FOR OFFICIAL USE

National Qualifications 2016

Mark

X716/76/01 Computing Science

FRIDAY, 27 MAY

1:00 PM – 3:00 PM

X7167601

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day | Month | Year

Scottish candidate number

Total marks — 90

SECTION 1 — 20 marks

Attempt ALL questions.

SECTION 2 — 70 marks

Attempt ALL questions.

Show all working.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give this booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

SQA ©

X7167601 01

MARKS | DO NOT WRITE IN THIS MARGIN

SECTION 1 — 20 marks

Attempt ALL questions

1. A real number is stored using 32-bit floating point representation. The mantissa is allocated 24 bits and 8 bits are allocated to the exponent.

Comp Sys

Describe the effect if the allocation is changed to a 16-bit mantissa and a 16-bit exponent. **2**

2. Nadia wishes to store a video clip that is 24 frames per second, duration is 95 seconds and has a resolution of 1280 × 720 with a colour depth of 16 bits.

NA

Calculate the storage requirement for the uncompressed video clip. Show all working and express your answer in appropriate units. **2**

NA

3. Classes and subclasses are key characteristics of object-oriented programming.

Explain why the use of classes and subclasses reduces implementation time for programmers. **2**

NA

4. Rapid Application Development (RAD) is often used when a program is required quickly.

Describe **two** ways that the use of Rapid Application Development (RAD) reduces the time taken to create a working program. **2**

[Turn over

NA

5. An administrator at a gym uses a database to add new member details. Members can have student, adult or senior membership. The administrator types new member details into a form as shown below.

MEMBER DETAILS

First Name:	Oliver
Last Name:	Wilson
D.O.B.:	21/01/1994
Member ID:	3133
Membership:	Student

Describe **two** ways to improve the usability of this form. **2**

NA

6. Pupils access files from a shared folder on their school network server. These files are available for the pupils to open, but only a teacher can edit and save the files to this folder.

Describe how this is implemented. **2**

DDD

7. BorrowABike is a company that hires bikes to customers for one day. They have a relational database with three tables as shown below.

Members	Bikes	Hire
MemberID	BikeID	MemberID*
Name	Colour	BikeID*
Address	Wheelsize	HireDate
Phone		Cost

(a) Explain why a compound key is required for the Hire table. **1**

(b) The data dictionary for a table includes the field name. State **two** other items that would be specified in a data dictionary. **2**

WDD

8. A website containing information about different countries is being created. Part of the HTML code is shown below.

```
<html>
<head>
    <title><h1>Countries</h1></title>
<head>
<body>
    <h1> Welcome to countries of the world!</h1>
    <p1>Countries in Europe</p1>
    <p align = centre> France</p>
</body>
</html>
```

(a) Identify **two** errors in the HTML code above. **2**

(b) The developer of the website decides to include metatags.

(i) State the purpose of metatags. **1**

(ii) State where in the code the metatags should be inserted. **1**

Comp Sys

9. State **one** reason why the increased use of technology has had a negative effect on the environment. **1**

SECTION 2 — 70 marks

Attempt ALL questions

10. Mrs McColl is a computing teacher who creates a program to grade her pupils' work. Mrs McColl's students have had two tests, one in Software Design and Development (SDD) and one in Information Systems Design and Development (ISDD).

SDD

Name	SDD	ISDD
Liam	C	B
Sohale	D	C
Craig	A	A
Katya	B	B
Rebecca	B	C
Wei-Lin	B	B

(a) Using pseudocode, or a programming language of your choice, write an algorithm for a subroutine that will count the number of pupils who achieved a grade B in both tests. **5**

10. (continued)

NA

(b) Mrs McColl implements the program using global variables. Another teacher suggests that she makes use of parameter passing instead.

State **two** benefits of using parameter passing rather than global variables. **2**

Parameters are used to pass data between subprograms. Parameters can be passed by reference or passed by value.

(c) Explain why passing by value is more demanding on system resources when the data being passed is held in an array. **2**

10. (continued)

SDD (d) Mrs McColl's program is modular and makes use of functions. Explain what is meant by a function. **1**

NA (e) Mrs McColl's employer must conform with the requirements of the Regulation of Investigatory Powers Act (RIPA).

(i) State **two** responsibilities, detailed in this act, for the employer. **2**

NA (ii) Describe **two** concerns Mrs McColl may have as a result of this act. **2**

[Turn over

11. Tomek has created a website for the fans of the China Cats electropop group. The site has a home page at www.tomek91.com with links to three pages: a Tour Dates page, a Band Members page and a Fans page.

WDD

(a) Describe an addition that would make this a multi-level site. **1**

(b) On the Band Members page, when the pointer is moved over the name of each member a photograph and a mini-biography are shown.

This interactive feature was created using a scripting language. Describe how this is executed. **1**

(c) Tomek was asked to make all the large headings appear in Tahoma font, blue and centred wherever they appear on each page. He chooses to do this with an external style sheet.

(i) Write a Cascading Style Sheet (CSS) rule to manage the large headings. **3**

11. (c) (continued)

WDD

(ii) State **two** benefits of using an external style sheet. **2**

(d) Searching for the "China Cats" or "electropop" on the World Wide Web with a search engine does not give a prominent result for this site.

Describe **two** ways that Tomek can improve this without incurring any further costs. **2**

Comp Sys

(e) Tomek is planning to sell band merchandise through his website.

Explain why the presence of a digital certificate will improve customer confidence when buying from the website. **2**

[Turn over

12. Emma works in a recording studio. She needs a music mixing program that supports all the latest audio file formats.

NA

(a) Emma can choose between open source or proprietary software.

Describe a benefit, to Emma, of each type of software. **2**

(b) Emma would also like to use the music software on her home computer. Her home computer has an operating system which is not compatible with her choice of software.

Describe a software solution that would allow Emma to run the program on her current operating system. **2**

(c) Emma records a vocalist singing the voice track for a new recording.

(i) Describe how increasing the sample rate and depth at the time of recording would improve the quality of this sound file. **2**

12. (c) (continued)

NA

(ii) Describe a compression technique that reduces the file size for sound. **1**

Comp Sys

(d) Emma's home computer has a data bus and an address bus.

Describe how each bus is used when reading data from memory. **2**

[Turn over

SDD **13.** Eloïse wants to search for an item of data held in an array. She writes the following algorithm.

```
Line 1      SET list to [71,76,66,67,89,72]
Line 2      SET target to 71
Line 3      SET found to false
Line 4      FOR counter FROM 0 to 5 DO
Line 5          IF list[counter]=target THEN
Line 6              SET found to true
Line 7          ELSE
Line 8              SET found to false
LINE 9          END IF
LINE 10     END FOR
LINE 11     IF found =true THEN
LINE 12         SEND "Item found" TO DISPLAY
LINE 13     ELSE
LINE 14         SEND "Not found" TO DISPLAY
LINE 15     END IF
```

(a) A trace table is shown below which shows the line numbers where a variable has changed. State the missing values at A, B, C and D

Line	list	target	counter	found
1	[71,76,66,67,89,72]			
2		A		
3				B
4			0	
6				C
4			1	
8				D

A = _____ B = _____ C = _____ D = _____ **4**

(b) The algorithm is incorrect and so outputs the wrong message.

(i) Explain why the algorithm is incorrect. **1**

_____

_____

_____

13. (b) (continued)

SDD (ii) Describe how to correct the algorithm. **1**

NA (c) Explain why the use of cache memory improves system performance when running lines 4 to 10. **2**

[Turn over

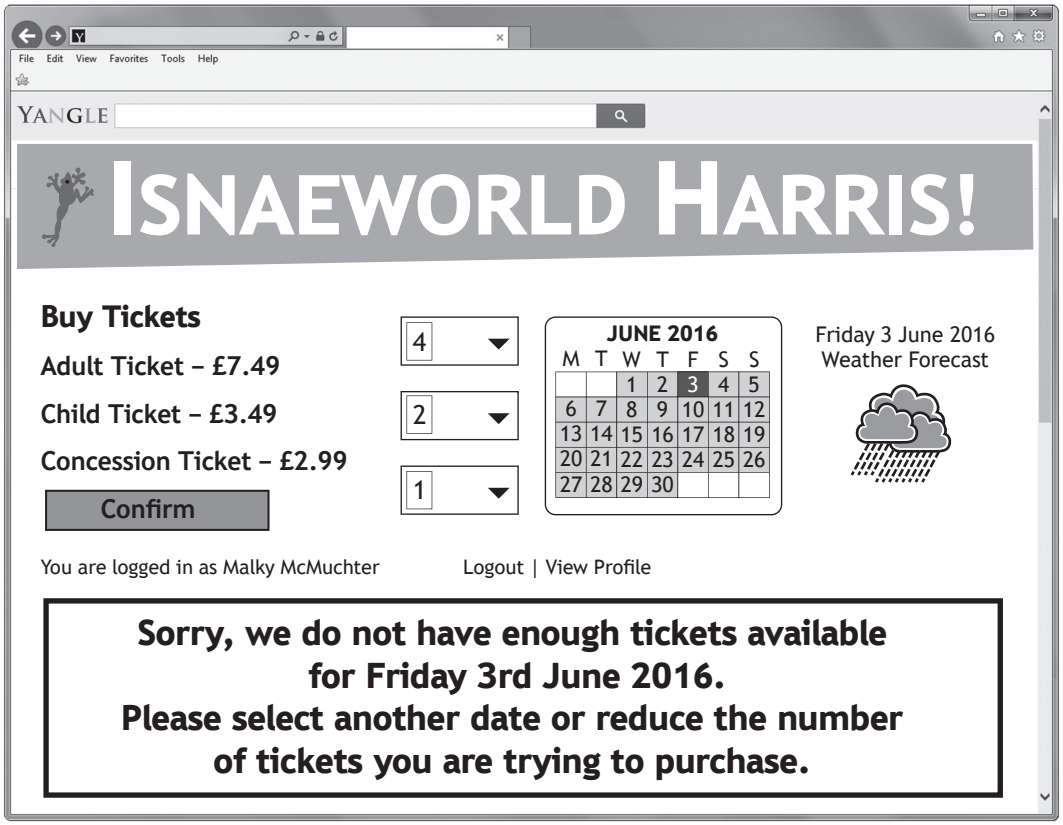
NA

14. Isnaeworld is a theme park in Harris. It uses a database driven website. On any given day, there are 5000 entry tickets available.

(a) State **two** reasons why Isnaeworld makes use of a database driven website. **2**

NA

(b) Customers can purchase tickets to gain entry to the theme park by completing an online form.



A customer has attempted to purchase four adult, two child and one concession tickets.

Explain how the web server dynamically generates the web page shown above. **4**

14. (continued)

DDD

(c) Isnaeworld also allows customers to book tickets for specific attractions within the theme park. Isnaeworld uses a relational database to store bookings for each attraction.

The relational database has four tables as shown below.

Customer	**Attraction Booking**	**Theme Park**	**Attraction**
Customer ID	Customer ID*	Park ID	Attraction ID
First Name	Attraction ID*	Name	Park ID*
Surname	Card Number	Town	Manufacturer
Member Status	Ref Number	Postcode	Category
	Date		

Draw an entity relationship diagram to show the relationships between the four tables. **3**

14. (continued)

NA (d) Isnaeworld make a full backup of all of their data every Sunday.

(i) Explain why this backup strategy is insufficient. **1**

(ii) Describe how this backup strategy could be improved. **2**

NA (e) When a customer attempts to buy tickets on the Isnaeworld website, they see the following message and check box.

> By ticking this box you give us permission to share your details with third party organisations
>
> ✓ Accept

Explain why Isnaeworld must include this message if they intend to share customer details with third party organisations. **2**

15. Tony coaches a team of eight elite athletes for a 400 metre race. Tony uses a program to help analyse each athlete's performance.

SDD

A sample of the data held on each athlete is shown below.

Athlete Data	
Forename	Salma
Surname	Hussain
Runner number	324
Professional	True
Season best	45·12
Weight (kg)	67·5

Tony has added a record structure to his program.

RECORD athleteData IS {STRING forename, STRING surname, INTEGER runnerNumber, BOOLEAN professional, REAL seasonBest, REAL weight}

(a) Tony wants to store his eight athletes' data using the record structure shown above. The variable name is athletes.

Using pseudocode, or a programming language of your choice, declare the variable which can store the data for the eight athletes. **2**

(b) Using pseudocode, or a programming language of your choice, write the code necessary to add the data for the athlete Salma shown in the table above. Your answer should use the variable declared in part (a). **3**

15. (continued)

SDD

(c) Tony wants to find the fastest 400 m time of the season.

Using pseudocode, or a programming language of your choice, design an algorithm to find the fastest season time. Your answer should use the variable declared in part (a). **5**

15. (continued)

(d) Tony has added the following to his program.

```
Line 1    CREATE "C:\MyAthletes\winner.txt"
Line 2    SEND fastest TO "C:\MyAthletes\winner.txt"
Line 3    CLOSE "C:\MyAthletes\winner.txt"
```

(i) Describe the purpose of line 1. **1**

(ii) Describe the purpose of line 2. **1**

(e) Tony runs his program but the program produces the wrong output when compared with his test data.

Other than a trace table, name and describe a technique that Tony could use to locate and identify the error. **2**

[END OF QUESTION PAPER]

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS

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