Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

4914290235

COMPUTER SCIENCE **0478/12**

Paper 1 Theory **May/June 2022**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **12** pages.

1 **(a)** Denary values are converted to binary values to be processed by a computer.

Draw **one** line from each denary value to the correctly converted 8-bit binary value.

Denary	8-bit binary
	00100001
41	10100110
	00101001
174	10000110
	10101110
86	01010110

[3]

Working space

.....

.....

.....

.....

.....

(b) Binary values can also be converted to denary values.

Give the correct denary value for the 12-bit binary value 000101010111
Show all your working.

.....

.....

.....

.....

Denary value .....

[2]

2 Hexadecimal is used for Hypertext Markup Language (HTML) colour codes.

An HTML colour code is:

#2F15D6

Each pair of digits is stored as binary in an 8-bit register.

(a) Give the 8-bit binary value that would be stored for each pair of hexadecimal digits.

2F								
15								
D6								

[6]

Working space

.....

.....

.....

.....

.....

(b) HTML colour codes and Media Access Control (MAC) addresses are two examples of where hexadecimal is used in Computer Science.

Give **two** other examples of where hexadecimal can be used in Computer Science.

Example 1 .....

Example 2 .....

[2]

(c) Websites can be created using HTML structure and presentation.

State what is meant by HTML structure and presentation.

Give an example of each in your answer.

Structure .....

.....

.....

.....

Presentation .....

.....

.....

.....

[4]

(d) Explain why presentation is often separated from structure when creating a web page.

.....

.....

.....

..... [2]

3 Joelle is a student who uses the Internet.

(a) The table contains **five** terms or definitions that relate to the Internet.

Complete the table by writing each missing term or definition.

Term	Definition
browser	....
.....	this is the company that provides a user with a connection to the Internet
.....	this is a protocol that is used to send data for web pages across the Internet
Uniform Resource Locator (URL)	....
cookie	....

[5]

(b) Joelle uses a firewall to keep her data safe when she uses the Internet.

Tick (✓) to show which statement about firewalls is true.

	Tick (✓)
Firewalls can only be hardware-based	☐
Firewalls can only be software-based	☐
Firewalls can be hardware-based or software-based	☐

[1]

(c) Joelle's parent also uses the firewall to limit the websites that Joelle can access.

Explain how the firewall is used to limit the websites that Joelle can access.

.....

.....

.....

.....

.....

.....

.....

..... [4]

4 Jason is a programmer who writes computer programs in a high-level language.

(a) Describe what is meant by a high-level language.

.....

.....

.....

.....

.....

..... [3]

(b) Jason wants to distribute a computer program he has written. He is considering distributing it to users as freeware or free software.

(i) Explain **one** drawback to a user if the program is distributed as freeware.

.....

.....

.....

..... [2]

(ii) Explain **one** benefit to a user if the program is distributed as free software.

.....

.....

.....

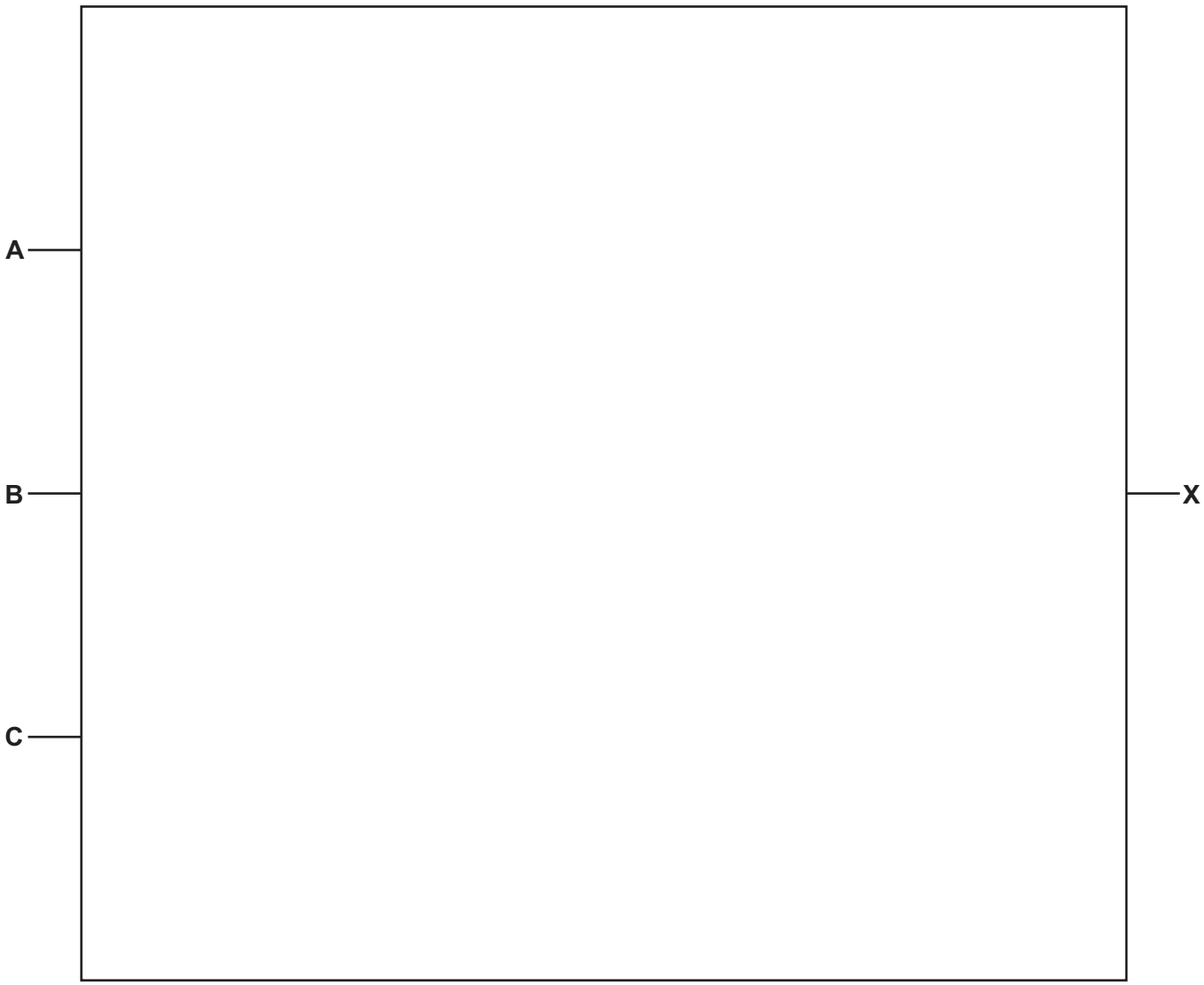
..... [2]

5 Consider the following logic statement:

X = ((**A** OR **B**) AND (NOT (**B** XOR **C**)) AND **C**)

(a) Draw a logic circuit to represent the given logic statement.

Do **not** attempt to simplify the logic statement. All logic gates must have a maximum of **two** inputs.



[5]

(b) Complete the truth table for the given logic statement.

A	B	C	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

6 Millions of emails are sent between users on a daily basis.

(a) Identify **two** online security attacks that can be carried out using email.

Describe how email is used to enable the attack.

Online security attack 1 .....

Description .....

.....

.....

.....

.....

Online security attack 2 .....

Description .....

.....

.....

.....

.....

[6]

(b) Online security attacks can maliciously damage data.

One security method to keep data safe from online attacks is a firewall.

Identify **two** other security methods that keep data safe from online attacks.

Security method 1 .....

Security method 2 .....

[2]

(c) Data can also be damaged accidentally.

One example of how data can be damaged accidentally is by shutting down a computer before saving data. To prevent this from happening, a user should make sure they have saved all data before shutting down a computer.

Complete the table by giving **three** other examples of how data can be damaged accidentally.

Give a method of prevention for each example.

Example	Method of prevention
.....	.....
.....	.....
.....	.....
	.....
.....	.....
.....	.....
.....	.....
	.....
.....	.....
.....	.....
.....	.....
	.....

[6]

7 Cassie stores data for her business every day. She stores the data using optical data storage.

(a) Identify **three** examples of optical data storage.

Example 1 .....

Example 2 .....

Example 3 .....

[3]

(b) **Six** statements are given about the operation of three different types of storage.

Tick (✓) to show which statements apply to each type of storage. Some statements may apply to more than **one** type of storage.

	Type of storage		
Statement	**Magnetic (✓)**	**Optical (✓)**	**Solid state (✓)**
this storage has no moving parts			
this storage uses a laser to read and write data			
this storage uses a read/write head			
this storage burns pits onto a reflective surface			
this storage uses NAND and NOR technology			
this storage stores data in tracks and sectors			

[6]

8 Sam develops a software application. He distributes a version of the software as shareware.

(a) Describe what is meant by shareware.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Identify **three** ethical issues that may need to be considered when developing and distributing software.

Ethical issue 1 .....

Ethical issue 2 .....

Ethical issue 3 .....

[3]

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MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **13** printed pages.

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

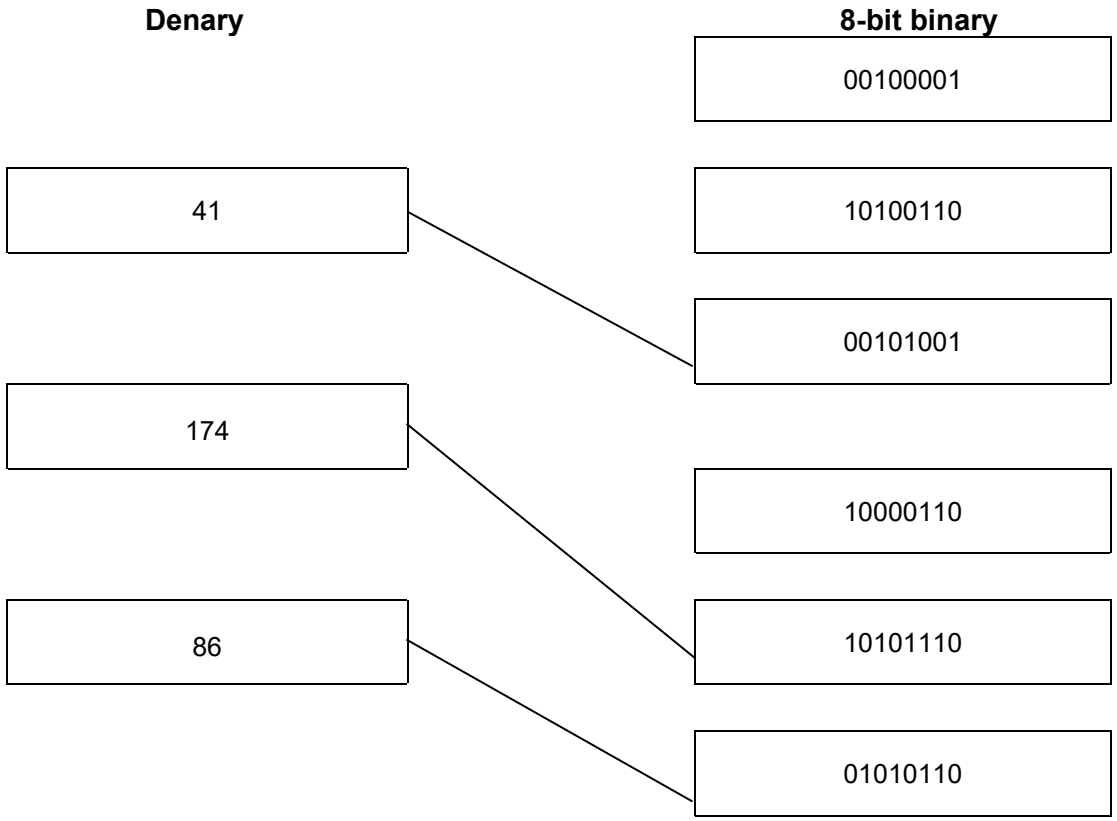
Please note the following further points:

The words in **bold** in the mark scheme are important text that needs to be present, or some notion of it needs to be present. It does not have to be the exact word, but something close to the meaning.

If a word is underlined, this **exact** word must be present.

A single forward slash means this is an alternative word. A double forward slash means that this is an alternative mark point.

Ellipsis (…) on the end of one-mark point and the start of the next means that the candidate **cannot** get the second mark point without being awarded the first one. If a mark point has an ellipsis at the beginning, but there is no ellipsis on the mark point before it, then this is just a follow-on sentence and **can** be awarded **without** the previous mark point.

Question	Answer	Marks
1(a)	**One** mark for each correct line  	**3**
1(b)	**One** mark for correct working, **one** mark for correct answer Working e.g. • 256 + 64 + 16 + 4 + 2 + 1 Answer: • 343	**2**

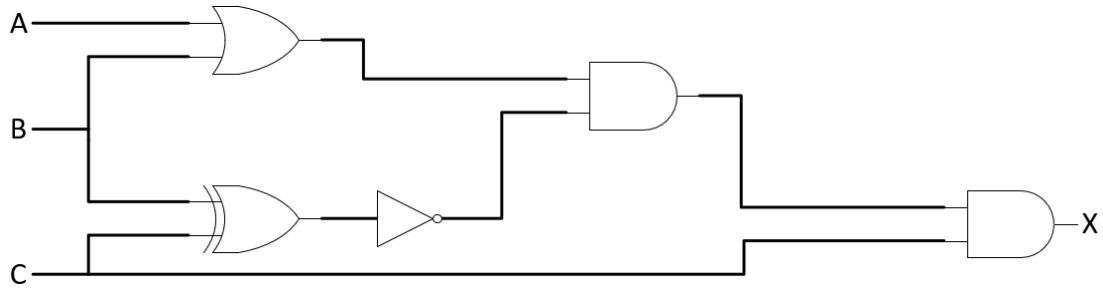
Question	Answer	Marks
2(a)	**Two** marks each correct conversion (**one** mark for the first four bits, **one** mark for the second four bits) 2F: 0 0 1 0 | 1 1 1 1 15: 0 0 0 1 | 0 1 0 1 D6: 1 1 0 1 | 0 1 1 0	**6**
2(b)	Any **two** from: • IP address • Error messages/codes • Assembly language // low-level language • URL // web address • Memory dumps • Locations in memory	**2**
2(c)	**One** mark for a description, **one** mark for a correct example **Structure** • **Layout** of the web page • e.g. Where text is placed **Presentation** • **Formatting** of the web page • e.g. the colour of the font	**4**

Question	Answer	Marks
2(d)	**Two** from: • The **formatting** of the page can be changed/edited **without needing to alter the structure** • … so, they can make regular updates without needing to check the structure • The **formatting** document can be used again for a different website … • If further content and web pages are added to the website, the necessary formatting can be easily applied … • … so, this can save time when developing/updating a website • Allows use of CSS to standardise formatting • … so, CSS only needs to be created once (to be applied to each webpage)	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>One mark for the correct term or definition
<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>browser</td><td>Software/application that allows users to view web pages / render HTML</td></tr>
<tr><td>Internet Service provider // ISP</td><td>this is the company that provides a user with a connection to the Internet</td></tr>
<tr><td>HTTP // HTTPS</td><td>this is a protocol that is used to send data for web pages across the Internet</td></tr>
<tr><td>Uniform Resource Locator (URL)</td><td>a text-based version of a web address</td></tr>
<tr><td>cookie</td><td>a text file (stored by web browser) that contains data about a user’s browsing habits/details/preferences</td></tr>
</table></td><td>5</td></tr>
<tr><td>3(b)</td><td>• Hardware or software based</td><td>1</td></tr>
<tr><td>3(c)</td><td>Four from:

• (The parent can) set criteria for the websites she is allowed to visit
• … such as a whitelist/blacklist of websites
• The firewall will examine the data/traffic incoming and outgoing from her computer
• If data is sent from a website that is not allowed, it will be blocked</td><td>4</td></tr>
</table>

Question	Answer	Marks
4(a)	Any **three** from: • It uses English-like statements • It needs to be converted to **machine code** (to be processed by a computer) • … using a translator • It is portable • One line of code can perform multiple commands	**3**
4(b)(i)	**Two** from: • The user is not allowed to access the **source code** … • … so, they cannot tailor the software to their needs • … so, they cannot fix any bugs in it • The software is still covered by copyright • The user must get the owner's **permission** to do anything beyond using it	**2**
4(b)(ii)	**Two** from: • The user can access the **source code** … • … so, they can tailor the software to their needs • … so, they can fix any bugs in it • … so, the source code could be studied for educational purposes • The user can redistribute the software/program … • … but this must be done under the same terms as the original software	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>5(a)</td><td>One mark for each correct logic gate with correct input(s)
 
</td><td>5</td></tr>
<tr><td>5(b)</td><td>Four marks for 8 correct outputs
Three marks for 6/7 correct outputs
Two marks for 4/5 correct outputs
One mark for 2/3 correct outputs
<table>
<tr><th>A</th><th>B</th><th>C</th><th>Working space</th><th>X</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td></td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td></td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td></td><td>1</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td></td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td></td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td></td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td></td><td>1</td></tr>
</table></td><td>4</td></tr>
</table>

Question	Answer	Marks
6(a)	**One** mark for identifying the attack, **two** marks for the description • Phishing • Email is sent to user to encourage them to click link • … that takes user to fake website Pharming • Email is sent to user to encourage them to click link/download attachment • … that triggers **download** of **malicious code** that will redirect user to fake website Virus/malware • Email is sent to user to encourage them to click link/download attachment • … that triggers **download** of virus/malware Denial of service // DoS • A very large number of emails are sent to a **server**/**network at the same time** • … crashing the **server**/**network**	**6**
6(b)	Any **two** from: • Encryption • Password • Two-step / Two-factor authentication/verification • Biometric device • Anti-malware // Anti-virus • Proxy-server	**2**

Question	Answer	Marks
6(c)	**One** mark for identifying an issue, **one** mark for suggesting a suitable prevention – Power surge/loss (damages hardware) – Use a UPS – Water can be spilled on the device – Don't have water near the device – Keep device in a waterproof box when not is use – Fire can destroy device – Use electrics safety – Keep device in a fireproof box when not is use – Data is accidentally deleted – Add verification method for data deletion – Set access levels for data to limit who can delete the data – Incorrect use of **storage** device – Making sure device is ejected before removing – Physical damage to hardware // hardware failure – Correct care and maintenance of hardware – Software failure – Making sure it is always up to date // enable automatic updates	**6**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(a)</td><td>Three from:

• CD
• DVD
• Blu-ray</td><td>3</td></tr>
<tr><td>7(b)</td><td>One mark for each correct row

<table>
<tr><th rowspan="2">Statement</th><th colspan="3">Type of storage</th></tr>
<tr><th>Magnetic (✓)</th><th>Optical (✓)</th><th>Solid state (✓)</th></tr>
<tr><td>this storage has no moving parts</td><td></td><td></td><td>✓</td></tr>
<tr><td>this storage uses a laser to read and write data</td><td></td><td>✓</td><td></td></tr>
<tr><td>this storage uses a read/write head</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>this storage burns pits onto a reflective surface</td><td></td><td>✓</td><td></td></tr>
<tr><td>this storage uses NAND and NOR technology</td><td></td><td></td><td>✓</td></tr>
<tr><td>this storage stores data in tracks and sectors</td><td>✓</td><td>(✓)</td><td></td></tr>
</table></td><td>6</td></tr>
</table>

Question	Answer	Marks
8(a)	Any **four** from: • Trial version of software • … for a limited time / number of uses • … with limited features • … free of charge • If full version is required need to pay fee / sign up // When trial over user is asked to pay / sign up • Protected by copyright • Type of software **licence**	**4**
8(b)	Any **three** from: e.g. • Copyright • Plagiarism • **Production/distribution** of malware • Intellectual property theft • Privacy of data • Age appropriation • Offensive materials • Environmental impact of distribution media e.g. CDs • Accessibility of software • Security of software • Following guidelines of professional bodies e.g. ACM/IEEE/BCS	**3**