FOR OFFICIAL USE

National Qualifications 2018

Mark

CS(N5)18B

Computing Science

Duration — 2 hours

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forenames(s)

Surname

Number of seat

Date of birth

Day D D

Month M M

Year Y Y

Scottish candidate number

Total marks – 110

SECTION 1 – 25 marks

Attempt ALL questions in this section.

SECTION 2 – 85 marks

Attempt ALL questions in this section.

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 marks for this paper.

MARKS | DO NOT WRITE IN THIS MARGIN

SECTION 1 – 25 marks

Attempt ALL questions

1. Convert the denary number 169 to binary. **1**

2. A vector graphic file stores objects and their attributes.

(a) State the name of the object shown above. **1**

(b) State two attributes of this object. **2**

Attribute 1 _____

Attribute 2 _____

3. This pseudocode allows a user to enter a capital letter from "A" to "F" when making a choice from a menu program.

```
Line 1   RECEIVE menuitem FROM (STRING) KEYBOARD
Line 2   WHILE menuitem < "A" OR choice > "F" DO
Line 3     SEND "Error: Re-enter choice A to F" TO DISPLAY
Line 4     RECEIVE menuitem FROM (STRING) KEYBOARD
Line 5   END WHILE
```

Explain what happens if a user enters "X". **2**

MARKS | DO NOT WRITE IN THIS MARGIN

4. Sally is writing a program based on the following design.

```
Line 1     RECEIVE skillBonus FROM KEYBOARD
Line 2     IF skillBonus = True THEN
Line 3          bonusPoints = 100
Line 4     ELSE
Line 5          bonusPoints = 0
Line 6     END IF
```

State the name of each variable in the program and a suitable data type for each. **4**

Variable 1

Name _____ Data type _____

Variable 2

Name _____ Data type _____

5. A program is being tested. When the program is running a large number is entered and the following error message is displayed. The program then terminates.

```
ERROR: Overflow error on Input
```

(a) State the type of error that has been generated. **1**

_____

(b) Explain why this error was not detected while the code was being written. **2**

_____

_____

6. An audio file is stored at the following address
https://mysounds.com/whitenoise.mp3

Write the HTML to play this file within a web page. **3**

[Turn Over

MARKS | DO NOT WRITE IN THIS MARGIN

7. Kelly has developed a wireframe of a new web site for a customer. The next step is to develop a low-fidelity prototype.

(a) Describe what is meant by a low-fidelity prototype. **2**

(b) Describe how a low-fidelity prototype would be used with the customer. **1**

8. A school teacher has lost a laptop storing details of pupils.

(a) Explain why this is a breach of the Data Protection Act 1998. **1**

(b) State two other implications for the teacher of **storing** pupil data. **2**

Implication 1:

Implication 2:

MARKS | DO NOT WRITE IN THIS MARGIN

9. This SQL statement is used to query a database system.

```
SELECT * FROM car WHERE model = "XJS"
```

(a) Explain what the expected output from this statement would be. **2**

(b) The field **model** has a validation rule applied to it to ensure that it is never more than 8 characters.

State the name given to this type of validation. **1**

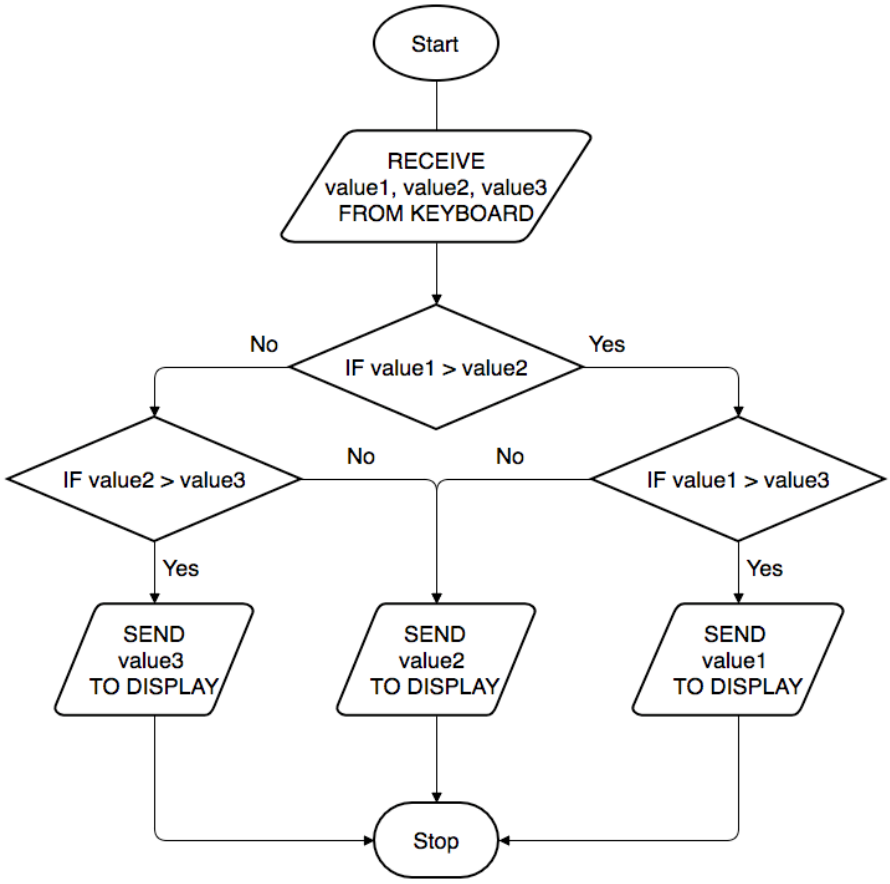
[Turn Over

MARKS DO NOT WRITE IN THIS MARGIN

SECTION 2 – 85 Marks

Attempt ALL questions

10. A design is created for a simple program. The design is shown below.



(a) State the design technique used in this diagram. **1**

_____

(b) The design should produce a program which displays the largest number from the three entered.

	value1	value2	value3	result
Test 1	12	8	6	12
Test 2	7	15	9	9
Test 3	3	13	22	13

The test data for three runs of the program are shown above. The data indicates there is an error in the design.

(i) State the type of error in the design. **1**

_____

10. (b) (Continued)

(ii) Describe how this error could be corrected. You may wish to write a description or re-draw part of the design. **2**

(c) When implementing this solution, describe one advantage of using an interpreter and one advantage of using a compiler to translate the program code into binary. **2**

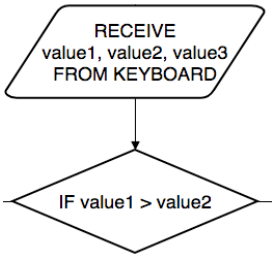
Interpreter _____

_____

Compiler _____

_____

(d) The following part of the program is executed.



Name the part of the processor which carries out each of the following tasks.

(i) Carries out the comparison between value1 and value2. **1**

_____

(ii) Receives the input for value1 and allocates it to memory. **1**

_____

[Turn Over

MARKS | DO NOT WRITE IN THIS MARGIN

11. A university offers modules to students. Here is an example of the data about lecturers and the modules they deliver.

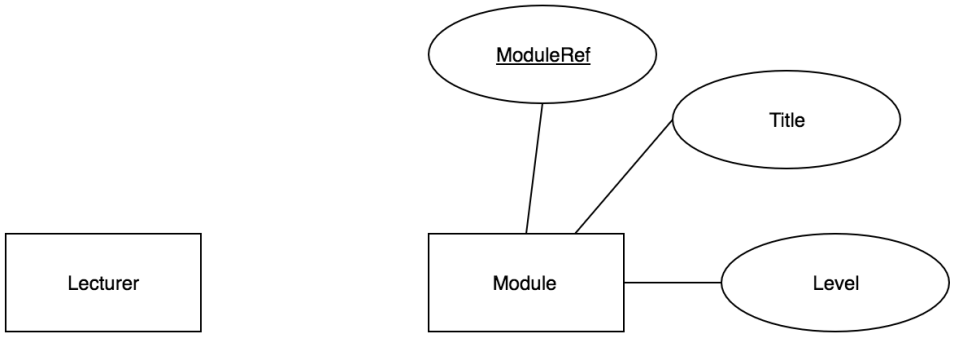
Lecturer

Lecturer ID	First Name	Last Name	Area
2651	Davy	Welsh	Law
2652	Pam	White	Politics
2653	Amber	Rose	Computer Science
2654	Shaun	Bolt	Engineering
2655	Amanda	Stoker	Mathematics

Module

Module Ref	Title	Level	Lecturer ID	Credit
UG192	Law and Society	1	2651	2
UG821	Contract law	2	2651	3
PG291	Eastern European Integration	4	2652	1
DP972	Binary Logic	2	2653	1
UG112	Computer Systems	1	2653	2.5
UG982	Algebra I	1	2655	3
BA927	EU Law I	2	2651	1
PG939	Physical Laws	3	2651	1.5
UG822	Contract law	2	2651	3

(a) Complete the entity-relationship diagram below. **5**



(b) A new lecturer is added to the database. The lecturer's details are as follows.

LecturerID	FirstName	LastName	Area
2650	Pam	White	Computing Science

Explain if adding this data will have an impact on the referential integrity of the database. **2**

11. (continued)

(c) The database is queried using the following statement.

```
SELECT LecturerID, FirstName, LastName
FROM Lecturer, Module
WHERE Lecturer.LectuerID = Module.LectuerID
      AND Lecturer.LecturerID = 2654
```

The query returns no data. Explain why this is the case. **3**

(d) There are data entry errors in the database. All level 1 modules should be worth 1 credit.

SQL is written to correct these errors.

```
UPDATE Module
SET Credit = 1
WHERE LecturerID = 2651 OR LecturerID =2655
```

(i) Explain why this SQL Statement would not correct these errors. **1**

(ii) Explain why this SQL Statement would create additional errors in the database. **1**

11. (continued)

MARKS

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(e) The university wish to remove the following module from the database.

Module Ref:	UG821
Title:	Contract law
Level:	2
LecturerID:	2651
Credit:	3

(i) Evaluate the effect of running the SQL statement below:

```
DELETE FROM Module
WHERE Title = "Contract law" AND Credit = "3"
```

2

(ii) Write an SQL statement which would be a more efficient way to remove the required data from the database. **1**

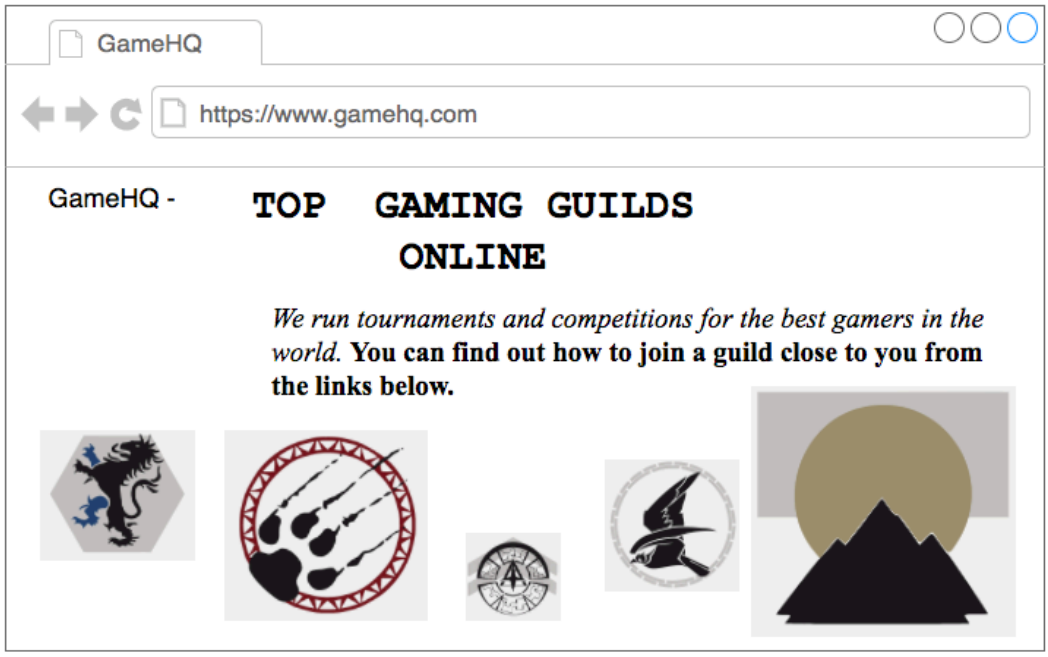
(f) Complete this SQL statement so that the resulting data is sorted by Level descending and Credit ascending.

```
SELECT ModuleRef, Title, Level FROM Module
```

2

MARKS | DO NOT WRITE IN THIS MARGIN

12. GameHQ is a online gaming company. Megan has created a web site for them which is shown below.



(a) Megan tests her website using a browser and notices a lack of consistency.

Explain why the home page above lacks consistency. **2**

(b) Each of the images shown in the homepage is a GIF.

(i) State **two** reasons why a GIF is a suitable format for the images shown above. **2**

Reason 1 _____

Reason 2 _____

[Turn Over

12. (b) (continued)

(ii) Megan is given a photograph which shows the guild members celebrating a recent completion win.

Megan saves this image as a GIF but is unimpressed by the results. Explain why saving this image as a GIF would result in a poor-quality image. 2

(c) Megan is to add an image file Int2017.jpg to a page. The image should have a caption that appears below it.

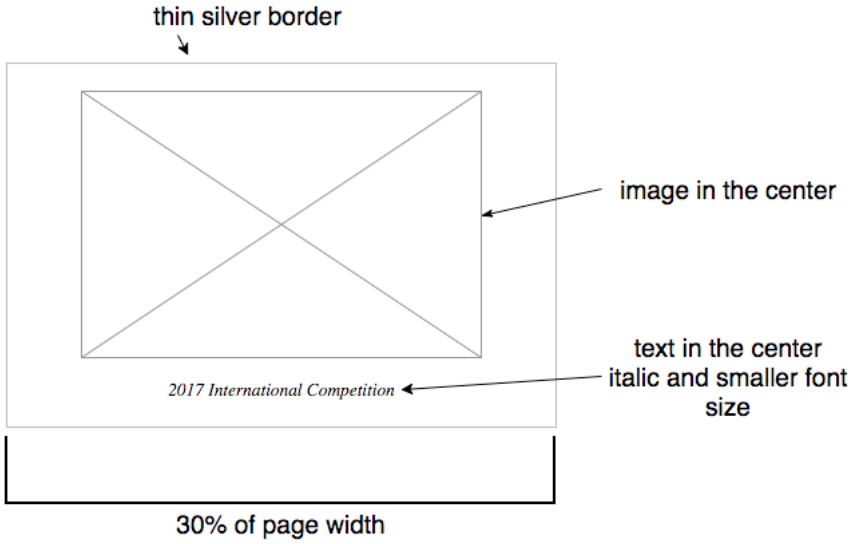
(i) Complete the HTML code below to display the image and caption.

```
<___________ class="figure">
<p><img src="_____________________________" width="300"
height="200" alt="2017 International Competition">
<_______>
     <p>2017 International Competition</p>
<_____________>
```

3

12. (c) (continued)

(ii) This HTML code is to be styled based on the wireframe Megan created.



Complete the CSS code below to meet the requirements. **2**

```
.figure {
  width: 30%
  _____________________: _____________________;
  font-style: italic;
  _____________________: _____________________;
  border: thin silver solid;
  margin: auto;
}
```

(d) Megan tests the website by ensuring that links in the site take the user to the correct destination.

Describe two additional tests that could be performed on the website. **2**

Test 1 _____

_____

Test 2 _____

_____

12. (continued)

(e) Megan has been asked to add a new web page to the site. The site is based on a recent magazine article about one of the guilds.

E-sports nation: How competitive gaming became a flourishing sport

It's a Sunday in late August, an hour and a half before the biggest game of their lives, and the five teammates are remarkably calm. Hunched on folding chairs pulled into the center of their Madison Square Garden dressing room, they listen intently as coach Chris Ehrenreich, three years removed from a stint as an undergraduate assistant with the Clemson football team, reminds them not to let the crowd noise rattle them. Assistant coach Tony Gray, 22, runs through the X's and O's one last time.

Fruit and whole-grain bread sit on a table, ready to nourish the team during intermissions. The huddle breaks, and the players chat as they begin their individual warmup drills.

Ninety minutes later, as nearly 12,000 fans scream and smack their Thunderstix together, the members of Counter Logic Gaming (CLG) walk onstage to face their most hated rival, Team SoloMid (TSM), in a best-of-five series to determine the North American champion in the video game League of Legends.

The page will include:

- Information from the magazine article
- Photographs from the magazine article
- A game play video from the competition featured in the article.

Using this information, draw a wireframe design for the new page. **3**

MARKS DO NOT WRITE IN THIS MARGIN

12. (continued)

(f) Megan includes the images and text from the magazine article however GameHQ has received a letter from the magazine's publishers which mentions breach of copyright.

Explain why the magazine has sent the letter. **2**

[Turn Over

MARKS | DO NOT WRITE IN THIS MARGIN

13. Guitar Shop sells guitars and accessories. Guitar Shop maintains a database of all the products they have in stock. Some of the records from the relational database are shown below.

Table name: Manufacture

ManuCode	Manufacturer Name	Sales Email	LocalRep
1001	Fender	sales@fender.com	Max Smith
1002	Gibson	support@gibson.co.uk	Sally Ross
1004	Rickenbacker	sales@riclenbacker.net	Gail Scott
1006	Yamaha	sales@yamaha.co.uk	Paul Garden

Table: Product

ProdRef	Product Name	Price	ManuCode	Notes
7627	TelecasterMX2	£726.50	1001	Includes case
8762	Statocaster'52	£450.21	1001	
4241	Flying V 120	£999.99	1002	
6133	650C Colorado	£760.96	1004	
7182	360/12	£950.00	1004	Beginner package

(a) Guitar shop's relational database contains primary and foreign keys.

(i) State the purpose of a foreign key in a relational database. **1**

_____

(ii) Complete the table below to identify the keys that were created when this relational database was implemented. **3**

	Table	Field
Primary key		
Primary key		
Foreign key		

(b) When not in use, Guitar Shop staff switch off computer systems to reduce energy use. Describe two other methods of reducing the energy use of a computer system. **2**

Method 1 _____

_____

Method 2 _____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

13. (continued)

When recommending a size of guitar to play, staff at Guitar Shop use the following table.

Age (in Years)	Guitar Size
0 to 5	Quarter Size
6 to 8	Half Size
9 to 12	Three Quarter Size
13 and older	Full Size

(c) Analyse the problem and identify the input, the process and the output. **3**

Input _____

Process _____

Output _____

(d) Using a design technique of your choice, design an efficient solution to the problem of finding the correct size of guitar. **5**

[Turn Over

MARKS | DO NOT WRITE IN THIS MARGIN

(e) The program to find the correct size of guitar is implemented to match the design.

State examples of exceptional and extreme test data that could be used when testing the program. **2**

Exceptional _____

Extreme _____

(f) Guitar Shop is developing a mobile application that will display:

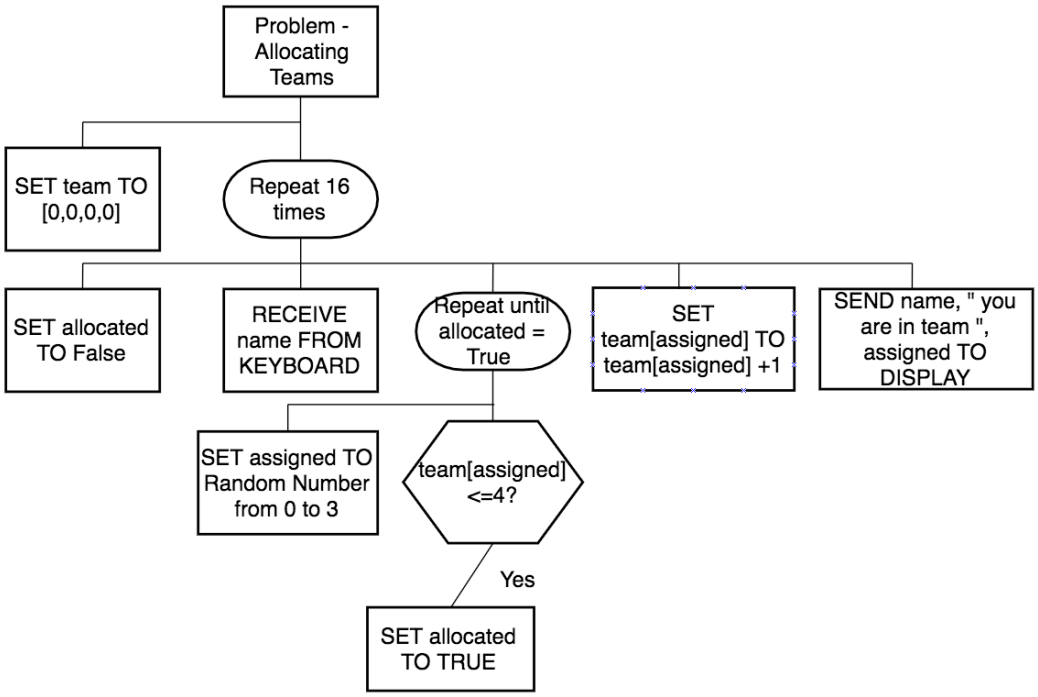
- an initial menu of manufacturers (when clicked will display all products by that manufacture on a separate screen).
- A keyword search (including a voice input option) which will display matching search results on a separate screen.
- Access to a guitar tuner screen.
- Access to a "Contact Us" screen where a message can be sent to the shop.

Create a user interface design, using the information above and the details of the manufacturers given here: Fender, Gibson, Rickenbacker, Yamaha **4**

MARKS | DO NOT WRITE IN THIS MARGIN

14. 16 people attend a quiz night and a program has been created which randomly assigns each person to one of four teams. A team is full if it has four people in it. If this is the case then the program tries to assign the person again until he or she is allocated to a team with a space.

A design for the program is shown below.



(a) The line "SET team TO [0,0,0,0]" declares an array of integers. Explain the purpose of the array "team" in the design above. **3**

(b) Other than the array team, list the other variables and data types that would be required to implement the design.

The first one has need done for you. **3**

Variable name	Data type
loop	integer

14. (continued)

(c) The program is tested with normal test data. The results are shown below.

	Name	Actual Output
Person 1	Sally	Sally, you are assigned to team 1
Person 2	John	John, you are assigned to team 0
Person 3	Phillip	Phillip, you are assigned to team 3
Person 4	Mary	Mary, you are assigned to team 2
Person 5	Rohan	Rohan, you are assigned to team 0
Person 6	Blake	Blake, you are assigned to team 3

(i) The program works with four people assigned to each of the four teams, however the teams are Team 0, Team 1, Team 2 and Team 3. Explain why this has happened. **3**

(ii) This problem can be corrected by making a simple change to the program. You may write a description or redraw an element of the diagram. **1**

(d) When the program is translated, it is stored in memory. Describe how computer memory is organised so that the program can be accessed. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

15. Read the following design for a solution to a problem.

Algorithm

1. Ask user to enter their date of birth
2. Ask user to enter their name
3. Generate ID Card Number
4. Display the ID Card Number

Refinements

1.1 Ask user to enter year of birth
1.2 Ask user to enter month of birth
1.3 Ask user to enter day of birth

2.1 Ask user to enter surname only
2.2 Ask user to enter first initial

3.1 Store the ID card number as: surname + first initial + year of birth + month of birth +day of birth

(a) State which design technique has been used for the above solution. **1**

_____

(b) State the output expected if the design is tested by Wendy Jones who has a date of birth of 27/09/2002. **3**

_____

(c) Refinement 3.1 stores the Id card number.

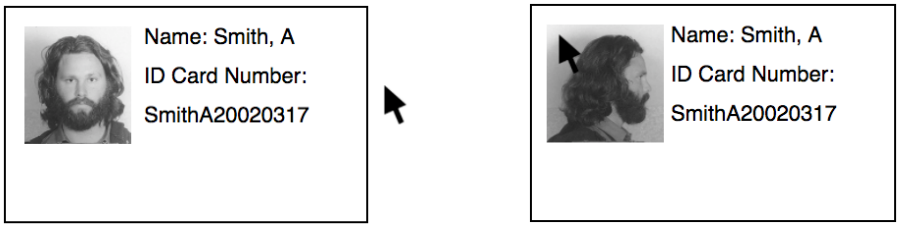
State two programming constructs that would be required to implement this refinement. **2**

Construct 1 _____

Construct 2 _____

15. (continued)

(d) A web site is created to display information about ID cards.



The image changes when the mouse moves over the image.

```
<a href=""
  onMouseOver="document.userimg.src='user-image2.jpg';"
  onMouseOut="document.userimg.src= user-image1.jpg';">
     <img src="user-image1.jpg" name="userimg">
</a>
```

(i) State the language used to create dynamic content in web pages. **1**

(ii) The graphic changes when the mouse pointer is placed over it. Identify the event in the code that causes the graphic to change. **1**

(e) The web site makes use of an external cascading style sheet.

Describe what is meant by an external cascading style sheet. **2**

[*END OF QUESTION PAPER*]

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ADDITIONAL SPACE FOR ANSWERS

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL SPACE FOR ANSWERS