODEC) in the transmission of a VoIP, audio-file and video-file conversation
- main characteristics of alternative transmission methods, including:
  - fibre optic
  - wireless (infrared, microwave, satellite)
  - wire connectors
- parallel and serial transmission of data, and bi-directional transmission
- the benefits of packet switching as a method of sending data over a wide area network
- the contents of a packet as a group of bits that include packet identification, error control bits, coded data, destination address
- comparison of data transfer rates, effective ranges, and identify appropriate uses of different transmission methods, including:
  - fibre optic
  - wireless (infrared, microwave, satellite)
  - wire connectors.

*continued*

**What needs to be learnt**

Understand the concepts, structures and implications of wireless networks, including:

- the components of a wireless network including router, access points and wireless network adaptors
- client-side processing including the use of rollover images on a web page
- server-side processing including submitting a completed form on a web page
- the difference between client-side processing and server-side processing and examples of client-side and server-side processes.

**Data storage**

Understand the concepts, processes and implications of data storage, including:

- a database structure in terms of tables, records, fields, data types and relationships
- an online database such as a database that can be accessed via a network, including the internet
- the roles of a Database Management System (DBMS) and structured query languages in the manipulation of data stored in an online database.

**What needs to be learnt****Learning aim C: Investigate issues with operating online****Possible threats to data**

Understand the concepts, applications, process and implications regarding protecting data online, including:

- malicious and accidental damage to data and situations where either could occur
- security measures taken to protect data that is transmitted and stored digitally including encryption, firewalls and anti-virus software
- measures taken to protect the security and integrity of data, including passwords, levels of permitted access, firewalls and anti-virus software
- the need to backup data and identify and describe different procedures for backing up data.
- how data might be recovered if lost
- the benefits and possible inherent dangers of widespread use of social networking websites and instant messaging
- the importance to individuals of the management of their e-reputation
- security issues and consequences associated with the widespread use of email, including spread of viruses, phishing and identity theft.

Consider ways in which online technology can be used to monitor individuals' movements and communications.

In relation to IT systems, consider how current legislation controls how personal data can be used and must be protected by organisations.

## **Teacher guidance**

### **Resources**

There are no special resources needed for this unit.

### **Assessment guidance**

This unit is assessed using an onscreen test. Edexcel sets and marks the test. The test lasts for 1 hour and has 50 marks. The assessment is available on demand.

Learners will complete an onscreen test that has different types of questions including objective and short-answer questions. Where appropriate, questions will contain graphics, photos, animations or video. An onscreen calculator is available for questions requiring calculations. An onscreen notepad is available for making notes. Each item will have an accessibility panel that allows a learner to zoom in and out, and apply a colour filter.

Learners should be encouraged to keep up to date with emerging technology as part of their learning experience.

Centres are encouraged to be aware of developments in systems and technologies. In terms of assessment, we will issue updates annually in April to be taken into account during delivery from the following September. External assessments will reflect updates from the subsequent January.

# Unit 2: Technology Systems

Level: **1 and 2**

Unit type: **Core/Mandatory**

Guided learning hours: **30**

Assessment type: **External**

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## Unit introduction

Technology systems are involved in many of the objects we use every day, from a laptop computer and routers relaying internet traffic, to logging in to a social networking site. This unit provides a first look at how the main building blocks of technology systems work.

You will explore the common hardware components of technology systems, such as a touch screen or a printer, and the internal building blocks of a computer like the processor, buses and memory. The unit also covers the purpose of networks, which allow different devices within a technology system to communicate. (This topic is covered in more detail in *Unit 1: The Online World* and *Unit 11: Computer Networks*.)

No technology system is complete without the software that brings it to life. You will explore different types of software. These will include the operating system (OS) that supports the communication and management of resources, and utility programs that provide functionality to maintain the system.

You will also learn about the role of applications software, such as office programs, graphics packages, accounting software and CAD/CAM, that supports many aspects of everyday business life.

This unit supports all of the optional specialist units in the Award, especially *Unit 8: Mobile Apps Development*, *Unit 9: Spreadsheet Development*, *Unit 10: Database Development*, *Unit 11: Computer Networks*, *Unit 12: Software Development* and *Unit 13: Website Development*.

This unit is particularly useful if you are considering a career in the IT sector, as it includes key concepts and processes which form the basis of any technology system and is relevant for many roles in the industry.

## Learning aims

In this unit you will:

- A understand how the components of technology systems work together
- B understand how data flows between internal components of a computer and is processed to provide information
- C understand different types of software.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand how the components of technology systems work together</b></p> <p><b>Computer and technology systems</b> Understand the concepts:</p> <ul style="list-style-type: none"> <li>• a computer is a machine that processes digital data</li> <li>• a technology system is the complete collection of components (hardware, software, peripherals, power supplies, communication links) making up a single computer installation.</li> </ul> <p><b>Applications and issues of technology systems</b> Understand:</p> <ul style="list-style-type: none"> <li>• application of technology systems used in different sectors, including construction, finance, health, manufacturing (including CAD/CAM/use of robots) and retail</li> <li>• issues involved in the use of technology systems, including health and safety, security measures (passwords, authentication, levels of access), environmental, sustainability, privacy and copyright</li> <li>• reasons why future development of a technology system is important to organisations, including competitive advantage, reduced costs and improved performance.</li> </ul> <p><b>Computer hardware devices</b> Understand the features, uses and implications of hardware devices, including:</p> <ul style="list-style-type: none"> <li>• devices (PC, server, laptop, tablet, games console and other programmable digital devices)</li> <li>• input – keyboard, mouse, sensors, touch screen, microphone, scanner, digital camera</li> <li>• output – printers (inkjet, laser, impact), speakers, force feedback devices, actuators, screens, projectors, robot arms, other control devices</li> <li>• storage devices – solid state, optical media, magnetic media</li> <li>• that modern technology devices are often multifunctional (have both input and output functionality)</li> <li>• how hardware components and software can be combined to form an automated technology system (self-service checkout, production line)</li> <li>• the uses of devices that capture data for automated systems (barcode readers, magnetic strip readers, optical character readers (OCR), optical mark readers (OMR) and radio frequency identification systems (RFID))</li> <li>• suitable devices to suit the requirements for a specific user and purpose, and justify their use.</li> </ul> <p style="text-align: right;"><i>continued</i></p>

**What needs to be learnt****Computer networking**

Understand the concepts, applications and implications of networks, including:

- the purpose of different types of network (local area network (LAN), wide area network (WAN), personal area network (PAN), mobile broadband)
- the common uses of network systems (resource sharing, data sharing, entertainment, communication)
- the benefits of computer networking
- the need to synchronise data held on devices forming a PAN.

**Data transfer**

Understand the concepts, implications and processes of data transfer, including:

- physical methods of transferring data between devices using wireless or cabled topology to meet the requirements for a specific user and purpose
- wireless methods of transfer including the use of Wi-Fi and Bluetooth technologies
- cabled methods for transfer of data between devices, including the use of optical fibre, unshielded twisted pair (UTP) and coaxial cables
- the benefits and drawbacks of these physical methods.

**What needs to be learnt****Learning aim B: Understand how data flows between internal components of a computer and is processed to provide information****Internal components of a computer**

Understand the main characteristics, functions and role of the internal components of a computer, including:

- the motherboard – printed circuit board (PCB) holding main components of the system
- central processing unit (CPU) – arithmetic and logic unit (ALU), control unit, registers
- memory (RAM, ROM, including Flash memory)
- graphics/sound/video hardware
- heat dispersal systems – fans and heat sinks
- storage devices – solid state, optical and magnetic
- how internal components of a computer affect performance and user experience
- comparison of different specifications of internal components
- how the features of the central processing unit and graphical processing unit affect performance and user experience:
  - clock speed
  - caches
  - multiple processing cores
  - heat, power consumption
- how the features of mobile devices affect performance/user experience:
  - System-on-a-Chip (SoC)
  - CPU and GPU
  - battery life
- comparing how mobile systems are different from traditional platforms
- how the features of memory and storage devices affect performance/user experience:
  - memory (cache and RAM)
  - storage devices (solid state, optical and magnetic media)
- the role of computer buses in carrying data between the internal components of a computer.

*continued*



**What needs to be learnt****Analogue and digital data**

Understand the concepts, processes and implications of data transmission, including:

- the differences between analogue and digital transmission of data
- the need to convert analogue signals to digital signals and digital signals to analogue signals
- how data in a computer is represented using binary notation (bit, bytes, word length).

Understand and use binary format and the concepts of data storage, including:

- how characters can be represented in binary format and convert whole numbers into binary numbers (zero up to 10)
- conversion of binary numbers (up to 8 bits) to whole numbers (base 10)
- units used to describe memory and data storage (bit, byte, kilobyte, megabyte, gigabyte, terabyte, petabyte).

**What needs to be learnt****Learning aim C: Understand different types of software****Software**

Understand the concepts, differences and implications of software, including:

- software as a series of programs used to direct the operation of technology systems
- the differences between custom-made and off-the-shelf programs
- the advantages and disadvantages of using custom-made and off-the-shelf programs.

Understand the concepts, implications and structures of programming, including:

- the hierarchical structure of a computer as:
  - application software package (user interface)
  - high-level programming language
  - low-level programming language
  - machine code (binary number notation)
  - hardware
- the main characteristics of high-level programming languages, including imperative, procedural, event-driven and object-orientated programming languages
- the main characteristics of low-level programming languages, including assembly language and machine code
- the main distinctions between programs in high-level and low-level forms in terms of structure, closeness to spoken language and intuition of use.

**Introduction to computer programming concepts**

Understand, use and interpret flowcharts, including:

- flowchart symbols as described in the British Computer Society's *BCS Glossary of Computing and ICT* (ISBN 978-1-906124-00-7, or subsequent editions), including terminators, connectors, processes and decision boxes
- the purpose of simple processes represented in flowchart diagrams (decision making, finding largest/smallest number in a sequence, rates of discount/interest/payments)
- inputs and/or outputs from simple processes represented in flowchart diagrams, including currency conversions, converting marks to grades, calculating wages including overtime payments
- completion of flowchart diagrams with any missing decision statements and decision outcomes

Recognise and understand:

- the terms used in a computer programs, specifically: declaration, input, output, assignment, variables (local and global) and constants, sub-routines, scope of variables
- the need to annotate code to allow for maintenance
- the use of data types, including character, string, integer, real and Boolean
- the use of data structures, including records and simple arrays.

*continued*

## What needs to be learnt

### Operating systems and applications

Understand the concepts, functions, and implications of operating systems, including:

- the role of an operating system in terms of file management, hardware management (drivers), resource allocation and security
- the role of utility applications, including disk defragmenters, firewalls and anti-virus software
- the differences between graphical user interfaces and command-line user interfaces
- the features of an operating system with a graphical user interface, including user interface, accessibility and ease of use
- the features and benefits of operating systems for mobile devices, including user interface, accessibility and ease of use
- the role of productivity applications, including office software, graphics, multimedia and web-authoring software
- the benefits of using suites of productivity applications
- the factors to consider when installing or upgrading an operating system or productivity application:
  - hardware platform
  - accessibility features
  - compatibility with preferred applications and hardware
  - cost (licence, set-up, training, maintenance)
  - speed
  - security features (including firewalls, malware management, setting user permissions, user support).

## Teacher guidance

### Resources

There are no special resources needed for this unit.

### Assessment guidance

This unit is assessed using an onscreen test. Edexcel sets and marks the test. The test lasts for 1 hour and has 50 marks. The assessment is available on-demand.

Learners will complete an onscreen test that has different types of questions including objective and short-answer questions. Where appropriate, questions will contain graphics, photos, animations or video. An onscreen calculator is available for questions requiring calculations. An onscreen notepad is available for making notes. Each item will have an accessibility panel that allows a learner to zoom in and out, and apply a colour filter.

Learners should be encouraged to keep up to date with emerging technology as part of their learning experience.

Centres are encouraged to be aware of developments in systems and technologies. In terms of assessment, we will issue updates annually in April to be taken into account during delivery from the following September. External assessments will reflect updates from the subsequent January.

## Unit 3: A Digital Portfolio

Level: **1 and 2**

Unit type: **Core**

Guided learning hours: **30**

Assessment type: **Internal**

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### Unit introduction

This unit is your chance to show off! A digital portfolio is an exciting onscreen way to showcase your achievements to potential employers or when applying for a course. It is all about:

- the projects you have created and developed
- your use of communication and presentation skills
- your capabilities and potential.

Digital portfolios can be viewed by anyone with a computer and an internet browser. You will learn how to create a digital portfolio that includes a series of web pages with links to content that you have created. You will learn how to make use of multimedia assets such as images, sound and video to make your portfolio appealing and engaging.

For this unit, your digital portfolio will have a clear purpose and audience to show them who you are and what you are capable of. It should have a structure that is logical and easy to navigate and must be in a format that can be uploaded and viewed on the web.

You should think of your portfolio as a shop window, carefully selecting a range of content including work done on this BTEC course as well as any other appropriate content. Every item should be clearly introduced, explaining why it is included and what it demonstrates to the viewer. Multimedia assets should be used to enhance the experience for the viewer, not as a substitute for good content.

This unit can be used as synoptic unit to bring together the content of all the optional specialist units in the course. It can be studied alongside the other units and completed at the end of the course.

### Learning aims

In this unit you will:

A design a digital portfolio

B create and test a digital portfolio

C review the digital portfolio.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Design a digital portfolio</b></p> <p><b>Basic project lifecycle</b>  Stages of the project lifecycle:</p> <ul style="list-style-type: none"> <li>• design (e.g. storyboards, structure chart, assets, software)</li> <li>• create/develop and test a product e.g. iterative cycle of development and feedback from test users</li> <li>• review (e.g. feedback from others).</li> </ul> <p><b>Digital portfolio structure</b>  Web pages, including:</p> <ul style="list-style-type: none"> <li>• home page with introduction and links to sections</li> <li>• section pages to introduce purpose of section and link to context pages</li> <li>• context pages to introduce and link to items of content.</li> </ul> <p><b>Digital portfolio user interface</b>  Interface to include:</p> <ul style="list-style-type: none"> <li>• page formatting – colour scheme, fonts</li> <li>• assets required for web pages – (e.g. images, sound, video)</li> <li>• navigation – navigation bar, links (internal, text, graphical, buttons), consistency.</li> </ul> <p><b>Digital portfolio content</b>  Consider:</p> <ul style="list-style-type: none"> <li>• selection – variety of extracts, snapshot of experiences and projects</li> <li>• file formats</li> <li>• compression</li> <li>• accessibility.</li> </ul> <p><b>What should go in the design?</b>  Designs to include:</p> <ul style="list-style-type: none"> <li>• audience and purpose <ul style="list-style-type: none"> <li>◦ description of likely attributes</li> <li>◦ description of purpose</li> </ul> </li> <li>• timeline – outline schedule including key stages in the project lifecycle</li> <li>• content – files and assets required, formats, folder structure</li> <li>• structure chart to show how pages are linked</li> <li>• storyboards of webpages – illustrating panels for each page</li> <li>• user interface – formatting, assets, navigation</li> <li>• alternative design ideas</li> <li>• presentation of content – file folders, compression, accessibility.</li> </ul> <p style="text-align: right;"><i>continued</i></p>

**What needs to be learnt****Learning aim B: Create and test a digital portfolio****Prepare content**

For the content in a digital portfolio:

- prepare (including gathering and creating assets) extracts and other content for portfolio, i.e. to demonstrate achievements and potential
- convert to acceptable file formats (to ensure format is appropriate for users)
- create logical folder structure for content
- ensure all content is stored within the portfolio folder structure.

**Create web pages**

Use appropriate web authoring tools and techniques:

- colour schemes
- page formatting features
  - tables
  - fonts
  - alignment
  - colour
  - line spacing
  - bullets
- content for web pages, including
  - text – introductions, commentaries
  - images
  - sound or video
  - lines and simple shapes
  - internal hyperlinks (text, graphical, buttons)
  - navigation bar
- images/objects
  - position
  - crop and size
  - alignment
  - orientation
  - text wrapping
  - resolution.

*continued*

**What needs to be learnt****Test the portfolio**

To test a digital portfolio:

- check all the pages and content are within the portfolio folder structure
- activate links to internal content (external links are prohibited)
- test the digital portfolio for functionality and document actions taken, including:
  - that all links work and open correct content
  - that all web pages are error free
  - the effectiveness of the home page and other pages
- test the digital portfolio for usability and document any actions taken, including:
  - user interface
  - ease of navigation
  - impact of content, bearing in mind the purpose
  - clear and consistent content and style
- check functionality on another computer system and browser.

**Learning aim C: Review the digital portfolio**

Review the content of a digital portfolio, including:

- considering the extent to which the portfolio meets the needs of the audience and the purpose
- evaluating the design documentation and any changes made during development of the portfolio
- incorporating comments from end reviewers
- making valid suggestions for further improvements.



## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Design a digital portfolio</b>			
1A.1 Identify the audience and purpose for the design of a digital portfolio.	2A.P1 Describe the audience and purpose for the design of a digital portfolio.	2A.M1 Produce detailed designs for a digital portfolio, including: <ul style="list-style-type: none"> <li>• alternative solutions</li> <li>• detailed storyboard of the layout and content of pages</li> <li>• a detailed structure chart with complete navigation routes</li> <li>• fully referenced sources for the ready-made assets.</li> </ul>	2A.D1 Justify the final design decisions, explaining how the digital portfolio will: <ul style="list-style-type: none"> <li>• fulfil the stated purpose</li> <li>• meet the needs of the audience.</li> </ul>
1A.2 Produce designs for a digital portfolio, with guidance, including: <ul style="list-style-type: none"> <li>• outline storyboards of the layout and content</li> <li>• a list of ready-made assets to be used.</li> </ul>	2A.P2 Produce designs for a digital portfolio, including: <ul style="list-style-type: none"> <li>• a timeline for the project</li> <li>• a storyboard of the layout and content of pages</li> <li>• a structure chart indicating navigation routes</li> <li>• a list of ready-made assets to be used, including sources.</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim B: Create and test a digital portfolio</b>			
1B.3 Prepare portfolio content, with guidance.#	2B.P3 Prepare portfolio content and save in appropriate file formats, using folders, demonstrating awareness of purpose.#	2B.M2 Select and refine a range of portfolio content and save in appropriate file formats, using a logical folder structure and demonstrating awareness of the audience.#	2B.D2 Refine the portfolio to improve navigation and include commentaries that justify the choice of content.#
1B.4 Create a functional digital portfolio, with guidance.	2B.P4 Create a functional digital portfolio, including: <ul style="list-style-type: none"> <li>• home page and section pages</li> <li>• context pages.</li> </ul>	2B.M3 Develop the portfolio using, demonstrating awareness of the audience: <ul style="list-style-type: none"> <li>• a range of suitable assets on the web pages</li> <li>• consistent navigation</li> <li>• commentaries to explain the content.#</li> </ul>	
1B.5 Test the digital portfolio for functionality, with guidance	2B.P5 Test the portfolio for purpose and functionality on a different system and browser, and take appropriate action.	2B.M4 Gather feedback from others and use it to improve the portfolio, demonstrating awareness of audience and purpose.	

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Review the digital portfolio</b>			
1C.6 Identify how the final portfolio is suitable for the intended purpose.	2C.P6 Explain how the final portfolio is suitable for the intended audience and purpose.	2C.M5 Review the extent to which the final portfolio meets the needs of audience and purpose, considering feedback from others.	2C.D3 Evaluate the final digital portfolio against the initial designs and justify any changes made, making recommendations for further improvement.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resources required for this unit are:

- web-authoring software (local or online)
- audio- and/or video-recording equipment and suitable editing software.

Learners must have work from their other BTEC First in Information and Creative Technology units available and completed in order to compile these and other materials into the portfolio.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

This unit assesses the learner's ability to create a self-contained digital portfolio to showcase evidence of their achievements, particularly their achievements on the BTEC I&CT course. Their digital portfolio will consist of the interface (i.e. the web pages) and content that can be accessed using it. Their portfolio must include work from their other completed units in the BTEC I&CT course.

Learners need to be aware of the requirements of this unit at the start of their course and could start planning for it from then. For instance, it would be beneficial to create a folder to store extracts from products and systems developed in their other internally assessed units, and keep a project diary where they can record comments that would form the basis of the portfolio commentaries. However, this unit should be completed at the end of the course.

The variety of content included in the portfolio will partly depend on the number of units completed on the course. But learners may wish to include evidence of other appropriate achievements, such as other qualifications, Duke of Edinburgh Award work, community work and/or personal qualities.

The portfolio must consist of a number of web pages in .html format linked together in a structure designed by the learner. It must be possible to view the evidence on another system using freely available software and readers.

Any suitable software may be used to construct the portfolio, locally or online. Web authoring software is recommended. However, if presentation or other software is used to develop the pages of the portfolio, learners must ensure that the files are saved in .html format; presentations or similar digital documents are **not** acceptable.

Learners should have given consideration to the best way of preparing and presenting their content. When using screenshots, for example, do they display all the required information and can they be read easily?

Context pages should present commentaries that 'set the scene', introduce the content and provide additional information about the choice of evidence.

## Learning aim A

**Please note: learners' portfolios must include work from other completed units in the BTEC I&CT course.**

Learners should allocate sufficient time for designing the overall style and how they will present the content in their digital portfolio, aiming for consistency of presentation, good layout and colour schemes, and considering how to use layout and colour in pages viewed onscreen. They should consider the extent to which designs will inform the creation of the digital portfolio, making sure it is clear what the audience will experience.

**For 2A.P1:** learners should describe the target audience and purpose for the design of their portfolio.

*For level 1, as a minimum, learners should identify the audience and purpose for the design of their portfolio.*

**For 2A.P2:** learners should produce design documents for their portfolio. Designs should include a clear idea of the timeline for the project, storyboard mapping out the layout and content (with a minimum of eight screens), a structure chart indicating navigation routes, and a list of ready-made assets. Assets for the web pages, such as text, images, audio and video, should be listed. It should be clear where these assets will be used.

*For level 1, as a minimum, learners should produce an outline design for their digital portfolio storyboard to illustrate the layout and content (with a minimum of four screens), and a list of ready-made assets, which together give an indication of what the product would be like.*

**For 2A.M1:** learners should produce outline alternative design solutions (e.g. a description of alternative styles and layouts), detailed storyboard (with a minimum of eight screens) showing what each web page will be like, and details of assets and where they will be found. A structure chart should show complete navigation and a sources table of ready-made assets should be given. The design documentation should be sufficiently detailed to allow someone else to visualise the completed portfolio.

**For 2A.D1:** learners should justify their design choices, explaining how each asset enhances the user experience and how their choice of navigation options makes the product easy to use, taking account of the intended audience.

## Learning aim B

Learners should prepare (including gathering and creating, where needed) a range of appropriate content, selecting extracts that show what they have achieved and give an indication of future potential. They should create the web pages for the portfolio, taking care to prepare assets that enhance the user experience and draw focus to the content.

**For 2B.P3:** learners should create a folder structure to store the portfolio content files and the web pages. They should ensure that all content is fit for purpose and is in appropriate file formats, such as .pdf, .html, .jpg and .mp3. It is essential that all content can be viewed on different systems using freely available software. Each item of content should be given an appropriate name.

*For level 1, as a minimum, learners should prepare and save the portfolio content.*

**For 2B.M2:** learners should refine the folder structure to ensure that it is logical and clear. They should select suitable content from their work and prepare a range of extracts which give a good overview of their achievements, demonstrating an awareness of the audience.

**For 2B.P4:** learners should create their digital portfolio.

The digital portfolio should include:

- a home page and section pages to introduce the learner and the purpose of the portfolio
- context pages containing appropriate assets, comments to introduce the portfolio content and links to the portfolio content.

Web pages should include comments to introduce items of portfolio content and should make some use of suitable multimedia assets.

*For level 1, as a minimum, learners should have created a functional digital portfolio including links to some appropriate content.*

**For 2B.M3:** learners should develop their portfolio further, demonstrating an awareness of audience. The context pages should include clear explanations for the choice of content and a range of assets, such as a video introduction or audio explanation of an item of content. Learners should not spend excessive time adding multimedia assets and should take care only to include those that improve the portfolio and do not detract from the content. The navigation and commentaries should be consistent throughout the portfolio.

**For 2B.P5:** learners should test and take appropriate action to ensure the portfolio is fully functional. Learners should check their portfolio can be viewed on another type of browser and another computer system.

*For level 1, as a minimum, learners should test the functionality of their portfolio.*

**For 2B.M4:** learners should test their portfolio and get feedback on it. Learners should think carefully about who they choose to be test users. Ideally, test users need to be part of the target audience or, at least, be able to represent it. Feedback should be gathered from others regarding the portfolio. Learners should acknowledge when a change was suggested but ignored, and give the reason.

**For 2B.D2:** learners should refine their digital portfolio so that it includes detailed commentaries that contextualise the content. The assets should enhance the user experience and the user should be drawn to the content.

### **Learning aim C**

Learners should objectively review the extent to which the final digital portfolio meets the requirements. Suggestions for improvement should be valid and specific. Feedback from others should be used to inform the review process.

**For 2C.P6:** learners explain two reasons why their portfolio is suitable for the intended audience and purpose.

*For level 1, as a minimum, learners identify why their portfolio is fit for purpose, for example, "My portfolio is to be part of a job application, so I have included different projects that use lots of different skills and ideas to show everything that I can do."*

**For 2C.M5:** learners should consider how well their portfolio addresses the needs of the intended audience and purpose of the portfolio. Learners should incorporate feedback from end reviewers into their review, rather than simply recording what was said. This will be of most value if reviewers are able to represent the target audience (e.g. adults, prospective employers), ensuring that comments are realistic and valid.

**For 2C.D3:** learners should evaluate the final portfolio against the design documentation, explaining the rationale for any changes that were made. They should identify further potential improvements, assisted by feedback from end reviewers.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

The context of a digital portfolio can cover a variety of areas, including:

- showcasing work to demonstrate for employers
- as part of an application to further or higher education
- showcasing products for potential customers

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1, 1A.2 2A.P1, 2A.P2, 2A.M1, 2A.D1	<b>Design a Portfolio</b>	<p>You are applying for a job with an IT company. As part of the application process, the company wants to see examples of the products you have made and the projects you have completed.</p> <p>Design a digital portfolio to go alongside your application, which includes at least two products or projects you have worked on. The content of your portfolio should show a range of your IT skills and experience, and be related to the work of the IT company you are applying to.</p> <p>In your portfolio, specify audience and purpose. Include a timeline, structure chart, storyboards and details of assets required.</p> <p>Justify the choice of assets and the design of the portfolio in relation to the audience and purpose.</p>	<ul style="list-style-type: none"> <li>• Design documentation.</li> </ul>
1B.3 2B.P3, 2B.M2	Content of the Portfolio	<p>Create a logical folder structure to store the content.</p> <p>Select content and prepare extracts.</p> <p>Save the extracts in appropriate file formats and in appropriate folders.</p>	<ul style="list-style-type: none"> <li>• Screenshot of folder structure.</li> <li>• Content in folders.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.4, 1B.5 2B.P4, 2B.P5, 2B.M3, 2B.M4, 2B.D2	Make the Portfolio  Test the Portfolio	Create a home page, section pages and context pages using appropriate text and other assets such as audio or video. Build portfolio and activate links to content. Carry out testing for functionality, ensuring that all links work and open the correct content. Check the web pages for errors and make changes if necessary. Ask test users to try out portfolio and give feedback. Make changes if appropriate.	<ul style="list-style-type: none"> <li>• Final digital portfolio.</li> <li>• Final digital portfolio and documentation.</li> </ul>
1C.6 2C.P6, 2C.M5, 2C.D3	Reviewing your Portfolio	Evaluate the digital portfolio, including the extent to which it meets the needs of audience and purpose. Explain any changes to the product compared with the design, incorporate feedback from end reviewers and make recommendations for further improvements.	<ul style="list-style-type: none"> <li>• Review document.</li> </ul>



# Unit 4: Creating Digital Animation

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **30**

Assessment type: **Internal**

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## Unit introduction

How are the amazing visual effects in science fiction and fantasy films, and computer games, made? This unit provides you with an introduction to tools/techniques and processes that are used commercially when creating computer animation.

Animation is the creation of moving images and has a long history. Today modern animations are usually created using a computer. It is an exciting and fast moving area of creative technology that provides an opportunity to combine creative and technical computing skills, and is one in which the UK excels. The creative industries have grown considerably in recent years and provide increasing employment opportunities. An animator can work in a number of different creative areas: creating effects for live-action films, feature-length animations and computer games. Non-narrative animations feature in online advertising and software interface design.

In this unit you will investigate the range of applications and features of existing animation products or sequences, that have been created for an intended audience and purpose. You will be able to apply your findings when creating your own computer animation which do not require user interaction.

You will then design, create and test your own animated product, in a similar way to how it is done in industry, and be introduced to the technology and techniques used by the professionals. You will be given a brief which will need to be fulfilled. You will also need to think about the creative aspect of the project as well as technical skills to use. You will review your completed animated product having obtained feedback from others.

In particular, this unit develops skills from *Unit 1: The Online World* and the following optional specialist units: *Unit 5: Creating Digital Audio*, *Unit 6: Creating Digital Graphics* and *Unit 7: Creating Digital Video*. In addition, it supports the content of *Unit 8: Mobile Apps Development* and *Unit 13: Website Development*.

## Learning aims

In this unit you will:

- A understand the applications and features of digital animation products
- B design a digital animation product
- C create, test and review a digital animation product.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the applications and features of digital animation products</b></p> <p><b>Types of animation</b>          Know the different types of traditional and digital based animation, including:</p> <ul style="list-style-type: none"> <li>• flick book</li> <li>• cel animation</li> <li>• stop motion</li> <li>• cut-out (paper-based and computer-generated images either scanned or as graphics)</li> <li>• rotoscoping</li> <li>• skeletal animation</li> <li>• Flash animation</li> <li>• computer-generated imagery (CGI).</li> </ul> <p><b>Applications of digital animation</b>          Applications and purpose of digital animation, including:</p> <ul style="list-style-type: none"> <li>• different existing digitally animated products (e.g. TV programmes, films, computer games, music videos, advertisements, internet and mobile content, simulation, product development)</li> <li>• the effect (e.g. evoke emotion, educate) they have on different audiences (e.g. age, gender, interest, need).</li> </ul> <p><b>Features of digital animation</b>          Features of computer-animated products, e.g.:</p> <ul style="list-style-type: none"> <li>• type of animation</li> <li>• 2-D and 3-D models</li> <li>• image type (bitmap/photo and vector)</li> <li>• frames per second</li> <li>• resolution</li> <li>• timing and length</li> <li>• special effects (motion blur/fade, rendering effects, morphing, camera angles)</li> <li>• audio (speech, music, sound effects).</li> </ul>

**What needs to be learnt****Learning aim B: Design a digital animation product****What goes into the design?**

Designs include:

- intended audience (age, gender, interests), purpose and requirements (as defined in a brief)
- storyboards containing panels which outline the main assets (characters, objects, scenes, sounds) and which include some main panels that show how the assets combine, with timing, camera angles and flow shown
- list of any ready-made assets, with their sources documented and referenced in a sources table, e.g.:
  - graphics – characters and/or objects
  - audio clips – speech, sound effects and/or music
  - video clips
- alternative ideas for the design
- if required, prototypes of the animated product, e.g. characters, objects, video clips, audio clips, scenes (hand-drawn or computer-generated prototypes are acceptable formats for designs).

**What needs to be learnt****Learning aim C: Create, test and review a digital animation product****Creating the animation**

## Preparing assets

- Gather ready-made digital assets (characters, objects, audio clips, video footage) from other sources (e.g. internet, media such as CD or DVD).
- Hand draw or use graphic-editing software to create original assets (characters, objects and/or backgrounds).
- Import original and ready-made assets:
  - graphics and/or video files, e.g. .tga, .jpg, .png, .dpx, .iff, .avi, .mov (QuickTime), .ac (AC3D), .obj (Wavefront), .lwo (Lightwave), .motion capture, .mp4 and .mpg
  - audio files, e.g. .wav, .aiff, .au, .mp3
- reference ready-made assets appropriately in a sources table, considering copyright issues.
- Graphic-editing software:
  - vector editing tools/techniques, e.g.:
    - text
    - line and curve (types and thickness)
    - shading, colour fills, gradients, patterns
    - layering
  - photo editing tools/techniques, e.g.:
    - selecting and removing parts (lasso, eraser, marquee)
    - cropping and resizing images
    - shape fill with texture, solid colours, colour gradient or outline with colour
    - scale, rotate, reflect and distort layers.

If required for the product, record original audio and video, import assets into animation software and use software to edit the original assets.

*continued*

**What needs to be learnt****Animation-editing software**

- 2-D digital animation techniques (3-D techniques are acceptable but not required):
  - cut-out (either scanned images or digitally generated graphics)
  - rotoscoping
  - skeletal animation
- animation-editing software tools/techniques:
  - edit key frames (e.g. insert, delete, copy)
  - tweening
  - layering
  - camera movement (e.g. panning, cuttings from one shot to another, zoom, angles)
  - rendering (e.g. shading, reflections, edge effects and shadows)
  - transition effects (e.g. motion blur/fade, morphing)
  - audio speech, sounds and/or music
  - lip-sync mouth movement to audio.

**Test the animation****Improving the animation:**

- test the animated product for functionality (e.g. sound is audible, the animation runs, the length of the clip is appropriate)
- test that the animation is fit for purpose
- gather feedback from others on quality (e.g. the characters and/or objects move as intended, timing is accurate, sound quality is high), functionality, audience and purpose
- document any improvements and update the sources table for ready-made assets
- understand the reasons for exporting and compressing animation files (e.g. to ensure format is appropriate for reviewers and/or users)
- export and compress the animation product into a suitable final file type (e.g. .swf, .mpeg, .wmv, .sb, .mpg) and size.

**Review the animation****Review the finished digital animation product for:**

- quality of the animation product
- fitness for audience and purpose
- suitability against the original requirements
- legal and ethical constraints, e.g. copyright, eSafety, suitable content
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the applications and features of digital animation products</b>			
1A.1 Identify the intended purpose and features of two animation products.	2A.P1 Explain the intended purpose and features of two different animation products.	2A.M1 Review how the products are fit for purpose and their intended effect on the audience.	2A.D1 Discuss the strengths and weaknesses of two animation products.
<b>Learning aim B: Design a digital animation product</b>			
1B.2 Identify the audience and purpose for the design of an animation.	2B.P2 Describe the audience and purpose for the design of an animation.	2B.M2 Produce a detailed animation product design, including reasons why alternative ideas have been discarded.#	2B.D2 Justify the final design decisions, explain how they will: <ul style="list-style-type: none"> <li>• fulfil the stated purpose and requirements of the brief</li> <li>• meet the needs of the audience.#</li> </ul>
1B.3 Produce an outline design for an animation product, with guidance. The design must include an outline storyboard.	2B.P3 Produce designs for an animation product of at least 30 seconds duration. The design must include: <ul style="list-style-type: none"> <li>• description of requirements from the brief</li> <li>• a storyboard</li> <li>• a list of ready-made assets</li> <li>• audio.#</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Create, test and review a digital animation product</b>			
1C.4 Prepare assets for the animation, with guidance.	2C.P4 Prepare assets for the animation product, demonstrating awareness of purpose, with sources of assets listed.	2C.M3 Prepare assets for the animation product demonstrating awareness of audience with all sources of assets fully referenced.	2C.D3 Refine assets to create a high-quality animation product.*
1C.5 Edit assets to create an animation product of at least 20 seconds, testing the product for functionality with guidance.*	2C.P5 Edit assets to create an animation of at least 30 seconds which includes audio.* Test the product for functionality and purpose against the original requirements, making any necessary improvements to the product.	2C.M4 Gather feedback from others on the quality of the product and use it to improve the product, demonstrating awareness of audience and purpose.*	
1C.6 Identify how the final animation product is suitable for the intended purpose.	2C.P6 Explain how the final animation product is suitable for the intended audience and purpose.	2C.M5 Review the extent to which the final animation product meets the needs of the intended audience and the purpose, considering feedback from others and any constraints.	2C.D4 Evaluate the final animation product and the initial design and justify any changes made, making recommendations for further improvement.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resources required for this unit are animation software, e.g.:

- Flash
- Toon Boom Studio
- Anime Studio
- Blender
- After Effects
- any other appropriate animation software

Other optional resources include:

- digital drawing tablet and pen
- digital scanner
- digital video recorder or web cam
- solid colour background (i.e. green screen)
- audio software packages such as Audacity and Apple Garage Band.

Learners will need access to a suitable assignment brief that specifies the intended audience, purpose of the animation and the user requirements.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

Evidence for this unit requires learners to show that they understand the features of animation products and the processes involved in creating them. They also need to demonstrate practical skills when designing, creating, testing and reviewing a digital animation product of their own to meet a given brief.

Please note that it is not appropriate for learners to use ready-made animation scenes or templates, such as those found in PowerPoint, and a slideshow is not sufficient. Also, for the purpose of this qualification, stop-motion and cel animation techniques are prohibited.

To achieve all grading criteria, learners should have access to existing animation products.

### Learning aim A

Learners should investigate two different existing animation products created using different animation techniques, e.g. rotoscoping, flick book and cut-out, and one of these should be 3D animation. For each product they should identify technical features of the animation and content, audience and purpose. Learners should be encouraged to choose products themselves to investigate, such as computer games, computer-animated film clips, digitally animated music videos and product-design animations (e.g. for medical devices and buildings). The two animations should be designed for different purposes.



**For 2A.P1:** learners should explain the purpose of the animation products and identify features, including file type and size, length, quality, any details of any special effects, e.g. motion blur/fade, rendering effects, morphing and/or camera angles.

*For level 1, as a minimum, learners should identify the purpose of two animated products and limited features, e.g. file type and size, length, quality, 2-D or 3-D models.*

**For 2A.M1:** learners should review whether the animated products are fit for purpose and their intended effect on the audience.

**For 2A.D1:** learners should look at one animation in more detail and discuss the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

### **Learning aim B**

Learners should design a 2-D digitally animated product to meet a given brief. Learners are not prevented from creating 3-D animations but should recognise the significant additional challenges this would present. The design should be for an animation product for a specific audience and purpose that is between 30 seconds and 2 minutes long and which runs continuously **without** user interaction. The animation can be abstract but must demonstrate basic motion of at least one character.

Centres are encouraged to use evidence from the creation of an animated product as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** for the design, learners should describe the purpose and intended audience for the product (as outlined in the brief), for the design ideas for the product.

*For level 1, as a minimum, learners should identify the audience and purpose for their animation design.*

**For 2B.P3:** Learners should produce design ideas for an animation product, describing any design requirements from the brief. Initial design ideas can either be hand drawn or produced using editing software.

They should create a list of ready-made assets (graphics, audio and video) and a storyboard showing at least six main panels for characters, objects and audio assets and how these will be combined. Motion should also be indicated on the storyboard. Learners can create prototypes for their ideas, e.g. key frames, but these should not be finished products. Learners should include audio in their designs.

*For level 1, as a minimum, learners should produce an outline design for their animation product. An outline design would contain an outline storyboard containing at least three main panels that give an indication of what the product would be like and what it is about.*

**For 2B.M2:** learners should extend their design documentation and increase the level of detail in their design documents, including outline design ideas, for example a description of alternative characters and storyline or alternative audience. Learners should give reasons why these ideas have been discarded and so should not be fully worked-up designs.

They should refine the chosen design idea, which must include a detailed storyboard showing a minimum of 12 panels, an indication of motion, and descriptions of what original and ready-made assets are included and how they are combined. Learners should also include details of animation effects, e.g. motion blur/fade, rendering effects, morphing and camera angles, and what edits are required to the ready-made assets.

**For 2B.D2:** learners should explain how each asset helps meet the purpose and original requirements in the brief. Learners should refer back to their storyboard and explain how the design meets the needs of the intended audience.

Learners may wish to do this by annotating their design documents and describing why (e.g. 'I have used a certain gesture here because ...'). They should also justify why they have chosen to combine assets in this way to fulfil the brief, and why the chosen design was selected.

### Learning aim C

Learners should create, test and review an original digital animation product of between 30 seconds and 2 minutes in length (excluding any repeated looped sections). Although learners may deviate from their plans (as often happens with any project) they should aim to create a final product that closely resembles their original design. Any major changes should be noted on their design with a brief reason for the change, e.g. 'I found a more appropriate character or sound effect'.

The type and nature of the graphics and video assets required by learners will depend on the animation techniques used. The following techniques are acceptable:

- cut-out – either scanned, hand drawn and/or ready-made images or computer-drawn graphics
- rotoscoping (video footage that is edited into a graphical format)
- skeletal animation (graphical characters).

**For 2C.P4:** learners should gather required ready-made graphic asset(s), e.g. for background scenes and objects, and video and audio asset(s), e.g. speech, music and sound effects. Video and audio assets can be ready-made and/or original. All ready-made asset(s) should be listed in a sources table.

Learners should prepare original graphics for the main characters and, if required, for objects and scenes, demonstrating awareness of purpose, e.g. if the computer animation is about a 'mad professor' then the character can be recognised as such and is appropriate for the purpose of the animation. Graphic assets can be hand drawn, created using editing software and/or, for the rotoscoping animation technique, they can be converted from video asset(s) into graphical assets using the animation editing software.

*For level 1, as a minimum, learners should gather and prepare some assets for the animation. Some of the graphical assets will be missing (e.g. characters, objects and scenes) or the main characters will be incomplete (e.g. characters may be missing limbs or shading may be unfinished) and audio assets may be omitted.*

**For 2C.M3:** learners should gather and prepare graphics that are high quality, demonstrating awareness of the intended audience. For example, characters should be fit for audience in the use of characterisation, texture and colour, and the individual assets should have a common look and feel, e.g. as with the characters in the *South Park* cartoon.

The sources table should be detailed enough for another person to independently obtain all of the assets used.

**For 2C.P5:** learners should edit their original and ready-made graphics and audio assets to create their designed animation product. The animation must be at least 30 seconds long and not more than 2 minutes in length (excluding any repeated loop sections).

Learners should test their products for functionality, e.g. that the animation plays and volume levels are appropriate. The products should contain the correct assets, and the product should be fit for purpose. For this criterion, it is acceptable to have some brief interruptions in the motion and movement that is shaky and/or in the wrong direction. Learners should make any improvements based on their testing. Changes can be evidenced by annotating their design documents.

Learners should check whether their animation needs to be compressed and exported so that teachers can review their product quickly.

*For level 1, as a minimum, learners should edit the original and ready-made graphics to create an animation product of least 20 seconds (excluding any repeated looped sections). This product may not contain any audio assets and some of the assets will be missing or incomplete. Learners should test their product for functionality (e.g. that the animation plays and the volume levels are appropriate).*

**For 2C.M4:** learners should gather feedback from at least one other person on the quality of their products. They should then respond to the feedback to improve the animation, demonstrating awareness of audience and purpose. For instance, the assets must integrate well together, with characters, objects and scenes sharing a similar style and colour scheme.

If rotoscoping is used then an attempt must have been made to reduce 'boil' (caused when the output slightly deviates from the image that varies between frames, which causes unnatural shake). This does not apply when 'boil' is being used as a required effect or style, which should be clearly stated in the design.

**For 2C.D3:** teachers should be aware that the process of creating a product is iterative.

The digital animation product should be refined to a high quality, which means the sound is free from noise, the motion is synchronised, smooth, realistic and flows as intended, and the timing is accurate. All of the ideas from testing, feedback and reviewing their designs as they create the animations should have been considered as how best to refine the product.

Learners should ensure there are copies of both the initial and refined versions of the animation product saved, with annotations on design documents where appropriate.

**For 2C.P6:** The learner should explain reasons why the product is suitable for audience and purpose. Learners should give at least one reason for audience and one for purpose.

*For level 1, as a minimum, learners should identify why their animation is fit for purpose, for example, "My animation is suitable for use in a toddler's TV show, as it is simple and easy to follow and brightly coloured".*

**For 2C.M5:** learners should build on the strengths, weaknesses and explanations in the Pass criteria to review how much the product is suitable for the intended audience and purpose as defined in the designs. They should also seek feedback from at least one other person. This could be asking a peer to watch and listen to the computer animation and give written/recorded feedback, or playing it to the class and asking them to fill in a short questionnaire. Learners should use this feedback when considering how suitable their product is.

Learners must consider any legal and ethical constraints they encountered during the creation of the animation products, for instance copyright, eSafety and the use of content appropriate for the target audience.

**For 2C.D4:** learners should evaluate the final products against the initial designs in terms of audience, purpose and client requirements as required by the brief, and justify any changes that were made, explaining the rationale for those changes. They should also recommend at least three improvements but do not need to implement the enhancements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Possible scenarios for this unit are:

- animations for a music video
- a short children's cartoon
- an advertisement for chocolate milkshake.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Investigation	Consider at least two existing and different animation products and explain the use of animation features and the purpose of each. Look at how these features are suitable for the target audience and analyse the impact of the clip on the audience.  What are the strengths and the weaknesses of each animation?	<ul style="list-style-type: none"> <li>• Research report or a magazine article.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.P3, 2B.M2, 2B.D2	Smoking vs Health-design	<p>A charity has commissioned you to produce a short 2-D (or 3-D, for an additional challenge) computer animation about the dangers of smoking. The animation is for the charity's website and is aimed at young people 14–19 years old.</p> <p>Describe who are the audience for your animation, and what its purpose is. What are you going to design?</p> <p>Design an animation for the charity, including:</p> <ul style="list-style-type: none"> <li>• a storyboard</li> <li>• a list of assets to use, including some audio.</li> </ul> <p>Outline some alternative ideas for the animation, such as characters, plot or effects.</p> <p>Justify why your design meets the original requirements and why you have chosen some ideas above others.</p>	<ul style="list-style-type: none"> <li>• Design documentation and prototypes.</li> </ul>
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Making the Animation	<p>Prepare by gathering assets together and create your animation, keeping the audience and purpose of your clip in mind. Note any changes you make to your design as you go through.</p> <p>Edit your assets together and test that your clip works.</p> <p>Get feedback from others on the clip and refine it to make it as high quality as you can, recording the sources of your assets and updating your design documents with each change you make.</p>	<ul style="list-style-type: none"> <li>• Completed digital animation product</li> <li>• Annotated and updated design documents</li> <li>• Records of feedback and comments.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.6 2C.P6, 2C.M5, 2C.D4	Review	Evaluate the clip, justifying why it meets the brief, and suggest improvements and consider any constraints. Why is it suitable for the audience and purpose? Get feedback from others on your animation and use it in your explanation. Justify and explain any changes you made to the design through the process. How would you improve it further?	<ul style="list-style-type: none"> <li>• Evaluation report.</li> <li>• Feedback from others.</li> </ul>





# Unit 5: Creating Digital Audio

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **30**

Assessment type: **Internal**

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## Unit introduction

Audio products can be used to change an individual's mood, from the extremes of reducing them to tears to making them smile. Many companies now routinely use digital audio products, such as adverts on the TV, music, computer games, mobile phones and audible alerts or warnings. Mobile devices allow us to listen to audio at any time, so we can listen to a podcast on our MP3 player whenever and wherever we want. Job roles which use the creation of audio include sound designers, sound engineers and music artists and producers.

You will plan, record and edit digital audio products in a similar way to how it is done in industry and be introduced to the technology and techniques used by professionals. You will be given a brief that will need to be fulfilled. You will also need to think about creative aspects of the project as well as technical skills. You will need to record original audio and combine this with imported audio files to create an audio product. Once finished, you will review the products, having obtained feedback from others, and evaluate possible improvements.

In particular, this unit develops skills from *Unit 1: The Online World* and the following optional specialist units: *Unit 4: Creating Digital Animation*, *Unit 6: Creating Digital Graphics* and *Unit 7: Creating Digital Video*. In addition, it supports the content of *Unit 8: Mobile Apps Development* and *Unit 13: Website Development*.

## Learning aims

In this unit you will:

- A understand the applications and features of digital audio products
- B design digital audio products
- C create, test and review digital audio products.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the applications and features of digital audio products</b></p> <p><b>Applications of digital audio</b></p> <p>Applications and purpose including:</p> <ul style="list-style-type: none"> <li>• a range of different existing audio products or clips (e.g. podcasts, radio adverts, news, plays, comedy shows, live music, speeches)</li> <li>• the effect (e.g. evoke emotion, educate) they have on different audiences (e.g. age, gender, interest, need).</li> </ul> <p><b>Features of digital audio products</b></p> <p>Features, e.g.:</p> <ul style="list-style-type: none"> <li>• file types (e.g. .mp4, .wav, .wma, .aac)</li> <li>• file sizes</li> <li>• timing and length</li> <li>• quality</li> <li>• codecs</li> <li>• platforms and compatibility</li> <li>• special effects (e.g. echo, fade, distortion, change of pitch or tempo)</li> <li>• voiceovers</li> <li>• soundtracks</li> <li>• layering</li> <li>• transitions/mixing</li> <li>• multi tracks.</li> </ul>

**What needs to be learnt****Learning aim B: Design digital audio products****Designing a digital audio product**

Designs include:

- intended audience, purpose and any other requirements (as given in a brief)
- script (e.g. what will be included in the product, any dialogue, instructions, effects and directions)
- list of any ready-made digital assets (e.g. an individual digital audio recording of any type such as speech, music or sound effect). Sources for ready-made assets must be documented and referenced
- timeline, e.g. outlining what different assets are included and when different assets will be combined
- alternative design ideas
- if required, prototype design ideas of the digital audio assets (e.g. voice overs, soundtrack, cropping/mixing of recorded clips) and special effects (e.g. echo, fade, distortion, change of pitch or tempo)
- recording schedule (e.g. the day(s) on which learners plan to record, the equipment they will need and the people who will be involved)
- consideration of health and safety constraints while recording (e.g. trailing cables, carrying heavy equipment, high volume levels, use of headphones) and the environment where the recording will take place (e.g. no liquids near electrical equipment).

**What needs to be learnt****Learning aim C: Create, test and review digital audio products****Record original audio assets**

Use audio equipment:

- features of recording equipment (e.g. directional, covers/pop shields/muffs, range (Hz), length of cord/wireless, portability/clip-on, cost)
- types of equipment used for recording:
  - microphones
  - other equipment (e.g. dictaphones, in-camera, mobile phones)
- features of playback equipment (e.g. range (Hz), length of cord/wireless, cost)
- types of equipment for playback:
  - headphones
  - speakers.

**Prepare and test the equipment**

Use audio equipment:

- perform a soundcheck and adjust set up if necessary (e.g. to reduce background noise), distance from microphone and sound levels
- record original audio assets safely from different sources.

**Create digital audio products**

Prepare (gather and create) audio assets.

Gather ready-made audio assets from other sources (e.g. the internet, other media such as CD or DVD) and reference them in a sources table

Audio editing software, e.g.

- import audio files (e.g. .wav, .aiff, .au, and .mp3)
- editing, e.g.:
  - cut, copy, paste and delete clips
  - edit and mix tracks
  - fade the volume up or down smoothly
  - layering separate audio assets
- effects, e.g.:
  - change the pitch without changing the tempo, or vice versa
  - adjust volumes, balance, amplify, and normalise effects
  - special effects like echo and reverse speech
  - filters (e.g. pitch, tempo, pan)
- sound quality, e.g.:
  - clean the audio product of unwanted noise (e.g. static, hiss or hum)
  - understand tracks can have different sample rates or levels of quality (e.g. 24 bit or 32 bit).

*continued*

## What needs to be learnt

### Test audio products

Test and refine audio products

- Test the audio products for functionality (e.g. checking that the assets work, that sound is audible, the clip runs, the length of the clip is correct) and against the original requirements of the brief
- Gather feedback from others on feedback on quality (e.g. they are free of unwanted noise, the assets are synchronised and flow, timing is accurate and sound quality is high), functionality, audience and purpose.
- Document any improvements, including updating the sources table for ready-made assets.
- Understand the reasons for exporting and compressing audio files (e.g. to ensure format is appropriate for reviewers or users).
- Export and compress the audio product into suitable final file type (e.g. .mp3, .wav, .wma) and size.

### Review the audio products

Review the finished audio products for:

- quality of the audio product
- fitness for audience and purpose
- meeting the original requirements
- legal and ethical constraints (e.g. copyright, eSafety, suitable content)
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the applications and features of digital audio products</b>			
1A.1 Identify the intended purpose and features of two digital audio products.	2A.P1 Explain the intended purpose and features of two different digital audio products.	2A.M1 Review how the products are fit for purpose and their intended effect on the audience.	2A.D1 Discuss the strengths and weaknesses of the digital audio products.

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim B: Design digital audio products</b>			
1B.2 Identify the audience and purpose for the design of a digital audio product.	2B.P2 Describe the audience and purpose for the design of a digital audio product.	2B.M2 Produce detailed audio designs, including reasons why alternative ideas have been discarded.#	2B.D2 Justify the final design decisions, explaining how they will: <ul style="list-style-type: none"> <li>• fulfil the stated purpose and requirements of the brief</li> <li>• meet the needs of the intended audience.#</li> </ul>
1B.3 Produce outline design(s) for the digital audio product(s). Each design must include: <ul style="list-style-type: none"> <li>• outline script</li> <li>• timeline.</li> </ul>	2B.P3 Produce designs for two digital audio products, each of at least three minutes duration, which together include speech, music and sound effects. Each design must include: <ul style="list-style-type: none"> <li>• description of requirements from the brief</li> <li>• a script</li> <li>• a list of the ready-made digital audio assets to be used</li> <li>• a timeline.#</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Create, test and review digital audio products</b>			
1C.4 Record audio and gather audio assets, with guidance.	2C.P4 Carry out a soundcheck and record audio, demonstrating awareness of purpose, and prepare audio assets, listing sources used.	2C.M3 Record high quality original audio, demonstrating awareness of audience, with all sources of assets fully referenced.	
1C.5 Edit audio assets to create a digital audio product of at least three minutes duration, and test it for functionality, with guidance	2C.P5 Edit audio assets to create two digital audio products each of at least three minutes duration.  Test the products for functionality, purpose and against the original requirements, making any necessary improvements to the products.	2C.M4 Gather feedback from others on the quality of the digital audio products and use it to improve the product, demonstrating awareness of audience and purpose.	2C.D3 Refine audio assets to create two high-quality digital audio products.
1C.6 For each of the final digital audio products, identify how they are suitable for the intended purpose.	2C.P6 For each of the final digital audio products, explain how the final product is suitable for the intended audience and purpose.	2C.M5 Review the extent to which each of the final digital audio products meets the needs of the intended audience and the purpose, considering feedback from others and any constraints.	2C.D4 Evaluate the final digital audio products against the initial designs and justify any changes made, making recommendations for further improvements.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills



## Teacher guidance

### Resources

The special resources required for this unit are:

- suitable audio editing software package, e.g. Audacity, Adobe Audition, Apple Garage Band, Sony Sound Forge
- microphones and/or other recording equipment
- headphones/speakers.

Learners need access to assignment briefs that specify the intended audience and purpose for the audio products required.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

Evidence for this unit will require learners to show that they understand the features of audio and the processes involved in recording and editing it. They also need to demonstrate practical skills in designing, creating, testing and reviewing an audio product of their own to meet a given brief.

To achieve all grading criteria, learners should have access to existing audio clips/products for investigation. They should also have access to equipment and software to allow them to create their own audio product through editing and testing audio assets.

Learners should record their own original audio assets to combine and edit into the final product. A final product should not only contain ready-made audio files edited together but must also include some original material.

### Learning aim A

Learners should investigate two different existing audio products and identify features about the technical qualities, the content, intended audience and purpose. Learners should be encouraged to choose their own products or clips and to investigate different types of products, such as podcasts, radio adverts, music, and recordings of speeches. The two digital audio products should be designed for different purposes.

**For 2A.P1:** learners should explain the purpose of the audio products or clips and the features used including file type and size, length, quality, details of any special effects, e.g. voiceovers, layering, mixing or use of multitracks.

*For level 1, as a minimum, learners should identify the purpose of two audio products/clips and limited features – file type and size, length and quality.*

**For 2A.M1:** learners should review whether the audio products/clips are fit for purpose and how they are intended to affect the audience.

**For 2A.D1:** learners should look at the digital audio products in more detail and discuss the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

## Learning aim B

Learners should design two audio products to given briefs. Each product should be between three and five minutes long and for a specific audience and purpose. Between the two products, they should have the opportunity to combine speech, music and sound effects. Learners should consider any health and safety requirements, e.g. trailing cables, carrying heavy equipment, high volume levels, use of headphones, and the environment where the recording will take place, e.g. possibly near a busy road.

Centres are encouraged to use evidence from the creation of audio products as part of the learner's digital portfolio (*Unit 3: A digital portfolio*).

**For 2B.P2:** for each design, learners should describe the purpose and target audience, relating this to their design ideas for the product.

*For level 1, as a minimum, learners should identify the audience and the purpose for their design.*

**For 2B.P3:** learners will generate design ideas for a digital audio product. Learners should include any requirements for the product required in the brief. They should create a list of ready-made assets to be combined, a script and a timeline showing how and when the different assets will be combined. The script should include the people involved and give an overview of what will be included, and any dialogue.

Learners could also include a recording schedule to help organise their recordings. Learners can create prototypes for their ideas, e.g. a sound effect, but these should not be finished products.

*For level 1, as a minimum, learners should produce an outline design for their audio products. An outline design would contain an outline script and a timeline to give an indication of what the product would be like and what it is about.*

**For 2B.M2:** learners should extend their design documentation and increase the detail in their design documents, including outlines of alternative ideas and give the reasons why they have discarded them, e.g. an outline of variations on the script or alternative audiences for their products. These should not be fully worked up designs, but annotations or sketches to demonstrate the development in their design process.

Learners should refine both designs, which must include a detailed script (including timing), any instructions or stage directions, note where assets are included, and include a detailed timeline for how the different assets will be combined. The detailed timeline should include details on what sort of transitions, fades, etc. are required.

**For 2B.D2:** learners should justify why they chose the final design ideas from the alternative ideas outlined for the Merit criteria. Learners should explain how each asset helps meet the purpose and requirements from the brief. Learners should refer back to their script and timeline for combining assets, and explain how the design meets the needs of the intended audience and purpose.

Learners may wish to do this by annotating their design documents and describing why, e.g. 'I have used sound fading in here because ...'. They should also justify why they have chosen to combine assets in this way to fulfil the brief, and why the chosen design was selected.

## Learning aim C

Learners should prepare and carry out recordings and gather and source additional ready-made assets such as music and sound effects. They should then use these to create their planned audio products.

Although learners may deviate from their plans (as happens with any project), they should aim to create final products that closely resemble their original design. Any major changes should be noted on their design with a brief reason for the change, e.g. 'Had to change an actor's voice due to illness' or 'Found a different, more appropriate piece of music'.

**For 2C.P4:** learners should check their equipment (as defined in their design) and carry out a soundcheck to make sure they are prepared for their actual recordings, making adjustments if necessary, e.g. ensuring minimal or no background noise and good sound levels. These could be evidenced by photographs and/or witness statements.

Learners should then carry out their recordings. If they need to carry out several recordings in different locations then they should complete a new soundcheck each time.

Learners should gather and prepare ready-made audio assets such as music and/or sound effects. To evidence gathering these audio assets, learners should include a table of sources. Learners should demonstrate an awareness of purpose for the product.

*For level 1, as a minimum, learners should create original recordings and gather prepared ready-made audio assets. They may not have carried out a soundcheck and their recordings may be of low quality.*

**For 2C.M3:** learners should ensure that their recordings are high quality, meaning that the recordings are clear with minimal background noise. The table of sources should be detailed enough for another person to independently obtain all of the assets used. Learners should demonstrate an awareness of the intended audience.

**For 2C.P5:** learners should edit their original recordings and gathered assets to create their designed audio products, while considering the requirements of the brief. Their two products must each be at least three minutes in length but no more than five minutes in length.

Learners should test their products for purpose and functionality, checking that the products play and that volume levels are appropriate, and that they are the correct length and contain the correct assets, and then make improvements based on that testing.

If required, when learners have completed their audio products, the products should be compressed and available in a suitable file type to enable review and feedback to take place.

*For level 1 as a minimum, learners should edit the original and gathered audio, and created audio product(s) of least three minutes. Learners should test their product for functionality.*

**For 2C.M4:** learners should gather feedback from at least one other person on the quality of their products. They should then respond to the feedback to improve the audio, demonstrating awareness of audience and purpose in the changes they make.

**For 2C.D3:** teachers should be aware that the process of creating a product is iterative.

The product should be refined to a high quality, which means the sound is free from noise, the assets are well synchronised and flow, and the timing is accurate. The product should be refined, using feedback from others where appropriate. Learners should ensure there are copies of both the initial and the refined versions of the audio products saved, with annotations on design documents where appropriate. All of the ideas from testing, feedback and reviewing their designs as they create the digital audio products should have been considered as how best to refine the product.

**For 2C.P6:** learners should explain reasons why the product is suitable for audience and purpose. Learners should give at least one reason for audience and one for purpose.

*For level 1, as a minimum, learners should identify how their products are fit for purpose, for example, 'My audio clip is for news radio programme, so it is short and keeps to the facts, with one person speaking and music only at the beginning and end'*

**For 2C.M5:** learners should build on the strengths, weaknesses and explanations from the Pass criteria to review how much the product is suitable for the intended audience and purpose as defined in the designs. They should also seek feedback from at least one other person. This could be by asking a peer to listen to their clip and give written/recorded feedback, or by playing it to the class and asking them to fill in a short questionnaire. Learners should use this feedback when considering how suitable their product is.

Learners must consider and explain any legal and ethical constraints they encountered during the creation of the audio products. For instance, copyright, eSafety, and the use of appropriate content for the target audience.

**For 2C.D4:** learners should evaluate the final products against the initial designs in terms of audience, purpose and original requirements in the brief, and justify any changes that were made, explaining the rationale for those changes. They should also recommend at least three improvements but do not need to implement them.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Possible scenarios for this unit include:

- a short podcast (humorous or informative)
- a radio news segment
- a comedy sketch for radio
- a radio advert
- a trail for a radio drama
- a live music recording.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1,	Research	<p>You are applying for a job with BBC Radio 4. As part of your application process, you have been asked to produce a trail for a new radio comedy programme and a short podcast to inform listeners about a recent scientific discovery.</p> <p>In order to design your two audio products, you first must do some research into trails and podcasts that are currently available.</p> <p>Review at least two existing and different audio products and explain features about the technical qualities, content and message/ purpose.</p> <p>Match these features to the target audience, analyse the impact of the clip on the audience.</p>	<ul style="list-style-type: none"> <li>• Research report or magazine articles.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.P3, 2B.M2, 2B.D2	Pre-production	<p>Using your experience from your research, you now can plan your trail and your podcast. Design two audio products based on the briefs. Describe the purpose and target audience for each. What are the requirements in the brief for these clips?</p> <p>Create a script and list of assets and plan for how the different assets will combine. Justify how this design entirely meets the briefs. How are they suited for the audience and purpose?</p>	<ul style="list-style-type: none"> <li>• Design documents or prototypes including description of purpose and audience, script, list of assets, and timeline of how the assets will combine.</li> </ul>
1C.4 2C.P4, 2C.M3	Production and Post-production	<p>For each product, you have to prepare and carry out your recordings.</p> <p>Carry out a sound check and prepare to record, including checking sound levels. Record all original audio footage. Gather additional audio assets and create a bibliography for the sources of assets.</p>	<ul style="list-style-type: none"> <li>• Evidence of soundcheck, e.g. completed checklist with photographs or video of learner carrying it out.</li> <li>• Digital files of original audio recordings.</li> <li>• Digital files of ready-made sound assets.</li> </ul>
1C.5 2C.P5, 2C.M4, 2C.D3	Editing and testing	<p>Each of your products now needs to be edited and tested before being completed.</p> <p>Edit the original footage into audio clips, incorporating all the different gathered assets. Make sure your products are as high quality as you can make them.</p> <p>Test the products for functionality, check they are in a suitable format for review and gather feedback from another person.</p>	<ul style="list-style-type: none"> <li>• Completed audio clips in native or compressed file type.</li> <li>• Evidence of testing and feedback, e.g. completed questionnaire or witness statement.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.5 2C.P6, 2C.M5, 2C.D4	Review	At the interview, you will be expected to evaluate your products and discuss how you could improve them. Evaluate the final product, justifying how they meet the briefs and are suitable for the audience and the purpose. Suggest improvements and consider any constraints.	<ul style="list-style-type: none"> <li>Evaluation report.</li> </ul>





# Unit 6: Creating Digital Graphics

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **30**

Assessment type: **Internal**

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## Unit introduction

You will see graphics at work whenever you surf websites, play computer games, go shopping or read a user manual. Graphics are used to communicate messages in every part of our lives, such as advertising, music, fashion, interior design and architecture. It is the job role of a graphic designer to create digital graphics, that bring colour, information and interest to our lives for a wide range of industries.

In this unit you will investigate a range of applications and features of existing graphic products and consider their audience and purpose. You will be able to apply some of what you discover to your own digital graphic products.

You will design, create and test graphic products in a similar way to how it is done in industry and be introduced to the technology and techniques used by professionals. You will need to think about the creative aspects of the product as well as the technical (both vector-editing and photo-editing). Once finished, you will review the products, having obtained feedback from others, and evaluate possible improvements.

In particular, this unit develops skills from *Unit 1: The Online World* and the following optional specialist units: *Unit 4: Creating Digital Animation* and *Unit 7: Creating Digital Video*. In addition, it supports the content of *Unit 8: Mobile Apps Development* and *Unit 13: Website Development*.

## Learning aims

In this unit you will:

- A understand the applications and features of digital graphic products
- B design digital graphic products
- C create, test and review digital graphic products.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the applications and features of digital graphic products</b></p>
<p><b>Applications of digital graphics</b></p> <p>Applications and purpose, including:</p> <ul style="list-style-type: none"> <li>• a range of different existing graphic products (e.g. logos, signs, posters, magazine covers, packaging, web graphics, engineering drawings, manuals, imagery in movies and computer games)</li> <li>• the effect (e.g. to invoke emotion, educate, inform, entertain) they have on different audiences (e.g. age, gender, interest, need).</li> </ul> <p><b>Features of digital graphics</b></p> <p>Features, e.g.:</p> <ul style="list-style-type: none"> <li>• type – vector graphic or bitmap image (photograph)</li> <li>• text</li> <li>• composition</li> <li>• use of colour and texture</li> <li>• size and position</li> <li>• characters and objects</li> <li>• file type and sizes</li> <li>• resolution.</li> </ul>

**What needs to be learnt****Learning aim B: Design digital graphic products****Design documents**

Designs include:

- intended audience, purpose and requirements as defined in a brief for two products, one vector with text and one bitmap with text
- initial design ideas/prototypes (an early sample or model built to test a concept) – to illustrate content and appearance and can either be produced using:
  - digital editing techniques (as given in learning aim C), or
  - traditional methods such as hand-drawn on paper
- a list of ready-made bitmap and/or vector digital graphic assets (e.g. a company logo, a character or an object) which can be combined with original graphic assets to create a product – sources for ready-made assets must be documented and referenced
- alternative design ideas
- consideration of health and safety constraints while taking original photographs with a camera (e.g. carrying heavy equipment and the environment where the photography will take place, e.g. no liquids near electrical equipment).

**What needs to be learnt****Learning aim C: Create, test and review digital graphic products****Preparing assets**

Gathering and selecting ready-made vector and bitmap assets, considering:

- sources (e.g. the internet, other media such as CD or DVD), referencing them appropriately
- copyright for ready-made graphics.

**Graphics software**

Vector editing software tools/techniques, e.g.:

- line (types and thickness)
- shapes
- text
- shading and effects
- colour fills, gradients and patterns
- group and ungroup
- rotate and reflect
- scale and dimensions
- duplicate and clone
- combine shapes and paths
- edit and break apart paths
- layering.

Photo editing software tools/techniques, e.g.:

- importing and combining images
- selecting and removing parts (lasso, eraser and marquee)
- cropping and resizing images
- duplicate and clone
- colour selection and palettes
- gradients and opacity
- brush and spray effects
- contrast and greyscale
- filters
- scale, rotate, reflect and distort layers.

*continued*

**What needs to be learnt****Testing and refining graphic products**

Use different processes to test and refine graphic products:

- vector and bitmap asset properties (e.g. resolution, file type, filesize, compression)
- gather feedback from other people on quality (e.g. resolution, accuracy of the line drawing), audience and purpose
- document any improvements to the products, including updating the sources table for ready-made assets
- understand the reasons for exporting and compressing graphic product files (e.g. to ensure format is appropriate for reviewers or users)
- export and compress the graphic products into suitable final file types (e.g. .jpg, .gif, .swf)

**Reviewing products**

Review the finished graphic products for:

- quality
- fitness for audience and purpose
- suitability against the original requirements
- legal and ethical constraints (e.g. copyright, eSafety, suitable content)
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the applications and features of digital graphic products</b>			
1A.1 Identify the intended purpose and features of two different graphic products.	2A.P1 Explain the intended purpose and features of at least two different graphic products.	2A.M1 Review how the products are fit for purpose and their intended effect on the audience.	2A.D1 Discuss the strengths and weaknesses of the graphic products.

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim B: Design digital graphic products</b>			
1B.2 Identify the audience and purpose for the design of a graphic product.	2B.P2 Describe the audience and purpose for the design of a graphic product.	2B.M2 Produce detailed graphic product designs, including reasons why alternative ideas have been discarded.#	2B.D2 Justify the final design decisions, explaining how they will: <ul style="list-style-type: none"> <li>• fulfil the stated purpose and requirements in the brief</li> <li>• meet the needs of the audience.#</li> </ul>
1B.3 Produce outline design(s) for the digital graphic products. Each design must include outline product ideas.	2B.P3 Produce designs for two digital graphic products with different purposes and audiences. One design must be for a vector image and the other must be for a bitmap image. Each design must include: <ul style="list-style-type: none"> <li>• requirements of the brief</li> <li>• documented product ideas and/or prototypes</li> <li>• a list of any ready-made assets to be used.#</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Create, test and review digital graphic products</b>			
1C.4 Prepare assets for the graphic products, with guidance.	2C.P4 Prepare assets for the graphic products, demonstrating awareness of purpose, with a list of sources for ready-made assets.	2C.M3 Prepare high-quality assets for the graphic products, demonstrating awareness of audience, with all sources of assets fully referenced.	2C.D3 Refine assets to create two high-quality digital graphic products.*
1C.5 Edit assets to create graphic products, and test them for functionality, with guidance.*	2C.P5 Edit assets to create two graphic products that both include text.  Test the products for quality, purpose and against the original requirements, making any necessary improvements.*	2C.M4 Gather feedback on the quality of the products, and use it to improve the product, demonstrating awareness of audience and purpose.*	
1C.6 For each of the final graphic products, identify how the final product is suitable for the intended purpose.	2C.P6 For each of the final graphic products, explain how the final product is suitable for the intended audience and purpose.	2C.M5 Review the extent to which each of the final graphic products meets the needs of audience and the purpose, considering feedback from others and any constraints.	2C.D4 Evaluate the initial designs and the final graphic products and justify any changes made, making recommendations for further improvement.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills



## Teacher guidance

### Resources

The special resources required for this unit are:

- vector-graphics editing software (e.g. Illustrator, CorelDRAW, DrawPlus, Inkscape, Visio or any other suitable graphics-editing package)
- bitmap-graphics editing software (e.g. PhotoShop, PaintShop Pro, PhotoPlus or any other suitable graphics editing package)
- digital devices to capture images (e.g. scanner, webcam, digital camera, mobile phone).

Learners should have access to assignment briefs that specify the intended audience and purpose for the two graphic products required.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

Evidence for this unit will require learners to show that they understand the features of graphic products and the processes involved in creating them. They also need to demonstrate practical skills when designing, creating, testing and reviewing graphic products of their own to meet the briefs. To achieve all grading criteria, learners should have access to existing graphic products for investigation.

Learners should prepare (gather, create) assets and edit them into the final products. The products must contain both ready-made and original vector and bitmap graphics that have been edited and both should also include text.

#### Learning aim A

**For 2A.P1:** learners are required to review two graphic products created by others. Learners should explain features of the products, the technical qualities, the content, audience and purpose. Features should include composition, use of colour, size and position. The two graphic products should be designed for different purposes.

*For level 1, as a minimum, learners should identify the purpose of two graphics products and limited features – file type and size, length and quality.*

**For 2A.M1:** learners should review whether the graphics products are fit for purpose and their intended effect upon the audience.

**For 2A.D1:** learners should look at the graphic products in more detail and discuss the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

#### Learning aim B

Learners should design two graphics products to meet the given briefs. Each product should have specific audiences and purposes and incorporate text. Between the two products, learners should have the opportunity to consider the features of their products, such as the use of colour, composition, textures and background images. One product should require the use of vector graphics and the other should require the use of bitmap images.

Centres are encouraged to use evidence from the creation of digital graphics products as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** for each design, learners should describe the purpose and intended audience for the product, relating this to design ideas.

*For level 1, as a minimum, learners should identify the intended audience and purpose for their designs.*

**For 2B.P3:** learners should generate design ideas for two graphic products. The designs must include text and must be for a minimum of one vector graphic product and one bitmap graphic product. Learners should include a list of ready-made assets to be used. Learners should describe the requirements for the product as outlined in the brief, for example the dimensions of a static advert.

The design documentation should illustrate the content and appearance of the two product ideas. The ideas can either be created using traditional hand-drawn methods or using a range of techniques from an appropriate editing software package. They must not be finished products but should demonstrate accuracy, e.g. where vector lines join or where backgrounds are removed from images. The products must incorporate text and be fit for their intended audience and purpose.

*For level 1, as a minimum, learners should create an outline design for their digital graphic products or complete a full design for one product only. An outline design would contain the purpose and outline design documentation to give an indication of what the product would be like and what it is about.*

**For 2B.M2:** learners should extend their design documentation to include outline alternative ideas, e.g. the same product photographed from different angles under different lighting conditions, and give the reasons why they have been discarded. These should not be fully worked-up designs but annotations or sketches to demonstrate the design ideas.

Learners should refine detailed designs for each graphic product (e.g. specify colours, font types, textures, photo images and characters) and as well as preparing designs accurately with a good sense of scale.

**For 2B.D2:** learners should justify why they chose the final design ideas and not their alternative designs. Learners should explain how each asset helps meet the purpose and requirements in the brief.

Learners should refer back to their design documentation and explain how the design meets the needs of the intended audience. They may wish to do this by annotating their design documents and describing why (e.g. 'I have used a texture here because ...'). They should also justify why they have chosen to fulfil the brief by combining graphics assets and text in this way, and why the chosen design was selected.

### **Learning aim C**

The designs will be used to create the digital graphic products. Although learners may deviate from their designs (as happens with any project), they should aim to create final products that closely resemble their original design. Teachers should recognise that the design process (the activities of gathering, creating and preparing assets and then editing them to create finished products) is iterative.

**For 2C.P4:** learners should prepare (gather and create) their assets. They should gather ready-made graphic assets such as photographs, logos and objects and list them in a table of sources. Learners should also create any original assets, e.g. take appropriate photographs using a camera and/or produce line (vector images) drawings using editing software. Original and ready-made assets should be prepared properly for inclusion in the digital products, e.g. cropped appropriately and created accurately (for example where vector lines join or where backgrounds are removed from images).

Both ready-made and original assets should demonstrate awareness of purpose for the product. These could be evidenced by the individual digital assets and through annotation on design documents.

*For level 1, as a minimum, learners should gather and prepare ready-made images and create and prepare original graphic assets. The quality of their assets is likely to be of low quality, e.g. images not cropped appropriately, vector lines that do not join appropriately and inaccurate removal of images from backgrounds, and/or individual assets required for their design may be missing.*

**For 2C.M3:** learners should prepare assets, including gathering ready-made graphic assets such as bitmap images, e.g. logos and objects, and list them in a sources table. The table should be detailed enough for another person to independently obtain all the assets used. Learners should keep the purpose and requirements of the brief in mind.

Learners should create original and prepare ready-made high-quality graphic assets. For instance, vector drawings should be to scale and proportion and be an accurate representation of the object or character they portray. Bitmap images should be optimised, e.g. be an appropriate file type and size and suitable resolution (for example, images are no more than 72 dots per inch or 40-80 KB to facilitate fast loading for a website). They should demonstrate awareness of the intended audience.

**For 2C.P5:** learners should edit their ready-made and original graphic assets to create their digital graphic products, keeping the requirements of the brief in mind. Both products should include text; one product should require the use vector graphics and the other should require the use of bitmap images.

Learners should test the quality of their products, e.g. that images are cropped and vector lines join appropriately, any images have been removed accurately from backgrounds and all the required elements of the design have been included. Learners should also check that their products are fit for purpose and make improvements based on that testing.

If required, when learners have completed their graphic product they should compress the file into a suitable file type to enable it to be reviewed and feedback given.

*For level 1, as a minimum, learners should edit the ready-made and original graphic assets to create at least one digital graphic product. However, the quality of their product is likely to be low, e.g. images not cropped appropriately, vector lines that do not join appropriately and inaccurate removal of images from backgrounds, and/or individual assets required in their design may be missing. Learners should test their product for functionality.*

**For 2C.M4:** learners should gather feedback on the quality of their products from at least one other person, e.g. appropriate images have been used, vector drawings are to scale and proportion, assets are an accurate representation of the object or character they portray and a range of editing techniques have been used. They should then respond to the feedback to improve their product, demonstrating awareness of audience and purpose.

**For 2C.D3:** teachers should be aware that the process of creating a product is iterative.

The product should be refined to a high quality, e.g. a good selection of appropriate and compelling imagery, correct and appropriate use of formatting and editing techniques and a clear message. The products should have been refined using feedback from others, where appropriate. Learners can incorporate any other refinements into their design, noting any changes.

Learners should ensure that they have saved copies of both the initial and the refined versions of the graphics, with annotations on design documents where appropriate. All of the ideas from testing, feedback and reviewing their designs as they create the digital graphic products should have been considered.

**For 2C.P6:** learners should explain reasons why the product is suitable for audience and purpose. Learners should give at least one reason for the audience and one for the purpose.

*For level 1, as a minimum, learners should identify why their final product is suitable for audience and purpose. For example, 'This is a warning notice, so I have made sure the words are simple and clear, and the graphics are simple to understand. I have only used a few colours so it is easy to read quickly'.*

**For 2C.M5:** learners should build on the strengths, weaknesses and explanations from the Pass criteria to review how much the product is suitable for the intended audience and purpose as defined in the designs. They should also seek feedback from at least one other person. This could be by asking a peer to review their graphics and give written/recorded feedback, or by presenting them to the class and asking them to fill in a short questionnaire. Learners should use this feedback when considering how suitable their product is.

Learners must consider and explain any legal and ethical constraints they encountered during the creation of the digital graphic products. These might include, for instance, issues surrounding copyright, eSafety and the use of content appropriate for the target audience.

**For 2C.D4:** learners should evaluate the final products against the initial designs in terms of audience, purpose and original requirements, and justify any changes that were made, explaining the rationale for those changes. The evaluation should include an explanation of how the resolution, size and compression of the final products make them fit for purpose and audience. Learners should also recommend at least three improvements but they do not need to implement them.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Research – Technology Products	<p>You work for a company that makes technology products. You are asked to produce graphics for a promotional campaign for a new smartphone.</p> <p>Before you design your products, you must review graphics that are used currently.</p> <p>Review at least two different graphic products used in advertising and explain their features, including technical qualities, content and purpose.</p> <p>Consider whether these products are fit for purpose, and how they affect the audience. How have they been designed to be used in promotion?</p> <p>How would you improve these products?</p> <p>What are their strengths?</p>	<ul style="list-style-type: none"> <li>Research report or magazine articles.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.P3, 2B.M2, 2B.D2	A Promotional Campaign	<p>Your graphics need to be used to promote a new smartphone. The smartphone is aimed at the 16–25 age group and offers options to target both sexes.</p> <p>You need to design two graphic products to be used in the campaign.</p> <p>Design one vector and one bitmap graphic product, both including text. The graphics should include:</p> <ul style="list-style-type: none"> <li>• a user guide – line drawing(s) of the product illustrating the size and main features</li> <li>• an advert – including an image(s) of the product in use and compressed appropriately for viewing on screen (the website used to advertise the smartphone) and on paper (high-end magazine).</li> </ul> <p>The brief will include further requirements.</p> <p>Describe why the products will be fit for audience and purpose.</p> <p>Provide a sources table for the ready-made assets.</p> <p>Justify how this design meets the brief for your products.</p>	<ul style="list-style-type: none"> <li>• Design documents or prototypes including description of purpose and audience, list of ready-made assets, and illustrations of the products</li> <li>• A sources table of ready-made assets.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5 2C.P4, 2C.P5, 2C.M3, 2C.M4, 2C.D3	Create Graphics	<p>The original and ready-made digital graphics should be prepared, created and combined with text to provide the main illustration for a user guide for the smartphone and an advert for the smartphone.</p> <p>Update the sources table.</p> <p>Test the products for quality, e.g. images are cropped appropriately and accurately, and vector lines join or backgrounds are removed from images competently.</p> <p>Check that the products are fit for purpose and audience, while considering the original requirements, and make any improvements as necessary.</p>	<ul style="list-style-type: none"> <li>• Digital files of ready-made graphic assets</li> <li>• Digital files of original graphic assets</li> <li>• Completed graphic assets in native or compressed file types</li> <li>• Evidence of testing and feedback, e.g. completed questionnaire or witness statement</li> <li>• Finished products in a suitable digital file format: <ul style="list-style-type: none"> <li>○ a user guide illustration</li> <li>○ an advert</li> </ul> </li> </ul> <p>(Files prepared to suit both types of specified media).</p>
1C.6 2C.P6, 2C.M5, 2C.D4	Review	Evaluate the final products, justifying how they meet the briefs and are fit for purpose and suitable for the audience. Suggest improvements you would make if you designed these products again and consider any constraints.	<ul style="list-style-type: none"> <li>• Evaluation report.</li> </ul>





# Unit 7: Creating Digital Video

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **30**

Assessment type: **Internal**

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## Unit introduction

Video is one of the most powerful ways to convey a message in modern society and different types of video are transmitted worldwide. These range from a documentary or news item that can change minds and encourage people to take action to a movie that will entertain, or a well-made advert that can increase product sales or raise money for a charity. Job roles which use digital video include camera operators who capture original footage, and editors who use computers to manipulate the original footage and combine it with other assets such as animations, audio and text.

In this unit you will investigate the range of applications and features of digital video products which have been created for a specific audience and purpose. You will apply some of your findings to your own digital products.

You will be given a brief to fulfil and will be introduced to the technology and techniques professionals use. You will need to think about the creative aspects of the product, as well as the technical. You will need to record original video assets and combine these with other assets, e.g. audio, as required. You will review your finished product having obtained feedback from others and evaluate possible improvements.

In particular, this unit develops skills from *Unit 1: The Online World* and the following optional specialist units: *Unit 5: Creating Digital Audio*, and *Unit 6: Creating Digital Graphics*. In addition, it supports the content of *Unit 4: Creating Digital Animation*, *Unit 8: Mobile Apps Development* and *Unit 13: Website Development*.

## Learning aims

In this unit you will:

- A understand the applications and features of digital video products
- B design a digital video product
- C create, test and review a digital video product.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the applications and features of digital video products</b></p> <p><b>Applications of digital video products</b></p> <p>Applications and purpose, including:</p> <ul style="list-style-type: none"> <li>• a range of different existing digital video products/recordings (e.g. a TV news segment, a sketch for a comedy show, a section of documentary, a TV advert, a movie trailer, machinima)</li> <li>• the effect (e.g. evoke emotion, educate, entertain, inform) that they have on different audiences (e.g. age, gender, interest, need).</li> </ul> <p><b>Features of digital video</b></p> <p>Features, e.g.:</p> <ul style="list-style-type: none"> <li>• file types (.avi, .mpeg, etc.)</li> <li>• file sizes</li> <li>• timing and length</li> <li>• quality</li> <li>• codecs</li> <li>• platforms and compatibility</li> <li>• resolution (e.g. HD, for web)</li> <li>• bit rate</li> <li>• frames per second</li> <li>• layers (soundtrack, narrative, etc.).</li> </ul>

**What needs to be learnt****Learning aim B: Design a digital video product****Design documents**

Designs include:

- intended audience (age, gender, interests), purpose and the requirements defined in the brief
- initial design ideas
- script (e.g. what will be included in the product, dialogue, instructions, effects, stage directions)
- storyboard outlining the main panels of action showing characters, scenery, props and sounds and identifying timing, camera angles and flow
- list of ready-made digital assets (audio – speech, music and/or sound effects, graphics, and video recordings of any type). Sources for ready-made assets must be documented and referenced
- alternative design ideas
- recording schedule (e.g. the day(s) on which learners plan to record, the equipment they will need and the people who will be involved).
- logsheet (log of what scenes are recorded and their details)
- health and safety considerations of filming (e.g. trailing cables, risk of falling, slippery surfaces, sharp objects, heavy equipment and the environment where the recording will take place)

Carry out a recce (reconnaissance, an initial investigation) for the filming location(s):

- types of location, e.g.:
  - exterior
  - interior
  - stage
- considerations, e.g.:
  - indoor/outdoor
  - lighting
  - ambient sounds
  - weather
  - legalities (e.g. need to obtain permission, health and safety)
  - transport
  - security

Recruit a cast/crew:

- types of cast (e.g. lead actors, secondary actors, extras)
- job roles of crew, e.g.:
  - director
  - cinematographer (cameraman)
  - sound recordist
  - lighting technician.

**What needs to be learnt****Learning aim C: Create, test and review a digital video product****Recording original video clips**

Features of video recording equipment:

- digital video equipment: zoom, pan, placement of camera, use of tripod, camera angles, specifications of cameras (e.g. DV tape or digital storage, images sensors – e.g. CMOS/CCDs, connectivity to editing machine, cost)
- screen capture software: screen region, mouse pointer, narration.

Understand the difference between original video clips recorded onto tape and digital formats, and the saved digital format (usually .dv) and other wrapped formats (e.g. .avi, .qt), which are known as assets.

**Create a video product**

Gather ready-made video, audio and/or graphic asset(s) from other sources (e.g. internet, other media – such as CD or DVD).

Video editing software, e.g.:

- import video files and other files (e.g. music)
- editing tools and techniques, e.g.:
  - cut, copy, paste and delete clips
  - split and trim clips
  - transitions
  - text
- effects tools and techniques, e.g.:
  - filters
  - overlays
  - layering (video and audio)
  - picture in picture
- video quality tools and techniques, e.g.:
  - contrast
  - sharpen
  - saturation
  - white balance.

*continued*

## What needs to be learnt

### Test the video product

Test the video products for functionality during editing (e.g. checking that the clips' play and volume levels are appropriate, picture quality is usable, products are the correct length).

Gather feedback from others, including quality (e.g. that they only capture what is needed, the clips flow together well, timing is accurate, sound quality high – minimal or no noise, picture quality is high, and video is appropriate for audience and purpose).

Document any improvements, updating the sources table for ready-made assets.

Render the video (if required) into a suitable final size and format (e.g. .avi, .flv, .mpeg, .mov, .wmv). Understand the process of rendering and the reasons for doing it and consider technical aspects (e.g. format, file size, bandwidth, length, compression, frames per second (fps), bit rate).

### Review the video product

Review the finished video product for:

- quality
- fitness for audience and purpose
- suitability against the original requirements
- legal and ethical constraints, e.g. copyright, eSafety and suitable content
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the applications and features of digital video products</b>			
1A.1 Identify the intended purpose and features of two different digital video products.	2A.P1 Explain the intended purpose and features of two different digital video products.	2A.M1 Review how the products are fit for purpose and their intended effect on the audience.	2A.D1 Discuss the strengths and weaknesses of one digital video product.
<b>Learning aim B: Design a digital video product</b>			
1B.2 Identify the audience and purpose for the design of a digital video product.	2B.P2 Describe the audience and purpose for the design of a digital video product.	2B.M2 Produce a detailed video design, including reasons why alternative ideas have been discarded. The design must include: <ul style="list-style-type: none"> <li>• logsheet</li> <li>• recce of filming locations.#</li> </ul>	2B.D2 Justify the final design decisions, explaining how the designs will: <ul style="list-style-type: none"> <li>• fulfil the stated purpose and requirements in the brief</li> <li>• meet the needs of the audience.#</li> </ul>
1B.3 Produce an outline design for a video product. The design must include: <ul style="list-style-type: none"> <li>• an outline script</li> <li>• an outline storyboard.</li> </ul>	2B.P3 Produce a design for a video product of at least 5 minutes duration. The design must include: <ul style="list-style-type: none"> <li>• description of requirements from the brief</li> <li>• a script</li> <li>• a storyboard</li> <li>• a cast/crew list</li> <li>• a list of any ready-made assets if used.#</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Create, test and review a digital video product</b>			
1C.4 Record video clips and, if required, prepare any other assets, with guidance.	2C.P4 Record video clips and, if required, additional audio clips and prepare any other assets, demonstrating awareness of purpose, with sources of assets listed.	2C.M3 Record high-quality video clips, demonstrating awareness of audience, with all sources for assets fully referenced.	
1C.5 Edit original video clips and, if required, any other assets to create a video product of at least 3 minutes' duration, and test for functionality, with guidance.	2C.P5 Edit original video clips, if required, audio clips and ready-made assets to create a video product of at least 5 minutes' duration.  Test the product for functionality and purpose, checking that it meets the original requirements, making any necessary improvements to the products.	2C.M4 Gather feedback from others about quality of the product and use it to improve the product, demonstrating awareness of audience and purpose.	2C.D3 Refine video and other assets to create a high-quality video product.

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
1C.6 For the final video product, identify how the final product is suitable for the intended purpose.	2C.P6 For the final video product, explain how the final product is suitable for the intended audience and purpose.	2C.M5 Review the extent to which the final video product meets the needs of audience and the purpose, considering feedback from others and any constraints.	2C.D4 Evaluate the final video product and the initial designs and justify any changes made, making recommendations for further improvements.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills



## Teacher guidance

### Resources

The special resources required for this unit are:

- video cameras – either video recorders or screen capture software, e.g. Camtasia, Fraps or screen capture software for other material, e.g. game console footage – Hauppauge PVR (personal video recorder)
- video-editing software, e.g. Adobe Premiere (Pro or Elements), Sony Vegas, Final Cut (Express or Pro).

Learners need access to a suitable assignment brief, a cast and crew, and if required, audio equipment. Teachers should consider the maximum length of product appropriate for the brief.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

Evidence for this unit will require learners to show they understand the features of video, and the processes involved in filming and editing digital clips. They will also need to demonstrate practical skills in designing, creating original recordings, editing, testing and reviewing a digital video product of their own, to meet a given brief that outlines requirements for the product. It is not acceptable to produce the product without using digital video editing software. Learners will need to record original video material: they cannot just use ready-made assets edited together.

To achieve all grading criteria, learners should have access to existing digital video products for investigation. They should also have access to equipment and software to allow them to produce their own video product through editing and testing video assets.

Please note that:

- it is not acceptable to use Windows Movie Maker editing software because, at the time of writing, the software does not provide the required technical functionality
- the video recording must be captured on digital cameras, either on hard drive or DAT tapes, rather than on 8 mm celluloid or similar.

### Learning aim A

Learners should investigate two existing digital video products for different purposes and consider features about the technical qualities, the content, and intended audience and purpose. Learners should be encouraged to choose their own clips, and to investigate different types of digital video products, such as a TV news segment, an outside broadcast for breakfast TV, a sketch for a comedy show, a section of documentary, a TV advert, movie trailer or training film. The two digital video products should be designed for different purposes.

**For 2A.P1:** learners should explain the purpose of the video clip and the use of features in the clip, including file type, file size, length, quality, any codecs used, resolution, frames per second and describe any use of layers.

*For level 1, as a minimum, learners should identify the purpose of video product and limited features, including file type, file size, length and quality.*

**For 2A.M1:** learners should review whether the clips are fit for purpose, and their intended effect on the audience.

**For 2A.D1:** learners should look at one digital video product in more detail and discuss the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

### Learning aim B

Learners should design their own digital video product to a given brief. The video should be at least 5 minutes long, but no longer than 10 minutes, for learners aiming to achieve a Level 2 Pass. Learners should consider health and safety constraints of filming, (e.g. trailing cables, risk of falling, slippery surfaces, sharp objects, heavy equipment and choice of location).

Centres are encouraged to use evidence from the creation of a digital video product as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** learners should describe the intended audience and purpose of the product, relating this to design ideas.

*For level 1, as a minimum, learners should identify the intended audience and purpose for the video product.*

**For 2B.P3:** learners will produce design ideas for a digital video product. Learners should describe any requirements for the product (as outlined in the brief). They should create a script and storyboard showing at least six main panels. The script should include the people involved (cast and crew), and give an overview of what will be included in the video. The storyboard should give an idea of what will happen from beginning to end, although it might not cover all aspects.

Learners should produce:

- a cast/crew list showing names of those involved, and the role they will take
- a list of any ready made-assets to be used.

The learner can use a recording schedule to plan and organise the production of their video.

*For level 1, as a minimum, learners should produce an outline design for their video product. An outline design would contain a script which may not be complete and a storyboard, which should include at least three main panels that should give an indication of what the video product will be about and what will be included.*

**For 2B.M2:** learners should produce detailed design documents, including outlines of alternative ideas and why they have discarded them, e.g. an outline of variations on the script or alternative audiences for their products. These should not be fully worked-up designs, but annotations or sketches to demonstrate the development in their design process.

Learners should give more detail in their design documents, considering purpose, intended audience and requirements given in the brief. This should include an explanation of what the learner must include in the designs to fulfil requirements, e.g. 'My target audience is x, therefore the video product needs to include ...'. The designs should be developed to include a detailed script that includes all dialogue, stage directions and instructions to cast and crew, including any equipment, e.g. camera positions. The documents should include a detailed storyboard, which includes at least 12 main panels and explains the action in detail. Information about timing and transitions between scenes should be noted, and the learner should include a logsheet to note which scenes/clips are recorded, their timing and details, and evidence of recce(s) to filming location(s). Learners can also include any prototype video and audio clip(s) in their design documents, but these should be draft versions only, and not the final versions of clips.

To meet this criterion, a learner does not need to record video at more than one filming location, but if their design requires multiple locations, then learners must complete multiple recce(s).

**For 2B.D2:** learners should justify why they chose the final design ideas from the alternative ideas outlined for the Merit criteria. Learners should explain how each asset helps meet the stated purpose and requirements in the brief, including reference to the script, storyboard, logsheet and recce report.

Learners may wish to do this by annotating their designs and describing why they have chosen an idea, e.g. 'I have used a fade transition in here because...'. They should also justify why they have chosen to combine assets in this way to fulfil the brief, and why the chosen design was selected.

### Learning aim C

Learners should prepare and carry out filming and prepare (create and gather) additional assets, such as music, graphics or sound effects. Learners should use these to create their planned digital video product. Although learners may deviate slightly from their plans (as happens with any project), they should aim to produce a final product that closely resembles their design. Any major changes should be noted on their design, with a brief reason for the change, e.g. 'had to change an actor due to illness' or 'found a different piece of music that better matched the images'.

**For 2C.P4:** learners should carry out the filming at the locations where they have done their recce(s), using the people in their cast/crew list. Learners should prepare and gather any other ready-made assets they need, such as music, sound effects or graphics. Learners should demonstrate an awareness of purpose for the product, while considering any requirements from the brief. The assets should have the sources they have used listed in a source table.

*For level 1, as a minimum, learners should have made original recordings and prepared and gathered any other assets needed, such as music. The quality of their filming and original video clips may be low and/or incomplete.*

**For 2C.M3:** learners should ensure that their recordings are of a high quality, meaning that their video clips only capture what is needed, sound recording is clear and free from most noise, and the images are of a good quality. Learners should demonstrate an awareness of the audience. The bibliography of gathered sources should be detailed enough for another person to find all the specific sources used.

**For 2C.P5:** learners should edit their original video clips and gathered assets into their designed digital product. Their product should certainly be at least 5 minutes' duration, and no more than 10 minutes. Learners should also test their product for functionality, purpose, and against any requirements in the brief. Testing should include checking that the clips play, volume levels are appropriate, picture quality is usable, products are of the correct length, and the product follows the order in the storyboard. Improvements should be based on the results of testing.

If required, when learners have completed their video product, the product should be rendered and available in a suitable file type to enable review and feedback.

*For level 1, as a minimum, learners should have edited their original and ready-made clips to create a video product of least 3 minutes' duration. Learners should test their product for functionality (that the assets play and have suitable volume levels).*

**For 2C.M4:** learners should gather feedback from at least one other person about the quality of their products. They should then respond to the feedback to improve the video, demonstrating awareness of audience and purpose.

**For 2C.D3:** teachers should be aware that the process of creating a product is iterative.

The product should be refined to a high quality, meaning it is clear, the assets flow well and are synchronised, the timing is accurate and the sound and picture quality is high. The product should be refined, using feedback from others where appropriate. Learners should ensure there are copies of both the initial and the refined versions of their video clips, with annotations on the designs where appropriate.

**For 2C.P6:** learners should explain reasons why the product is suitable for audience and purpose. Learners should give at least one reason for audience and one for purpose.

*For level 1, as a minimum, learners should identify how their product is fit for purpose, for example, 'My video is an educational video so it has short scenes and has a summary screen at the end'.*

**For 2C.M5:** learners should build on the strengths, weaknesses and explanations in the Pass criteria to review how much the product is suitable for the intended audience and purpose as defined in the designs. They should also seek feedback from at least one other person. This could be asking a peer or 'test buddy' to review their video product to suggest strengths, weaknesses and improvements (either written or recorded evidence). Learners should use this feedback when considering how suitable their product is. Learners must consider and explain any legal and health and safety constraints they encountered during the creation of the digital video products, for example, copyright constraints that affected the assets they used. They should consider health and safety in terms of using their equipment and filming on location. Their explanations should include typical health and safety measures, such as no trailing cables and no bare wires, and consider individual aspects relating to their filming locations.

**For 2C.D4:** learners should evaluate their final product against the initial design, identifying good and bad points, justifying why their product meets the needs of the audience, is fit for purpose and meets the brief, and justify changes made between the design and final product. They should make recommendations for at least three improvements. They do not need to act on the improvements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Possible scenarios for this unit include:

- a TV news segment
- an outside broadcast for breakfast TV
- a sketch for a comedy show
- a section of documentary
- a TV advert
- a movie trailer
- a training film (e.g. how to use screen capture software)
- machinima.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Research	<p>You work for a TV company that produces a breakfast TV programme. You've been asked to produce a new segment for the programme, providing a round-up of funny news items. Before you design a pilot segment to show the producers of the programme, you need to research existing video segments.</p> <p>Review at least three existing and different digital video products/clips and explain features about the technical qualities, content and the message/purpose.</p> <p>Match these features to the target audience and analyse the impact of the clip on the audience.</p> <p>What could be improved in the clip? What are the strengths of the clip?</p>	<ul style="list-style-type: none"> <li>• Research report or magazine articles.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.P3, 2B.M2, 2B.D2	Pre-production	<p>Design a video clip based on the requirements of the brief you have been given by the producers of the programme. Explain the purpose and target audience.</p> <p>Write a complete script and storyboard, and create a recording schedule and logsheet.</p> <p>Recruit a cast/crew, and carry out a recce of filming location(s).</p> <p>Consider any alternative ideas in the design for the TV segment.</p> <p>Justify how this design entirely meets the brief from the producers.</p>	<ul style="list-style-type: none"> <li>• Design documentation, including description of purpose and audience, script, storyboard, recording schedule, logsheet, cast/crew list and recce report.</li> <li>• Prototype clips.</li> </ul>
1C.4 2C.P4, 2C.M3	Production and Post-production	<p>Record all original video clips and, if required, audio clips. Prepare any additional assets needed and describe any relevant constraints. Make sure you have noted any health and safety issues or legal issues for your TV segment.</p>	<ul style="list-style-type: none"> <li>• Digital files of original video clips and, if required audio clips, demonstrating range of skills used.</li> <li>• Digital files of acquired assets.</li> <li>• Documentation of health and safety issues when filming (perhaps using annotated photographs).</li> <li>• Report of legal issues.</li> </ul>
1C.5 2C.P5, 2C.M4, 2C.D3	Editing and Testing	<p>Edit the original video clips and assets into a digital video product. Render the finished TV segment into a suitable file format if you need to.</p> <p>Test that your clip is functional and get feedback from another person on your video. Is it fit for purpose? Is it suitable for the audience? Amend your clip to make sure it meets the original requirements in the brief.</p>	<ul style="list-style-type: none"> <li>• Completed video clip in native format.</li> <li>• Completed video clip in rendered format.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.6 2C.P6, 2C.M5, 2C.D4	Review	<p>At the meeting with the producers, you will need to show that your TV segment meets the brief, the viewers will like it and you have reviewed your design.</p> <p>Obtain feedback from another person to act as the viewer. Evaluate the final product and justify why it meets the brief and suggest improvements.</p> <p>Describe legal and/or ethical constraints, and any health and safety considerations.</p> <p>Your evaluation could be used to present your thoughts and considerations to the producers in order to be asked to do another TV segment.</p>	<ul style="list-style-type: none"> <li>• Evidence of feedback, e.g. completed questionnaire.</li> <li>• Evaluation report/ presentation.</li> </ul>





# Unit 8: Mobile Apps Development

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **30**

Assessment type: **Internal**

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## Unit introduction

How many people do you know who have smartphones or mobile tablet devices? This means that they are carrying considerable computer power around with them. There has been an explosion of software applications, known as apps, to use on these devices. You can use apps for many different purposes; for example, a location app helps you to find your nearest shop, and a leisure app makes it easy to download your favourite music.

Software developers and engineers have scrambled to meet the demand for mobile apps, that are increasingly being used by businesses and organisations. The market for Apple, Android and other apps have boomed. Software engineers are involved with the design, development, testing and maintenance of apps. In addition, software businesses that develop apps employ other professionals, including creative designers, artists and sound engineers.

In this unit you will investigate the characteristics and uses of mobile apps, and learn how mobile apps are developed. Then you will design, develop, test and review your own mobile app. Rather than producing large amounts of original code from scratch, the emphasis in this unit is on you integrating predefined programs/code snippets (specific instructions for a mobile computer) with ready-made and original assets (e.g. buttons and sounds) by using some original code. This will save you significant amounts of time when developing your mobile app. You will review your finished app, having obtained feedback from others, and evaluate possible improvements.

You may even be able to get it published on the internet and take pride in people using an app you made.

In particular this unit develops skills from *Unit 1: The Online World* and *Unit 2: Technology Systems*. In addition, this unit develops the skills from the following specialist units: *Unit 4: Creating Digital Animation*, *Unit 5: Creating Digital Audio* and *Unit 6: Creating Digital Graphics*. It also complements the delivery of *Unit 12: Software Development*.

## Learning aims

In this unit you will:

- A understand the characteristics and uses of mobile apps
- B design a mobile app
- C develop and test a mobile app
- D review the finished mobile app.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the characteristics and uses of mobile apps</b></p> <p><b>The purpose of mobile apps</b></p> <p>Mobile apps are computer programs that instruct a computer's Central Processing Unit (CPU) to carry out the set of specific instructions given in a program for a specific reason and use.</p> <p><b>Typical uses of mobile apps</b></p> <p>Know why we develop mobile apps and know typical uses, including:</p> <ul style="list-style-type: none"> <li>• to give information (e.g. BBC, photo, video, music)</li> <li>• for navigation (in the physical world) (e.g. location identification, nearest tube stations, sandwich shop)</li> <li>• for entertainment (e.g. YouTube, Spotify)</li> <li>• for leisure and fitness (e.g. tracking fitness, RunKeeper)</li> <li>• for communication (e.g. Skype mobile, Live Messenger, Fone Time)</li> <li>• for augmented reality (e.g. Layar, Junaio).</li> </ul> <p><b>Features of mobile apps</b></p> <p>Key features and characteristics, e.g.:</p> <ul style="list-style-type: none"> <li>• purpose of the app</li> <li>• user requirements</li> <li>• user-friendliness (e.g. what are the features of the interface/screens that are presented to the user? How does the user communicate with the app and make things happen?)</li> <li>• dependence on particular hardware</li> <li>• interface elements</li> <li>• integration with standard operating-system software (e.g. contacts list, text messaging)</li> <li>• platforms and compatibility.</li> </ul> <p><b>Programming mobile apps</b></p> <p>Know there are types of programming language; including C++, Java and XML. Understand the reasons for compiling programs.</p>

**What needs to be learnt****Learning aim B: Design a mobile app****Software development life cycle**

Software development life cycle, including:

- requirements of the problem
- design specification (i.e. scope, inputs, outputs, processing, user interface)
- constraints (i.e. programming language and timescales for development)
- develop code
- test
- maintain code.

**Designing a mobile app**

Design to include:

- purpose
- user requirements or problem to solve.
- a proposed solution using design tools, e.g.:
  - a description of the main program tasks – input and output format (e.g. to add two numbers together and display a result)
  - screen layouts and navigation including prototypes (initial splashscreen, main activity screen, other screens or screen elements)
  - algorithms with a description of the method of solution and processing structure (flow charts, pseudocode and events)
  - control structures
  - data validation
- a brief outline of alternative solutions for the intended app (e.g. screen layouts and navigation)
- a list of any pre-defined programs, or code snippets to be used
- ready-made and original assets
  - video, graphics, audio and animation, e.g. sprites, sounds, images, movies, animations and buttons that will be integrated into the app (these are available on the internet and other media, such as CD or DVD)
  - all sources for pre-defined programs and ready-made assets documented and referenced
- test plan with test data (e.g. testing the inputs and expected outputs and compilation of the code)
- constraints (e.g. device capabilities, such as connectivity, screen size, memory storage or programming language).

**What needs to be learnt****Learning aim C: Develop and test a mobile app****Preparing content to develop an app**

- Prepare and gather pre-defined programs, snippets and/or subroutines, and ready-made and original assets.
- Edit (using appropriate editing software) and optimise assets for a mobile platform (e.g. sacrificing quality for smaller file size).
- Use file formats that are appropriate for the intended platform.

**Develop and refine an app**

Use a development environment to write the code for a mobile app.

Integrate ready-made programs, code snippets and assets with some original code.

Use suitable program constructs to edit and create code:

- command words, e.g.:
  - comments
  - constants (variables with a constant value that cannot change)
  - operators; arithmetic ( +, -, \*, /, %) and logical ( <, <=, >, >=, AND, OR, true, false)
  - reserved words that have special meaning within the programming language and are used to write instructions in a program (e.g. in Java 'const' and 'goto' are reserved words)
  - input and output commands
  - local variables (variables that only exist inside the subroutine/function where they are declared and used)
  - global variables (variables that exist throughout the entire program and in subroutines/functions)
  - assignment
  - loops, (counter-controlled, conditional, iteration, [while do, repeat...until, for...to do])
  - sequential statements, selections (If... then...).
- Subroutines/functions/procedures (e.g. reading in data, printing out information).
- a range of data types, e.g.:
  - character
  - string (text)
  - integer and real (numbers)
  - Boolean.
- basic string handling commands to examine individual characters and substrings.

*continued*

### What needs to be learnt

- Event handling:
  - forms
  - assigning properties to screen components (e.g. buttons, boxes, data validation and drop-down lists)
  - actions.

Annotate code to demonstrate understanding and to allow effective repair/debugging of the program.

When required, compile the program into a suitable format to create an executable program.

### Quality of software programs

Know that software design and techniques affect the quality of the app developed:

- efficiency/performance, e.g. the amount of system resources a program consumes (processor time, memory space, accessing storage media)
- maintainability, i.e. the ease with which a program can be modified by its present or future developers in order to carry out corrective, perfective or adaptive alterations to the code
- portability, i.e. the range of computer hardware and operating system platforms on which the source code of a program can be run/compiled/interpreted
- usability, i.e. the ease with which an end user can use the program for its intended purpose or, in some cases, even unanticipated purposes.

### Test the app

Test the program solution:

- for functionality against the test plan with the test data
- is fit for purpose
- by reviewing the quality of the program in terms of efficiency/performance, maintainability, portability and usability
- gather feedback from others on the quality (efficiency/performance, maintainability, portability and usability) of the solution.

Document any changes to the design, including changes to the source table for pre-defined programs/snippets and ready-made assets.

Improve or refine the app (e.g. efficiency/performance, maintainability, portability, usability).

**What needs to be learnt****Learning aim D: Review the finished mobile app****Review the app**

Review the finished mobile app for:

- user requirements
- fitness for purpose
- constraints (e.g. programming language, time, copyright, device capabilities – connectivity and screen size)
- quality of the program (e.g. efficiency/performance, maintainability, portability, usability)
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the characteristics and uses of mobile apps</b>			
1A.1 Identify the uses and features of two different apps.	2A.P1 Explain the uses and features of two different apps.	2A.M1 Review how the features of the apps affect the usability and intended use by the audience.	2A.D1 Discuss the strengths and weaknesses of the apps.
<b>Learning aim B: Design a mobile app</b>			
1B.2 Identify the purpose and user requirements for the app.	2B.P2 Describe the purpose and user requirements for the app.	2B.M2 Produce a detailed design for a mobile app, including: <ul style="list-style-type: none"> <li>• alternative solutions</li> <li>• a detailed proposed solution using a range of design tools</li> <li>• test data.#</li> </ul>	2B.D2 Justify the design decisions, including: <ul style="list-style-type: none"> <li>• how they will fulfil the purpose and the user requirements</li> <li>• any design constraints.#</li> </ul>
1B.3 Produce a design for a mobile app with guidance, including an outline of the proposed solution.	2B.P3 Produce a design for a mobile app, including: <ul style="list-style-type: none"> <li>• a proposed solution</li> <li>• a list of any pre-defined codes/programs</li> <li>• a test plan</li> <li>• a list of sources for any pre-defined code and assets.#</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Develop and test a mobile app</b>			
1C.4 Prepare predefined code and assets with guidance.	2C.P4 Prepare predefined code snippets and assets for the app, demonstrating awareness of purpose, listing sources for assets used.	2C.M3 Optimise assets for the app, demonstrating good awareness of the user requirements, with all sources for assets fully referenced.	2C.D3 Refine the app, taking account of the quality of the code and user feedback.*
1C.5 Edit predefined code and integrate with assets to develop an app, with guidance, containing: <ul style="list-style-type: none"> <li>• one or more screens</li> <li>• constructs.*</li> </ul>	2C.P5 Edit predefined code and integrate with assets to develop an app which includes: <ul style="list-style-type: none"> <li>• one or more screens</li> <li>• constructs</li> <li>• commentary throughout the code.*</li> </ul>	2C.M4 Develop a functional multi-screen app containing original code, that meets the user requirements and purpose.*	
1C.6 Test the app for functionality and purpose, repairing any faults and documenting any changes made, with guidance.	2C.P6 Test the app for functionality and purpose, repairing any faults and documenting any changes made.	2C.M5 Gather feedback from others on the usability of the app, and use it to improve the app, demonstrating awareness of audience and purpose.	



Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim D: Review the finished mobile app</b>			
1D.7 For the final app, identify how the final app is suitable for the user requirements and purpose.	2D.P7 For the final app, explain how the final app is suitable for the user requirements and purpose.	2D.M6 Review the extent to which the final app meets the user requirements and purpose, considering feedback from others and any constraints.	2D.D4 Evaluate the final app and the initial designs and justify any changes made to the quality of the code, making recommendations for further improvement.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resources required for this unit are:

- a software development kit for a mobile device programming language, e.g. Android App Inventor
- an onscreen emulator for a mobile device
- example mobile device(s) on which to run apps
- graphic and audio-editing software to edit and optimise ready-made and original assets.

Teachers may wish to use an application such as Scratch to introduce learners to the concepts of programming. Scratch is available free from <http://scratch.mit.edu/download>.

Learners should be provided with a brief to design and develop an app, or decide on their own user requirements and purpose for the app.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

In this learning aim, learners will investigate the characteristics of mobile apps and how they are used.

**For 2A.P1:** learners should consider a range of existing mobile apps. It may be beneficial to offer a selection of apps, preferably ones with a clear purpose and audience, from which they can choose two. Learners should explain the features and intended use of each app. The two apps should be designed for different purposes.

*For level 1, as a minimum, learners should be able to identify the purpose and some of the features of at least two existing mobile apps, including presentation interface elements and compatibility.*

**For 2A.M1:** learners should review how the features of the two apps affect the intended use, usability and appeal to the audience.

**For 2A.D1:** learners should look at one app in more detail and consider the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

#### Learning aim B

Learners are not expected to find their own problems or create their own project brief. Suitable scenarios should allow learners to achieve all assessment criteria. The user requirements should be given in the brief:

- purpose of the software program
- task(s) the software must perform
- a list of the required user inputs and outputs
- an outline of any processing/functions required.

Centres are encouraged to use evidence for the development of the software program as part of the learner's digital portfolio (Unit 3). For instance, a movie showing snapshots throughout the development process would be appropriate, as would an audio diary of the process, or blog entries as developments are made.

**For 2B.P2:** learners should describe the user requirements and purpose of the app for their design, as well as the user requirements for their design.

*For level 1, as a minimum, learners should identify the purpose of the app and the user requirements for the design.*

**For 2B.P3:** for a given problem outlined in a brief, learners should design their proposed solution. The design documents should include:

- a proposed solution using basic design tools, including a description of the main program tasks (data input and output, screen layouts and navigation, and descriptions of the method of solution)
- a list of any pre-defined programs/code snippets (including any functions or sub-routines) and assets, documenting the sources appropriately
- a test plan (to test for the logic and functionality).

Learners will produce design ideas for apps. Please note that learners do not have to create original assets unless they choose to do so. The original assets may have been produced in a unit such as *Unit 5: Creating Digital Audio* or *Unit 6: Creating Digital Graphics*.

*For level 1, as a minimum, learners should suggest an outline of a proposed solution which will contain:*

- *a description of the main program tasks – input and output (e.g. to add two numbers together and display a result)*
- *screen layouts (input and output) – templates or design sheets can be used to help learners with their design.*

**For 2B.M2:** in addition to the requirements for the pass grade, learners should produce:

- a detailed proposed solution, using a range of suitable tools (in addition to those used at pass) such as flowcharts, control structures pseudocode, events, data handling, and error handling and reporting)
- a brief outline of any alternative solutions for the intended software program,
- test data.

**For 2B.D2:** at this level, learners are expected to be able to justify their design decisions and how the chosen design fulfils the purpose and user requirements. They should consider the suitability for end users and the quality and thoroughness of their design work. They also need to review their design in light of any constraints (e.g. screen size) arising from the device and the programming language used. Learners should explain why alternative designs were rejected.

### Learning aim C

The designs will be used to create the mobile app. Although learners may deviate from their designs (as happens with any project), they should aim to develop final products that closely resemble their original design. The teacher should recognise that the activities of gathering and preparing code and assets, along with original code, is an iterative process.

**For 2C.P4:** learners should prepare (including gathering) predefined code and ready-made assets, such as buttons and images, and list them in a table of sources (please note, many assets will be included within the development environment, e.g. buttons). Chosen assets should demonstrate awareness of user requirements and purpose. The sources of assets should be listed.

*For level 1, as a minimum, learners should prepare ready-made assets required for the app. This may include sprites, sounds, images, movies, animation and buttons from a variety of sources.*

**For 2C.M3:** learners should optimise ready-made assets. For instance, bitmap images should be optimised (e.g. be an appropriate file type and size to increase the responsiveness of the app). Learners should demonstrate good awareness of audience and purpose. All predefined code and assets should be fully listed in a sources table, which should be detailed enough for another person to independently obtain the assets used.

**For 2C.P5:** learners should integrate the pre-prepared code snippets and assets by editing the code. They should then develop the app by:

- creating an interface which demonstrates an awareness of the user requirements and purpose of the app
- assigning code to assets, e.g. buttons to control behaviour
- writing comments within the code to explain how it works.

The interface may be a single screen with a number of assets that cause an event to happen.

*For level 1, as a minimum, learners should integrate and edit the assets and code to develop the app. Their app should contain one or more screens and simple constructs.*

**For 2C.M4:** learners should edit defined code and develop some original code to fulfil the design requirements of the app. The development process will include creating a multi-screen interface that reflects the planned interface, with assets on each screen. The app should be multifunctional.

**For 2C.P6:** learners should test the functionality of code, ensuring it is fit for purpose and adjust the code as required to fix any problems. They should document any changes to the program. Testing documentation might range from a simple checklist to a more elaborate testing schedule that includes due dates for completion of different parts of the project.

*For level 1, as a minimum, learners should test the app for functionality and fitness for purpose. They should fix any faults and document their changes.*

**For 2C.M5:** learners should gather feedback from others when testing the app, considering the user requirements and purpose of the app, and use it to improve the app.

**For 2C.D3:** teachers should recognise that the activities of developing and testing computer programs is iterative process and not sequential. Consequently, the Distinction criteria for this learning aim is assessed through using the learners' work from both the Pass and Merit criteria.

Learners should refine their mobile app, taking account of user feedback, where appropriate to do so, and the quality of the code, e.g. maintainability (how easily the code can be modified), portability (on different platforms) and usability. All of the ideas from testing, feedback and improving their designs as they create the apps should have been considered as how best to refine the product.

## Learning aim D

**For 2D.P7:** for the final review, learners should be able to explain why their app is suitable for the user requirements and purpose. Learners should give one reason for audience and one for purpose.

*For level 1, as a minimum, learners should identify why their app is suitable for the user requirements and purpose. This could be achieved through a discussion with the teacher about the outcomes of their project and evidence with a witness statement and observation record.*

**For 2D.M6:** for the final review, learners should review their app with others, discussing the extent to which their solution meets the needs of the original requirements and purpose of the app. Learners should consider how constraints, user feedback and testing has affected the suitability of the app.

**For 2D.D4:** at this level, learners should evaluate their initial designs and the completed app. They should identify any changes made from the design stage and justify these changes.

Learners should make at least three specific suggestions for improvement for the completed program to ensure it is fully functional, well coded and fit for purpose, including considerations of any constraints, user requirements and purpose.

Learners do not need to implement the enhancements.

## Programming constructs and techniques for level 1 assessment

It is recognised that some learners may fail to achieve a full Pass at level 2. Learners being assessed for the level 1 criteria for learning aims B and C are therefore not required to include all of the different programming constructs in their work for assessment.

The constructs that learners working at level 1 should be familiar with and include in their assessment evidence are shown below.

Use program constructs e.g.:

- command words:
  - comments
  - constants (variables with a constant value that cannot change)
  - arithmetic operators ( +, -)
  - reserved words which have special meaning within the programming language and are used to write instructions in a program e.g. in Java 'const' and 'goto' are reserved words
  - local variables – only exist inside the subroutine/function where they are declared and used
  - global variables – exist throughout the entire program and in subroutines/functions
  - assignment
  - counter controlled loops.
- a range of data types, e.g.:
  - string (text)
  - integer and real (numbers)

- event handling:
  - forms
  - assigning properties to screen components (e.g. buttons, boxes and drop down lists)
  - actions.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Reviewing Apps	<p>You work for a publishing company that is moving into increasing its digital publishing for handheld devices and smartphones.</p> <p>Your manager is going to ask you to lead on an app design project, and to investigate educational mobile apps currently available.</p> <p>Your manager wants to know how mobile apps could be used to:</p> <ul style="list-style-type: none"> <li>• support people with their learning and development</li> <li>• create a guidebook for a major city.</li> </ul> <p>They have asked you to prepare a presentation that describes the purpose, quality and features of both these apps.</p>	<ul style="list-style-type: none"> <li>• Presentation.</li> </ul>
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Design an Interactive Alphabet App	<p>A leading educational publisher has asked you to develop an interactive app. The app is intended to help children learn their alphabet. Learners should design an interactive app which will include pre-defined and edited code with assets.</p> <p>You should describe how your design meets the user requirements and purpose.</p> <p>Designs should include:</p> <ul style="list-style-type: none"> <li>• list of assets or code</li> <li>• proposed solution</li> <li>• test plan</li> <li>• alternative ideas for designs</li> </ul>	<ul style="list-style-type: none"> <li>• Processing structures, e.g. flowcharts and structure diagrams.</li> <li>• List of tools, functions and subroutines.</li> <li>• Report.</li> <li>• Screens (input and output).</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5, 1C.6 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.P6, 2C.M5, 2C.D3	Developing and Testing	<p>You should now have everything you need to develop your interactive learning app.</p> <ol style="list-style-type: none"> <li>1. Gather, prepare and optimise predefined programs/code snippets and assets (e.g. images, sound, video) that you will use in the interactive app.</li> <li>2. Reference sources in a table.</li> <li>3. Develop the interactive app, using the predefined programs/code that you have gathered. Edit pre-defined code and any original code to create the app. Do not forget to include commentary within the code.</li> <li>4. Test the app against the test plan, checking the user requirements are still being met, and document any changes to the app. Correct any errors in the app.</li> <li>5. Get feedback from one other person on the app, including how easy it is to use and the quality of the code.</li> <li>6. Review and refine your app in light of feedback.</li> </ol>	<ul style="list-style-type: none"> <li>• Annotated code.</li> <li>• Annotated design.</li> <li>• User feedback.</li> <li>• Functional apps.</li> <li>• Test plans and data.</li> <li>• Source table for assets.</li> </ul>
1D.7 2D.P7, 2D.M6, 2D.D4	Review the App	<p>How could the app be improved?</p> <p>Consider strengths and points you could improve in your design.</p> <p>How suitable is your app for the audience and purpose? Does it meet the user requirements?</p> <p>Justify where your design has changed through the development, including what has changed following feedback, and explain how you would improve the program further.</p>	<ul style="list-style-type: none"> <li>• Annotated code.</li> <li>• Annotated design.</li> <li>• User feedback.</li> <li>• Evaluation report.</li> </ul>



# Unit 9: Spreadsheet Development

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **30**

Assessment type: **Internal**

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## Unit introduction

Spreadsheets are used to store, manipulate and analyse data and to present it in easy-to-understand ways. They are invaluable for collecting and manipulating data of all types. Spreadsheets can be formatted to create clear, concise reports and can be sorted, filtered and updated with the touch of a button.

Spreadsheets are used extensively in many organisations to help people carry out their job roles. For instance, accountants use spreadsheets to keep track of the money going into and out from a business, and scientists use them to analyse the results of their experiments and record the data for use in the future.

In this unit you will understand the many uses for spreadsheets and the tools and techniques that are available and become skilled at using them. You will be able to apply some of your findings to your own spreadsheet solutions.

In this unit, you will understand the many uses for spreadsheets. You will discover the many tools and techniques that are available in spreadsheet software and will become skilled at using them. You will investigate some of the ways spreadsheets used in real-life. You will design a spreadsheet solution for a brief. You will then develop and test your spreadsheet solution to store, manipulate and analyse a large amount of data and present the output data in easy-to-understand way. Once completed, you will review the finished spreadsheet solution having obtained feedback from others, and evaluate possible improvements.

In particular, this unit develops skills from *Unit 1: The Online World* and *Unit 2: Technology Systems*. In addition, it supports the content of *Unit 10: Database Development*.

## Learning aims

In this unit you will:

- A understand the uses of spreadsheets and the features available in spreadsheet software packages
- B design a spreadsheet
- C develop and test a spreadsheet
- D review the finished spreadsheet.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the uses of spreadsheets and the features available in spreadsheet software packages</b></p>
<p><b>What is a spreadsheet?</b></p> <p>Spreadsheet software stores, manipulates and analyses large amounts of data accurately and to present the output data in an easy-to-understand way.</p> <p><b>How and why spreadsheets are used</b></p> <p>Know why organisations use spreadsheets, e.g.:</p> <ul style="list-style-type: none"> <li>• improve productivity and accuracy</li> <li>• support decision making (e.g. scenario modelling, goal seek, regression and data mining)</li> <li>• present information</li> <li>• analyse data</li> <li>• perform calculations</li> <li>• manipulate large datasets.</li> </ul> <p>Activities where spreadsheets are used, e.g.:</p> <ul style="list-style-type: none"> <li>• cost modelling (e.g. in small- and medium-sized enterprises (SMEs))</li> <li>• analysis of data (e.g. scientific experiments or market research)</li> <li>• tracking progress and recording results (e.g. homework and test results in a school or college)</li> <li>• creating timetables and results (e.g. league table information for a football league)</li> <li>• stock control (e.g. in a shop or manufacturing organisation).</li> </ul> <p><b>Features of spreadsheet software</b></p> <p>Tools and techniques (e.g. cell replication and formatting, page setup and user interfaces (as listed in learning aim C)).</p> <p>Purpose of tools and techniques (e.g. aid usability, productivity, accuracy and the presentation of output data).</p>

**What needs to be learnt****Learning aim B: Design a spreadsheet****Designing a spreadsheet**

Designs include:

- intended purpose and user requirements
- design documentation that includes
  - worksheet structure diagram showing the proposed layout, calculations/processes (e.g. formulae and functions) and data input method (e.g. labeling and row and column use, forms, cell formatting, validation, conditional formatting)
  - user input interface identifying appropriate tools/techniques.
  - user output data (e.g. ideas for presentation showing format(s) and tools/techniques)
  - onscreen user navigation and guidance (e.g. navigation prompts, input messages and validation (including lists))
  - test plan with test data to test functionality (e.g. test, expected result, actual result)
  - a brief outline of alternative design ideas (e.g. choice of calculations and artistic style of the solution).

**What needs to be learnt****Learning aim C: Develop and test a spreadsheet****Developing a spreadsheet solution**

Use spreadsheet software tools and techniques, e.g.:

- cell manipulation (e.g. entering and editing data, autofilling, replication, conditional formatting (to highlight outcomes))
- cell formatting (e.g. colours, shading, merging cells, alignment)
- data manipulation (e.g. filters, sorts, pivot tables)
- formulae (e.g. add, subtract, divide, multiply)
- functions (e.g. sum, average, count and countIF, lookup, index)
- logical functions (e.g. IF, AND, OR, NOT)
- data validation
- relative and absolute cell referencing
- boxes (e.g. lists, drop-down)
- data entry forms
- lookup tables
- nested IF functions
- cell protection
- types of charts and graphs (e.g. bar, pie)
- chart and graph formatting (e.g. titles, resizing, labels)
- worksheets (e.g. headers, page breaks, links)
- conditional formatting
- named ranges, relative and absolute cell referencing
- goal seek – what if function
- macros.

**Test and refine a spreadsheet**

Test the spreadsheet solution for functionality and usability.

Provide onscreen user navigation and instructions.

Gather feedback from others, e.g. on user requirements, functionality, user experience (e.g. usability, performance, adaptability to different scenarios).

Improvements and/or refinements to the spreadsheet solution, e.g. adaptability, usability, productivity.

**What needs to be learnt****Learning aim D: Review the finished spreadsheet****Reviewing the spreadsheet solution**

Review the finished spreadsheet solution against:

- user requirements
- fitness for purpose
- user experience (e.g. usability, performance, adaptability)
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the uses of spreadsheets and the features available in spreadsheet software packages</b>			
1A.1 Identify how spreadsheets are used for two different activities and how the features are used in the spreadsheets.	2A.P1 Explain how spreadsheets are used for two different activities, and how the features are used in the spreadsheets.	2A.M1 Review how the features in the spreadsheets could improve productivity, accuracy and usability.	2A.D1 Discuss the strengths and weaknesses of the spreadsheets.
<b>Learning aim B: Design a spreadsheet</b>			
1B.2 Identify the purpose and user requirements for the spreadsheet.	2B.P2 Describe the purpose and user requirements for the spreadsheet	2B.M2 Produce detailed designs for a spreadsheet, including: <ul style="list-style-type: none"> <li>• alternative solutions</li> <li>• detailed worksheet structure diagram</li> <li>• test data.</li> </ul>	2B.D2 Justify final design decisions, including: <ul style="list-style-type: none"> <li>• how the spreadsheet solution will fulfil the stated purpose and user requirements</li> <li>• any constraints to the design.</li> </ul>
1B.3 With guidance, produce a design for a spreadsheet including: <ul style="list-style-type: none"> <li>• worksheet structure diagram.</li> </ul>	2B.P3 Produce a design for a spreadsheet, including: <ul style="list-style-type: none"> <li>• worksheet structure diagram</li> <li>• how output data is to be presented</li> <li>• a test plan.</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
Learning aim C: Develop and test a spreadsheet			
1C.4 With guidance, develop a spreadsheet with a given realistic dataset.	2C.P4 Develop a spreadsheet with a given realistic data set, containing a user interface for data input and presentation of output data.	2C.M3 Refine the spreadsheet to improve usability and accuracy using onscreen user navigation and guidance.	2C.D3 Refine the spreadsheet using automated tools/techniques to improve productivity, accuracy and presentation of output data.*
1C.5 With guidance, test the spreadsheet for functionality and purpose, and repair any faults, documenting any changes made.*	2C.P5 Test the spreadsheet for functionality and purpose and repair any faults, documenting any changes made.*	2C.M4 Gather feedback from others on usability, and use it to improve the spreadsheet, testing the additional functionality and repair any faults.*	
Learning aim D: Review the finished spreadsheet			
1D.6 For the final spreadsheet, identify how the final spreadsheet is suitable for the purpose.	2D.P6 For the final spreadsheet, explain how the final spreadsheet is suitable for the user requirements and purpose.	2D.M5 Review the extent to which the final spreadsheet meets the user requirements and purpose while considering feedback from others.	2D.D4 Evaluate the final spreadsheet against the initial designs and justify any changes that were made, making recommendations for further improvements to the spreadsheet.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resource for this unit is access to spreadsheet editing software. Learners will need to be given example spreadsheets and an assessment brief, giving a situation that requires a spreadsheet solution.

Learners should produce a spreadsheet solution to a problem in a given brief and with either a given dataset. The user requirements in the assessment brief should include:

- the purpose of the spreadsheet
- the task(s) the spreadsheet must perform
- the information the spreadsheet must supply, in what form, to whom
- an outline of the required processing/calculations.

This unit assumes that learners already have a basic understanding of and ability to use spreadsheets which cover basic spreadsheet tools and techniques such as using formulae, e.g. add, subtract, divide and multiply.

Learners can devise their own brief, but it must be approved by the centre before being used for assessment.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

**For 2A.P1:** learners should explain how two spreadsheets are used in the real world, for example to measure performance over time or to calculate profit and loss. They should describe how the tools and techniques included in the spreadsheets are used. The two spreadsheets should be designed for different purposes.

*For level 1, as a minimum, learners should identify how two spreadsheets are used in the real world and identify how the features (e.g. formulae, layout) are used in two given spreadsheets.*

**For 2A.M1:** learners should review how the features (e.g. functions, layout, structure) could improve productivity, accuracy and usability in the spreadsheets.

**For 2A.D1:** learners should look at the spreadsheets in more detail and consider the strengths and weaknesses of the spreadsheets. They should discuss at least one strength and one weakness.

#### Learning aim B

Learners need to design a spreadsheet solution for a specific purpose.

Centres are encouraged to use evidence from the development of the spreadsheet as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** learners should describe the user requirements and purpose of the spreadsheet in their designs.

*For level 1, as a minimum, learners should identify the purpose and the user requirements for their spreadsheet design.*



*For level 1, as a minimum, learners should have created an outline design for their spreadsheet solution. An outline design would contain worksheet layout and data input diagram. Some annotations should indicate the processes and appropriate tools/techniques used, e.g. functions and formulas. This will give an indication of what the product would be like and what it is about.*

**For 2B.P3:** learners should design a spreadsheet solution. This should be a workable design and should include:

- a worksheet structure diagram including calculations and tools/techniques to be applied, e.g. cell formatting, functions, formulas, IF statements
- output data presenting the results/outcome
- a test plan.

**For 2B.M2:** the detailed spreadsheet design will contain:

- a brief description of alternative solutions, e.g. choice of calculations and style
- a detailed worksheet structure diagram indicating data validation (including lists), e.g. multiple worksheets, cell referencing, input messages, error messages, macros, cell protection and navigation between multiple worksheets
- test data, e.g. test, expected result, actual result.

**For 2B.D2:** learners should justify their design decision, explaining how they meet the brief. Learners may wish to do this by annotating their design documents and describing why (e.g. 'I have used a function here because ...'). They should also justify why they have chosen a specific design to fulfil the brief in terms of purpose and user requirements. Learners should explain why alternative designs were rejected, and consider any constraints.

### **Learning aim C**

Learners' designs will be used to create the spreadsheet solution. Although learners may deviate from their designs (as happens with any project), they should aim to create a final spreadsheet that closely resembles their original design (unless there is a good reason not to).

**For 2C.P4:** learners will develop a spreadsheet solution for a given purpose to meet the brief. The spreadsheet will contain a user interface for data input and for the presentation of output data. It will include simple functions and formulae. Data for the spreadsheet will be sorted and the spreadsheet will be formatted appropriately to promote ease of use. Learners will have created either a chart or a graph to present the result/output from the spreadsheet solution.

*For level 1, as a minimum, learners should develop a spreadsheet solution for a brief. The solution should include formulae and simple functions, some formatting, and basic output to present the outcome/result.*

**For 2C.M3:** learners will refine their spreadsheet solution to improve the usability of their spreadsheet. Onscreen user navigation and guidance includes:

- input messages
- validation (including lists)
- error messages
- navigation prompts and guidance
- conditional formatting
- labels
- data-entry forms
- a commentary explaining the output presentation.

**For 2C.P5:** learners should test the functionality of the spreadsheet and make changes based on these tests to repair any faults. The spreadsheet should be fully functional and fit for purpose. Changes to the spreadsheet should be documented: different versions from stages of development could be used to evidence this.

*For level 1, as a minimum, learners should test the spreadsheet solution for functionality and purpose and repair any faults.*

**For 2C.M4:** learners should test the functionality of any additional tools/techniques used, repair any faults and gather feedback on their spreadsheet from potential users, and use it to improve the spreadsheet. They should cover the ease of use of the spreadsheet solution, both in terms of the storage, manipulation and analysis of data and the data output presentation.

**For 2C.D3:** teachers should recognise that the process of developing and testing a spreadsheet is iterative, and not a sequential process. Learners will refine the spreadsheet solution using automated tools/techniques to improve productivity, accuracy and the presentation of output data. Automated tools/techniques used to do this include macros, links, named ranges and pivot tables.

All of the ideas from testing, feedback and reviewing their designs as they create the spreadsheet solution should have been considered as how best to refine the product.

### **Learning aim D**

Learners will complete a review of their finished spreadsheet solutions. This is a reflective exercise to establish what the strengths and areas for improvement of the solution are against the purpose and user requirements.

**For 2D.P6:** learners should have assessed the functionality of their spreadsheet and should explain why their spreadsheet is suitable for user requirements and purpose. Learners should try to avoid identifying mundane points such as the colour used (unless that is particularly important) and instead think about why their solution is appropriate and how it can be made more appropriate.

*For level 1, as a minimum, learners should identify how their spreadsheet is suitable for the purpose and user requirements.*

**For 2D.M5:** learners should review the extent of how their spreadsheet solution meets the brief, based on feedback, and consider how the spreadsheet measures up against the original purpose and user requirements.

**For 2D.D4:** learners should evaluate their final spreadsheet solution against the initial designs and justify any changes made. Learners should make at least three recommendations for how they could further improve their spreadsheet.

Learners do not need to implement the enhancements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Learners should have access to an assessment brief that outlines the purpose and user requirements and a suitable data set (of at least 50 rows). Possible scenarios for this unit include:

- a spreadsheet showing potential costs for a series of mobile phone tariffs
- a membership list for a pop band's fan club showing age ranges and location of members
- fixtures, results and league table information for a football league
- a costing model for a charity event
- a profit-and-loss model for a clothing/sports shop, including incoming and outgoing stock.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Application of Spreadsheets	<p>You are completing a placement with the local football club in the administration department. Your manager wants you to investigate spreadsheets which could:</p> <ul style="list-style-type: none"> <li>• manage the season ticket holder information</li> <li>• manage the results, fixtures and league table information for the club.</li> </ul> <p>Before you design a spreadsheet for one of these uses, you must investigate ways in which different organisations use spreadsheets. Your manager is keen to make their spreadsheet systems as efficient as possible.</p> <p>For two given spreadsheets, you should present two reports entitled 'Top 10 spreadsheet tools/techniques'. They should highlight their use in the spreadsheets, describe their purpose, and explain how these tools/techniques improve productivity, accuracy and usability.</p>	<ul style="list-style-type: none"> <li>• Evidence of independent research into how organisations use spreadsheets</li> <li>• Top 10 spreadsheet tools/techniques in the form of pamphlet, presentation report or demonstration for a meeting.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Designing a Spreadsheet Solution	<p>You have been asked to produce a spreadsheet to manage the season ticket holder information. You will produce design documents for a spreadsheet solution to meet your manager's needs.</p> <p>Your design documents should consider the formatting of inputs to the spreadsheet, what processes (calculations) are required, and the output presentation of the result/outcome displayed as a chart, graph or table.</p>	<ul style="list-style-type: none"> <li>Design documents, including: <ul style="list-style-type: none"> <li>user needs</li> <li>purpose</li> <li>worksheet layout</li> <li>proposed functions, formula and calculations, named ranges</li> <li>potential output in charts and graphs</li> <li>a basic plan to test the spreadsheet.</li> </ul> </li> </ul>
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Developing and Testing a Spreadsheet Solution	<p>Now you will create a spreadsheet solution to manage the information about season ticket holders.</p> <p>You should complete a test plan that includes testing how well the spreadsheet solution is used by people in the administration team.</p> <p>You should test their spreadsheet for functionality, purpose and usability, gathering user feedback from the people who try the spreadsheet. You should record any changes made.</p>	<ul style="list-style-type: none"> <li>A spreadsheet solution to a proposed brief</li> <li>Test plan.</li> </ul>
1D.6 2D.P6, 2D.M5, 2D.D4	Review	<p>Before you present your manager with your ideas for a spreadsheet solution, and demonstrate how it can be used, you must review your solution and design. The review should consider strengths and areas for improvement and justify changes you have made to your original design.</p> <p>You should make specific recommendations for further improvement of the solution.</p>	<ul style="list-style-type: none"> <li>Evaluation.</li> </ul>

# Unit 10: Database Development

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

Do you use the internet to search for information, such as music tracks, items in an online shop or train times? If so, the chances are that you are using a database without realising it! Many IT systems involve the use of databases and it is important to understand how they work.

Databases are designed to hold data in a digital form, for example, a record for each computer game in a shop. Database tools can be used to ensure the data is valid and accurate. They also allow information to be restricted to certain individuals and to be analysed and presented in reports.

Job roles include database administrators who oversee the performance, integrity and security of a system and database managers who are responsible for the way a company manages, organises and stores its information.

In this unit you will investigate the features and uses of databases by exploring what they are and what you can do with them. You will be able to apply some of your findings to your own database solution.

You will also learn how to use database software to design, develop and test relational databases for a brief. Once completed, you will review your database, having obtained feedback from others, and evaluate possible improvements.

In particular this unit develops skills from *Unit 2: Technology Systems* and the following optional specialist units: *Unit 9: Spreadsheet Development* and *Unit 12: Software Development*.

## Learning aims

In this unit you will:

- A understand the uses of and tools/techniques used in databases
- B design a relational database
- C develop and test a relational database
- D review the finished relational database.

## Learning aims and unit content

### What needs to be learnt

#### Learning aim A: Understand the uses of and tools/techniques used in databases

##### Why are databases used?

The purpose of database software is to store, manage and extract a large amount of organised information for one or more users.

Know why organisations use databases to:

- improve productivity
- make decisions
- present information
- interpret data
- perform calculations
- manage large datasets.

Examples of uses of a database:

- health (data – doctors, patients, appointments)
- employment (data – name, payroll, department)
- agencies (data – client, services, reservations)
- sale of goods (data – orders, goods, invoices)
- libraries (data – books, loans, members)
- police (data – offenders, crime, officers).

##### Tools and techniques used in a database

Tools and techniques include, e.g.:

- table structures
- field characteristics
- validation rules
- indexing
- records
- relationships
- forms
- sorts
- queries.

(As listed in learning aim C.)

*continued*

## What needs to be learnt

### Using databases to improve working practices

Improving productivity and accuracy in a database, e.g.:

- creating and presenting financial reports
- record keeping
- backing up data
- collaborative working
- searching and planning information.

### Databases and relationships

Types of databases, e.g.:

- local
- online (web)
- flat file (contains a single table of information)
- relational (uses common identifiers found within a data set consisting of two or more related tables).

Types of relationships, e.g.:

- one-to-one is a relationship between one record in the first table that corresponds to exactly one record in the related table
- one-to-many is a relationship where each record in the first table may have many linked records in the related table, but will still have only one corresponding record in the first table
- many-to-many is a relationship where each record in the first table may have linked records in the related table and vice versa.

## Learning aim B: Design a relational database

### Designing a database

Designs should be based around the intended purpose and user requirements as defined in a brief to solve a problem.

Design documentation, including:

- hardware, software and other resources required
- entity Relationship Diagram (ERD), including entities, attributes and relationships
- validation and verification procedures
- input and output screens/forms and reports
- constraints (e.g. hardware and software availability)
- test plan with test data to test functionality
- a brief outline of alternative design ideas.

**What needs to be learnt****Learning aim C: Develop and test a relational database****Software tools and techniques to develop a relational database**

Create and edit:

- single and multiple table structures with appropriate field characteristics, including
  - field names
  - field data types, e.g. alphabetic (text and memo), numeric (number, currency, and date/time), alphanumeric (text and memo), logical (yes/no and true/false), web (hyperlink), lookup wizards
  - field sizes (e.g. byte, integer, long integer, single, double and decimal)
  - field formats (e.g. fixed and decimal places)
  - default values
- validation rules and text, which applies to a range, format and length for different data types including input masks
- indexing (e.g. primary key, foreign key)
- create new records (e.g. populate tables with data manually or import a data set from an external source (text file or spreadsheet))
- edit and delete existing records of data
- create, edit and delete relationships
- use wizards.

Create and edit forms, including:

- simple forms (e.g. data-entry and main menu forms with limited functionality)
- customised forms, which suit users and purpose, e.g. a data-entry form that facilitates accurate data entry, has an appropriate user interface with programmable buttons that run events (navigation, add new record, delete record, print record) and main menu forms allowing users to access sub-forms (e.g. data-entry forms), run queries and view reports
- sub-forms
- forms should
  - allow navigation between sub-forms
  - enable the entry of data into single and multiple tables
  - have appropriate entry-form field lengths
  - provide clear labelling of entry-form fields
  - provide instruction fields where necessary
  - include validation checks on field entries as appropriate
  - delete existing forms.

*continued*



### What needs to be learnt

Use reports:

- create and edit reports to present meaningful information for a purpose and specific users, using features (e.g. titles, page layout, colours, field selection, date/time, grouping, introductions and images)
- delete existing reports.

Use sorts:

- sort records using a single field (alpha or numeric, ascending and descending)
- sort records using multiple fields.

Use queries:

- queries with single criteria on one or two fields using relational operators
- queries with multiple criteria using at least two tables, making use of logical operators (e.g. AND, OR, NOT) and wildcards.

Automation, security and usability e.g.:

- automated tasks using macros
- security to protect the database
- provide onscreen user navigation and instructions.

### Testing a database

The testing process:

- Test the relational database for functionality, purpose and usability
- Use feedback from others, for example, on the database's functionality, its usability, and its performance
- Consider possible improvements and/or refinements to the relational database, for example, additional tables, additional queries, forms, reports, automation (macros) and security
- Provide onscreen user navigation and instructions.

### Learning aim D: Review the finished relational database

#### Reviewing a database

Review the finished relational database for:

- the user requirements and user experience (e.g. usability and reliability)
- fitness for purpose
- any constraints (e.g. hardware and software availability)
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the uses of and tools/techniques used in databases</b>			
1A.1 Identify the uses of databases and how the tools/techniques are used in two different databases.	2A.P1 Explain the uses of databases and how the tools/techniques are used in two different databases.	2A.M1 Review how the tools/techniques are used in two databases to improve productivity, accuracy and usability.	2A.D1 Discuss the strengths and weaknesses of the databases.
<b>Learning aim B: Design a relational database</b>			
1B.2 Identify the purpose and user requirements for the database.	2B.P2 Describe the purpose and user requirements for the database.	2B.M2 Produce a detailed design for a relational database, including: <ul style="list-style-type: none"> <li>• alternative designs</li> <li>• a detailed database structure</li> <li>• test data.</li> </ul>	2B.D2 Justify final design decisions, explaining how the relational database will fulfil the stated purpose and user requirements, and any constraints in the design.
1B.3 Produce a design for a database with guidance, including a single table database structure with a data entry form.	2B.P3 Produce a design for a relational database, including: <ul style="list-style-type: none"> <li>• a database structure</li> <li>• a test plan.</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
Learning aim C: Develop and test a relational database			
1C.4 Develop a database with a realistic data set with guidance, including: <ul style="list-style-type: none"><li>• a single table structure</li><li>• a data-entry form.</li></ul>	2C.P4 Develop a relational database with a realistic data set, which includes: <ul style="list-style-type: none"><li>• two tables</li><li>• sort records</li><li>• data-entry forms.</li></ul>	2C.M3 Develop the database demonstrating awareness of users' requirements and accuracy. To include: <ul style="list-style-type: none"><li>• customised data-entry forms</li><li>• queries and output data reports</li><li>• onscreen navigation and guidance</li></ul>	2C.D3 Refine the database solution using automated tools and techniques to improve productivity, accuracy and the presentation of output data, taking account of user feedback.*
1C.5 Test the functionality of the database and repair any faults with guidance.*	2C.P5 Test the functionality and purpose of the relational database for functionality, repairing any faults.*	2C.M4 Gather feedback from others and use it to improve the database and test any additional functionality, repairing any faults.*	
Learning aim D: Review the finished relational database			
1D.6 Identify how the final database is suitable for the user requirements and purpose.	2D.P6 Explain how the final database is suitable for the user requirements and purpose.	2D.M5 Review the extent to which the finished database meets the user requirements, considering feedback from others.	2D.D4 Evaluate the finished database against the design and justify any changes made, making recommendations for further improvements to the database.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resource required for this unit is database software that allows the creation and use of relational database structures.

Learners will also need a brief to design and develop a database against.

A brief should include:

- purpose
- 'client' and user requirements for the database
- task(s) the database must perform
- information the database must supply, in what form and to whom
- data to be input into the database, how and from where
- the processing that is required in the database
- the level of security needed to access the database.

The tasks, data and processing in the brief must meet the following requirements (as a minimum):

- at least two tables with appropriate field attributes, including names, sizes formats, data types, validation rules and text
- define appropriate primary and foreign keys
- a given data set containing at least 50 records
- at least one one-to-many relationship between at least two tables
- sort records using single and multiple fields
- at least two data-entry forms, which enables entry of data into single and/or multiple tables
- a main menu form, which links to the data-entry sub-forms and includes options to run queries and view reports
- at least five queries, which searches for meaningful information using single and multiple criteria in at least two tables, using relational and logical operators and wildcards
- at least three reports to present meaningful information for a purpose and audience.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners will investigate databases by describing the main uses of databases, as well as the purpose of the tool/techniques they include.

**For 2A.P1:** learners should explain the uses of databases and how the tools/techniques are used in two given databases, e.g. an appointment system for a doctor's surgery that stores records of patients, appointments and medical history, with the intention of using features such as reports to identify the numbers of cancelled appointments in any given month. The two databases should be designed for different purposes.

*For level 1, as a minimum, learners should identify the uses of databases and how the tools/techniques are used for two databases, including tables, fields, records, queries and reports.*

**For 2A.M1:** learners should explain how the tools/techniques of the databases could improve productivity, accuracy and usability, e.g. sending an automated mail shot to every patient in the database using their address details, explaining important news about the surgery.

**For 2A.D1:** learners should look at the databases in more detail and consider the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

### **Learning aim B**

Learners should now have an understanding of what databases are and should be able to distinguish between different types of databases. They will be able to apply what they find out during their investigation of databases in the development of their own relational database.

Learners will design, develop and test a relational database.

Learners should be given a brief, which will allow them to design a relational database for a given purpose. The brief should ideally be written with a 'client' in mind, including clear objectives of what they want the database to perform and present. This will include a data set containing at least 50 records that learners will be expected to import into the database.

Centres are encouraged to use evidence from the development of the database as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** To produce a design for a relational database, learners must first be able to understand and interpret the purpose and users requirements for the product, relating this to design ideas for the product. They should be able to provide a description of the relational database and what it is intended to be used for.

*For level 1, as a minimum, learners should identify the user requirements and purpose for the design of their database.*

**For 2B.P3:** learners need to provide a database structure, including at least two tables with appropriate field attributes (e.g. names, sizes, formats, data types), an entity relationship diagram illustrating at least one, one-to-many relationship and a data input form. Learners must also provide a test plan giving an outline of the range of tests that they will perform when the relational database is developed.

*For level 1, as a minimum, learners should have created an outline design for their relational database. Their outline design will contain a single table database structure with appropriate field attributes and input/output screen for a data entry form.*

**For 2B.M2:** learners will need to consider alternative design ideas to suit audience and purpose including:

- different ways of presenting reports and forms.
- A detailed database structure including what validation and verification procedures would apply to the data. Learners will also need to provide an input and output screen/form for a main menu with options to access at least two data-entry sub-forms, run queries and view reports. All forms at this stage should be customised to meet audience and purpose. Examples include applying appropriate logos, themes, titles and user instructions. Learners must include some test data as part of the test plan, which should reflect the user requirements.
- an outline of at least five queries and three reports that will extract and present meaningful information.

**For 2B.D2:** learners should justify their final design decisions, explaining how the relational database will fulfil the stated purpose and user requirements. Learners must also think about the constraints, e.g. software availability and whether or not this will have an impact on developing the relational database. If it does, learners should consider whether there are any alternatives for developing the same solution. Learners should explain why alternative designs were rejected.

### Learning aim C

Learners will have a design of what their intended database will do, how it will be structured and how it will be tested. They should therefore be ready to apply their practical skills and knowledge to develop and test a relational database.

**For 2C.P4:** learners should use appropriate software resources (identified in their design) to develop their relational database. The relational database that they design must demonstrate awareness of the purpose of the database and user requirements.

As a minimum, learners should have developed a relational database that demonstrates the following competencies (as defined in the brief):

- consists of at least two tables with appropriate field attributes including names, sizes formats, data types, validation rules and text
- has defined primary and foreign key(s)
- has tables populated with a combined data set containing at least 50 records
- has at least one example of a one-to-many relationship
- sorts records using single and multiple fields alphabetically or numerically in ascending or descending order
- includes at least two data-entry forms.

*For level 1, as a minimum, learners should have developed a database which includes a single table with appropriate field attributes and an input form for data entry.*

**For 2C.M3:** learners will develop the database, demonstrating an awareness of the intended user requirements and accuracy by:

- creating reports to present meaningful information, using features (e.g. titles, page layouts, colours, field selection, date/time, grouping, introductions and images)
- customising data-entry forms, to enable entry of data into single and multiple tables. The fields should have appropriate entry-form field lengths, have clear labelling of entry-form fields, provide instruction fields where necessary and include validation checks on field entries where appropriate and facilitate navigation
- creating and editing a main menu form with options to access other forms, queries and reports
- searching with single and multiple criteria on one or two fields in at least two tables, using relational and logical operators and wildcards
- onscreen user navigation and guidance.

**For 2C.P5:** learners will be expected to follow their test plans (as defined in their design) and test the functionality and purpose of their database.

Learners are likely to experience technical difficulties as they develop their database. Where this happens, learners will be expected to resolve these difficulties, and by doing so will have made the necessary repairs to their database. It is important that learners make appropriate comments on their designs and test plans about any issues they discover and how they resolved them.

*For level 1, as a minimum, Learners must show they have tested for the functionality of their database.*

**For 2C.M4:** over and above the existing functionality testing, learners will also be required to test the functionality of the additional features of the database, as implemented for 2C.M3.

Learners will also complete usability testing with the help of at least one person who can act as the 'client'. The 'client' should comment on the functionality and usability of the relational database. Learners should record this feedback as part of the testing process.

**For 2C.D3:** teachers should recognise that the process of developing and testing a database is an iterative process. When making refinements to their database, learners should take into account their test results and feedback.

Learners should refine the database solution using automated tools and techniques to improve productivity, accuracy and the presentation of output data. The database should include:

- error messages resulting from validation and verification checks to data (including queries and reports) and the user interface (forms)
- onscreen user guidance to assist users with the user interface, particularly with instructions on how to navigate throughout the forms, data entry and data management, queries and reports
- automations (e.g. the ability to automate tasks using macros).

Learners will also be expected to make refinements to their databases by taking account of their test results and feedback from the 'client'.

All of the ideas from testing, feedback and reviewing their designs as they create the database should have been considered as how best to refine the product.

### **Learning aim D**

**For 2D.P6:** learners should explain why their final database meets the user requirements and purpose.

*For level 1, as a minimum, learners should have identified how their database meets the purpose and user requirements.*

**For 2D.M5:** learners should build on the comments they made for the pass criteria, and should refer back to the user requirements as defined in their design when doing so. They should also seek feedback from another person about the final relational database. An interview would be an ideal way of discussing the relational database and recording the feedback. Learners should use this feedback to identify strengths and potential improvements.

**For 2D.D4:** learners should evaluate their design against the final database in terms of overall user experience and user requirements in the original brief. They should justify any changes that were made through the development of the database and explain the rationale for the changes. Refinements could include exporting data, using data to create mail shots, macros, complex queries, etc. They should also give at least three recommendations for any further improvements, but do not need to implement the enhancements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

An idea for a scenario is:

- an endangered animal's charity needs a database of all the animals that it supports.
- members will be able to use the database online to search for information and to generate reports.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	How and Why are Databases Used?	<p>You work for a local health authority and have been asked to develop simple information management systems for doctors' surgeries to use in the area. Before you design a database solution, you want to prepare a demonstration to show how databases are currently used in two different ways by organisations.</p> <p>Write a short description of the use and features of databases in two different organisations. How does each database improve productivity?</p>	<ul style="list-style-type: none"> <li>• A short report.</li> </ul>



Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Designing a Database for a Doctor's Surgery	<p>You begin your design of an information system by designing a database for a doctor's surgery for a new appointment system. The surgery has five doctors.</p> <p>Design a database to store service users' details and their appointments, with appropriate fields. Your design should include:</p> <ul style="list-style-type: none"> <li>• at least two tables</li> <li>• an entity relationship diagram</li> <li>• input and output screens</li> <li>• at least two data-entry forms for new service users and appointments</li> <li>• at least one main menu form that accesses at least two data-entry sub-forms, including options to view queries and reports.</li> </ul> <p>The design should include the structure, validation, queries and reports that will extract and present meaningful information and a test plan with test data.</p> <p>Customise your forms.</p> <p>Justify how your design meets the requirements of the doctor's surgery.</p>	<ul style="list-style-type: none"> <li>• Database design documents</li> <li>• Structure</li> <li>• Justification.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Developing Your Database	<p>You should now develop your pilot database and test it out with some users.</p> <p>Create the database structure and build a relationship between the tables. Add appropriate data validation.</p> <p>Your database should be able to sort records alphabetically or numerically, in ascending and descending order. Create two data-entry forms that are suitable for staff use, e.g. adding new patients and new appointments.</p> <p>Create one main menu form that will allow staff to navigate between all forms (e.g. data-entry sub-forms) and be able to run queries and view reports.</p> <p>Create appropriate queries that will search for patient or appointment data, e.g. a service user's address or medical history.</p> <p>Create appropriate reports that will extract and present information, e.g. a report of missed appointments in any given day, week or month.</p> <p>Populate your database with the given dataset.</p> <p>Test your database (including any validation rules). Repair any features that do not work.</p> <p>Get the opinion of at least one other person on your database in terms of how easy it is to use.</p> <p>Improve your database.</p>	<ul style="list-style-type: none"> <li>• Database</li> <li>• Annotated design documents</li> <li>• Witness statement and observation records</li> <li>• Updated versions of files</li> <li>• Feedback from users.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
2D.P6, 2D.M5, 2D.D4	Reviewing Your Database	<p>You now need to review your database solution before you present it to your manager or roll it out across surgeries in the local area.</p> <p>Give at least three strengths and one improvement you could make to your database.</p> <p>Does your finished database meet the brief given by the doctor's surgery? How does it meet the requirements of the brief? How is it suitable for the users?</p> <p>What changes did you make to your designs? Explain any changes made. How would you improve your database to roll it out for other surgeries?</p>	<ul style="list-style-type: none"> <li>• A report</li> <li>• Annotation of design and feedback responses.</li> </ul>



# Unit 11: Computer Networks

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

Computer networking is an important part of our daily business and personal lives that most people take for granted. Without networks, many of the tools and systems used by business and individuals would not function: we couldn't surf the worldwide web, send and receive emails, or use a variety of devices such as a smartphone, laptop or games console to communicate with friends and family online.

So, what is computer networking? In its simplest form, computer networking is a collection of interconnected, wired or wireless, hardware devices and associated software that allows computers to communicate and share resources with each other.

There are a number of job roles that involve working with computer networks. These include:

- network engineers who design, develop, test, operate and support computer networks and services
- network managers who ensure that the network capacity can meet an organisation's needs and that it is secure
- IT support technicians who find and correct software and hardware problems for computer users, including problems in computer networks.

In this unit, you will come to understand the features and uses of computer networks by exploring what networks are, as well as the different types of network and how they affect user experience. You will investigate issues such as reliability (frequency of network failure and performance) and how quickly data are transferred across the network under different conditions. You will be able to apply some of your findings to your own computer network. You will also learn about the different hardware and software devices needed for networking, and how these can be combined to make a computer network. You will also put your knowledge and skills into practice by designing, developing and testing your own computer network for a brief. Once completed, you will review your network against the brief and obtain feedback from the client, having obtained feedback from others, and evaluate possible improvements.

In particular this unit develops skills from *Unit 1: The Online World*, *Unit 2: Technology Systems* and complements the skills in *Unit 12: Software Development*.

## Learning aims

In this unit you will:

- A understand the features and uses of computer networking
- B design a computer network
- C develop and test a computer network
- D review the finished computer network.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the features and uses of computer networking</b></p> <p><b>Computer networks</b></p> <p>Computer networks are a collection of interconnected, wired or wireless, hardware components and software that allow computer devices to communicate and share data with each other.</p> <p><b>Features of computer networks</b></p> <p>Understand the different features of computer networks:</p> <ul style="list-style-type: none"> <li>• connection method (e.g. wired and wireless)</li> <li>• scope or scale (e.g. Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Personal Area Network (PAN), Storage Area Network (SAN))</li> <li>• architecture (e.g. peer-to-peer, client-server)</li> <li>• topology, including             <ul style="list-style-type: none"> <li>◦ physical (e.g. star, bus, ring, mesh, tree and point-to-point)</li> <li>◦ logical (e.g. Ethernet and token ring)</li> </ul> </li> <li>• protocols and their function (e.g. Ethernet, Internet Protocol (IP), Transmission Control Protocol (TCP))</li> <li>• security (with regard to files, folders, data, network access, resources)</li> <li>• utilities (e.g. virus protection, access control, backup, remote desktop)</li> <li>• services (e.g. login, user account management, file/folder permissions to an individual user/group of users, security, software deployment)</li> <li>• users (e.g. can be used by individuals or groups of people arranged in different ways for different uses).</li> </ul> <p>Understand how data is transferred across the computer network, e.g. packet routing, transmission modes (half duplex, duplex, serial and parallel) and transfer rates.</p> <p><b>Uses of a computer network</b></p> <p>Use of networks, e.g.:</p> <ul style="list-style-type: none"> <li>• communication (e.g. email, instant messaging, social networking, blogs, forums, wikis, web conferencing)</li> <li>• sharing hardware resources (e.g. internet, printer, scanner, storage, processing power)</li> <li>• exchanging information (e.g. files, data and other types of information)</li> <li>• multi-user environments (e.g. gaming, collaborative working)</li> <li>• storage (e.g. files, data centres)</li> <li>• applications (e.g. online databases, online spreadsheets, intranet, extranet).</li> </ul> <p style="text-align: right;"><i>continued</i></p>

**What needs to be learnt**

Consider how these features could affect productivity or the user experience, e.g.:

- record keeping
- increasing speed
- sharing information securely
- backing up
- keeping individuals informed
- collaborative working
- playing computer games in a multi-player gaming environment.

**What needs to be learnt****Learning aim B: Design a computer network****Designing a network**

Requirements of the brief, to include:

- purpose
- requirements/objectives/activities (refer to assessment guidance)
- details of the users and their roles/function (including number of users)
- size/geographical spread/location
- costs (budget)
- constraints.

Initial design ideas and alternative solutions to developing the intended computer network. There will be more than one way to develop the same computer network using different topologies, hardware components and network architectures.

**Hardware components in the network**

Features of hardware components:

- their role/purpose
- how they connect
- how they communicate with other components in the intended computer network.

Hardware components, e.g.:

- computer systems/workstations/servers
- network adapters (wired/wireless)
- router (wired/wireless)
- hub
- switch
- network cabling (e.g. fibre optics, UTP, STP, coaxial; connectors)
- wireless (e.g. infrared, Bluetooth, laser, narrow-band [single-frequency] radio).

**Software components in the network**

Features of software components:

- their role/purpose
- their relationship with other components in the intended computer network.

Software components, to include:

- applications (e.g. internet browsers, firewalls, email, antivirus, network utilities (remote management), office applications)
- operating system with appropriate utilities capable of operating in a network environment.

Constraints to consider:

- costs (e.g. component cost for the intended computer network)
- technical constraints (e.g. hardware and software availability).

*continued*



**What needs to be learnt****Design documentation**

To include:

- computer network set-up and configuration, e.g. IP addressing/subnet masks (if appropriate), security, sharing files and folders, access permissions for users, managing user accounts (add, remove and amend), and sharing hardware/software resources, e.g. internet, printers, storage devices
- network user rights (e.g. administration rights, access control rights, shared resource rights)
- network diagram (e.g. structure of the network, components, positioning of the components, connection medium and IP addresses (if applicable))
- test plan with test data to test functionality (e.g. testing the connectivity between all devices on the network).

What needs to be learnt
<b>Learning aim C: Develop and test a computer network</b>
<p><b>Develop a computer network</b></p> <p>Develop a peer-to-peer or client-server network (depending on hardware and software resource availability) that meets the brief.</p> <p><b>Gathering components</b></p> <p>Network components to gather:</p> <ul style="list-style-type: none"> <li>• a minimum of two computer systems/workstations/clients</li> <li>• a server (if appropriate and resources available)</li> <li>• simulated software, such as Packet Tracer (if no hardware and software resources are available)</li> <li>• network adapters (wired or wireless)</li> <li>• network cabling (if wired)</li> <li>• a hub/router/switch (if networking more than two computer systems/workstations/clients)</li> <li>• a server operating system (if building a client-server network)</li> <li>• operating system (e.g. adding/removing/amending users, sharing files and folders, setting access permissions to files and folders, installing applications, sharing hardware resources, i.e. printer or any other network device)</li> <li>• utilities (e.g. remote desktop management, user rights, access control, firewall configuration, anti-virus, scheduling).</li> </ul> <p><b>Health and safety when developing a network</b></p> <p>Health and safety issues, e.g. hardware, electrical connection risks and guidelines, handling equipment.</p> <p><b>Testing the network</b></p> <ul style="list-style-type: none"> <li>• Test the computer network for functionality/connectivity using command tools, such as ipconfig and ping (reliability, performance, e.g. time to transfer a file across the network)</li> <li>• Use the full range of utilities/services provided by the operating system to test other aspects of the network (e.g. shared resources, user accounts, access control, file/folder permissions)</li> <li>• Feedback from 'client' (e.g. functionality, usability, requirements, performance)</li> <li>• Potential improvements to the computer network (e.g. performance, capacity, accessibility, portability, reliability, security).</li> </ul>
<b>Learning aim D: Review the finished computer network</b>
<p>Review the finished computer network against:</p> <ul style="list-style-type: none"> <li>• user requirements</li> <li>• purpose</li> <li>• user experience (e.g. reliability, performance)</li> <li>• constraints (e.g. hardware and software availability).</li> </ul>

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the features and uses of computer networking</b>			
1A.1 Identify the uses and features of a different computer network.	2A.P1 Explain the uses and features of a different computer network.	2A.M1 Review how the uses and features of a different computer network affect the user experience.	2A.D1 Discuss the strengths and weaknesses of the network.
<b>Learning aim B: Design a computer network</b>			
1B.2 Identify the purpose and 'client' requirements for the network.	2B.P2 Describe the purpose and 'client' requirements for the network.	2B.M2 Produce a detailed design for a computer network including: <ul style="list-style-type: none"> <li>• alternative solutions</li> <li>• an outline of how the computer network will be set up and configured</li> <li>• test data</li> <li>• costs involved with setting up the computer network.</li> </ul>	2B.D2 Justify final design decisions, explaining how the computer network will fulfil the stated purpose and 'client' requirements, describing the impact of any constraints on the design.
1B.3 Produce a design for a computer network, with guidance, including: <ul style="list-style-type: none"> <li>• a list of hardware and software components</li> <li>• the number of network users</li> <li>• an outline network diagram.</li> </ul>	2B.P3 Produce a design for a computer network including: <ul style="list-style-type: none"> <li>• a list of hardware and software components, their role, and how they connect and communicate with each other</li> <li>• a network diagram</li> <li>• a test plan.</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
Learning aim C: Develop and test a computer network			
1C.4 Develop a computer network, with guidance, that has: <ul style="list-style-type: none"><li>• at least two network users</li><li>• network users sharing one folder and three files.</li></ul>	2C.P4 Develop a computer network that has: <ul style="list-style-type: none"><li>• at least three network users</li><li>• users sharing at least five folders and at least seven files.</li></ul>	2C.M3 Develop a complex computer network with at least one additional shared hardware device and network utility software resource, demonstrating awareness of the original requirements.	2C.D3 Refine the computer network in order to improve performance and reliability, taking account of feedback.
1C.5 Test the computer network for connectivity, with guidance.	2C.P5 Test the computer network for functionality, connectivity against original requirements, and repair any faults as necessary.	2C.M4 Test the computer network and gather feedback, and use it to improve the computer network on user experience for functionality and connectivity.	
Learning aim D: Review the finished computer network			
1D.6 For the final computer network, identify how it is suitable for the intended purpose and original requirements.	2D.P6 For the final computer network, explain how the final computer network is suitable for the intended original requirements and purpose.	2D.M5 Review the extent to which the final computer network meets the original requirements while considering feedback.	2D.D4 Evaluate the initial designs against the final computer network and justify any changes that were made, making recommendations for further improvements to the computer network.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resource required for this unit is access to networking hardware components and software. Learners can also use network simulators, such as Packet Tracer to develop their understanding of concepts.

Hardware and software resources will be needed for the practical aspects of the unit. As a minimum, each learner will need access to two PCs with network adapters, cabling (if wired), wireless router (if wireless) and appropriate software, and simple manuals for the setting up and testing of the computer network. If there are more than two PCs, a hub or router will be required to connect them together.

The practical activities, although limited, should take place in a workshop with appropriate tools, and take account of health and safety requirements. Access to technical support is valuable, unless the teacher is very experienced.

To illustrate concepts and aid demonstrations, a wide range of current hardware components should be available for learners to study and use.

Learners will require an appropriate brief in order to design the network, and access to the 'client' (potentially the teacher) in order to get feedback about the network.

What they observe and find out during the investigation in learning aim A can be applied in the development of their own computer network.

For this unit, learners will need good background materials in the form of handouts, and diagrams of network structures and network operations.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners will investigate computer networks, describing the main uses and features of a network.

**For 2A.P1:** learners should explain the uses and features of a given computer network. For example, what features a computer network requires, allowing people to play computer games simultaneously in a multi-player gaming environment.

The two computer networks should be designed for different purposes.

*For level 1, as a minimum, learners should have identified uses and features of computer networks. For a given network, they are likely to have identified only the main features and the main uses of the network, without any description which relates the two together.*

**For 2A.M1:** learners should review how the uses and features of a given computer network could affect the user experience, e.g. reliability (frequency of network failure) and performance (how quickly data is transferred across the network under different conditions). The learner should explain how different features in the network affect the user experience, e.g. speed, connectivity, reliability.

**For 2A.D1:** learners should look at one computer network in more detail and discuss the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

## Learning aim B

Learners should now have an understanding of what computer networks are used for, and their features. Learners will design, develop and test their own computer network. They have a choice of designing either a **peer-to-peer** or **client-server** network, depending on hardware and software resource availability.

Learners should be given a brief, which will allow them to design a computer network. The brief should ideally be written with a 'client' in mind with clearly stated resource requirements and objectives.

The brief must include the following requirements (as a minimum):

- create at least three network users, one of whom must be a network administrator with full control over the computer network
- create at least five shared folders and seven shared files, with different access permissions for different users
- configure network users, e.g. place in groups, set login restrictions, disable accounts
- create at least one shared hardware network resource, e.g. printer, scanner, external storage device
- configure network users, e.g. add more users, remove existing users, change passwords(s), change access rights, set login restrictions, disable user accounts
- setup use of network utilities, e.g. remote desktop, instant messaging, antivirus, firewall.

Centres are encouraged to use evidence from the development of the network as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** in order to produce a design for a computer network, learners must first be able to understand and interpret the requirements from the brief for the product. They should be able to provide a description of the client's requirements for the computer network, and its intended use.

*For level 1, as a minimum, learners will identify the 'client' requirements for the network and its intended purpose.*

**For 2B.P3:** learners will design the network. This should include a description of users' needs, and their role when using the computer network. For example, one or more users may be given administrator responsibilities for maintaining the computer network. Learners need to provide a structure for their computer network, which must include a list of hardware components and software resources, the names and roles of the people that will be using the network, the role of the networking components and how they connect or communicate with each other. They should also provide a network diagram showing the structure of the network, network devices and other equipment, positioning of network devices and equipment, connection medium and IP address (if applicable).

Learners must also provide a test plan, giving an outline of the range of tests that they will perform when the network is developed.

*For level 1, as a minimum, learners should have created an outline design for their computer network. An outline design would contain a list of hardware and software components, the number of users, and an outline network diagram illustrating the network devices and their connections.*

**For 2B.M2:** learners should include some alternative solutions within their design documentation. For example, variations of how the same network can be developed, either by changing the physical or logical topologies or changing the network components. They must have also considered how their computer network will be set up and configured; for example, setting up IP addresses and subnet masks, and setting up different access permissions for individual or groups of network users. All network users will be expected to have a username and password to access the computer network. Learners must have also considered the costs involved with setting up a network, in terms of the hardware components and software resources. Learners must include some test data as part of the test plan, which should reflect the 'client' requirements.

**For 2B.D2:** learners should justify their design decisions, including their final choice of network design and why they chose one design compared to another. Learners should be able to reference that to the given purpose and 'client' requirements. Learners must also think about constraints, e.g. hardware and software availability, and whether or not this will have an impact on developing the computer network. If it does, are there any alternatives for developing the same solution? Learners should explain why alternative designs were rejected.

### Learning aim C

Learners will have a design of what their intended computer network will do, what it will consist of, where it will be located, how it will be connected, set up and configured, and how it will be tested. They should therefore be ready to apply their practical skills and knowledge to develop and test a computer network.

**For 2C.P4:** learners should use appropriate hardware components and software resources (identified in their design) to develop their computer network. The computer network that they build must demonstrate awareness of the purpose of the network and the 'client' requirements.

As a minimum, learners should have developed a computer network that has (as defined in the brief):

- at least three network users, one of whom is a network administrator
- users sharing of at least five folders and seven files, which have different access permissions for the three network users.

*For level 1, as a minimum, learners should have developed a computer network which shows that they have been able to set up at least two network users, and create and share one folder and three files (with no access permissions).*

**For 2C.M3:** as a minimum, learners will develop a more complex computer network, with the addition of at least one additional hardware device and software resource. These could include a printer, scanner, external storage device, internet or email. They will share and configure the hardware device(s) and utilities on the network.

**For 2C.P5:** learners will be expected to follow their test plans (as defined in their design) and test the functionality and connectivity of their computer network, in terms of checking the physical connections and electronic communication between devices. They should also test that the network meets their 'client' requirements.

Learners are likely to experience technical difficulties as they develop their computer network. Where this happens, learners will be expected to resolve these difficulties, and by doing so will have made the necessary repairs to their computer network. It is important that learners make appropriate comments in their designs and test plans about any issues they discover, and how they have resolved them. Where appropriate to do so, photographs of problems and solutions or witness statements and observation records can be used as evidence of this process.

Learners must adhere to all health and safety guidelines when undertaking practical activities with electronic equipment.

*For level 1, as a minimum, learners must show that they have tested connectivity between at least two network devices, e.g. computer systems in the network.*

**For 2C.M4:** learners will be required to test the functionality of the additional hardware device(s) and software resource(s) over and above the existing functionality testing.

Learners will also complete user-experience testing with the help of at least one person who can act as the 'client'. The 'client' should be commenting on the functionality, performance and reliability of the computer network. Learners should record this feedback as part of the testing process.

**For 2C.D3:** teachers should recognise that the process of developing and testing networks is an iterative process. When making refinements to their network, learners should take into account their test results and feedback.

Learners should refine their network to improve the reliability and performance. If it is not possible for learners to apply their improvements (for example, due to software or hardware constraints), learners should explain what they would do if they had the opportunity focusing on reliability and performance. Learners will also be expected to make refinements following their test results and the feedback from the 'client'.

Refinements could include configuring the computer network, such as configuring the users, e.g. adding more users, removing existing users, changing access rights, setting login permissions, disabling accounts, or demonstrating a range of networking utilities, such as remote desktop.

All of the ideas from testing, feedback and reviewing the computer network should have been considered as learners go through the refinement process.

### **Learning aim D**

**For 2D.P6:** learners should explain why their network is suitable for the intended purpose and the original requirements.

*For level 1, as a minimum, learners should have identified how their network is suitable for the purpose and the original requirements.*

**For 2D.M5:** learners should build on the explanations for the Pass criteria, and review how well the 'client' requirements and purpose have been met. They should also seek feedback from the 'client' about the final network. An interview would be an ideal way of discussing the computer network and recording the feedback.

Learners should use this feedback to identify strengths and potential improvements for their network.

**For 2D.D4:** learners should evaluate the initial designs/solutions against the final computer network in terms of costs, overall user experience, and purpose and 'client' requirements in the original brief. They should justify any changes that were made and explain the rationale for those changes. They should also give recommendations for at least three improvements, but do not need to implement the enhancements.



## **Suggested assignment scenario**

The information below is guidance only, and centres should refer to the suggested assessment outline table for more information.

### **Suggested scenario**

You work for a network development company called Dayce Networking Solutions.

A new 'client' wants your company to design and develop a small computer network for their office in a nearby town. There is currently a team of eight people working in the office. These people are all using stand-alone computer systems, one of which is connected to a laser printer.

The 'client' has given the following requirements.

- All team members must be able to access and use the computer network.
- The computer network must be configured to allow adding more users, changing access rights, and setting login restrictions.
- All team members must have their own individual folder on the computer network with full access rights. Everyone should be able to access each other's folders with different access rights. This should be configured for at least six people.
- Everyone will be working with a minimum of seven files on the network.
- All computers in the network must be able to connect to the laser printer.
- The computer network should make use of remote desktop to allow users to take control of other computers in the network.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Investigation	<p>For the scenario, the 'client' wants to know a little more about what a computer network is, its features and potential uses.</p> <p>The 'client' also wants to know how these features and uses could improve the user experience of the network.</p> <p>You need to consider strengths and weaknesses of two existing networks.</p> <p>Prepare a presentation or a report for the 'client'.</p>	<ul style="list-style-type: none"> <li>• Web page.</li> <li>• Presentation.</li> <li>• Report.</li> <li>• Interview.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Designing a Computer Network	<p>You have been given a brief by your company, Dayce Networking Solutions.</p> <p>Your task is to design a network solution to fulfil your 'client' requirements.</p> <p>Prepare design documentation to include:</p> <ul style="list-style-type: none"> <li>• a description of the computer network, and what it will be used for</li> <li>• a list of components, with an explanation about their role, and how they will connect/communicate with each other on the computer network</li> <li>• the names of all people that will become users of the computer network, and their role in the network</li> <li>• details of how the computer network will be configured</li> <li>• a network diagram</li> <li>• a list of hardware constraints and software availability</li> <li>• a test plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Web page.</li> <li>• Report.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Developing a Computer Network	<p>Develop a computer network for your 'client'. You must include the following:</p> <ul style="list-style-type: none"> <li>• addition of at least three network users, one of whom must be a network administrator who has full control over the computer network</li> <li>• sharing at least five folders and seven files, which have different access permissions for different users</li> <li>• sharing at least one hardware/software network resource, e.g. printer, scanner, external storage device, internet, email</li> <li>• configuring network users, e.g. adding more users, removing existing users, changing a password, changing access rights, setting login restrictions, disabling accounts</li> <li>• use network utilities, e.g. remote desktop, instant messaging, antivirus, firewall.</li> </ul> <p>Test and document the computer network. Make any necessary improvements to the computer network as a result of troubleshooting the computer network. Meet with your 'client' to discuss your progress and to gather some feedback about your computer network. Refine your computer network, taking on board feedback from your 'client' and test results.</p>	<ul style="list-style-type: none"> <li>• Witness statements.</li> <li>• Observation records.</li> </ul>
1D.6 2D.P6, 2D.M5, 2D.D4	Review the Finished Computer Network	Evaluate the computer network, justifying why it meets the brief, suggest improvements and consider any constraints.	<ul style="list-style-type: none"> <li>• Report.</li> </ul>

# Unit 12: Software Development

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

We live in an age of computer devices, which organisations and individuals have come to rely on. Computer devices are everywhere and advances in these take place daily. It is essential for organisations and IT professionals to develop and maintain software programs that bring to life the technology we all rely on.

Being able to create software programs could give you a brilliant opportunity for a varied, interesting, challenging and prosperous career that few other vocational sectors can match. Software developers or engineers develop, test and maintain computer programs to solve problems and/or improve productivity. To create successful programs, you have to develop good problem-solving and creative-thinking skills. In addition, businesses are likely to employ teams of people to develop software programs, including system analysts who examine IT systems and business processes.

In this unit, you will learn the rules of a programming language and how to write code to develop a successful program. You will be able to apply some of your findings to your own software solutions.

In addition, you will learn what factors affect the quality of the program and how to produce good quality programs. You will design and develop your own software program to fulfil a brief. You will test your programs for functionality and purpose, and identify and repair faults. You will review your finished program, having obtained feedback from others, and evaluate possible improvements.

This unit is not platform dependent and a range of program-development environments can be used.

In particular this unit develops skills from *Unit 2: Technology Systems* and it complements the delivery of *Unit 8: Mobile Apps Development*.

## Learning aims

In this unit you will:

- A understand the characteristics and uses of a software program
- B design a software program
- C develop and test a software program
- D review the finished software program.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the characteristics and uses of a software program</b></p> <p><b>Why is software used?</b></p> <p>Software programs instruct a computer's central processing unit (CPU) to automatically carry out a set of instructions used to solve a problem and/or improve productivity.</p> <p>Know why we develop software programs and their uses, e.g.:</p> <ul style="list-style-type: none"> <li>• gaming and entertainment (e.g. computer games, CGI in movies, virtual worlds, social networking)</li> <li>• increasing productivity (e.g. automating processes in manufacturing, stock control systems)</li> <li>• information storage and management (e.g. stock control systems, booking systems)</li> <li>• completing repetitive tasks (e.g. control robotic arms in manufacturing) and dangerous tasks (e.g. defusing explosive devices, nuclear plants)</li> <li>• solving complex problems (e.g. weather forecasting).</li> </ul> <p><b>Characteristics of software programs:</b></p> <ul style="list-style-type: none"> <li>• programming languages</li> <li>• constructs and techniques.</li> </ul> <p><b>Programming languages</b></p> <p>Types of programming language, including procedural languages like Pascal, C and Cobol, and event-driven languages such as VB, VB.NET, VBA, Visual C++.</p> <p>Programming languages contain a range of constructs and techniques, including:</p> <ul style="list-style-type: none"> <li>• command words</li> <li>• subroutines</li> <li>• basic string handling</li> <li>• basic file handling</li> <li>• data structures</li> <li>• event handling.</li> </ul> <p>Understand:</p> <ul style="list-style-type: none"> <li>• the reasons for compiling programs</li> <li>• there are a variety of program design methods</li> <li>• how flowcharts can be used to represent the processes within programs.</li> </ul> <p style="text-align: right;"><i>continued</i></p>

**What needs to be learnt****Quality of software programs**

Know that software design and techniques affect the quality of the program developed:

- efficiency/performance, e.g. the amount of system resources a program consumes (processor time, memory space, accessing storage media)
- maintainability, e.g. the ease with which a program can be modified by its present or future developers in order to carry out corrective, perfective or adaptive alterations to the code
- portability, e.g. the range of computer hardware and operating system platforms on which the source code of a program can be run/compiled/interpreted
- reliability, e.g. the accuracy of its outputs
- robustness, e.g. the quality of the coding that ensures the extreme data can be processed without causing the program to crash
- usability, e.g. the ease with which an end user can use the program for its intended purpose or, in some cases, even unanticipated purposes.

**What needs to be learnt****Learning aim B: Design a software program****Software development life cycle**

Software development life cycle, which includes:

- assess requirements
- design specification, e.g.
  - scope
  - inputs
  - outputs
  - processing
  - user interface
  - constraints (e.g. programming language and timescales for development)
- develop code
- test
- maintain.

**Designing software**

Designs include:

- intended purpose and user requirements (as defined in a brief)
- a problem definition statement
- a proposed solution using design tools, e.g.
  - a description of the main program tasks – input and output format (such as to add two numbers together and display a result)
  - screen layouts and navigation, including prototypes (e.g. initial splash screen or main activity screen)
  - algorithms with a description of the method of solution (such as, flowcharts, pseudocode and events)
  - data structures
  - data storage
  - control structures
  - data validation
  - error handling and reporting
- a brief outline of alternative solutions for the intended software program (e.g. for screen layout and navigation)
- a list of any pre-defined programs and/or code snippets and their sources
- test plan with test data (e.g. testing the inputs and expected outputs and compilation of the code)
- constraints (e.g. device capabilities including connectivity, memory storage or programming language).



**What needs to be learnt****Learning aim C: Develop and test a software program****Developing software**

Develop software:

- Understand a development environment to produce code
- Develop and refine the software program using suitable programming language constructs and techniques
- Use program constructs and techniques.

**Constructs and techniques**

Program constructs, e.g.:

- comments
- constants (variables with a constant value that cannot change)
- operators (arithmetic [+ , - , \* , / , %] and logical [< , <= , > , >= , AND , OR , true , false])
- reserved words (which have special meaning within the programming language and are used to write instructions in a program, e.g. in Visual Basic 'Get' and 'Repeat' are reserved words)
- input and output commands
- local variables (exist only inside the subroutine/function where they are declared and used)
- global variables (exist throughout the entire program and in subroutines/functions)
- assignment
- sequence
- counter controlled loops
- conditional loops
- iteration (while do, repeat ... until, for ... next)
- sequential statements, selections (if ... then ... else)
- recursion
- subroutines/functions/procedures.

Data types, e.g.:

- character
- string (text)
- integer and real (numbers)
- Boolean.

Use basic string-handling commands to examine individual characters and substrings.

*continued*

**What needs to be learnt**

Basic file-handling operations, e.g.:

- open
- read
- write
- close.

Use data structures:

- user-defined data types and record structures
- arrays.

Event handling:

- forms
- assigning properties to screen components, e.g. buttons, boxes, data validation and drop-down lists
- actions
- imported structures.

Annotate the code to demonstrate understanding and to allow effective repair/debugging of the program and for maintainability.

Compile the program into a suitable format to create an executable program.

**Testing and refining the software**

Test the program solution:

- for functionality against the test plan with the test data
- by reviewing the quality of the program in terms of reliability, usability, efficiency/performance, maintainability and portability
- gather feedback from others on the quality (reliability, usability, efficiency/performance, maintainability, portability) of the solution.

Document any changes to the design, including changes to the source table for pre-defined assets.

Improvements and/or refinements to the software program.

**What needs to be learnt****Learning aim D: Review the finished software program****Reviewing software**

Review the finished software program for:

- user requirements
- fitness for purpose
- user experience (e.g. ease of navigation)
- constraints (e.g. programming language, time, device capabilities (memory, connectivity))
- quality of the program (e.g. reliability, usability, efficiency/performance, maintainability, portability)
- strengths and improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the characteristics and uses of a software program</b>			
1A.1 Identify the purpose of two simple programs and their characteristics, including tools and techniques used.	2A.P1 Explain the purpose of two simple programs and their characteristics, including tools and techniques used.	2A.M1 Comment on the quality of one of the given simple programs, suggesting any improvements and provide a flowchart to show the processing.	2A.D1 Discuss the strengths and weaknesses of the software program.
<b>Learning aim B: Design a software program</b>			
1B.2 Identify the purpose and user requirements for the software program.	2B.P2 Describe the purpose and user requirements for the software program.	2B.M2 Produce a detailed design for a program, including: <ul style="list-style-type: none"> <li>• alternative solutions</li> <li>• a detailed proposed solution using a range of design tools</li> <li>• test data.</li> </ul>	2B.D2 Justify the design decisions, including: <ul style="list-style-type: none"> <li>• how they will fulfil the stated purpose and user requirements</li> <li>• any design constraints.</li> </ul>
1B.3 Produce, with guidance, a design for a program, including: <ul style="list-style-type: none"> <li>• a problem definition statement</li> <li>• an outline of the proposed solution.</li> </ul>	2B.P3 Produce a design for a program, including: <ul style="list-style-type: none"> <li>• a problem definition statement</li> <li>• a proposed solution</li> <li>• a list of any pre-defined functions/subroutines</li> <li>• a test plan.</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Develop and test a software program</b>			
1C.4 With guidance, develop a program for a given brief, that contains: <ul style="list-style-type: none"> <li>• a user interface (input and output)</li> <li>• constructs/techniques.* (Please see guidance)</li> </ul>	2C.P4 Develop a program for a given brief, which includes: <ul style="list-style-type: none"> <li>• a user interface (input and output)</li> <li>• constructs/techniques</li> <li>• commentary throughout the code.*</li> </ul>	2C.M3 Develop a functional program that meets the given brief.*	2C.D3 Refine the software program, taking account of the quality of the code and user feedback.*
1C.5 With guidance, test the program for functionality and against the original requirements and repair any faults.	2C.P5 Test the program for functionality using the test plan and against the original requirements and repair any faults.	2C.M4 Test the program using the test data, gathering feedback from others on the usability and quality of the program, and use it to improve the software program. Repair any faults.	

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim D: Review the finished software program</b>			
1D.6 For the software program, identify how the final program is suitable for purpose and the original requirements.	2D.P6 For the software program, explain how the final software program is suitable for the original requirements and purpose.	2D.M5 Review the extent to which the software program meets the original requirements, considering feedback from others and any constraints.	2D.D4 Evaluate the final software programs against the initial designs and the quality of the code, and justify any changes made, making recommendations for further improvement.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

Centres should consider carefully which programming language(s) they are going to use and whether the language will allow learners to meet all the assessment criteria for this unit. Please note that at level 2 we do not expect learners to develop programs in an object-oriented language.

Teachers may wish to introduce learners to the concepts of programming using an application such as Scratch, available from <http://scratch.mit.edu/download>, or BYOB, which allows users to build their own subroutines. BYOB is available from <http://byobberkeley.edu/>.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

Learners will investigate the characteristics of software programs. This includes:

- why software is used
- knowing that different programming languages exist and that they have different constructs/techniques
- functions of the constructs and techniques
- understanding how the quality of the software programs are affected by the design choice of techniques and constructs.

### Learning aim A

Learners will be given two sections of code or programs to investigate. The given programs should be appropriate for the level of the learner, including a good range of program constructs and techniques given in learning aim C.

**For 2A.P1:** learners should explain the purpose of the code for each of the two given programs, e.g. to carry out calculations, and explain the characteristics, including constructs and techniques being used within the program, e.g. variables and functions. The two software programs should be designed for different purposes.

*For level 1, as a minimum, learners should be able to identify the purpose of the code and identify the constructs and techniques, e.g. variables and functions.*

**For 2A.M1:** learners should review the quality (e.g. efficiency/performance, maintainability and usability) of the program. Learners should provide specific suggestions for improving the quality of this program. Learners should also include a flowchart showing how the program functions.

**For 2A.D1:** learners should look at one software program in more detail and discuss the strengths and weaknesses of the product. They should discuss at least one strength and one weakness.

## Learning aim B

Learners should have access to a suitable assessment brief, which contains the user requirements of the program, including:

- the purpose of the software program
- the task(s) the software must perform
- what the required user inputs and outputs are
- an outline of any processing/functions required.

Centres are encouraged to use evidence from the development of the software as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** learners should describe the user requirements and purpose of the program for their designs.

*For level 1, as a minimum, learners should identify the user requirements and the purpose of the program for their designs.*

**For 2B.P3:** for a given problem outlined in a brief, learners should outline their proposed solution. The design documentation should include:

- a problem definition statement
- a proposed solution using basic design tools – a description of the main program tasks, (e.g. data input and output format), screen layouts and navigation, simple data structures and algorithms or descriptions of the method of solution
- a list of any pre-defined programs and/or subroutines documenting the source
- a test plan (to test for the logic and functionality).

*For level 1, as a minimum, learners should identify the purpose and user requirements for the program. The outline of a proposed solution will contain:*

- *a problem definition statement*
- *a description of the main program tasks – input and output (e.g. to add two numbers together and display a result)*
- *screen layouts (input and output) – templates or design sheets can be used to help learners with their design.*

**For 2B.M2:** in addition to the requirements for the pass grade, learners should produce:

- a detailed proposed solution using a range of suitable tools (in addition to those used at pass level) such as algorithms, e.g. flowcharts, data structures, data storage, control structures, data validation and error handling and reporting
- a brief outline of any alternative solutions for the intended software program
- test data.

**For 2B.D2:** learners are expected to be able to justify their design decisions and how the chosen design fulfils the stated purpose and user requirements for the given brief. They should consider the suitability for the end user and the quality and thoroughness of their design work. Learners need to consider their design in light of any constraints arising from the programming. For example, language used, and the device capabilities (e.g. memory) in terms of the quality of the user interface, manipulation and storage of data, and ease of use. Learners should explain why alternative designs were rejected.



## Learning aim C

Learners will develop and test their program for a given brief.

**For 2C.P4:** learners should develop their solution to the given brief by implementing their design. Some learners will find that their designs do not allow them to implement a solution. In this case, learners should amend their program but should not revisit the design work at this stage. Learners should ensure that they are developing solutions using some constructs/techniques from the level 2 content in learning aim C. These include conditional-controlled loops, Boolean data types and functions. The program should also include commentary built into the program and have a user interface with both input and output facilities.

*For level 1, as a minimum, learners should use their designs and their understanding of the level 1 constructs/techniques to create simple programs to solve the given problem.*

**For 2C.M3:** at this level, learners will produce a functional program that satisfies the brief. Learners are likely to need to adapt their designs to create a fully functioning software solution.

**For 2C.P5:** learners should compile/run (depending on the programming language being used) and test their program using their test plan. During the testing process they should keep evidence of any changes made to the code, and repair any faults. Learners should test that their program meets the original requirements from the brief.

*For level 1, as a minimum, learners should compile/run their program and test the program's main functions to ensure that data can be input, processed and output.*

**For 2C.M4:** learners should compile/run (depending on the programming language being used) and test their program using the test data. They should correct any errors found in the code and produce evidence to show any changes made to the program. Learners should work with others to obtain feedback on the quality and functionality of their program, and use this to improve the program.

**For 2C.D3:** teachers should recognise that the process of developing and testing software is an iterative process. When making refinements to their software, learners should take into account their test results and user feedback.

Learners should refine the software program, taking account of user feedback and the quality of the code, e.g. maintainability, portability, usability.

All of the ideas from the testing, feedback and reviewing the software program should have been considered in when refining the product.

### Learning aim D

**For 2D.P6:** learners should review their program in light of the results of their testing and should explain how their program is fit for purpose and meets the original requirements.

*For level 1, as a minimum, learners should identify how their software meets the original requirements and the purpose.*

**For 2D.M5:** learners should consider the outcomes of their testing and should review the extent to which the program solves the given problem. Learners should gather feedback from others and consider changes they would like to make in the light of this feedback.

**For 2D.D4:** learners should evaluate their initial designs and the completed program. They should identify any changes made from the design stage and justify these changes in terms of the requirements and the features of the language used, and any other constraints.

Learners should make at least three specific suggestions for improving the completed program to ensure it is fully functional, well coded and fit for purpose.

Learners do not need to implement the enhancements.

## Programming constructs and techniques for level 1 assessment

It is recognised that some learners may fail to achieve a full Pass at level 2, so learners being assessed for the level 1 criteria for learning aims B and C are not required to include all of the different programming constructs in their work for assessment.

The constructs that learners working at level 1 should be familiar with and include in their assessment evidence are shown below.

Use program constructs and techniques, e.g.:

- program constructs, e.g.
  - comments
  - constants – variables with a constant value that cannot change
  - operators – arithmetic ( +, –)
  - reserved words – which have special meaning within the programming language and are used to write instructions in a program, e.g. in VisualBasic 'Get' and 'Repeat' are reserved words
  - local variables – only exist inside the subroutine/function where they are declared and used
  - global variables – exist throughout the entire program and in subroutines/functions
  - assignment
  - sequence
  - counter controlled loops
- subroutines/functions/procedures
- use a range of data types, e.g.
  - character
  - string (text)
  - integer and real (numbers)
- use data structures
  - user-defined data types and record structures
- event handling
  - forms
  - assigning properties to screen components, e.g. buttons, boxes and drop-down lists
  - actions.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Reviewing Programs	<p>You are a programmer working for a software development company.</p> <p>Your manager has asked you to look at two programs. For each program, comment on:</p> <ul style="list-style-type: none"> <li>• characteristics of the code</li> <li>• constructs/techniques used</li> <li>• purpose.</li> </ul> <p>For one of the programs, review:</p> <ul style="list-style-type: none"> <li>• the quality of the code</li> <li>• any improvements you would make to the program</li> <li>• the processes within the program.</li> </ul>	<ul style="list-style-type: none"> <li>• Annotated code.</li> <li>• Draft replacement code.</li> <li>• Report.</li> <li>• Flow chart.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Design a Password Program	<p>Your manager has asked you to design a program that converts different currencies based on a given exchange rate.</p> <p>You should explain how your design meets the user requirements when addressing the problem.</p> <p>You will need to design a software program that meets the user requirements and purpose, and include in your design:</p> <ul style="list-style-type: none"> <li>• a problem definition statement</li> <li>• a proposed solution</li> <li>• a description of the main program tasks, (e.g. data input and output format), screen layouts and navigation, simple data structures and algorithms or descriptions of the method of solution</li> <li>• a list of any pre-defined programs and/or subroutines and include the source</li> <li>• a test plan.</li> </ul>	<ul style="list-style-type: none"> <li>• Processing structures, e.g. flow charts and pseudocode.</li> <li>• List of tools, functions and subroutines.</li> <li>• Data validation.</li> <li>• Report.</li> <li>• Data structures and data storage.</li> <li>• Screens (input and output).</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Develop and Test	<p>Develop the program, including commentary within the code.</p> <p>Test the program against the test plan, checking the 'client' requirements are still being met and documenting any changes to the program.</p> <p>Fix any faults in the program.</p> <p>Get feedback on the program from one other person, including how easy it is to use and the quality of the code.</p> <p>Review and refine your program in light of feedback.</p>	<ul style="list-style-type: none"> <li>• Annotated code.</li> <li>• Annotated design.</li> <li>• User feedback.</li> <li>• Functional program.</li> <li>• Test plans and data.</li> </ul>
1D.6 2D.P6, 2D.M5, 2D.D4	Review the Program	<p>How could the program be improved?</p> <p>Include strengths and points you could improve.</p> <p>Justify where your design has changed during the development, including what has changed following feedback, and explain how you would improve the program further.</p>	<ul style="list-style-type: none"> <li>• Annotated code.</li> <li>• Annotated design.</li> <li>• User feedback.</li> <li>• Evaluation report.</li> </ul>

# Unit 13: Website Development

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

Have you ever viewed a website and wondered how it was created? Many different elements can be included in the website, such as text, graphics, animation, video and programs (client-side computer scripts). Many websites also contain sophisticated interactive features such as database search facilities, online purchasing and messaging. To be successful, a website must be visually interesting, while remaining easy to use.

With the internet being central to how most organisations and individuals communicate and do business, the creation and maintenance of websites is an important job role. There is a strong demand in the job market for web developers with appropriate technical and creative skills. For instance, a web-developer is a technical role involved with designing and developing websites, a content manager is responsible for keeping a website up to date and a search engine optimisation specialist encourages user traffic from internet search engines to specific websites.

In this unit, you will investigate the features and uses of websites by exploring what they are and how their integrated components and applications interact with each other.

You will also learn how to design, develop and test a website for a brief. Once this is completed you will review your website, having obtained feedback from others.

In particular this unit develops skills from *Unit 1: The Online World* and *Unit 2: Technology Systems*. It also develops the skills from the following units: *Unit 4: Creating Digital Animation*, *Unit 5: Creating Digital Audio*, *Unit 6: Creating Digital Graphics*, and *Unit 7: Creating Digital Video*. *Unit 12: Software Development* could also complement the content of this unit.

## Learning aims

In this unit you will:

- A understand the uses and features of websites
- B design a website
- C develop and test a website
- D review the finished website.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the uses and features of websites</b></p> <p><b>Why are websites used?</b></p> <p>The purpose of a website is to present information to an audience by using a collection of related web pages, traditionally hosted on a web server. This information may include text, graphics, video or other digital assets.</p> <p>Typical uses of websites, including:</p> <ul style="list-style-type: none"> <li>• presenting information (e.g. advertising, news)</li> <li>• storing information (e.g. archiving, cloud)</li> <li>• browsing and searching for information (e.g. real-time information)</li> <li>• improving productivity (e.g. email, collaborative working)</li> <li>• making decisions (e.g. financial, managerial)</li> <li>• communicating with people (e.g. social networking, video conferencing)</li> <li>• media sharing (e.g. listen to live radio, watch films)</li> <li>• e-commerce (e.g. shopping, banking)</li> <li>• education (e.g. libraries, online learning, assessments)</li> <li>• downloading information (e.g. data, media).</li> </ul> <p><b>Features of websites:</b></p> <ul style="list-style-type: none"> <li>• hyperlinks</li> <li>• action buttons</li> <li>• hot spots</li> <li>• templates</li> <li>• email links</li> <li>• registration and logins</li> <li>• forms (user input and feedback)</li> <li>• accessibility, e.g. text to speech.</li> <li>• e-commerce facilities</li> <li>• online forums</li> <li>• aesthetics, e.g. colours, layout, graphics/video/animation, audio, text, styles (use of style sheets).</li> </ul> <p style="text-align: right;"><i>continued</i></p>



**What needs to be learnt****Types of websites:**

- static
- dynamic.

Static websites are a collection of web pages primarily coded in HyperText Markup Language (HTML). These types of websites present static information to their audience, e.g. a brochure.

A dynamic website is a collection of web pages that often changes or customises itself frequently and automatically.

**How can user experience of websites be improved?**

Different features of websites can improve the user experience for an individual, business or organisation, e.g.:

- forms that allow customers to leave feedback
- dynamic interactions when socialising online
- applying style sheets to keep the same look and feel for a website
- making websites interactive by embedding digital assets.

**What needs to be learnt****Learning aim B: Design a website****Designing a website**

Designs include:

- intended purpose and user requirements as defined in a brief
- documented design ideas/prototypes, including:
  - original and/or ready-made digital assets (e.g. digital animation, digital graphic, digital audio, digital video or any combined assets). Sources for ready-made assets must be documented and referenced.
  - storyboard, containing a number of panels, showing the intended content and structure of the website
  - home page and folder structure
  - site map, to illustrate how web pages are interlinked
  - styles, templates and formats (e.g. colours, font size, font type, text and image alignment, page layouts)
- hardware, software and other resources required
- constraints, e.g. hardware and software availability, accessibility, browser compatibility, file and file formats, client-side functionality, and performance (bandwidth, processor, memory), availability of web plug-ins, e.g. ActiveX, Flash
- test plan, to test functionality
- a brief outline of alternative design ideas.

**What needs to be learnt****Learning aim C: Develop and test a website****Develop and test a website**

Prepare assets and create a website:

- Prepare (gather or create) suitable assets e.g. graphics, audio, video, other content such as text and external links
- Use appropriate software tools/techniques
- create and edit web pages including:
  - text
  - tables
  - forms (e.g. text field, text area, buttons, radio buttons, check boxes)
  - frames
  - navigation (e.g. menus, hyperlinks (internal and external), anchors)
  - interactive components (e.g. hot spots, pop-ups, buttons, menus, rollover images)
  - colour schemes, styles and templates (e.g. cascading style sheets, page layout, size and position (text, links, assets, forms), text wrapping, background colours)
  - embedded multimedia/digital asset content (e.g. digital graphics, digital video, digital audio, digital animation)
  - simple client-side scripts (e.g. embed JavaScript code to display a name in a pop-up box)
  - other formatting (e.g. HyperText Markup Language (HTML), Dynamic HyperText Markup Language (DHTML))
  - accessibility features (e.g. alternative tags, zoom features, text-to-speech)
  - check browser compatibility to present web pages
  - export and compress any digital assets into suitable file types (e.g. resolution and size appropriate for web pages)
  - suitable file names for web pages.

Website hosting:

- web server
- domain name
- web hosting services.

Test the website:

- Test the website for functionality, quality and usability
- gather feedback from others (e.g. on content, presentation, navigation, usability, accessibility, performance and purpose).
- improve and/or refine to the website to improve accessibility, e.g.:
  - alternative text tags
  - zoom features
  - text to speech features
- improve and/or refine the website to enhance performance, e.g.:
  - export and compress digital assets
  - add dynamic functionality.

**What needs to be learnt****Learning aim D: Review the finished website****Reviewing a website**

Review the finished website for:

- fitness for purpose and user requirements
- functionality
- information/content including digital assets
- user experience (e.g. usability, quality, performance)
- constraints
- strengths and potential improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the uses and features of websites</b>			
1A.1 Identify the intended use and features of two websites.	2A.P1 Explain the intended uses and features of two different websites.	2A.M1 Review how the features in two websites improve presentation, usability, accessibility, and performance.	2A.D1 Discuss the strengths and weaknesses of the websites.
<b>Learning aim B: Design a website</b>			
1B.2 Identify the purpose and user requirements for the website.	2B.P2 Describe the purpose and user requirements for the website.	2B.M2 Produce a detailed design for a website, including: <ul style="list-style-type: none"> <li>• alternative solutions</li> <li>• aesthetic features</li> <li>• interactive components.#</li> </ul>	2B.D2 Justify the final design decisions, including: <ul style="list-style-type: none"> <li>• how the design will fulfil the purpose and user requirements</li> <li>• including any design constraints.#</li> </ul>
1B.3 Produce a design for a four page interlinked website, with guidance, including an outline of the proposed solution.	2B.P3 Produce a design for an eight page interlinked website, including: <ul style="list-style-type: none"> <li>• a proposed solution</li> <li>• a list of assets</li> <li>• a test plan.#</li> </ul>		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Develop and test a website</b>			
1C.4 Prepare assets and content for the website, with guidance.	2C.P4 Prepare assets and content for the website, demonstrating awareness of purpose, listing sources of assets.	2C.M3 Prepare assets and content for the website demonstrating awareness of the users' requirements, with all sources fully referenced.	2C.D3 Refine the website, to improve accessibility and performance, taking account of user feedback and test results.
1C.5 Develop a website containing four interlinked web pages, with guidance.	2C.P5 Develop a website containing at least eight interlinked web pages, demonstrating awareness of purpose.	2C.M4 Develop a website including interactive components, demonstrating awareness of user requirements and taking account of usability.	
1C.6 Test the website for functionality and purpose repairing any faults and documenting changes, with guidance.	2C.P6 Test the website for functionality and purpose, repairing any faults, and documenting changes.	2C.M5 Test interactivity and gather feedback from others on the quality of the website, and use it to improve the website, showing awareness of user requirements.	

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim D: Review the finished website</b>			
1D.7 Identify how the final website is suitable for the intended purpose.	2D.P7 Explain how the final website is suitable for the intended audience and purpose.	2D.M6 Review the extent to which the finished website meets the needs of purpose and user requirements, while considering feedback from others and constraints.	2D.D4 Evaluate the final website against the design and justify any changes made, making recommendations for further improvements.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resource required for this unit is website authoring software that allows the creation of websites.

Learners should have access to an assignment brief to allow the learner to design a website for a given purpose. The brief should ideally be written with a 'client' in mind, and should have clear objectives of what they want the website to present. The brief should include details of any required text and digital assets (e.g. digital animation, digital video, digital audio, digital graphics).

If the brief requires learners to create assets for the website, they will also need access to suitable software in order to create audio, video, animation or graphics.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners will investigate websites in order to understand the uses of two websites and the purpose of their features. The websites should be designed for different purposes.

**For 2A.P1:** learners should explain the uses of two websites and the features they include, e.g. a theatre website that allows users to purchase tickets in advance using online payment methods, or a banking website that allows users to manage their bank accounts securely.

*For level 1, as a minimum, learners should have identified the intended uses of two websites and their features, including text, digital assets and links.*

**For 2A.M1:** learners should review how the features of the websites improves the presentation, usability and accessibility, e.g. allowing users to customise the website format so that people with visual difficulties can enlarge the text.

**For 2A.D1:** learners should look at the websites in more detail to discuss their strengths and weaknesses. They should discuss at least one strength and one weakness.

#### Learning aim B

Learners will design, develop and test a website.

Scenarios suitable for a brief should allow learners to achieve all assessment criteria. The brief should include:

- the purpose of the website
- the user requirements
- the information (e.g. text) that must be provided
- features that must be included (e.g. text, forms, frames, tables)
- the user interaction that is required
- digital assets to be included (e.g. digital animation, digital graphics, digital audio, digital video).



Centres can allow learners to devise their own scenario for the brief. However, all scenarios should be approved by the centre before being used in order to ensure access to all assessment criteria.

Centres are encouraged to use evidence for the design and development of the website as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** learners should describe the purpose and user requirements for their website.

*For level 1, as a minimum, learners should identify the purpose and user requirements for their website.*

**For 2B.P3:** learners must produce a design for an eight-page interlinked website. The design documentation should include:

- the proposed solution containing:
  - a storyboard (with at least eight panels – one per web page) that outline the layout, content (e.g. text, assets and features)
  - a description of styles, templates, formats and interactive features
  - a site map including home page and file structure
  - a description of the ready-made and/or original assets to be used
- a list, in a sources table, of any original and/or ready-made assets
- a test plan, giving an outline of the range of tests to check the functionality of the website.

Learners should include a collection of website ideas or prototypes in their designs. Learners should describe any styles, templates or formats, and include details of any interactive features. They should outline at least four different original and/or ready-made assets that they intend to use, and list the sources for these assets in a sources table.

*For level 1, as a minimum, learners should design an outline proposed solution. The outline of a proposed solution will contain a website structure including at least four panels in a storyboard, a site map and an outline of two original or ready-made asset to be used.*

**For 2B.M2:** learners will be expected to add to their original design documentation by considering complex tools and techniques.

Learners should include:

- how colour schemes and page styles will be applied consistently in all of the web pages
- how interactive components that make use of simple client-side scripting will be embedded, e.g. display a message to welcome the user, and how to make it easier for users to navigate.
- a brief outline of any alternative solutions for the intended website, e.g. the use of different assets for the intended website. These do not have to be fully worked-up designs.

**For 2B.D2:** learners should justify their design decisions, including why alternative designs were rejected, explaining how the website will fulfil the stated purpose and user requirements. Learners must also think about the constraints, e.g. software availability and whether or not this will have an impact on developing the website. If it does, are there any alternatives for developing the same solution?

## Learning aim C

Learners will apply their practical skills and knowledge to develop and test a website.

**For 2C.P4:** learners should prepare assets (by gathering assets and creating them, if required), and list the sources for ready-made assets. At least four assets should be included, such as graphic images, audio clips and animations, as outlined in their designs. They should demonstrate an awareness of the purpose of the website.

*For level 1, as a minimum, learners should prepare their assets and include at least two assets in their websites.*

**For 2C.M3:** learners should prepare their assets and content for the website which has considered the user requirements of the website. All ready-made assets should be fully referenced in a sources table, with enough detail for another person to individually obtain the assets used.

**For 2C.P5:** learners should use appropriate website authoring software develop their website using appropriate tools/techniques. They should demonstrate an awareness of the purpose and the website should be based on their designs. Learners should have developed a website that includes at least eight interlinked web pages with:

- at least four different assets
- internal and external hyperlinks
- text
- at least one table
- forms
- menus
- colour schemes and styles.

*For level 1, as a minimum, learners should have developed a website which includes at least four interlinked web pages, with text, a table, hyperlinks and two assets.*

**For 2C.M4:** learners should improve their website, taking account of usability and user requirements. Learners should include interactive components that make use of simple client-side scripting, e.g. JavaScript code that displays the date and time.

An example of improving usability would be consistent colour schemes and styles in all web pages (using a method like cascading style sheets).

**For 2C.P6:** learners will be expected to follow their test plans (as defined in their design) and test the functionality of their website, and check that it is fit for purpose.

Learners are likely to experience technical difficulties as they develop their website. Learners will be expected to make the necessary repairs to their website. It is important that learners make appropriate comments on their designs and test plans about any issues they discover, and how they have resolved them.

*For level 1, as a minimum, learners should have tested the website for functionality and fitness for purpose.*

**For 2C.M5:** learners should test the functionality of the interactivity features of the website. They should also test that the website meets the user requirements.

Learners should complete user-experience testing, with the help of a test user. Learners should record this feedback as part of the testing process. While considering the feedback, they should keep the user requirements of the website in mind. Learners should use their feedback and test results to improve the website.

**For 2C.D3:** teachers should recognise that the process of developing and testing a website is an iterative process. When making refinements to their websites, learners should take into account their test results and feedback from the 'client'.

Learners should refine their website using tools and techniques to cater for accessibility requirements and performance enhancements. For instance, learners could use:

- alternative text tags, text-to-speech to improve accessibility for users with hearing or visual impairments
- optimising assets to improve how quickly the website presents to the audience; if not appropriately compressed, video, animation and graphics can slow a website.

### **Learning aim D**

**For 2D.P7:** learners should explain why the product is suitable for the purpose and user requirements. Learners should give one reason for the purpose and one relating to user requirements.

*For level 1, as a minimum, learners should have identified how their website is fit for purpose, for example, 'My website is suitable to advertise films as it includes posters for recent film releases and links to film company websites and local cinemas'.*

**For 2D.M6:** learners should build on the explanations given in the Pass criteria, and refer back to the user requirements and purpose as defined in their design. They should also seek feedback from users about the final website. An interview would be an ideal way of discussing the website with notes used to record the feedback.

**For 2D.D4:** learners should evaluate the initial design ideas/prototypes against the final website in terms of overall user experience and 'client' requirements in the original brief. They should justify any changes that were made during development, and explain the rationale for any changes. They should also give at least three recommendations for improvements, but do not need to implement the enhancements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Investigating Websites	<p>You work for a web-development company and you have been asked to prepare a presentation to the directors of a prospective 'client'.</p> <p>The 'client' wants you to look at two existing competitors' websites, describing the features used.</p> <p>Explain how these features could improve the presentation, user experience, accessibility and performance of the websites.</p> <p>Think about the strengths and weaknesses of the websites.</p>	<ul style="list-style-type: none"> <li>• Presentation slides and notes.</li> <li>• Supporting material.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.M3, 2B.D2	Designing the Website	<p>The 'client' has now provided some detailed requirements.</p> <p>You have been asked to develop and document a design.</p> <p>The designs should include:</p> <ul style="list-style-type: none"> <li>• purpose and user requirements</li> <li>• website ideas/prototypes</li> <li>• styles, templates and formats</li> <li>• interactive features</li> <li>• site map</li> <li>• storyboards to show the layout and structure of the website</li> <li>• digital assets to be used</li> <li>• a test plan</li> <li>• a table of sources for the digital assets to be used.</li> </ul> <p>Explain why any ideas you are not using have been rejected. Justify your design choices, relating back to the user requirements.</p> <p>Describe any constraints that have affected your design.</p>	<ul style="list-style-type: none"> <li>• Supported design documentation.</li> <li>• Sources table.</li> <li>• Diagrams.</li> <li>• Prototype ideas or images.</li> <li>• List of assets.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5, 1C.6 2C.P4, 2C.P5, 2C.P6, 2C.M3, 2C.M4, 2C.M5, 2C.D3	Creating the Website	<p>The 'client' has asked you to develop the website according to the design. Your website should contain assets, hyperlinks, text, tables, forms, menus, colour schemes, styles, and interactive components (that include simple client-side scripting).</p> <p>Improve the website by improving navigation, accessibility and performance.</p> <p>Test the website for functionality, presentation and usability repairing any problems that arise. Get feedback from the 'client' on your website. Refine your final website.</p>	<ul style="list-style-type: none"> <li>Website at different stages, supporting material and documented discussion, annotated designs, updated source table.</li> </ul>
1D.7 2D.P7, 2D.M6, 2D.D4	Reviewing the Website	<p>Having completed the website, you now need to review it with the 'client'. Why is your website suitable for the 'client' and the purpose of the website? Include any improvements you could make, and what the strengths of your design are. Evaluate your website against your designs. Justify your changes.</p>	<ul style="list-style-type: none"> <li>Completed test plan, review feedback, supporting reports.</li> </ul>

# Unit 14: Installing and Maintaining Computer Hardware

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

Technology systems can include a multitude of external hardware devices and internal hardware components. Over time it is necessary to maintain the system to repair faults (such as a loose component) and improve performance or upgrade the system's functionality (for instance by installing a faster processor). Job roles that demonstrate installing and maintaining computer hardware include computer technician, technical support engineer, service team leader, and helpdesk engineer.

In this unit, you will develop an understanding of the benefits and implications of installing and maintaining hardware in technology systems. For a specific brief, you will install and maintain hardware in a technology system. This will involve finding and repairing faults with the internal hardware components of a computer, such as the processor or internal bus, and upgrading other internal components, such as adding a network card or additional memory. You will also learn how to install a new external hardware device, such as a printer or barcode scanner.

The technology system will then be tested for functionality and performance. Once completed, you will review your modified technology system against the brief and obtain feedback from the 'client', and evaluate possible improvements.

In particular, this unit develops skills from *Unit 2: Technology Systems* and supports *Unit 11: Computer Networks*, *Unit 15: Installing and Maintaining Computer Software* and *Unit 16: Automated Computer Systems*.

## Learning aims

In this unit you will:

- A understand the benefits and implications of installing and maintaining hardware in technology systems
- B plan installation and maintenance of hardware in a technology system
- C install, maintain and test hardware in a technology system
- D review the modified technology system.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the benefits and implications of installing and maintaining hardware in technology systems</b></p> <p><b>Computer hardware</b> Hardware to include:</p> <ul style="list-style-type: none"> <li>• internal components of a computer, e.g. network card, memory, processor</li> <li>• external hardware devices, e.g. printer, network router, barcode reader.</li> </ul> <p><b>Reasons to maintain technology systems</b> Know why we maintain technology systems, e.g.:</p> <ul style="list-style-type: none"> <li>• to prevent faults occurring and/or to repair faults</li> <li>• to upgrade internal components, e.g. processor, memory and/or storage, to improve performance</li> <li>• to upgrade external hardware devices to improve performance</li> <li>• to change system functionality, e.g. to network the technology system or allow printing/scanning.</li> </ul> <p>Know that:</p> <ul style="list-style-type: none"> <li>• computer faults are often connected to errors, mistakes, defects and/or failures found with some components of a technology system</li> <li>• examples of typical faults include power supply faults, loose connections, and graphics, sound or network card faults</li> <li>• faults vary depending on the hardware technology being maintained as hardware evolves over time.</li> </ul> <p><b>Benefits and implications of installing and maintaining hardware</b> Benefits, e.g.:</p> <ul style="list-style-type: none"> <li>• to reduce costs</li> <li>• to improve performance, e.g. efficiency and effectiveness</li> <li>• to improve/maintain customer service</li> <li>• to improve health and safety awareness.</li> </ul> <p style="text-align: right;"><i>continued</i></p>



**What needs to be learnt**

Implications, e.g.:

- training
- compatibility
- decommissioning
- service level agreements
- risks, such as:
  - electrostatic discharge (damage to components including printed circuit boards, memory cards)
  - component damage
  - data risk, (data loss, data corruption)
  - other risks (e.g. service loss).

How these implications could impact on an individual or organisation, e.g.:

- upgrading a hard disk drive could mean losing valuable data
- causing an electrostatic discharge to a new processor could damage the component resulting in a financial loss.

**What needs to be learnt****Learning aim B: Plan installation and maintenance of hardware in a technology system****Planning for installation and maintenance****Plan to include:**

- purpose of the installation or maintenance, e.g. compatibility, increased capacity, increased speed, increased reliability, software requirements, network requirements
- requirements of the brief ('client'/user requirements)
- alternative ideas for installing and maintaining hardware, i.e. there will be more than one way of improving the performance of the technology system, e.g. by increasing the memory or upgrading the processor
- hardware required, e.g.:
  - internal components of a computer, such as:
    - motherboard
    - central processing unit (CPU) or graphics processing unit (GPU)
    - memory
    - sound/video/network cards
    - heat dispersal systems, e.g. fans, heat sinks
    - storage devices, e.g. solid state, optical, magnetic
    - power supply unit (PSU)
    - connectors/ports
  - external hardware devices, such as:
    - monitor
    - printer
    - scanner
    - webcam
    - router
    - storage devices
    - broadcasting devices
    - lighting and/or sound devices
- tools required, e.g.:
  - antistatic equipment, e.g. antistatic packaging, wrist straps, antistatic mats
  - computer toolkits, e.g. chip inserter, chip extractor, assembly tweezers, slotted screwdriver, Phillips screwdriver, Torx screwdriver
- software resources, e.g. printer driver, installation setup and configuration
- installation and maintenance activity list, e.g. replace the motherboard battery, remove the heat sink and fan to access the processor, back up data and add a printer (external device) as part of an upgrade
- constraints (costs and technical), e.g. component cost, hardware and software availability, tools and component/device compatibility
- test plan and, if appropriate, test data (for functionality and performance).

**What needs to be learnt****Learning aim C: Install, maintain and test hardware in a technology system****Install and maintain hardware**

Preparation, e.g.:

- read manufacturer's hardware instructions
- test selection
- test configuration
- health and safety considerations, including antistatic equipment, precautions
- obtain resources (tools, hardware components and devices, access rights, software resources)
- check equipment
- other tasks (backing up data, recording serial numbers).

**Fault finding**

Tools and techniques, e.g.:

- utility
- run-time analysers
- test procedures, e.g. follow a test plan
- validating information
- responding to test plan (error messages, inconsistent data)
- loose connections
- jumper settings
- power support
- power-on self-test (POST)
- diagnostic software.

**Installation and maintenance activities**

Activities including, e.g.:

- fit new components and reconnect components and devices
- reassemble the computer system
- download software resources (hardware drivers)
- clean
- carry out safety checks
- system test
- dispose of packaging
- other tasks (i.e. restore data).

Feedback from 'client', e.g. functionality and performance.

Potential improvements to the technology system (e.g. performance, capacity, accessibility, reliability, security, user requirements).

*continued*

### **What needs to be learnt**

Health and safety issues throughout the installation and maintenance of a computer system, e.g.:

- hardware
- electrical connection risks and guidelines
- handling equipment

### **Learning aim D: Review the modified technology system**

Review the modified technology system against:

- the original brief ('client'/user requirements)
- purpose
- choice of hardware components
- constraints, e.g. budget and compatibility of hardware components.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the benefits and implications of installing and maintaining hardware in technology systems</b>			
1A.1 Identify the benefits of installing and maintaining hardware for two different technology systems.	2A.P1 Explain the benefits of installing and maintaining hardware for two different technology systems.	2A.M1 Review how installing and maintaining hardware for one technology system could impact an individual or organisation.	2A.D1 Discuss the strengths and weaknesses of hardware for a given technology system.

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim B: Plan installation and maintenance of hardware in a technology system</b>			
1B.2 Identify the purpose and 'client' requirements for installing and maintaining hardware in a technology system.	2B.P2 Describe the purpose and 'client' requirements for installing and maintaining hardware in a technology system.	2B.M2 Produce a detailed plan including reasons why alternative ideas for installing and maintaining hardware have been discarded.	2B.D2 Justify final decisions, explaining how the technology system will fulfil the stated purpose and 'client' requirements, describing the impact of any constraints on the plan.
1B.3 Produce a plan for installing and maintaining hardware in a technology system, with guidance, including: a list of installation and maintenance activities a list of hardware components and devices and software resources required for an upgrade.	2B.P3 Produce a plan for installing and maintaining hardware in a technology system including: a list of installation and maintenance activities a description of hardware components and devices and software resources required for an upgrade a description of fault-finding tools and techniques a test plan.		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Install, maintain and test hardware in a technology system</b>			
1C.4 Install and maintain hardware in a technology system, with guidance, that includes the: repair of at least one different internal hardware component faults upgrade of at least one internal hardware component.	2C.P4 Install and maintain hardware in a technology system that includes the: repair of at least two different internal hardware component faults upgrade of at least two different internal hardware components installation of at least one additional external hardware device.	2C.M3 Install and maintain hardware in a technology system, using appropriate tools and techniques to protect the data and system settings, demonstrating awareness of the user requirements and taking account of usability.	2C.D3 Refine the modified technology system in order to improve performance, taking account of feedback.
1C.5 Test the modified technology system for functionality and repair any faults, with guidance.	2C.P5 Test the modified technology system for functionality against the purpose and repair any faults as necessary.	2C.M4 Test the modified technology system and gather feedback, and use it to improve the technology system for user experience.	

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim D: Review the modified technology system</b>			
1D.6 For the modified technology system, identify how it is suitable for the intended purpose and original requirements.	2D.P6 Explain how the modified technology system is suitable for the intended purpose and original requirements.	2D.M5 Review the extent to which the modified technology system meets the original requirements, considering feedback from others and any constraints.	2D.D4 Evaluate the initial plan against the modified technology system and justify any changes that were made, making recommendations for further improvements.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills



## Teacher guidance

### Resources

As a minimum, each learner will need to access a technology system that can be dismantled, repaired and upgraded to meet a brief. Learners will need:

- access to internal hardware components in a computer, e.g. a memory card, processor, hard disk drive, optical storage device, graphics card
- at least one additional external hardware device, e.g. a printer, scanner, webcam.

It is important that the hardware components and devices have the accompanying manuals and any software installation disks (or at least links to download these from the manufacturer's website).

The practical activities should take place in a workshop with appropriate tools and take account of health and safety requirements.

Learners need access to a brief. The brief can either be created by the centre or be generated by the learner and approved by the centre.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners will develop an understanding of the computer hardware in two different technology systems, describing the benefits and implications of maintaining them.

**For 2A.P1:** learners should explain the benefits of installing and maintaining hardware in two different technology systems. For example, a benefit for a computer owner of maintaining their own technology system is saving on consultancy and labour costs.

*For level 1, as a minimum, learners should have identified the benefits of installing and maintaining the hardware in two different technology systems. They are likely to have listed only two examples, without any description.*

**For 2A.M1:** learners should review how installing and maintaining the hardware in one technology system could affect an individual or organisation. For example, hardware components could be damaged during an installation or upgrade because of mishandling, resulting in a financial loss to a business.

**For 2A.D1:** learners should discuss the strengths and weaknesses of hardware for a given technology system. For example, one weakness of the hardware could be that the manufacturer's warranty could be void if anyone attempts to upgrade the technology system. Learners should discuss at least one strength and at least one weakness.

#### Learning aim B

Learners should have an understanding of the typical faults found in most technology systems, as well as the range of hardware components that could be upgraded to improve performance.

Learners will establish the requirements for installing and maintaining hardware in a technology system based on a brief. The brief should allow learners to explore different possibilities for fulfilling the requirements. It should also allow them to produce a plan, outlining their ideas for repairing and upgrading a technology system, for both the internal hardware components of the computer and external hardware devices. The brief should ideally be written with a 'client' in mind and must include the following requirements (as a minimum):

- the reason (purpose) for a change to the hardware in a technology system and/or user requirements, and the requirements of any 'client' for the system
- a description of at least two different faults (arising from malfunctioning internal hardware components of a technology system)
- an outline of at least two different performance enhancements that would require the internal hardware components of a computer to be upgraded, e.g. additional memory to stream video
- a description of additional system functionality that would require the addition of at least one new external hardware device
- any special requirements/instructions/configuration
- timeframe
- budget (costs)
- constraints.

Centres are encouraged to use evidence for the installation and maintenance of the technology system as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** in order to produce a plan for the installation and maintenance of hardware in a technology system, learners must first be able to understand and interpret the requirements from the brief. Learners should be able to provide a description of the purpose and 'client' requirements for installing and maintaining hardware in a technology system.

If it is to be upgraded, learners will need to investigate the technology system to get an idea of its current state of repair and of its capabilities. It is expected that learners will 'lift the lid' of the technology system to maintain and upgrade what is inside.

*For level 1, as a minimum, learners will identify the 'client' requirements and purpose for installing and maintaining hardware in a technology system.*

**For 2B.P3:** learners will plan the installation and maintenance of hardware in a technology system.

They should include:

- a list of installation and maintenance activities
- a description of internal hardware components and external hardware devices
- software resources they would need to carry out an upgrade, including the role of the software and its relationship to the technology system and user
- a description of fault-finding tools and techniques to determine the hardware faults (observation, diagnostic tools).

They should also provide a test plan to cover the installation and maintenance of hardware in a technology system, giving an outline of the range of tests that they will perform once the technology system is modified. The test plan should also clearly show how they would find system faults, e.g. use of diagnostic tools and software.

*For level 1, as a minimum, learners should produce a plan for the installation and maintenance of hardware in a technology system. An outline plan would contain a list of installation and maintenance activities to be carried out, and a list of hardware components and devices and software resources needed for the upgrade.*

**For 2B.M2:** learners should consider alternative ideas for an upgrade within their plan. For example, in a scenario to increase the performance of a technology system, the alternatives to achieve this could include increasing the memory, swapping the processor or replacing magnetic hard disk drives for new solid state disk drives.

**For 2B.D2:** learners should justify decisions in their plan, explaining why they have chosen different hardware components, fault-finding tools and techniques while rejecting others, making reference to the given purpose and the 'client' requirements. Learners must also think about constraints, e.g. the availability of tools and hardware and whether or not this will have an impact on maintaining the hardware in a technology system. If it does, are there any alternatives for modifying the technology system to meet the same requirements? For example, if the 'client' requires an 80 GB hard disk drive but the only size available is 160 GB, consideration of this would be sufficient to cover the requirements.

### **Learning aim C**

Learners will install and maintain hardware in a technology system. They should apply their practical skills and knowledge to do this.

**For 2C.P4:** learners should use appropriate resources and fault-finding tools and techniques (as identified in their plan) to install and maintain the hardware in a technology system.

As a minimum, learners should have used appropriate fault-finding tools and techniques to identify and repair at least two different internal hardware faults in a technology system. They should also install and configure (upgrade) at least two internal hardware components and add at least one additional external hardware device.

*For level 1, as a minimum, learners should repair at least one internal hardware faults and upgrade at least one internal hardware component.*

**For 2C.M3:** learners should demonstrate good practice to protect data and system settings when maintaining hardware in a technology system. Learners should use appropriate tools and techniques to safely back up data prior to making any modifications to the technology system. They should also safely restore the data and system settings to the technology system after the modifications are complete. The modified technology system must demonstrate the learner's awareness of purpose, meet the user requirements and improve the usability of the system.

**For 2C.P5:** learners will be expected to follow their test plans (as identified in their plan) and test for functionality and purpose against the original requirements of the modification.

Learners are likely to experience technical difficulties as they install and maintain the hardware in a technology system. Where this happens, learners are expected to troubleshoot and resolve the difficulties, finding and repairing any internal computer hardware faults. It is important that learners make appropriate comments in their plans and test plans about any issues they discover and how they resolved them. Where appropriate to do so, it is acceptable to photograph problems and solutions or use witness statements and observation records as evidence of this process.

Learners must adhere to all health and safety guidelines when undertaking practical activities with electronic equipment.

*For level 1, as a minimum, learners should test their system and repair any faults.*

**For 2C.M4:** learners will be required to test the functionality of the technology system while ensuring that data is safely backed up and that system settings can be restored. Learners will also complete user-experience testing with the help of at least one person who can act as the 'client'. The 'client' should be commenting on the usability and the user-experience of the modified technology system. Learners should record this feedback as part of the testing process.

**For 2C.D3:** teachers should recognise that the process of installing, maintaining and testing hardware in technology systems is an iterative one.

Learners should refine the modified technology system in order to improve its performance. Learners are also expected to make further refinements based on their test results and feedback. These refinements will probably involve customising the hardware components to suit the 'client'. Other refinements could include accessing the advanced settings of the hardware components to see if they can be customised to make full use of their features and capabilities in a way that satisfies the 'client' or user, for example, by using software drivers to optimise a graphics card that takes full advantage of memory and processing power. This can be achieved by either reallocating physical memory resources or utilising USB flash drives to extend and support the memory, for example, ReadyBoost. Cleaning the internal hardware components, such as the power supply unit or heat sink, will also improve the performance of a technology system and prevent any overheating caused by particle build-up.

If it is not possible for learners to apply their refinements (for example, because of software or hardware constraints), learners should explain what they would do if they had the opportunity, focusing on performance. For example, the scarcity of high-performance graphics cards could prevent learners from refining the modified technology system. However, they could discuss how these graphics cards would improve performance with an explanation of how they would be configured.

All of the ideas from testing, reviewing and receiving feedback on the modified technology system should be considered as learners go through the refinement process.

### **Learning aim D**

**For 2D.P6:** learners should explain why their modified technology system is suitable for the intended purpose and the original requirements.

*For level 1, as a minimum, learners should identify how their modified technology system is suitable for the purpose and the original requirements.*

**For 2D.M5:** learners should build on the explanations for the Pass criteria, and review how well the 'client' requirements and purpose have been met, and should include details of how any constraints have affected the modified system. They should also seek feedback from the 'client' about the modified technology system. An interview would be an ideal way of discussing the modified technology system and recording the feedback.

Learners should consider any constraints that they have had to deal with when modifying the system.

**For 2D.D4:** learners should evaluate their initial plans against the modified technology system. They should justify any changes that were made and explain the rationale for those changes. They should also give recommendations for at least three improvements but do not need to implement any enhancements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Investigation	<p>You work as a consultant for an IT company that specialises in maintaining technology systems.</p> <p>For this scenario, a 'client' manages a small company with employees who use technology systems. They have found a few technical problems.</p> <p>Before the 'client' decides whether to buy a brand new system, they would like some advice from you about repairing and maintaining the existing system.</p> <p>They want to know:</p> <ul style="list-style-type: none"> <li>the benefits of installing and maintaining hardware in at least two different technology systems</li> <li>the implications for the organisation of maintaining hardware in at least one technology system.</li> </ul> <p>You need to consider the strengths and weaknesses of the hardware for a given technology system.</p> <p>Prepare a presentation or a report for the 'client'.</p>	<ul style="list-style-type: none"> <li>Web page.</li> <li>Presentation.</li> <li>Report.</li> <li>Interview.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Planning	<p>The 'client' would like you to upgrade and maintain the hardware in one technology system.</p> <p>Your task is to plan the installation and maintenance of hardware to fulfil your user requirements for the 'client'.</p> <p>Produce a plan to include:</p> <ul style="list-style-type: none"> <li>• a list of the installation and maintenance activities</li> <li>• a description of hardware components and devices and software resources required for an upgrade</li> <li>• a description of fault-finding tools and techniques</li> <li>• a test plan.</li> </ul> <p>You must also consider alternative ideas, e.g. alternative hardware solutions that will fulfil the same purpose.</p> <p>It is important that you explain how the plan meets the purpose and 'client' requirements and what effect it will have on users.</p>	<ul style="list-style-type: none"> <li>• Web page.</li> <li>• Report.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Repair and Upgrade	<p>You should now have everything you need to start maintaining the technology system.</p> <p>You must demonstrate that you can follow your plan to:</p> <ol style="list-style-type: none"> <li>1) safely back up all data and system settings in preparation for a system restore</li> <li>2) fault-find and repair at least two different hardware faults within the technology system</li> <li>3) install and configure at least two different internal hardware components in a technology as part of an upgrade</li> <li>4) install and configure at least one external hardware device as part of an upgrade</li> <li>5) restore all data and system settings.</li> </ol> <p>Test the modified technology system for functionality and performance and record the results.</p> <p>Meet with your 'client' to discuss your progress and to gather some feedback about your modified technology system.</p> <p>Make any necessary improvements to the modified technology system to improve the overall performance, taking on board feedback from your 'client' and test results.</p>	<ul style="list-style-type: none"> <li>• Witness statements.</li> <li>• Observation records.</li> </ul>
1D.6 2D.P6, 2D.M5, 2D.D4	Review	Evaluate the modified technology system, explaining why and how it meets the brief, suggesting improvements and considering any constraints.	<ul style="list-style-type: none"> <li>• Report.</li> </ul>





# Unit 15: Installing and Maintaining Computer Software

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

Computer software brings technology systems to life and is the main way we control and communicate with systems. Types of software include the operating system (OS), which supports the communication and management of resources, and application software, such as office programs and graphics packages designed to help the user perform specific tasks.

Over time it is necessary to install and maintain software in a system. This includes customising software applications to improve productivity, for instance to create new menus and keyboard short cuts. Job roles that require installing and maintaining computer software include computer technician, technical support engineer, service team leader, and helpdesk engineer.

In this unit, you will develop an understanding of the benefits and implications of installing and maintaining software in technology systems. As specified in a brief, you will learn how to install and maintain software in a technology system. This will involve installing and upgrading an operating system and different software applications, such as office or multimedia programs.

You will also customise different components of software applications to improve productivity, for example to create new toolbars and automate a range of tasks using a macro. The technology system will be tested for functionality, usability and productivity. Once completed, you will review your modified technology system against the brief and obtain feedback from the 'client', having obtained feedback from others, and evaluate possible improvements.

In particular, this unit develops skills from *Unit 2: Technology Systems*, *Unit 9: Spreadsheet Development*, *Unit 8: Mobile Apps Development*, *Unit 12: Software Development*, and supports *Unit 11: Computer Networks* and *Unit 14: Installing and Maintaining Computer Hardware*.

## Learning aims

In this unit you will:

- A understand the benefits and implications of installing and maintaining software in technology systems
- B plan installation and maintenance of software in a technology system
- C install, maintain and test software in a technology system
- D review the modified technology system.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the benefits and implications of installing and maintaining software in technology systems</b></p> <p><b>Computer software</b> Types of software, e.g.:</p> <ul style="list-style-type: none"> <li>• software applications (computer programs such as word processing, spreadsheets, databases, email)</li> <li>• system software (such as operating systems, system utilities, network utilities, device drivers)</li> <li>• programming software (such as compilers, interpreters, integrated development environments).</li> </ul> <p><b>Why we install and maintain computer software</b> Reasons to install and maintain computer software, e.g.:</p> <ul style="list-style-type: none"> <li>• to keep up to date with modern technologies</li> <li>• to customise different components of software applications to meet users' needs</li> <li>• to prevent software problems occurring and/or to repair software problems</li> <li>• to upgrade software (such as office applications, operating systems, device drivers)</li> <li>• to change system functionality (such as media centre, network, other specialist purposes).</li> </ul> <p><b>Benefits and implications of installing and maintaining software</b> Benefits:</p> <ul style="list-style-type: none"> <li>• to reduce costs</li> <li>• to improve productivity, e.g. configuration and customisation, specialist tools, time saving, error reduction, improved user perception</li> <li>• for customisation, e.g.:             <ul style="list-style-type: none"> <li>◦ speed (reducing key strokes)</li> <li>◦ accuracy (control data entry)</li> <li>◦ ease of use</li> <li>◦ style consistency (standardised templates)</li> </ul> </li> <li>• to improve performance, e.g. efficiency and effectiveness</li> <li>• to improve user experience</li> <li>• to improve communication</li> <li>• to improve/maintain customer service</li> <li>• to apply software updates made available by manufacturer</li> <li>• to improve security or stability, e.g. piloting software to evaluate how it integrates with current technology systems.</li> </ul> <p style="text-align: right;"><i>continued</i></p>

**What needs to be learnt**

Implications, e.g.:

- training requirements
- compatibility issues
- decommissioning
- service level agreements
- increase in complexity
- support needs
- costs and licensing, including copyright
- software issues, such as a new release of software can often present unforeseen faults (bugs) that are usually repaired through later software updates
- risks:
  - data risk (such as data loss, data corruption)
  - other risks (such as service loss)
- issues of software piracy
- registration.

How installing and maintaining computer software could improve the productivity for an individual or organisation, e.g.:

- updating the operating system will ensure that any new software applications are compatible with the latest standards
- customising a spreadsheet using macros to automate calculations and functions will result in saved time and improved efficiency.

**What needs to be learnt****Learning aim B: Plan installation and maintenance of software in a technology system****Planning to install and maintain software**

Plan to include:

- purpose of the installation or upgrade, e.g. compatibility, change in system functionality, upgrade, improve productivity (performance, speed, reliability)
- requirements of the brief ('client'/user requirements)
- alternative ideas for installing and maintaining software, e.g. there will be more than one system software or software application available that will contain the same features and perform the same function
- tasks/activities, e.g. install or upgrade an operating system, customise a spreadsheet to suit user's requirements, install or upgrade an office application, install software updates to the operating system
- software resources required, such as:
  - software applications, e.g.:
    - office applications, e.g. word processors, spreadsheets, databases, desktop publishing, email, web browsers
    - bespoke applications, e.g. custom-built specialist software designed for a specific purpose
  - system software, e.g.:
    - operating systems, e.g. open source, Windows-based, Mac-based
    - utility software, e.g. antivirus, home protection, security, data and system backup and restoration, defragmenter
    - software drivers, e.g. new hardware device installation
  - tools, e.g.
    - installation disks
    - operating instructions
    - registration information
    - software licence/product keys, e.g. creative commons, single or multi-user licence
- constraints (costs and technical), e.g. software costs/licensing, software availability, tools
- test/troubleshoot plan to test functionality and usability.

**What needs to be learnt****Learning aim C: Install, maintain and test software in a technology system****Install and maintain software in a technology system**

Preparation, e.g.:

- read manufacturer's software instructions
- test selection and configuration
- obtain resources, e.g. access rights, software installation resources and tools
- determine software installation source, e.g. media type, internet-based, synchronisation application, critical update from software provider
- check compatibility, e.g. software specification, storage requirements, technology system requirements, user requirements
- other tasks, e.g. backing up data, setting restore points, uninstalling existing software, software licence keys
- establish configuration, e.g. setting correct date/time, language settings, network and establish customisation, e.g. toolbars, menus, shortcuts, other user preferences.

**Installation and maintenance activities**

Process, e.g.

- identify software and purpose, (operating system software, software applications, bespoke software applications, utility software)
- download or gather software resources
- carry out pre-installation and post-installation checks
- back up data and system settings
- set restore points
- customise software applications
- system test
- dispose of/recycle packaging
- other tasks, e.g. restore data and system settings.

**Customisation**

Tools and techniques, e.g.:

- creating or changing components, e.g.:
  - default settings
  - menus
  - toolbars
  - templates
  - shortcuts
  - forms
  - macros.

Feedback from client, e.g. functionality, usability, productivity.

Refinements to the technology system to improve productivity, e.g. customising software applications by creating macros and forms.

Potential improvements to the technology system, e.g. performance, accessibility, reliability, security, client's requirements.

**What needs to be learnt****Learning aim D: Review the modified technology system**

Review the finished software installation against:

- original client and user requirements
- purpose
- suitability of choice of software resources
- any special requirements
- constraints.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the benefits and implications of installing and maintaining software in technology systems</b>			
1A.1 Identify the benefits of installing and maintaining software for two different technology systems.	2A.P1 Explain the benefits of installing and maintaining software for two different technology systems.	2A.M1 Review how installing and maintaining software in one technology system could improve productivity for an individual or organisation.	2A.D1 Discuss the strengths and weaknesses of software for a given technology system.

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim B: Plan installation and maintenance of software in a technology system</b>			
1B.2 Identify the purpose and 'client' requirements for installing and maintaining software in a technology system.	2B.P2 Describe the purpose and 'client' requirements for installing and maintaining software in a technology system.	2B.M2 Produce a detailed plan including reasons why alternative ideas for installing and maintaining software have been discarded.	2B.D2 Justify final decisions, explaining how the technology system will fulfil the stated purpose and 'client' requirements, describing the impact of any constraints on the plan.
1B.3 Produce a plan for installing and maintaining software in a technology system, with guidance, including: a list of installation and maintenance activities a list of software resources required for an installation or upgrade.	2B.P3 Produce a plan for installing and maintaining software in a technology system including: a list of installation and maintenance activities a description of software resources required for an installation or upgrade a description of customisation tools and techniques a test plan.		



Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Install, maintain and test software in a technology system</b>			
1C.4 Install and maintain software in a technology system, with guidance, that includes the: installation or upgrade of at least one different software applications customisation of at least two different components in software application(s).	2C.P4 Install and maintain software in a technology system that includes the: installation or upgrade of one operating system installation or upgrade of at least two different software applications customisation of at least three different components in software application(s).	2C.M3 Install and maintain software in a technology system, using appropriate tools and techniques to protect the data and system settings, demonstrating awareness of the user requirements and taking account of usability.	2C.D3 Refine the modified technology system in order to improve productivity, taking account of feedback.
1C.5 Test the modified technology system for functionality and repair any faults, with guidance.	2C.P5 Test the modified technology system for functionality against the purpose, and repair any faults as necessary.	2C.M4 Test the modified technology system, gather feedback, and use it to improve the technology system for functionality, productivity and user experience.	

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning Aim D: Review the modified technology system</b>			
1D.6 For the modified technology system, identify how it is suitable for the intended purpose and original requirements.	2D.P6 Explain how the modified technology system is suitable for the intended original requirements and purpose.	2D.M5 Review the extent to which the modified technology system meets the original requirements while considering feedback from others and the effect of any constraints.	2D.D4 Evaluate the initial plan against the modified technology system and justify any changes that were made, making recommendations for further improvements.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

As a minimum, each learner will need access to a technology system that will allow them to install, upgrade, maintain and customise software to meet a brief.

Learners will need:

- operating system software, e.g. open source, Windows-based, Mac-based
- at least two different software applications capable of customisation, e.g. office software, media software.

It is important that software resources are accompanied by the relevant manuals, installation disks (or software package downloaded in advance from the manufacturer's website), software licence/products keys, and any registration information.

The practical activities should take place with appropriate resources and tools.

It is recommended that free resources are obtained for the practical activities.

Learners need access to a brief. The brief can either be created by the centre or be generated by the learner and approved by the centre.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners will investigate and understand the computer software in two different technology systems, explaining the benefits and implications of installation and maintenance.

**For 2A.P1:** learners should explain the benefits and implications of installing and maintaining computer software in two different technology systems. For example, a benefit would include staying up to date with the latest security software to capture and quarantine new viruses. An implication may include the prohibitive costs of some software licences.

*For level 1, as a minimum, learners should identify the benefits of installing and maintaining the software in two different technology systems. They are likely to have listed only two examples, without any description.*

**For 2A.M1:** learners should review how installing and maintaining the software in one technology system could improve productivity for an individual or organisation. For example, customising a spreadsheet using a macro could save time and improve efficiency for an organisation by automating calculations and function.

**For 2A.D1:** learners should discuss the strengths and weaknesses of software for a given technology system. For example, one weakness of software is that it could be reliant on specialised hardware attached to the technology system. Learners should discuss at least one strength and at least one weakness.

#### Learning aim B

Learners will establish the requirements for installing and maintaining software in a technology system, based on a brief. The brief should allow learners to explore different possibilities for fulfilling the requirements. It should also allow them to produce a plan of their ideas for installing and/or upgrading system software and software applications, as well as for customising software applications for a given

purpose. Ideally, the brief should be written with a 'client' in mind, with clearly stated resource requirements and objectives.

The brief must include the following requirements (as a minimum):

- the reason (purpose) for a change to the software in a technology system and user/'client' requirements
- an outline of the technology system that requires an installation or upgrade of an operating system
- an outline of at least two different computer enhancements that would require an installation or upgrade of software applications, e.g. to upgrade existing office software to take advantage of new features and to keep office documents consistent for all users
- an outline of at least three different components of one or more software applications that could be customised to meet a given purpose, e.g. creating a new menu in an office program that displays a list of user's most-used functions
- an outline of any refinements that would require macros and/or forms to be created as part of customising a software application, e.g. a macro to automate a calculation task in a spreadsheet
- any special requirements/instructions/configuration
- timeframe
- budget (costs)
- constraints.

Centres are encouraged to use evidence for the installation and maintenance of the technology system as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** in order to produce a plan for the installation and maintenance of software in a technology system, learners must first be able to understand and interpret the requirements from the brief. Learners should be able to provide a description of the purpose and 'client' requirements for installing and maintaining software in a technology system.

If the technology system is to be upgraded or customised, learners will need to investigate it to get an idea of its current state and what it is capable of doing.

*For level 1, as a minimum, learners will identify the 'client' requirements and purpose for installing and maintaining software in a technology system.*

**For 2B.P3:** learners will plan the installation and maintenance of software in a technology system.

They should include:

- a list of installation and maintenance activities
- a description of software resources required for the installation or upgrade
- a description of the customisation tools and techniques needed to meet the 'client' requirements.

They should also provide a test plan to cover the installation and maintenance (including customisation) of software in a technology system, giving an outline of the range of tests that they will perform once the system is modified.

*For level 1, as a minimum, learners should produce a plan for the installation and maintenance of software in a technology system. An outline plan should contain a list of installation and maintenance activities to be carried out, and a list of software resources needed for the installation or upgrade.*

**For 2B.M2:** learners should consider alternative ideas for installing and maintaining software within their plan. For example, in a scenario where the technology system is intended to be used for working with digital images, there are different graphics and artwork packages available that users can use to achieve the same purpose. Learners should consider the distinctive features and benefits of different types of software when suggesting ideas in their plan.

**For 2B.D2:** learners should justify decisions in their plan, explaining why they have chosen different software resources and customisation tools and techniques while rejecting others, making reference to the given purpose and the 'client' requirements. Learners must also think about constraints, for example the availability of tools and software, and whether or not this will have an impact on maintaining the software in a technology system. If it does, are there any alternatives for modifying the system to meet the same requirements? For example, if the 'client' requires an operating system but there is no budget for purchasing a new operating system, it would be sufficient to obtain an open-source operating system from the internet and install this, to meet the same requirements.

### Learning aim C

Learners will install and maintain software in a technology system. They should apply their practical skills and knowledge to do this.

**For 2C.P4:** learners should use appropriate resources and customisation tools and techniques (as identified in their plan) to install and maintain the software in a technology system.

As a minimum, learners should have installed or upgraded and appropriately configured an operating system. They should have also installed or upgraded at least two different software applications, for example an office program or a multimedia program, as well as customised at least three different components of any installed software applications, for example create a new menu, change a toolbar or create a keyboard shortcut.

*For level 1, as a minimum, learners should install or upgrade at least one software application and customise at least two different components in one or more software applications. It is assumed that learners will be provided with a technology system that already has an operating system installed.*

**For 2C.M3:** learners should demonstrate good practice to protect data and system settings when maintaining software in a technology system. Learners should use appropriate tools and techniques to safely back up data prior to making any modifications to the technology system. They should also safely restore the data and system settings to the technology system after the modifications are complete.

The modified technology system must demonstrate the learner's awareness of the user requirements and improve the usability of the systems.

**For 2C.P5:** learners will be expected to follow their test plans (as identified in their plan) and test for functionality and purpose against the original requirements.

Learners are likely to experience technical difficulties as they install and maintain the software in a technology system. Where this happens, learners are expected to troubleshoot and resolve these difficulties, finding and resolving any software problems. It is important that learners make appropriate comments in their plans and test plans with regard to any problems they discover and how they have resolved them. Where appropriate to do so, it is acceptable to photograph or take screenshots of problems and solutions or use witness statements and observation records as evidence of this process.

*For level 1, as a minimum, learners should test their system and repair any faults.*

**For 2C.M4:** learners are required to test the usability of the technology system while ensuring that data is safely backed up and system settings can be restored. Learners will complete user-experience testing, with the help of at least one person who can act as the 'client'. The 'client' should be commenting on the functionality and usability of the modified technology system. Learners should record this feedback as part of the testing process.

**For 2C.D3:** teachers should recognise that the process of installing, maintaining and testing software in technology systems is an iterative process.

Learners should refine the modified technology system to improve productivity. Learners are also expected to make further refinements based on their test results and feedback. This must include customising software applications by either creating a macro or by creating a form for a given purpose. For example, they might create a new macro in a spreadsheet that will automate calculations and functions, or they might create a new user-friendly form that will allow users to enter records into a database.

All of the ideas from testing, reviewing and receiving feedback on the modified technology system should be considered as learners go through the refinement process.

### **Learning aim D**

**For 2D.P6:** learners should explain how their modified technology system is suitable for the intended purpose and the original requirements.

*For level 1, as a minimum, learners should identify how their modified technology system is suitable for the purpose and the original requirements.*

**For 2D.M5:** learners should build on the explanations for the Pass criterion, and review how well the 'client' requirements and purpose have been met. They should also seek feedback from the 'client' about the modified technology system. An interview would be an ideal way of discussing the modified technology system and recording the feedback. Learners should provide details of how any constraints have affected the modified system.

**For 2D.D4:** learners should evaluate their initial plans against the modified technology system. They should justify any changes that were made and explain the rationale for those changes. They should also give recommendations for at least three improvements but do not need to implement any enhancements.

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1.	Investigation	<p>You work as a software installation engineer for an IT company that specialises in maintaining technology systems.</p> <p>For this scenario, a 'client' manages a small company with employees that use technology systems.</p> <p>They want to know:</p> <ul style="list-style-type: none"> <li>the benefits and implications of installing and maintaining software in at least two different technology systems</li> <li>how software in at least one technology system could help improve productivity in their organisation.</li> </ul> <p>You need to consider the strengths and weaknesses of the software for a given technology system.</p> <p>Prepare a presentation or a report for the 'client'.</p>	<ul style="list-style-type: none"> <li>Web page.</li> <li>Presentation.</li> <li>Report.</li> <li>Interview.</li> </ul>

Criteria covered	Assignment title	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.M2, 2B.P3, 2B.D2	Planning	<p>The 'client' would like you to install and maintain the software in one technology system.</p> <p>Your task is to plan the installation and maintenance of software to fulfil your 'client's' requirements.</p> <p>Produce a plan to include:</p> <ul style="list-style-type: none"> <li>• a list of the installation and maintenance activities</li> <li>• a description of software resources required for an installation or upgrade</li> <li>• a description of customisation tools and techniques you will use when customising software applications to improve productivity</li> <li>• a test plan.</li> </ul> <p>You must also consider alternative ideas, e.g. different software or customisation tools and techniques of software installation that will fulfil the same purpose.</p> <p>It is important that you explain how the plan meets the purpose and 'client' requirements and what effect it will have on users.</p>	<ul style="list-style-type: none"> <li>• Web page</li> <li>• Report.</li> </ul>



Criteria covered	Assignment title	Scenario	Assessment evidence
1C.4, 1C.5 2C.P4, 2C.M3, 2C.P5, 2C.M4, 2C.D3	Installing and Maintaining	<p>You should now have everything you need to start maintaining the technology system.</p> <p>You must demonstrate that you can follow your plan to:</p> <ul style="list-style-type: none"> <li>• safely back up all data and system settings in preparation for a system restore</li> <li>• install or upgrade and appropriately configure an operating system</li> <li>• install or upgrade at least two different software applications</li> <li>• customise at least three different components in one or more installed software applications</li> <li>• make further refinements to the technology system by customising software applications to improve productivity – this must include implementing either a macro or form</li> <li>• restore all data and system settings.</li> </ul> <p>Test the modified technology system for functionality and usability and record the results.</p> <p>Meet with your 'client' to discuss your progress and to gather some feedback about your modified technology system.</p> <p>Make any necessary improvements to the modified technology system to improve the overall performance, taking on board feedback from your 'client' and test results.</p>	<ul style="list-style-type: none"> <li>• Witness statements</li> <li>• Observation records.</li> </ul>

Criteria covered	Assignment title	Scenario	Assessment evidence
1D.6 2D.P6, 2D.M5, 2D.D4	Review	Evaluate the modified technology system, explaining why it meets the brief, suggesting improvements and considering any constraints.	<ul style="list-style-type: none"> <li>• Report.</li> </ul>

# Unit 16: Automated Computer Systems

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

Automated computer systems feature heavily in our technological lifestyles. We are surrounded by technology systems that monitor and perform activities on our behalf, from central heating controllers regulating our environment to robots exploring the universe.

The development of automated computer systems is becoming essential across the world for manufacturing, security systems and home, industrial and transportation systems. Being able to develop and work with automated systems could lead to a challenging, varied and exciting career in any number of various roles in different companies, for example an electronic engineer and software engineer.

In this unit, you will investigate the characteristics, including benefits and features, of existing automated systems. Using a suitable self-assembly kit, you will design and develop an automated system for a brief. You will develop the system by making progress in small steps and building up programs that can control hardware devices by monitoring sensors and controlling outputs. To do this, you will learn some control programming, hardware assembly and trouble shooting skills.

You will review your final automated system and identify any further improvements.

This unit develops skills from *Unit 2: Technology Systems*, *Unit 8: Mobile Apps Development*, *Unit 11: Computer Networks*, *Unit 12: Software Development* and *Unit 14: Installing and Maintaining Computer Hardware*.

## Learning aims

In this unit you will:

- A understand the characteristics of automated systems
- B design an automated system
- C develop and test an automated system
- D review the finished automated system.

## Learning aims and unit content

### What needs to be learnt

#### Learning aim A: Understand the characteristics of automated systems

##### Automated systems

Automated systems contain hardware devices that are controlled by software programs that undertake specific activities based on inputs and outputs.

##### Characteristics of automated systems

- Features
- Benefits
- Reasons for use

##### Why automated systems are used

Reasons, e.g.:

- operating in hazardous environments, e.g. satellites in space
- completing monotonous tasks, e.g. food-packaging machinery
- completing precision tasks, e.g. manufacturing engineering components
- monitoring and control, e.g. temperature control system.

Benefits, e.g.:

- reduced costs
- improved performance, e.g. efficiency and effectiveness
- customisation, e.g. custom-made engineered parts
- improved repeatability (completing the same activity with a high degree of accuracy)
- improved customer service.

##### Features of automated systems

Know that automated systems comprise hardware and control software programs.

Systems include:

- hardware devices, including:
  - programmable devices/microcontrollers
  - input devices, e.g. touch and temperature sensors
  - output devices, e.g. LEDs, motors
  - other components, e.g. power source, mechanical structures
- control software programs, e.g. code to make a light or LED flash or to operate a line-following robot.

Use flow charts to represent processes within basic control programs.

**What needs to be learnt****Learning aim B: Design an automated system****Designing an automated system**

Design to include:

- intended purpose and 'client'/user requirements (as defined in a brief)
- at least one programmable device, one input and one output device
- system hardware diagrams showing:
  - the devices to be used (further guidance in learning aim C)
  - the input/output data flow between devices
  - device communication method (either serial or parallel)
  - any mechanical structures, e.g. chassis and wheels and the assembly method of devices/components
- a control program specification including:
  - a description of the main program tasks – input and output format
  - algorithms, e.g. structured English, flow charts, pseudocode
- a list of any predefined code and their sources, e.g. the internet, other media such as CD or DVD
- a brief outline of alternative solutions for the intended automated system, e.g. alternative sensor types and hardware configurations
- a test plan and, if appropriate, test data (to test the system inputs and expected outputs)
- constraints, e.g. device capabilities including connectivity and availability, memory storage or programming language.

**What needs to be learnt****Learning aim C: Develop and test an automated system****Develop an automated system**

Assemble hardware, including:

- programmable devices/controllers that can read from input devices (e.g. sensors) and control output devices (e.g. actuators, motors) and store and process data (e.g. Lego RCX/NXT, Arduino, PIC)
- input devices, e.g. light-dependent resistors, touch sensors, switches, accelerometers, infrared sensors, potentiometers, sound sensors, touch sensors, temperature sensors
- output devices, e.g. LEDs and LED arrays, lights, motors, servo valves, linear actuators, sound emitters (e.g. piezo speakers, buzzers, amplifiers), relays (e.g. H-bridge ICs for motor control)
- other components:
  - power source, e.g. photovoltaic cells and batteries
  - mechanical structures, e.g. protective/aesthetic shell, chassis (a framework that supports a manmade object), axles, wheels
  - data storage, e.g. solid state storage device.

Consider Health and safety issues, e.g. hardware, electrical connection risks and guidelines, handling equipment

**Develop control software program**

Use a development environment to produce original code and edit predefined program or code.

Develop and refine the control program using suitable programming language constructs and techniques.

Annotate the code to demonstrate understanding of the constructs/techniques and processing to allow effective repair/debugging of the program and for maintainability.

**Programming constructs and techniques**

Program constructs, e.g.:

- comments
- constants (variables with a constant value that cannot change)
- operators (arithmetic [ + - \* / % ] and logical [ < <= > >= AND OR true false])
- reserved words, which have special meaning within the programming language and are used to write instructions in a program, e.g. in NXT 'motor' and 'while' are reserved words.
- input and output commands
- local and global variables
- assignment
- sequence
- counter controlled and conditional loops (while do, repeat ... until, for ... next)
- sequential statements, selections (if ... then ... else)
- data types, e.g. integer and real (numbers), string (text), Boolean

*continued*

**What needs to be learnt**

- data structures, e.g. arrays, user-defined variables
- data storage, e.g. within hardware devices, on removable media
- subroutines/functions/procedures.

**Testing and refining the automated system**

Test automated system for functionality, e.g. against test plan, and if required, test data.

Gather feedback from others, e.g. 'client', users on the automated system.

Briefly document any changes to the design, including:

- changes to the references of sources for predefined code
- annotations on the code
- improvements and/or refinements to the automated system.

**Learning aim D: Review the finished automated system**

Review the finished automated system against:

- original requirements and purpose (as defined in the brief)
- constraints, e.g. programming language, time, device capabilities such as memory, connectivity, availability
- strengths and potential improvements.

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the characteristics of automated systems</b>			
1A.1 Identify the features and benefits of two different given automated systems.	2A.P1 Explain the features and benefits of two different given automated systems.	2A.M1 Review what one of the given automated systems does, providing a flow chart to show the processing of the control system.	2A.D1 Discuss the strengths and weaknesses of the automated systems.
<b>Learning aim B: Design an automated system</b>			
1B.2 Identify the purpose and user requirements for an automated system.	2B.P2 Describe the purpose and user requirements for an automated system.	2B.M2 Produce a detailed design for an automated system, including: alternative solutions two or more system hardware diagrams a detailed control program specification.*	2B.D2 Justify final design decisions, explaining how the automated system will fulfil the stated purpose and the user requirements, describing the impact of any constraints on the design.*
1B.3 Produce a design for an automated system, with guidance, including: <ul style="list-style-type: none"> <li>• an outline system hardware diagram</li> <li>• an outline control program specification</li> <li>• a list of any predefined code.*</li> </ul>	2B.P3 Produce a design for an automated system, including: <ul style="list-style-type: none"> <li>• a system hardware diagram</li> <li>• a control program specification</li> <li>• a list of any predefined code</li> <li>• a test plan.*</li> </ul>		



Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Develop and test an automated system</b>			
1C.4 Develop an automated system, with guidance, containing: at least one programmable device, input device and output device a control program using appropriate constructs/techniques * (Please see guidance).	2C.P4 Develop an automated system containing: at least one programmable device, input device and output device a control program using appropriate constructs/techniques, which is appropriately annotated.*	2C.M3 Develop a functional automated system that meets the given brief and contains a default fail-safe state.*	2C.D3 Refine the automated system, using feedback from others, to improve the system's performance.*
1C.5 With guidance: test the automated system for functionality repair any hardware and/or program faults.	2C.P5 Test the automated system for functionality using the test plan and against the original requirements. Repair any hardware and/or program faults.	2C.M4 Test the automated system, including additional functionality, against the original requirements, gathering feedback from others. Repair any hardware or program faults.	

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim D: Review the finished automated system</b>			
1D.6 Identify how the final system is suitable for the original requirements and purpose.	2D.P6 Explain how the final system meets the original requirements and purpose.	2D.M5 Review the extent to which the system meets the original requirements, considering feedback from others and any constraints.	2D.D4 Evaluate the final system against the initial designs and justify any changes that were made, making recommendations for further improvement.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

As a minimum, each learner will need access to hardware devices found in a suitable self-assembly kit for automated systems, specifically:

- a programmable device/microcontroller, e.g. Arduino, PIC, Lego programmable brick (RCX or NXT) with programming interface and cabling
- a programming environment, e.g. Arduino, PICAXE Programming Editor, PICLogicator, Lego NXT Mindstorms environment, LabVIEW, Flowol 4
- input devices, e.g. sensors for touch, light, sound, humidity, resistance, temperature, infrared, Hall Effect
- output devices, e.g. motors, servos, LEDs, lights, linear actuators
- other components, e.g. mechanical structure, power source, storage media (e.g. SD card).

It is important that hardware devices and components include the accompanying manuals, software installation disks or installation packages (downloaded in advance from the manufacturer's website).

The practical activities should take place in a workshop with appropriate tools and should take account of health and safety requirements.

Learners should be provided with a brief which allows them to meet the assessment requirements of the unit. Briefs can either be generated by the centre, or by the learner, and then approved by the centre.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners need access to a selection of different automated systems. At least two systems should be investigated: one should be a basic automated (e.g. line-following) vehicle and the other should be a commercial system, e.g. controlling temperature or traffic lights. These can be placed into context by the use of case studies or local examples, and demonstrated in the classroom.

**For 2A.P1:** learners should explain the characteristics of two given and different automated systems. The description should cover the what the systems do, their benefits and features, for example hardware devices and control programs of the automated system.

*For level 1, as a minimum, learners should identify the characteristics of two given and different automated systems. They are likely to be presented as a list without a description of how the system works.*

**For 2A.M1:** learners should review what one of the classroom-demonstrated automated systems does and provide a flow chart to show the processing in the control program.

**For 2A.D1:** learners should discuss the strengths and weaknesses of one of the classroom-demonstrated automated systems. Learners should consider at least one strength and at least one weakness.

## Learning aim B

Learners should understand the functionality of a range of hardware devices and components. They should also be familiar with the control program programming environment and a range of constructs/techniques used within the programming language.

Learners will establish the requirements for developing an automated system given in a brief. The brief should:

- allow learners to explore the possibilities when fulfilling the requirements of the brief
- allow learners to produce an automated system using a suitable kit-based system
- be written with a client in mind with clearly stated resource requirements and objectives.

The brief must include the following requirements (as a minimum):

- a description of the purpose of the automated system, e.g. an automated vehicle designed to carry a 1 kg mass and follow a line, turning right and left as required over a 5 m route
- any special requirements/instructions/configuration
- a timeframe
- a budget (costs)
- the constraints, e.g. system is to operate in an internal, dry environment.

Centres are encouraged to use evidence for the development of the automated system as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

**For 2B.P2:** learners should describe the user requirements and purpose of the automated system for the design.

*For level 1, as a minimum, learners should identify the user requirements and the purpose for the design of the automated system.*

**For 2B.P3:** learners will produce a design for an automated system built using a self-assembly kit of appropriate hardware devices. As a minimum, the system will contain at least one programmable device, one input device and one output device. Learners' designs should include:

- a description of purpose and the requirements of the client/user
- a system hardware diagram showing the devices to be used and illustrating the mechanical structures, e.g. chassis and wheels and the assembly of devices/components
- a control program specification describing the main program tasks, e.g. data input and output format
- a list of any predefined code
- test plan, outlining a range of tests for logic and functionality.

*For level 1, as a minimum, learners should produce an outline design for an automated system containing at least one programmable device, one input device and one output device. The design should include:*

- *an outline system hardware diagram showing the devices and components to be used*
- *an outline control program specification containing a description of the main program tasks e.g. data input and output format*
- *a list of any predefined code.*

**For 2B.M2:** in addition to the requirements for the pass grade, learners should produce:

- at least two system hardware diagrams:
  - at least one showing the devices to be used, input and output data flow between devices, and the device communication method
  - at least one illustrating any mechanical structures and the assembly method of devices/components
- a detailed control program specification describing the main program tasks and algorithms, e.g. structured English, flow charts, pseudocode outlining how the control program will work
- a brief outline of any alternative solutions and why they were configured in a certain way.

**For 2B.D2:** learners are expected to be able to justify their design decisions and how the chosen design fulfils the stated purpose and user requirements for the given brief. They should consider suitability for the end user and the quality and thoroughness of their design work. Learners need to review their design in light of any constraints arising from the hardware (for example operational range of sensors, the availability of devices) and control programming language. Learners should justify why alternative design ideas were rejected.

### Learning aim C

This learning aim is all about developing and testing an automated system for a given brief.

**For 2C.P4:** learners will implement their design. Some learners will find that their designs do not allow them to implement a solution. In this case, learners should amend their automated system and record changes to their design. They should develop their automated system by:

- assembling (while adhering to all health and safety guidelines) a range of hardware devices – as a minimum the system should contain at least:
  - one programmable device/controller, e.g. Lego RCX/NXT, Arduino, PIC
  - one input device, e.g. light-dependent resistors, touch sensors, switches
  - one output device, e.g. LED arrays, motors, relays, servo valves
  - other components, e.g. power source, mechanical structures
- develop a control program for the automated system by editing predefined code and some original code using appropriate constructs and techniques. The program must include reading from at least one sensor and result in at least one output to a device. Learners should also ensure that they develop solutions using some constructs/techniques from the more complex content in learning aim C (the constructs/techniques for level 1 assessment are shown at the end of this guidance). These include conditional-controlled loops and functions.

The code should be annotated to demonstrate understanding and to allow effective repair/debugging of the program and maintainability.

*For level 1, as a minimum, learners should use their designs to develop an automated system. They will assemble a range of hardware devices (at least one programmable device, one input device and one output device) and develop a control program using level 1 constructs/techniques (identified at the end of this guidance).*

**For 2C.M3:** learners should produce an automated system that satisfies the brief. The system should contain a fail-safe default state, for example, the system shuts down if the system limits are breached. Learners are likely to need to adapt their designs to create a fully-functioning system.

**For 2C.P5:** learners will test the automated system for functionality against the original requirements and using their test plans. For example, does the system meet its stated purpose; do input devices and output devices respond as expected? The automated system should function; however, it may not fully meet the brief.

As they develop their automated system, learners are likely to experience hardware and control programming technical difficulties. Where this happens, learners should troubleshoot and resolve these difficulties, finding and repairing any faults. To aid this process, learners may want to use a console to monitor the state of the system during operation. It is important that learners make appropriate comments in their code and briefly document any changes made to both the hardware and control program.

Where appropriate, it is acceptable to photograph problems and solutions or to use witness statements as evidence of this process.

*For level 1, as a minimum, learners should develop and test the automated system's main functions and repair any hardware and control program faults.*

**For 2C.M4:** learners should test their automated system including any additional functionality and the fail-safe state, using test data as appropriate. The default fail-safe state should operate when certain limits are breached.

They should correct any hardware and control program faults found in the code and produce evidence to show any changes made to the system.

Learners should obtain feedback on their automated system from others, for example from someone acting as a user of the system. Their system should fully meet the original requirements of the brief.

**For 2C.D3:** Teachers should recognise that the process of developing and testing automated systems is iterative and not a sequential process. Consequently, this criterion is assessed during an iterative development process.

Learners should refine the automated system, taking account of feedback from others to improve the system's performance, for example to complete a task more efficiently or more accurately. Examples include controlling temperature within a smaller tolerance or introducing ability to adapt to different external conditions, e.g. an automated vehicle designed to transport a 1 kg mass between two points could adapt to the terrain by changing speed, using less energy and reducing power consumption.

### **Learning aim D**

**For 2D.P6:** learners should describe how their automated system meets the original requirements and purpose in light of the results of their testing. Learners should be encouraged to celebrate the strengths of their work.

*For level 1, as a minimum, learners should identify how their automated system meets the original requirements and purpose.*

**For 2D.M5:** learners should build on the outcomes for the Pass criterion, to consider the outcomes of their testing and describe the extent to which the automated system meets the original requirements of the brief. Learners should gather feedback from others and consider changes they would like to make in the light of this feedback. Learners should consider any constraints that they have had to deal with when modifying the system.

**For 2D.D4:** learners should evaluate their initial designs and the completed automated system. They should identify any changes made from the design stage and justify them against the requirements and the features of the hardware and control programming language used. Learners should make at least three specific suggestions for improving the completed system, for example, identifying points of potential failure and suggesting how the system could be improved to prevent it. Learners do not have to implement the enhancements.

## Control program constructs/techniques for level 1 assessment

Some learners may fail to achieve a full Pass at level 2, so learners being assessed for the level 1 criteria for learning aims B and C are not required to include all of the different control programming constructs in their work for assessment.

The constructs that learners working at level 1 should be familiar with and include in their assessment evidence are shown below.

Use program constructs and techniques, e.g.:

- program constructs, e.g.:
  - comments
  - constants–variables with a constant value that cannot change
  - operators–arithmetic ( +, – )
  - reserved words – that have special meaning within the programming language and are used to write instructions in a program
  - input and output commands
  - local variables - only exist inside the subroutine/function where they are declared and used
  - global variables
  - assignment
  - sequence
  - counter controlled loops
- use a range of data types, e.g. character, string (text), integer and real (numbers)
- use data structures, e.g. user-defined data types and record structures.

## Suggested assignments

The table below shows a programme of suggested assignment outlines that cover the pass, merit and distinction criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

Please note that for the Automated Systems in Action assignment teachers should allow learners to investigate two different systems. One system should be a working kit-based system that can be demonstrated in the classroom and the other should be a commercial system. For the basic classroom system, the control program should be made available for learners to investigate.

Criteria covered	Assignment title	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Automated Systems in Action	<p>You work for a company that specialises in developing automated systems. A potential customer wants to know more about the characteristics of automated systems. You have been asked to prepare a presentation on the benefits and features of the following two systems:</p> <ul style="list-style-type: none"> <li>• a basic line-following automated vehicle that will move through a simple predetermined route and avoid obstacles</li> <li>• a commercial city-centre traffic light control program – the system monitors the flow of traffic based on inputs from inductance sensors in the road and alters the timing of the lights during each 24 hour period depending on the volume of traffic.</li> </ul> <p>So that the customer understands how the control program works, you have also been asked to provide a flow chart showing the algorithms used to control the basic automated vehicle.</p>	<ul style="list-style-type: none"> <li>• Presentation or report</li> <li>• Flow chart.</li> </ul>



Criteria covered	Assignment title	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.P3, 2B.M2, 2B.D2	Design for an Automated Vehicle	<p>The customer liked the presentation and would now like to see a design for a prototype automated vehicle which can be used to demonstrate the principles of a commercial system. The prototype vehicle should be capable of delivering a 1 kg mass between two points that are 5 m apart, avoiding any obstacles.</p> <p>The design should include an alternative solution and explain how the automated vehicle will fulfil the stated purpose and the user requirements. Any constraints that impact on the design should be covered.</p> <p>Prepare a justification for the customer to explain why you have designed the system the way you have, and what you considered.</p>	<ul style="list-style-type: none"> <li>• A description of purpose and user requirements</li> <li>• System hardware diagram(s)</li> <li>• A control program specification</li> <li>• A description of alternative solutions</li> <li>• A list of any predefined code</li> <li>• Test plan.</li> </ul>
1C.4, 1C.5 2C.P4, 2C.P5, 2C.M3, 2C.M4, 2C.D3	Develop and Test the Automated Vehicle	<p>Develop and test the prototype automated vehicle. The control program must allow the automated vehicle to travel between two points that are 5 m apart to deliver a 1 kg mass and avoid any obstacles.</p> <p>Refine the prototype, based on feedback from the customer or your manager where appropriate, to improve the performance of the system. For example, you might reduce the time taken to deliver the 1 kg mass or make the vehicle adapt to different external conditions, for example the nature of the terrain.</p>	<ul style="list-style-type: none"> <li>• Video of the automated guided vehicle</li> <li>• Annotated control program</li> <li>• Test results</li> <li>• Feedback from the customer or manager.</li> </ul>

Criteria covered	Assignment title	Scenario	Assessment evidence
1D.6 2D.P6, 2D.M5, 2D.D4	Review the Automated Vehicle	<p>Review the prototype automated vehicle, describing its strengths and potential further improvements. Consider the extent to which the automated system meets the original requirements and addresses feedback given from the customer.</p> <p>Justify how your design has changed during the development, including what has changed following feedback, and explain how you would improve the prototype system further.</p>	<ul style="list-style-type: none"> <li>• Evaluation report</li> <li>• Feedback from the customer</li> <li>• Annotated design documents.</li> </ul>

# Unit 17: Multimedia Products Development

Level: **1 and 2**

Unit type: **Optional specialist**

Guided learning hours: **60**

Assessment type: **Internal**

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## Unit introduction

When you play computer games, visit exhibitions, or go shopping online you will experience multimedia in action. You will also encounter it every time you watch a DVD, use online learning materials or visit a social networking site.

Multimedia plays an ever expanding and increasingly important role in daily life. It allows you to access information in new and inspiring ways, using combinations of assets such as video, sound effects, music, animation, images and text to create interactive products that are stimulating and easy to use. Relevant job roles include multimedia specialists who use software to manipulate assets into products and software developers/programmers who add functionality by writing computer code.

To be successful, a multimedia product must be suitable for the intended purpose and audience (for a linear product) or user requirements (for an interactive product). It must also be visually interesting, retain attention and present an intuitive interface that you will not need to learn, but instinctively know how to use.

Multimedia products include interactive presentations, information points and virtual reality simulations, as well as computer-based games and movies. These products have massive markets and there is real demand for people with the imagination and appropriate technical skills to create them.

In this unit, you will understand how multimedia products are used and the typical features they contain. You will be able to apply some of your findings when creating your own multimedia products. You will design, develop and test your own multimedia products against a brief.

Once completed you will review your work and obtain feedback from others.

In particular, this unit develops skills from *Unit 1: The Online World*, *Unit 4: Creating Digital Animation*, *Unit 5: Creating Digital Audio*, *Unit 6: Creating Digital Graphics* and *Unit 7: Creating Digital Video*. *Unit 12: Software Development* will also complement the content of this unit.

## Learning aims

In this unit you will:

- A understand the uses and features of multimedia products
- B design multimedia products
- C develop and test multimedia products
- D review the finished multimedia products.

## Learning aims and unit content

What needs to be learnt
<p><b>Learning aim A: Understand the uses and features of multimedia products</b></p> <p><b>Purpose of multimedia products</b></p> <p>The purpose of multimedia products is to present content to and engage an audience using a collection of assets, such as video and graphics, to provide an enhanced, multi-sensory, experience.</p> <p>Content can include the different assets: video clips, sound effects, music, animation sequences and images, as well as text.</p> <p><b>Know why individuals or organisations use multimedia products</b></p> <p>Uses of multimedia products:</p> <ul style="list-style-type: none"> <li>• present information, e.g. interactive slideshows, virtual tours</li> <li>• communicate with people, e.g. social networking, video conferencing</li> <li>• entertainment and leisure, e.g. computer games and movies</li> <li>• commerce, e.g. promotion of products and services</li> <li>• education, e.g. computer-aided learning, interactive assessments</li> <li>• develop skills, e.g. flight simulators.</li> </ul> <p><b>Features of multimedia products</b></p> <p>Types of multimedia product:</p> <ul style="list-style-type: none"> <li>• linear products – presenting pages or screens to an audience in a pre-determined sequence, e.g. a slideshow or movie.</li> <li>• interactive products – built in screen navigation and other features that allow users to interact with the product, e.g. computer games and simulations.</li> </ul> <p>Different features of products, e.g.:</p> <ul style="list-style-type: none"> <li>• ease of navigation</li> <li>• interactivity</li> <li>• appropriateness of content</li> <li>• game elements (i.e. light effects, characters)</li> <li>• game play (i.e. scoring, levels, rules, controls).</li> </ul> <p>Know how these features of multimedia products are used to improve the user experience for an individual, for example, how sound effects are used in computer games, video clips are embedded in learning packages, or animations are used in information points.</p>

**What needs to be learnt****Learning aim B: Design multimedia products**

To design a linear product and interactive product.

**Design documentation**

Documentation to include:

- requirements of the brief (audience, purpose and user requirements)
- documented ideas/prototypes including:
  - records of stimulus materials and mind maps of first ideas
  - storyboard, containing a number of panels, showing the intended layout, content and structure of the product
  - timelines for animations and movie clips with synchronised sound
  - hierarchy chart, to illustrate navigation, how screens are accessed
  - styles and formats, e.g. mood boards for colours, fonts and images
  - original and ready-made digital assets, e.g. animation, graphics, audio (e.g. sound effects and voice) and video clips. Sources for ready-made assets and details of editing should be documented and referenced
- hardware, software and other resources required
- test plans, to test functionality and user experience
- a brief outline of alternative design ideas, e.g. different characters, layouts/structures and styles.

What needs to be learnt
<p><b>Learning aim C: Develop and test multimedia products</b></p> <p><b>Develop linear and interactive multimedia products</b></p> <p>Use multimedia authoring tools/techniques, e.g.:</p> <ul style="list-style-type: none"> <li>• create and edit assets: <ul style="list-style-type: none"> <li>◦ text</li> <li>◦ images and other graphics</li> <li>◦ video clips, e.g. cut and join together, add effects</li> <li>◦ navigation, e.g. menus, hyperlinks (internal and external)</li> <li>◦ interactive components, e.g. hot spots, buttons, menus, rollover images</li> <li>◦ colour schemes, fonts and styles</li> <li>◦ animations, such as cut-out (i.e tweens), rotoscoping and skeletal</li> <li>◦ audio, including synchronisation of sound effects, music and voice over</li> </ul> </li> <li>• update the sources table with details of any ready-made assets</li> <li>• combine assets to create multimedia products</li> <li>• export and compress assets into suitable file types and sizes</li> <li>• if original video or audio is produced then consideration should be given to health and safety while recording, e.g. trailing cables, carrying heavy equipment, high volume levels and the environment where the recording will take place (e.g. on location).</li> </ul> <p><b>Testing multimedia products</b></p> <p>Test multimedia products for functionality, quality and usability.</p> <p>Obtain feedback from others, for example, effectiveness, content, presentation, interaction, usability, performance and purpose.</p> <p>Make improvements and/or refinements to multimedia products in response to testing and feedback from others.</p>
<p><b>Learning aim D: Review the finished multimedia products</b></p> <p>Review the finished multimedia products against:</p> <ul style="list-style-type: none"> <li>• fitness for purpose</li> <li>• audience (for a linear product)</li> <li>• user requirements (for an interactive product)</li> <li>• functionality</li> <li>• user experience, e.g. usability, quality, performance</li> <li>• constraints</li> <li>• strengths and potential improvements.</li> </ul>

## Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim A: Understand the uses and features of multimedia products</b>			
1A.1 Identify the intended uses and features of two different multimedia products.	2A.P1 Explain the intended uses and features of two different multimedia products.	2A.M1 Review how the multimedia products are fit for purpose and their intended effect on the audience/users.	2A.D1 Discuss the strengths and weaknesses of two multimedia products.
<b>Learning aim B: Design multimedia products</b>			
1B.2 Identify the audience/user requirements and purpose for the design of an interactive multimedia product.	2B.P2 Describe the audience/user requirements and purpose for the design of one linear and one interactive multimedia product.	2B.M2 Produce detailed designs for the multimedia products, including reasons why alternative ideas have been discarded.	2B.D2 Justify the final design decisions, explain how they will: fulfil the stated purpose and requirements of the brief meet the needs of the audience/users.
1B.3 Produce an outline design for an interactive multimedia product, with guidance.	2B.P3 Produce designs for one linear and one interactive multimedia product. Each design must include: documented product ideas/prototypes a list of ready-made assets a test plan.#		

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim C: Develop and test multimedia products</b>			
1C.4 Prepare assets for an interactive multimedia product, with guidance.	2C.P4 Prepare assets and content for the multimedia products, demonstrating awareness of purpose and listing sources of assets.	2C.M3 Prepare assets and content for the multimedia products, demonstrating an awareness of audience/user requirements, with all sources fully referenced.	2C.D3 Refine the high-quality multimedia products, taking account of feedback from others to enhance the audience/user experience.
1C.5 Develop an interactive multimedia product using suitable tools/techniques to combine assets and content, with guidance.	2C.P5 Develop one linear and one interactive multimedia product using suitable tools/techniques to combine assets and content, demonstrating awareness of purpose.	2C.M4 Develop one linear and one interactive multimedia product, demonstrating an awareness of audience/user requirements and taking account of usability.	
1C.6 Test the interactive multimedia product for functionality and purpose, repairing any faults and documenting changes, with guidance.	2C.P6 Test the multimedia products for functionality and purpose, repairing any faults and documenting changes.	2C.M5 Test any additional functionality and gather feedback from others on the quality of the products and use this to improve the products, demonstrating an awareness of audience/user requirements.	



Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
<b>Learning aim D: Review the finished multimedia products</b>			
1D.7 Identify how the final interactive multimedia product is suitable for the intended purpose.	2D.P7 Explain how the final multimedia products are suitable for the intended audience/user requirements and purpose.	2D.M6 Review the extent to which the final multimedia products meet the needs of the audience/user requirements, while considering feedback from others and constraints.	2D.D4 Evaluate the final multimedia products against the designs and justify any changes made, making recommendations for further improvements.

\*Opportunity to assess mathematical skills

#Opportunity to assess English skills

## Teacher guidance

### Resources

The special resources required for this unit include multimedia authoring software that enables the creation and editing of digital assets, including graphics, video, sound and animation. For example:

- graphics – Adobe Illustrator, Adobe Photoshop and Google Picasa 3 (freeware)
- game Authoring – Gamemaker, Multimedia Fusion and Flash
- sprite Production – Fireworks, Serif Draw Plus and Spriteforge
- 3-D Modelling – Google Sketchup (Free) and Blender (Free)
- audio – Audacity, Soundation (online) and Adobe Soundbooth
- video – Apple iMovie, Microsoft Moviemaker and Corel VideoStudio
- media players–QuickTime Player and Windows Media Player

Presentation software must **not** be used in the development of both products.

Learners will need a brief specifying the requirements for a linear multimedia product and an interactive multimedia product. The brief can either be created by the centre or by the learner and approved by the centre.

### Assessment guidance

This unit is assessed internally by the centre and externally verified by Edexcel. Please read this guidance in conjunction with *Section 8 Internal assessment*.

#### Learning aim A

Learners will investigate at least one linear and one interactive multimedia product to understand the uses of these products and their features. The products should be designed for different purposes.

**For 2A.P1:** learners should explain the uses and features of two different multimedia products. The multimedia products should be selected to cover a range of multimedia uses and features to provide learners with an opportunity for a broad and stimulating investigation.

*For level 1, as a minimum, learners should identify the intended uses and features of two multimedia products.*

**For 2A.M1:** learners should review how the multimedia products are fit for purpose and their intended effect on the audience/users.

**For 2A.D1:** learners should look at the multimedia products in more detail to discuss their strengths and weaknesses. They should consider at least one strength and at least one weakness.

#### Learning aim B

Learners should now have an understanding of what makes up a multimedia product. As learners develop their own multimedia products, they will be able to apply concepts that they discover or observe during their investigation.

Learners will design, develop and test two multimedia products, one linear product and one interactive product.

Scenarios suitable for a brief should allow learners to achieve all assessment criteria. The brief must include the following requirements for each product (as a minimum):

- a description of the purpose (clear objectives of what the multimedia products are intended to achieve)
- a description of the intended audience for the linear product and intended user requirements for the interactive product.
- location of the product, e.g. for a projector and screen or a mobile device.

Centres are encouraged to use evidence for the multimedia products as part of the learner's digital portfolio (*Unit 3: A Digital Portfolio*).

The learner may use any appropriate digital medium for presenting evidence, for instance a movie showing snapshots throughout the development process would be appropriate, as would blog entries as developments are made.

**For 2B.P2:** for the multimedia products learners should describe the purpose and audience (for the linear product)/user requirements (for the interactive product).

*For level 1, learners should identify the purpose and audience/user requirements for an interactive multimedia product.*

**For 2B.P3:** learners must first understand and interpret the brief for each multimedia product. They should produce design documentation that includes:

- ideas/prototypes that clearly indicate the idea and what the multimedia products might look like. These should include:
  - storyboard, containing a number of panels, to illustrate the layout, content (including interactive features) and structure of the product
  - timelines for any animations and movie clips, with synchronised audio
  - sources tables identifying ready-made digital assets, e.g. animation, graphics, music and sound effects, voice over, video clips
- test plans (to test for functionality).

*For level 1, as a minimum, learners should design an interactive multimedia product. The outline design ideas will contain a product structure, including a storyboard containing a number of panels. They should identify at least two assets that are to be incorporated into the product.*

**For 2B.M2:** in addition to the requirements for the pass grade, learners should produce detailed designs for their multimedia products. The detailed documents should include:

- records of stimulus materials and mind maps of first ideas
- styles and formats, e.g. mood boards for colours, fonts and images
- hierarchy chart of the content, to illustrate navigation, how screens are accessed
- hardware, software and other resources required for their products.

Learners should include a brief outline of alternative solutions for the intended multimedia products, giving reasons why some solutions were discarded.

**For 2B.D2:** learners should justify their design decisions, explaining how the multimedia products will fulfil the stated purpose and original requirements. Learners should justify the use of specific features which have been incorporated to enhance the user experience.

Learners may wish to do this by annotating their design documents and describing why, for example 'I have used sound fading in here because ...'. They should also justify why they have chosen to combine assets in this way to fulfil the brief and why the chosen design was selected and others rejected.

### Learning aim C

Learners will have a design of what their intended multimedia products will do, look like and how they will be tested. They should now be ready to apply their practical skills and knowledge to combine mainly ready-made assets to develop their products and test their outcomes. Many of the ready-made assets will have either been gathered from third parties, for example available from the internet while taking due consideration of copyright or created by completing units 4, 5, 6 and 7 on *Creating Digital Animation*, *Creating Digital Audio*, *Creating Digital Graphics* and *Creating Digital Video* respectively. Learners can produce additional original assets, but this should not be the focus of this unit.

**For 2C.P4:** learners should prepare assets (by gathering and editing assets and, if required, creating them) and list the sources for any ready-made assets. At least four assets should be included in each product, such as audio clips and animations, as outlined in their designs. They should demonstrate an awareness of the purpose of the multimedia products.

*For level 1, as a minimum, learners should prepare their assets for their interactive product, for example, a graphic should be cropped appropriately. Learners should include at least two assets (one audio and one animation).*

**For 2C.M3** learners should prepare their assets and content for the products, while taking into consideration the audience for the linear product and user requirements for the interactive product. All ready-made assets should be fully referenced in a sources table, with enough detail for another person to independently obtain the assets used.

**For 2C.P5:** learners should use appropriate software tools/techniques to combine their assets and develop their multimedia products, while demonstrating an awareness of the intended purpose.

As a minimum, the linear product should contain interlinked screens with:

- combinations of images with text
- suitable colour scheme and fonts
- screen transitions
- at least **two video clips**
- entry and exit effects applied to assets
- title screen(s).

As a minimum, the interactive product should contain:

- user interface for navigation and control
- suitable colour scheme and fonts
- at least **two animated assets**
- background sound track
- title screen(s).

If original video or audio is required as part of the design then due consideration should be given to health and safety issues while recording, e.g. the environment where the recording is due to take place.

*For level 1, as a minimum, learners should have used appropriate tools/techniques to combine assets to develop at least the interactive multimedia product. The minimum expected is a user interface for navigation and control, background sound track, at least two animated assets and a title screen.*

**For 2C.M4:** learners must continue to use tools and techniques to improve the multimedia products, demonstrating an awareness of audience for the linear product and user requirements for the interactive product.

For the linear product learners should take account of:

- suitable animation of text
- consistency of colour scheme and layout
- whether video clips are edited and combined with other assets
- automated running.

For the interactive product learners should take account of:

- controls such as stop, rewind, replay, navigation and character movement
- whether sound is synchronised to the animated assets
- fade in/out of music and voice over.

**For 2C.P6:** learners will be expected to follow their test plans and test the functionality of their multimedia products, checking that they are fit for purpose.

Learners are likely to experience technical difficulties as they develop their products. Learners will be expected to repair their multimedia products. It is important that learners make appropriate comments on their test plans or in accompanying logs about such issues and how they have resolved them.

*For level 1, as a minimum, learners should test the functionality and fitness for purpose of their products and repaired faults. They should document any changes made.*

**For 2C.M5:** over and above the existing functionality testing learners will be required to test the functionality of the additional usability features, as implemented for 2C.M4.

Learners should complete user-experience testing, with the help of at least one person who can act as a representative of the target audience for the linear product and intended users for the interactive product. The test user should be commenting on the effectiveness of the multimedia experience provided. Learners should record this feedback as part of the testing process.

**For 2C.D3:** teachers should recognise that the process of developing and testing multimedia products is an iterative and not sequential process. When making refinements to their products, learners should take into account their test results and feedback from others.

The multimedia products should engage the intended audience/users. For instance, a linear product, such as a film trailer, should combine video clips, high quality voice over and synchronised sound effects, with text and an interactive product, such as a computer game, should be highly playable, original, creative and interactive.

### **Learning aim D**

**For 2D.P7:** learners should explain why the final products are fit for purpose and suitable for the intended audience/user requirements. For each product, learners should give one reason why it is fit for purpose and one reason relating to audience/user requirements.

*For level 1, as a minimum, learners should identify how their final interactive multimedia product is fit for purpose, for example, 'My simple game is suitable for Key Stage 2 children as it includes fun characters which are easy to control'.*

**For 2D.M6:** learners should build on the explanations given in the Pass criteria and refer back to the original requirements and purpose, as defined in the brief. They should also seek and record feedback from others about the suitability of the final multimedia products and consider the impact of any constraints.

**For 2D.D4:** learners should evaluate the initial design ideas/prototypes against the final multimedia products, concentrating on the overall user experience and any original requirements given in the brief. They should justify any changes that were made during development and explain the rationale for any changes.

Learners should use this feedback to identify at least three further potential improvements but do not have to implement the enhancements.

*For level 1, as a minimum, learners should have identified at least one strength and one potential improvement to their multimedia product.*

## Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

### Brief 1

Design, develop and test a multimedia presentation intended to introduce the work of a charity concerned with the conservation of the rainforest. The presentation should be aimed at Key Stage 4 school pupils. It should be designed to inform them of the problems associated with the loss of the rainforest. The presentation is to be shown in school classrooms, using a large screen and data projector. The final presentation must include a list of all the digital assets used in its development.

### Brief 2

Design, develop and test a simple, single player computer game based on a maze. The game should be fun to play, aimed at Key Stage 2 children and maintain interest by incorporating levels of increasing difficulty. The game is to be played on laptops and standard PCs and should include user instructions on game play.

Criteria covered	Assignment	Scenario	Assessment evidence
1A.1 2A.P1, 2A.M1, 2A.D1	Investigation	<p>You are a consultant working for a multimedia development company. A customer (the 'client') has approached you asking for more information about multimedia products.</p> <p>You have been asked to produce a presentation which describes the uses and features of at least one linear and one interactive multimedia product.</p> <p>The customer would also like to find out how the multimedia products are fit for purpose and what their intended effect is on the audience/users.</p> <p>Think about the strengths and weaknesses of the multimedia products.</p>	<ul style="list-style-type: none"> <li>• Presentation slides and notes.</li> <li>• Supporting materials.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1B.2, 1B.3 2B.P2, 2B.P3, 2B.M2, 2B.M3, 2B.D2	Design multimedia products	<p>The customer would like you to develop two multimedia products based on two briefs.</p> <p>You have been asked to develop and document a design for each product. Each design should include:</p> <ul style="list-style-type: none"> <li>• purpose and audience/user requirements</li> <li>• product ideas/prototypes, including styles, templates and formats</li> <li>• storyboard to show the layout and structure</li> <li>• digital assets</li> <li>• timeline to indicate how assets combine</li> <li>• hierarchy chart of content</li> <li>• a table of sources</li> <li>• a test plan.</li> </ul> <p>Each multimedia product design should include alternative solutions and explain how they fulfil the stated purpose and audience/user requirements. Explain why any ideas you are not using have been rejected.</p> <p>Describe any constraints that have affected your design.</p>	<ul style="list-style-type: none"> <li>• A description of purpose and audience/user requirements for each multimedia product.</li> <li>• Proposed and alternative solutions for each multimedia product.</li> <li>• A list in a sources table of original and ready-made assets for each multimedia product.</li> <li>• A test plan for each multimedia product.</li> </ul>



Criteria covered	Assignment	Scenario	Assessment evidence
1C.4, 1C.5, 1C.6 2C.P4, 1C.P5, 2C.P6, 2C.M3, 2C.M4, 2C.M5, 2C.D3	Develop and test multimedia products	<p>You should now have everything you need to develop two multimedia products for the customer. This will involve:</p> <ol style="list-style-type: none"> <li>1. preparing (if required create, edit and optimise) digital assets that you will use in each multimedia product</li> <li>2. developing each multimedia product to fulfil the stated purpose and requirements set out in a brief</li> <li>3. testing each multimedia product against the test plan, checking the original requirements are still being met and documenting any changes made.</li> </ol> <p>Refine each multimedia product, based on feedback from others, where appropriate to do so, to enhance the audience/user experience.</p>	<ul style="list-style-type: none"> <li>• Functional multimedia products.</li> <li>• Annotated design.</li> <li>• Updated sources table.</li> <li>• Test plans and data.</li> <li>• Feedback from others.</li> </ul>

Criteria covered	Assignment	Scenario	Assessment evidence
1D.7 2D.P7, 2D.M6, 2D.D4	Review the multimedia products	<p>Having completed the multimedia products, you now have to review them. Review your products and explain why they are suitable for the 'client' (based on the requirements and purpose given in the brief), while considering feedback from others and any constraints.</p> <p>Justify where your design has changed during the development (from design to final product). Consider what you have changed following feedback and explain how you would improve each multimedia product further.</p>	<ul style="list-style-type: none"> <li>• Evaluation report.</li> <li>• Feedback from others.</li> <li>• Annotated design documents.</li> </ul>

# Annexe A

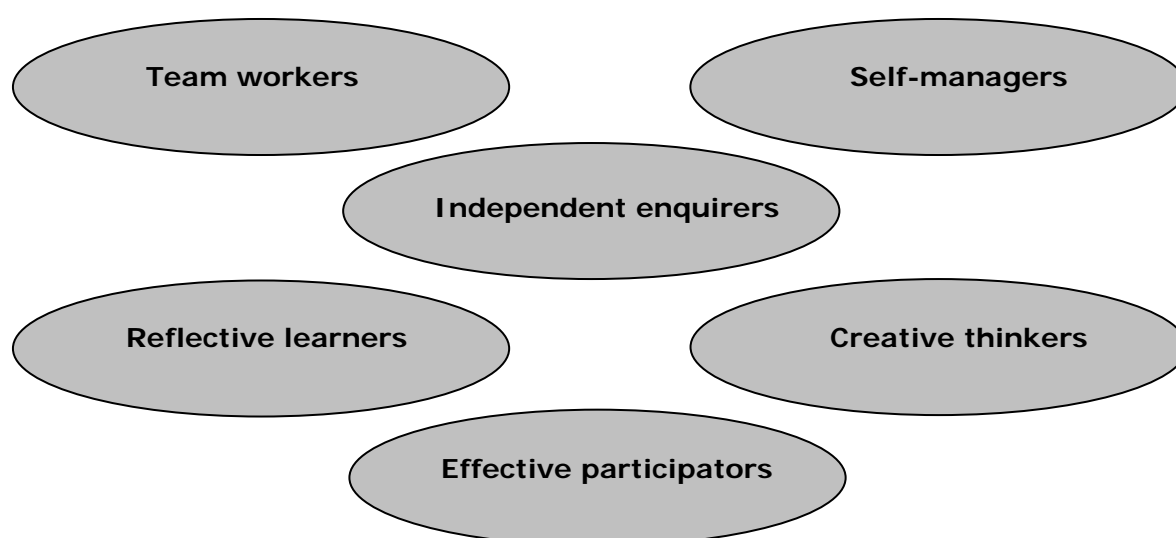
## Personal, learning and thinking skills

### A FRAMEWORK OF PERSONAL, LEARNING AND THINKING SKILLS 11–19 IN ENGLAND

Source – QCDA

The framework comprises six groups of skills that are essential to success in learning, life and work. In essence, the framework captures the essential skills of: managing self; managing relationships with others; and managing own learning, performance and work. It is these skills that will enable young people to enter work and adult life confident and capable.

The titles of the six groups of skills are set out below.



For each group, there is a focus statement that sums up the range of skills. This is followed by a set of outcome statements that are indicative of the skills, behaviours and personal qualities associated with each group.

Each group is distinctive and coherent. The groups are also interconnected. Young people are likely to encounter skills from several groups in any one learning experience. For example, an independent enquirer would set goals for their research with clear success criteria (reflective learner) and organise and manage their time and resources effectively to achieve these (self-manager). In order to acquire and develop fundamental concepts such as organising oneself, managing change, taking responsibility and perseverance, learners will need to apply skills from all six groups in a wide range of learning contexts.

## The skills

### Independent enquirers

#### Focus:

Young people process and evaluate information in their investigations, planning what to do and how to go about it. They take informed and well-reasoned decisions, recognising that others have different beliefs and attitudes.

#### Young people:

- identify questions to answer and problems to resolve
- plan and carry out research, appreciating the consequences of decisions
- explore issues, events or problems from different perspectives
- analyse and evaluate information, judging its relevance and value
- consider the influence of circumstances, beliefs and feelings on decisions and events
- support conclusions, using reasoned arguments and evidence.

### Creative thinkers

#### Focus:

Young people think creatively by generating and exploring ideas, making original connections. They try different ways to tackle a problem, working with others to find imaginative solutions and outcomes that are of value.

#### Young people:

- generate ideas and explore possibilities
- ask questions to extend their thinking
- connect their own and others' ideas and experiences in inventive ways
- question their own and others' assumptions
- try out alternatives or new solutions and follow ideas through
- adapt ideas as circumstances change.

### Reflective learners

#### Focus:

Young people evaluate their strengths and limitations, setting themselves realistic goals with criteria for success. They monitor their own performance and progress, inviting feedback from others and making changes to further their learning.

#### Young people:

- assess themselves and others, identifying opportunities and achievements
- set goals with success criteria for their development and work
- review progress, acting on the outcomes
- invite feedback and deal positively with praise, setbacks and criticism
- evaluate experiences and learning to inform future progress
- communicate their learning in relevant ways for different audiences.

### Team workers

#### Focus:

Young people work confidently with others, adapting to different contexts and taking responsibility for their own part. They listen to and take account of different views. They form collaborative relationships, resolving issues to reach agreed outcomes.

#### Young people:

- collaborate with others to work towards common goals
- reach agreements, managing discussions to achieve results
- adapt behaviour to suit different roles and situations, including leadership roles
- show fairness and consideration to others
- take responsibility, showing confidence in themselves and their contribution
- provide constructive support and feedback to others.

### Self-managers

#### Focus:

Young people organise themselves, showing personal responsibility, initiative, creativity and enterprise with a commitment to learning and self-improvement. They actively embrace change, responding positively to new priorities, coping with challenges and looking for opportunities.

#### Young people:

- seek out challenges or new responsibilities and show flexibility when priorities change
- work towards goals, showing initiative, commitment and perseverance
- organise time and resources, prioritising actions
- anticipate, take and manage risks
- deal with competing pressures, including personal and work-related demands
- respond positively to change, seeking advice and support when needed.

### Effective participators

#### Focus:

Young people actively engage with issues that affect them and those around them. They play a full part in the life of their school, college, workplace or wider community by taking responsible action to bring improvements for others as well as themselves.

#### Young people:

- discuss issues of concern, seeking resolution where needed
- present a persuasive case for action
- propose practical ways forward, breaking these down into manageable steps
- identify improvements that would benefit others as well as themselves
- try to influence others, negotiating and balancing diverse views to reach workable solutions
- act as an advocate for views and beliefs that may differ from their own.

## Summary of the PLTS coverage throughout the programme

This table shows where units support the development of personal, learning and thinking skills.

**Key:**

✓ indicates opportunities for development

a blank space indicates no opportunities for development

Unit	Personal, learning and thinking skills					
	Independent enquirers	Creative thinkers	Reflective learners	Team workers	Self-managers	Effective participants
1	✓	✓				
2	✓	✓				
3	✓	✓	✓		✓	
4	✓	✓	✓		✓	
5	✓	✓	✓		✓	
6	✓	✓	✓		✓	
7	✓	✓	✓		✓	
8	✓	✓	✓		✓	
9	✓	✓	✓		✓	
10	✓	✓	✓		✓	
11	✓	✓	✓		✓	
12	✓	✓	✓		✓	
13	✓	✓	✓		✓	
14	✓	✓	✓		✓	
15	✓	✓	✓		✓	
16	✓	✓	✓		✓	
17	✓	✓	✓		✓	

## Annexe B

### English knowledge and skills signposting

This table shows where an assessment criterion in a BTEC First unit can provide an opportunity to practise a subject content area from the GCSE English subject criteria (including functional elements).

Unit number and title	Learning aim	Assessment criterion reference	Subject content area from the GCSE subject criteria (details of the content area can be found below)
Unit 1: The Online World	N/A	N/A	N/A
Unit 2: Technology Systems	N/A	N/A	N/A
Unit 3: A Digital Portfolio	B	1B.3, 2B.P3, 2B.M2, 2B.M3, 2B.D2	2, 5, 15, 16
Unit 4: Creating Digital Animation	B	2B.P3, 2B.M2, 2B.D2	2, 5, 15, 16
Unit 5: Creating Digital Audio	B	2B.P3, 2B.M2, 2B.D2	2, 5, 15, 16
Unit 6: Creating Digital Graphics	B	2B.P3, 2B.M2, 2B.D2	2, 5, 15, 16
Unit 7: Creating Digital Video	B	2B.P3, 2B.M2, 2B.D2	2, 5, 15, 16
Unit 8: Mobile Apps Development	B	2B.P3, 2B.M2, 2B.D2	2, 5, 15, 16
Unit 9: Spreadsheet Development	N/A	N/A	N/A
Unit 10: Database Development	N/A	N/A	N/A
Unit 11: Computer Networks	N/A	N/A	N/A

Unit number and title	Learning aim	Assessment criterion reference	Subject content area from the GCSE subject criteria (details of the content area can be found below)
Unit 12: Software Development	N/A	N/A	N/A
Unit 13: Website Development	B	2B.P3, 2B.M2, 2B.D2	2, 5, 15, 16
Unit 14 Installing and Maintaining Computer Hardware	N/A	N/A	N/A
Unit 15 Installing and Maintaining Computer Software	N/A	N/A	N/A
Unit 16 Automated Computer Systems	N/A	N/A	N/A
Unit 17 Multimedia Products Development	B	2B.P3	2, 5, 15



## GCSE English subject content area

The topic areas below are drawn from the GCSE English subject criteria.

### **Learners should:**

- 1 analyse spoken and written language, exploring impact and how it is achieved
- 2 express ideas and information clearly, precisely, accurately and appropriately in spoken and written communication
- 3 form independent views and challenge what is heard or read on the grounds of reason, evidence or argument
- 4 understand and use the conventions of written language, including grammar, spelling and punctuation
- 5 explore questions, solve problems and develop ideas
- 6 engage with and make fresh connections between ideas, texts and words
- 7 experiment with language to create effects to engage the audience
- 8 reflect and comment critically on their own and others' use of language.

### **In speaking and listening, learners should:**

- 9 present and listen to information and ideas
- 10 respond appropriately to the questions and views of others
- 11 participate in a range of real-life contexts in and beyond the classroom, adapting talk to situation and audience and using standard English where appropriate
- 12 select and use a range of techniques and creative approaches to explore ideas, texts and issues in scripted and improvised work.

### **In reading, learners should:**

- 13 understand how meaning is constructed through words, sentences and whole texts, recognising and responding to the effects of language variation
- 14 evaluate the ways in which texts may be interpreted differently according to the perspective of the reader.

### **In writing, learners should write accurately and fluently:**

- 15 choosing content and adapting style and language to a wide range of forms, media, contexts, audiences and purposes
- 16 adapting form to a wide range of styles and genres.



## Annexe C

### Mathematics knowledge and skills signposting

This table shows where an assessment criterion in a BTEC First unit can provide an opportunity to practise a subject content area from the GCSE Mathematics subject criteria (including functional elements).

Unit number and title	Learning aim	Assessment criterion reference	Subject content area from the GCSE subject criteria (details of the content area can be found below)
Unit 1: The Online World	N/A	N/A	N/A
Unit 2: Technology Systems	B	N/A	1, 3, 4, 6, 21
	C	N/A	1, 3, 4, 6, 8, 13, 21
Unit 3: A Digital Portfolio	N/A	N/A	N/A
Unit 4: Creating Digital Animation	C	1C.5, 2C.P5, 2C.M4, 2C.D3	1, 7
Unit 5: Creating Digital Audio	N/A	N/A	N/A
Unit 6: Creating Digital Graphics	C	1C.5, 2C.P5, 2C.M4, 2C.D3	1, 7
Unit 7: Creating Digital Video	N/A	N/A	N/A
Unit 8: Mobile Apps Development	C	1C.5, 2C.P5, 2C.M4, 2C.D3	1, 3, 4, 6, 17
Unit 9: Spreadsheet Development	C	1C.5, 2C.P5, 2C.M4, 2C.D3	1, 3, 4, 6, 8, 13, 17

Unit number and title	Learning aim	Assessment criterion reference	Subject content area from the GCSE subject criteria (details of the content area can be found below)
Unit 10: Database Development	C	1C.5, 2C.P5, 2C.M4, 2C.D3	1, 3, 4, 6, 8, 13, 17
Unit 11: Computer Networks	N/A	N/A	N/A
Unit 12: Software Development	C	1C.4, 2C.P4, 2C.M3, 2C.D3	1, 3, 4, 6, 8, 13, 17
Unit 13: Website Development	N/A	N/A	N/A
Unit 14: Installing and Maintaining Computer Hardware	N/A	N/A	N/A
Unit 15: Installing and Maintaining Computer Software	N/A	N/A	N/A
Unit 16: Automated Computer Systems	B	1B.3, 2B.P3, 2B.M2, 2B.D2	1, 3, 4, 6, 21
	C	1C.4, 1C.P4, 1C.M3, 2C.D3	1, 3, 4, 6, 8, 13, 21
Unit 17: Multimedia Products Development	N/A	N/A	N/A

## GCSE Mathematics subject content area

The topic areas below are drawn from the GCSE Mathematics subject criteria.

### Learners should be able to:

- 1 understand number size and scale and the quantitative relationship between units
- 2 understand when and how to use estimation
- 3 carry out calculations involving  $+$ ,  $-$ ,  $\times$ ,  $\div$ , either singly or in combination, decimals, fractions, percentages and positive whole number powers
- 4 understand and use number operations and the relationships between them, including inverse operations and the hierarchy of operations
- 5 provide answers to calculations to an appropriate degree of accuracy, including a given power of ten, number of decimal places and significant figures
- 6 understand and use the symbols  $=$ ,  $<$ ,  $>$ ,  $\sim$
- 7 understand and use direct proportion and simple ratios
- 8 calculate arithmetic means
- 9 understand and use common measures and simple compound measures such as speed
- 10 make sensible estimates of a range of measures in everyday settings and choose appropriate units for estimating or carrying out measurement
- 11 interpret scales on a range of measuring instruments, work out time intervals and recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction
- 12 plot and draw graphs (line graphs, bar charts, pie charts, scatter graphs, histograms) selecting appropriate scales for the axes
- 13 substitute numerical values into simple formulae and equations using appropriate units
- 14 translate information between graphical and numerical form
- 15 design and use data-collection sheets, including questionnaires, for grouped, discrete or continuous data, process, represent, interpret and discuss the data
- 16 extract and interpret information from charts, graphs and tables
- 17 understand the idea of probability
- 18 calculate area and perimeters of shapes made from triangles and rectangles
- 19 calculate volumes of right prisms and of shapes made from cubes and cuboids
- 20 use Pythagoras' theorem in 2-D
- 21 use calculators effectively and efficiently

### In addition, level 2 learners should be able to:

- 22 interpret, order and calculate with numbers written in standard form
- 23 carry out calculations involving negative powers (only  $-1$  for rate of change)
- 24 change the subject of an equation
- 25 understand and use inverse proportion
- 26 understand and use percentiles and deciles
- 27 use Pythagoras' theorem in 2-D and 3-D
- 28 use trigonometric ratios to solve 2-D and 3-D problems.



## Annexe D

### Synoptic assessment

Synoptic assessment in information and creative technology is embedded throughout the units of study. The external units provide the essential knowledge, understanding and skills required in the subject and underpin the content of the optional specialist units. Learners studying the Edexcel BTEC Level 1/Level 2 First in Information and Creative Technology are able to demonstrate a number of synoptic approaches towards meeting the assessment criteria, including:

- showing links and holistic understanding/approaches to several units of study from the specification
- undertaking *Unit 3: A Digital Portfolio*, using work from all the completed units to build their digital portfolio
- interrelating overarching concepts and issues, bringing together their knowledge of information and creative technology
- developing an appreciation of how topics relate to one another, and how each may contribute to different uses and applications of technology
- making and applying connections to particular technology situations
- demonstrating their ability to use and apply a range of different methods and/or techniques
- being able to suggest or apply different approaches to contexts, situations, or in the effective tackling of specific technology-related problems
- synthesising information gained from studying a number of different technology-based activities
- using specialist terminology where appropriate
- demonstrating use of transferable skills, e.g. communication skills and business awareness
- demonstrating analytical and interpretation skills (of situations and/or results) and the ability to formulate valid well-argued responses
- evaluating and justifying their decisions, choices and recommendations.

### Examples

1. In the synoptic unit, *Unit 3: A Digital Portfolio*, learners reflect on their learning and identify connections from across their programme of study, such as problem-solving techniques and digital communication methods. The portfolio must include work from **all** the units they have completed in the course.
2. All optional specialist units follow the same project life cycle to investigate existing technology, and then to design, create/develop, test and review either a computer-based product or a system.
3. Different units support and develop from each other. For example,
  - *Unit 2: Technology Systems* supports *Unit 8: Mobile Apps Development*, *Unit 12: Software Development* and *Unit 16: Automated Systems Development* as it provides an introduction to programming
  - *Unit 5: Creating Digital Audio* and *Unit 6: Creating Digital Graphics* support *Unit 4: Creating Digital Animation* as these technologies are used in the creation of computer animations
  - *Unit 17: Multimedia Products Development* develops the learning from all four of the 'Creating Digital' units (Units 4, 5, 6 and 7).





## Annexe E

### The structure of the Edexcel BTEC Level 1/Level 2 First Award in Information and Creative Technology

The Edexcel BTEC Level 1/Level 2 First Award in Information and Creative Technology is taught over 120 guided learning hours (GLH). It has core and optional specialist units.

Learners must complete Unit 3, and either Unit 1 **or** Unit 2, and a choice of optional specialist units to reach a total of 120 GLH.

This BTEC First Award has units that your centre assesses (internal) and a choice of two units that Edexcel sets and marks (external).

<b>Edexcel BTEC Level 1/Level 2 First Award in Information and Creative Technology</b>			
<b>Unit</b>	<b>Core units</b>	<b>Assessment method</b>	<b>GLH</b>
1	The Online World	External	30
<b>OR</b>			
2	Technology Systems	External	30
<b>AND</b>			
3	A Digital Portfolio	Internal	30
<b>Optional specialist units</b>			
4	Creating Digital Animation	Internal	30
5	Creating Digital Audio	Internal	30
6	Creating Digital Graphics	Internal	30
7	Creating Digital Video	Internal	30
8	Mobile Apps Development	Internal	30
9	Spreadsheet Development	Internal	30
10	Database Development	Internal	60
11	Computer Networks	Internal	60
12	Software Development	Internal	60
13	Website Development	Internal	60

# INFORMATION AND CREATIVE TECHNOLOGY

# Specification

Issue 2

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