N5

P&N Publications
Prelim Exam for
2021 National
Qualifications

Mark

2020/2021 Computing Science

Duration — 2 hours

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day D D

Month M M

Year Y Y

Total marks — 110

SECTION 1 — 25 marks

Attempt ALL questions.

SECTION 2 — 85 marks

Attempt ALL questions.

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.

P&N ...the right choice

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SECTION 1 — 25 marks

Attempt ALL questions

1. Convert the denary number 111 into an 8-bit binary number. Show all your working. **1**

2. The following shows a database for second-hand car sales.

Car						
registration	**year**	**make**	**model**	**colour**	**engine**	**noOfOwners**
CD18AAB	2018	Vauxhall	Astra	Silver	1·4	2
RT68GHK	2018	Ford	Fiesta	Midnight	1·2	3
KL18RTY	2018	Renault	Clio	Grey	1·6	4
PP68OOP	2018	Ford	Focus	Black	2·0	3
HY19TRE	2019	Ford	Focus	Silver	2·2	1
AG69WAS	2019	Vauxhall	Astra	Red	2·1	5
KR69POP	2019	Renault	Megane	Blue	2·3	2

(a) State how the car table has been sorted. **2**

(b) State a suitable validation for the registration field. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

3. There are 20 pupils in a National 5 Computing class. The teacher wants to use a loop to enter the pupils' marks into a program.

State the type of loop that the teacher would use and explain why. **2**

Type of loop _____

Explanation _____

_____

4. When executing a program it is translated into binary.

(a) Explain what is meant by the term 'binary'. **1**

_____

_____

(b) Describe one advantage of using an interpreter and one advantage of using a compiler when translating the code. **2**

Advantage of using an interpreter

_____

_____

Advantage of using a compiler

_____

_____

5. State a precaution that could be used when sending emails. **1**

_____

6. State a graphic file type suitable for storing an animated logo. **1**

_____

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7. The code for part of a program is shown below.

```
…
Line 22  average = total / 3
Line 23  Print <average to 2 decimal places>
…
```

Using a language of your choice, state the predefined function and the associated parameters that may be used in Line 23. **2**

8. Images are created for a game using both bit-mapped and vector graphics.

(a) State one advantage of using a bit-mapped graphic. **1**

(b) Vector graphics in the game are stored as a series of objects and their attributes.

(i) State an object that could be used in a vector graphic. **1**

(ii) Explain what is meant by an attribute. Give an example to illustrate your answer. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

9. When the pointer is moved over an image on a website that image enlarges and reverts back to its original size when the pointer is removed.

(a) State the name of the language which has been used to produce this effect. **1**

_____

(b) State the command used when the pointer is removed from the image and it reverts back to its original size. **1**

_____

(c) The image which enlarges on the website was taken from another person's website.

State which law has been broken. **1**

_____

10. The program below works out a grade when a pupil's percentage mark is entered.

```
for counter in range(0,10):
  print("Enter your percentage mark")
  mark=int(input())
  if mark >= 90:
    print("You have achieved a grade A")
  elif mark >= 70 and mark < 90:
    print("You have achieved a grade B")
  elif mark >= 50 and mark < 70:
    print("You have achieved a grade C")
  elif mark >= 40 and mark < 50:
    print("You have achieved a grade D")
  else:
    print("You failed the test")
```

Describe two ways that this code could be made more readable by the programmer. **2**

1 _____

_____

2 _____

_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

11. Gamers play a computer game and connect online to play with others. A firewall is used by each of the gamers.

Describe the role of a firewall. **2**

12. The code below shows part of a program.

```
…
FOR loop FROM 1 TO 10 DO
  RECEIVE pupilMark FROM KEYBOARD
  SET total TO total + pupilMark
END FOR
…
```

State the standard algorithm used in the program above. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

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SECTION 2 — 85 marks

Attempt ALL questions

13. The Old Course at St Andrews does 1-hour tours relating to the history of the golf course.

They keep details of the tour guides and all the visitors in a database.

Sample data from both tables is shown below.

Visitor									
visitorNo	**title**	**firstName**	**surname**	**email**	**ticketType**	**country**	**radio**	**telNo**	**guideNo**
1	Mrs	Margaret	Park	mp1@pmail.com	Adult	Scotland	☐	07892345511	2
2	Mr	Gerd	Muller	gm13@alo.com	OAP	Germany	☑	001238769009	1
3	Miss	Chrissy	Smith	chrissy12@gotmail.com	Student	Canada	☐	001211217864	2
4	Mr	Tony	Smith	tonysmith@gotmail.com	Adult	Canada	☐	001211216522	2
5	Mr	Carlos	Puyot	fcb5@jahoo.com	Adult	Spain	☑	001215676432	1
6	Mr	Tom	Brown	tom@gt5.co.uk	OAP	Scotland	☐	07717899788	4
7	Miss	Joanne	Ross	joanne@gt5.co.uk	Under16	Scotland	☐	07719675538	4
8	Mrs	Lesley	Ross	lr45@pmail.com	Under16	Scotland	☐	07723456712	4

Guide					
guideNo	**title**	**firstName**	**surname**	**telNo**	**email**
1	Mr	Andrew	Taylor	07777123456	ajt@links.co.uk
2	Mrs	Elaine	Johnstone	07788456324	eaj@links.co.uk
3	Mrs	Margaret	Flynn	07703121314	mf1@links.co.uk
4	Mr	Richard	Mosby	07891238763	rm2@links.co.uk
5	Miss	Ali	Smith	07689555343	alis@links.co.uk

(a) The data dictionary shown is incomplete.

Entity: Guide					
Attribute Name	**Key**	**Type**	**Size**	**Required**	**Validation**
guideNo	PK	Number	2	Y	
title		Text	6	Y	
firstName		Text	25	Y	
surname		Text	25	Y	
telNo		Text		Y	**A**
email		Text	25	Y	

MARKS | DO NOT WRITE IN THIS MARGIN

13. (a) (continued)

Entity: Visitor					
Attribute Name	**Key**	**Type**	**Size**	**Required**	**Validation**
visitorNo	PK	Text	4	Y	
title		Text	6	Y	
firstName		Text	25	Y	
surname		Text	25	Y	
email		Text	25	Y	
ticketType		Text	8	Y	**B**
country		Text	20	Y	
radio		**C**		Y	
telNo		Text		Y	
guideNo	**D**	Number	2	Y	

Complete the table below to show the correct entry for each of the following missing items from the data dictionary. **4**

A	
B	
C	
D	

(b) Design a query to display the name, email and telephone number of all of the adult visitors who live in Scotland. **4**

Fields	
Table(s)	
Search Criteria	

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

13. (continued)

(c) The ticket type for Chrissy Smith is incorrect and should be changed to an Adult.

The SQL statement below is written to make the change.

```
UPDATE Visitor
SET ticketType = "OAP"
WHERE country = "Canada";
```

(i) Give two reasons why this SQL statement is not fit for purpose. **2**

Reason 1 _____

_____

Reason 2 _____

_____

(ii) Re-write the SQL statement to make it fit for purpose. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

13. (continued)

(d) Margaret Flynn is unwell and is therefore unable to carry out guided tours this year. She requests that her name be removed from the database.

Write an SQL statement to delete Margaret Flynn's record. **2**

(e) The following SQL statement is implemented in the database.

```
SELECT firstName, surname, country
FROM Visitor
WHERE radio = "Yes"
ORDER BY ticketType ASC;
```

Write the expected output from the SQL statement. **3**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

14. A local corner shop has all of its information on paper and wishes to upgrade to a relational database.

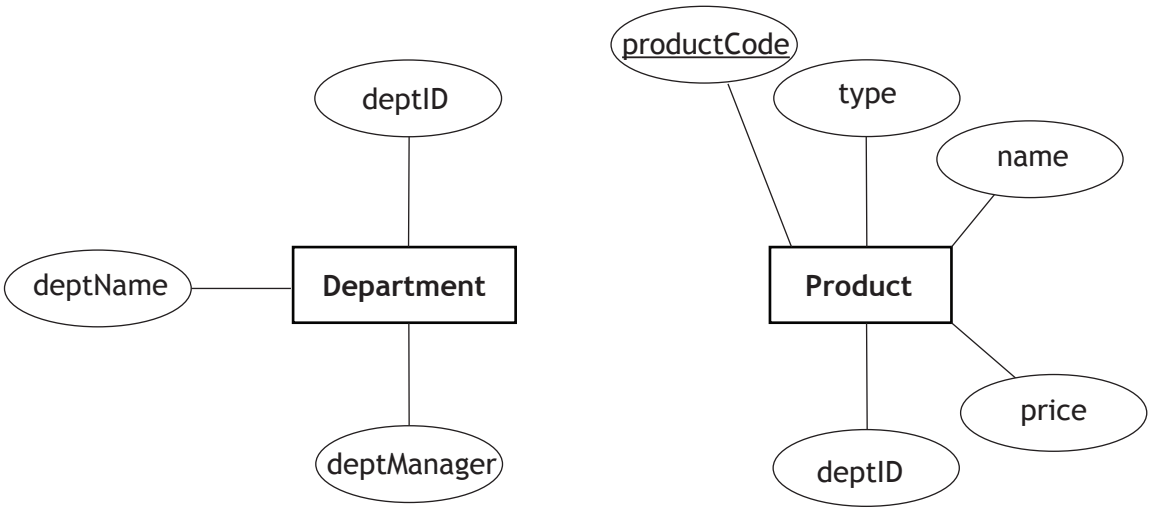
One record from each of the two tables is shown below.

Department	
deptID	45
deptName	Cereals
deptManager	Callum Park

Product	
productCode	111222
type	Wheat Biscuits
name	Wheaties
inStock	No
price	2·99
deptID	45

(a) Use the information provided to complete the entity relationship diagram. **5**

- drawing any missing attributes from either entity
- drawing the relationship between the entities
- naming the relationship between the entities
- identifying any additional key fields.



(b) State the purpose of a primary key in a relational database. **1**

_____

_____

(c) State a suitable data type for the `price` attribute. **1**

_____

MARKS | DO NOT WRITE IN THIS MARGIN

14. (continued)

(d) State a suitable type of validation for the `productCode` attribute. **1**

(e) Describe how to evaluate the accuracy of the expected output from an SQL statement. **1**

(f) The database was implemented with *referential integrity*.

Explain what is meant by referential integrity. **2**

(g) The shop want to keep energy costs to an absolute minimum.

State one method of reducing energy consumption when using the database. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

15. Sports Unlimited are creating a program which will calculate the total cost when a customer purchases tickets for its annual Mixed Martial Arts Expo.

Adults pay £20 per ticket and children pay £10 per ticket.

If more than 3 adult tickets and more than 3 child tickets are bought in a single purchase then a discount of £10 will be taken off the total cost.

Algorithm

1. Store cost of adult and child ticket
2. Get name of person making the booking
3. Ask how many adult and child tickets they wish to purchase
4. Calculate the total cost of the order
5. Display discount voucher message

Refinement

2.1 Enter your first name
2.2 Enter your second name

3.1 Enter how many adult tickets you require
3.2 Enter how many child tickets you require

(a) Using a design technique of your choice, refine step 4. **6**

MARKS | DO NOT WRITE IN THIS MARGIN

15. (continued)

(b) If a customer spends £70 or more on tickets then they are eligible for an in-store discount.

Step 5 of the algorithm has been implemented below.

```
....
Line 30  IF total < 70 THEN
Line 31    SEND "Sorry you are not eligible for a discount" TO DISPLAY
Line 32  ELSE
Line 33    IF totalcost >= 150 THEN
Line 34      SEND "You are eligible for a 20% discount." TO DISPLAY
Line 35    ELSE
Line 36      SEND "You are eligible for a 10% discount." TO DISPLAY
Line 37    END IF
Line 38  END IF
....
```

(i) State the lines in the pseudocode above which contain conditional statements. **2**

(ii) State the output if:

1. the total cost is 75 **1**

2. the total cost is 150. **1**

(iii) A tester has a total cost of £50. However, he receives a message stating he is eligible for a 10% discount.

1. State the type of error which has occurred. **1**

2. State the line which has caused this error. **1**

3. Describe how this line should have been written. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

15. (b) (continued)

(iv) State a suitable data type for the variable `totalcost` and explain your choice. **3**

Choice of data type

Explanation

(c) Ticket entry validation is added to the program. Test data will be used to ensure that it works correctly.

Complete the test table below. **3**

Type of Test	Input	Expected Output
	–1	Program asks user to enter valid input
Extreme		

(d) State the data type used to store the number of adult tickets and the number of child tickets required. **1**

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MARKS | DO NOT WRITE IN THIS MARGIN

16. McKinnon-Waddell are developing a new program to store the running times for professional 100 metre races.

The main menu should allow users to select to: add new races, search previous races, search for a runner or search for a venue.

(a) Design a user interface for the main menu of this program. **3**

(b) 8 runners compete in a single race and the program stores the race times as a 1-D array of float values.

(i) Explain why a 1-D array of float values is a suitable choice of data structure and data type to store the times of the runners in the race. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

16. (b) (continued)

(ii) An additional feature of the program is that it can calculate the average run time for each race.

Using a programming language of your choice, write efficient code to calculate and display the average time for a race.

The average time should be displayed to 2 decimal places.

Your code should use a running total within a loop. **4**

(c) State the part of the processor that would carry out comparisons of the runner's times. **1**

_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

16. (continued)

(d) (i) The program uses input validation. Part of the algorithm is shown below.

```
Line 50 REPEAT
Line 51   RECEIVE runnerTime FROM (FLOAT) KEYBOARD
Line 52   IF runnerTime < 0.0 THEN
Line 53     SEND "Time must be greater than 0.0"
            TO DISPLAY
Line 54   END IF
Line 55 _____________________________
```

Using a programming language of your choice, complete Line 55. Ensure that only acceptable values can be entered for a runner's time. **2**

Line 55:	

(ii) State the type of loop used in the algorithm in part (i) above. **1**

_____

(e) The time for a runner of 15·11 seconds would be stored in a computer system using floating-point representation, as shown below.

$$0{\cdot}1511 \times 10^{2}$$

Identify the mantissa and exponent in the above floating-point representation. **2**

Mantissa	
Exponent	

MARKS | DO NOT WRITE IN THIS MARGIN

17. Simon is a dog groomer who runs his own business, Simon's Dog Groomers. His business specialises in grooming show dogs.

Simon is currently developing a website to advertise his business.

(a) The website contains the following four pages.

- Home page
- Information about the company
- Specialised services
- How to contact the shop and opening times

All the pages on the site include a link back to the home page. The home page also contains an external hyperlink to a website which provides the latest information on upcoming shows.

Draw the navigational structure for this website. **3**

(b) When developing the website Simon decides to use PNG files instead of JPEG.

State one reason why PNG format may have been chosen instead of JPEG. **1**

_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

17. (continued)

(c) Simon develops a low-fidelity prototype of the home page.

In developing the home page several HTML elements are used.

The diagram below identifies where an `<img>` element has been used.

Complete the diagram by drawing arrows to identify where the `<p>`, `<h1>`, `<h3>` and `<a>` elements should be used. **4**

<a>

<p>

<h1>

<h3>

<img> →

Simon's Dog Groomers

Please select a link below to visit another page.

Links

- Information about our company
- Services we provide
- Contact Us and Opening Times
- Information about upcoming dog shows (www.scottishdogshows.co.uk)

(d) From the home page a user can select to go to the information, services or contact us page as well as the Scottish Dog Shows website.

(i) State the type of hyperlink used to go to the Contact Us page. **1**

_____

(ii) State the type of addressing you would use in the link to the Scottish Dog Shows website. **1**

_____

(e) When the home page is displayed in the browser, the menu appears as a list. The list is implemented using `<ul>` and `<li>` tags.

Add the HTML `<ul>` and `<li>` opening and closing tags to the list below. **3**

Information about our company
Services we provide
Contact Us and Opening Times
Information about upcoming dog shows (www.scottishdogshows.co.uk)

MARKS | DO NOT WRITE IN THIS MARGIN

17. (continued)

(f) Simon has developed the Contact Us page.

Below is an example of the HTML and CSS for the page.

HTML

```
<!DOCTYPE html>
<html>
<head>
      <title> Simon's Dog Groomers - Contact Us </title>
      <link rel = "stylesheet" href="sheet.css">
</head>

<body>
<div>
      <h1> Contact Us </h1>
</div>
<br>
<div id = "middle">
      <h2> Contact Details </h2>
      <p> Tel No: (01555) 771576 <br>
          Mob No: 07845 235896 <br>
          Email: enquires@simonsdogs.co.uk </p>
</div>
<br>
<div>
      <h2> Important Information </h2>
      <p> From the 1st of July to 15th of July we are
      closed for refurbishment.</p>
</div>

</body>
</html>
```

CSS

```
h1{text-align: center;
   color: DarkGreen;
   font-size: 24pt;
   font-family: Arial;}
div{background-color: LightGreen;}
#middle{background-color: LightBlue;}
```

(i) Simon has used an external stylesheet.

State two advantages of using an external stylesheet. **2**

1 _____

_____

2 _____

_____

MARKS | DO NOT WRITE IN THIS MARGIN

17. (f) (continued)

(ii) Simon wants all the `<div>` elements to display with a light green background:

```
div{background-color: LightGreen;}
```

Explain why a browser would not display the page with three light green sections. **2**

(iii) The contact page is displayed in the browser. Simon would like to change how the `<h2>` elements are displayed.

Write a CSS rule that would make all `<h2>` elements font colour black, the font to be 16 points in size and to use Times font. **2**

(g) Simon tests the consistency of the web pages once they have been completed.

State two other tests that can be carried out on a web page. **2**

Test 1 _____

Test 2 _____

[END OF QUESTION PAPER]

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ADDITIONAL SPACE FOR ANSWERS

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