P&N Publications
Prelim Exam for
2019 National
Qualifications

Mark

2018/2019 Computing Science

Duration — 2 hours and 30 minutes

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day		Month		Year	
D	D	M	M	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. State the range of numbers which can be represented using 16-bit two's complement. **1**

2. During the fetch-execute cycle a binary number is copied from memory to the CPU.

(a) The binary number might represent data or an instruction. What else could this binary number represent? **1**

(b) Where would this binary number be stored within the CPU? **1**

3. Two entities from a database design for a hotel room booking system are shown below.

Guest
guestID
name
email

Room
roomNumber
roomType

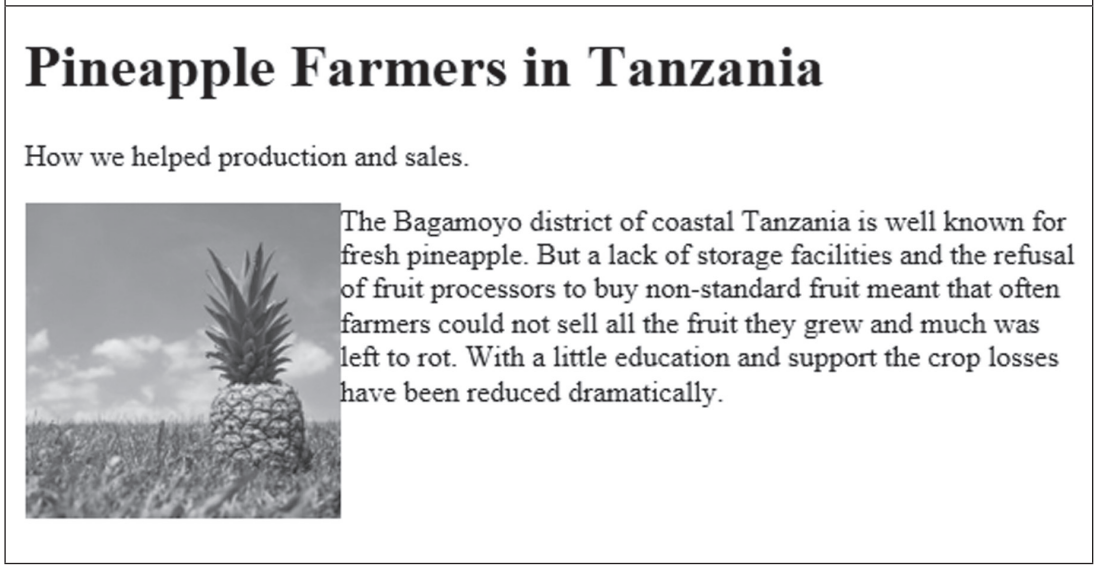
(a) State the *cardinality* of the relationship between these two entities. **1**

(b) Explain, in detail, how these two tables will be connected in the database. **3**

MARKS | DO NOT WRITE IN THIS MARGIN

4. A web page and its associated HTML code are shown below. The main body of text in the HTML has been removed.

```
<!DOCTYPE html>
 <html>
 <head>
  <style>
   ...
  </style>
 </head>
 <body>
  <h1>Pineapple Farmers in Tanzania</h1>
  <p>How we helped production and sales.</p>
  <p><img src="pineapple.jpg" alt="Pineapple" style="width:
  170px;height:170px;">The Bagamoyo district ... dramatically.
  </p>
 </body>
</html>
```



(a) Complete the missing line of code in the `style` tag. **3**

(b) The text is too close to the image. Write the code to suitably alter the image's margin property. **2**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

5. Explain the meaning of the term *scope* with reference to the following.

1. A local variable. **1**

2. A global variable. **1**

6. The algorithm below is to check that the water pressure in a pipe is within acceptable limits and send an appropriate message to a control panel.

```
Line 1  RECEIVE pressure FROM(REAL)SENSOR
Line 2  WHILE pressure > 70 AND pressure < 100 DO
Line 3      IF pressure > 70 AND pressure < 100 THEN
Line 4          SEND "Pipe pressure within limits" TO DISPLAY
Line 5      ELSE
Line 6          SEND "Danger, pipe pressure outwith limits" TO DISPLAY
Line 7      END IF
Line 8      RECEIVE pressure FROM(REAL)SENSOR
Line 9  END WHILE
```

(a) State the result if the sensor detects a pressure of 86. **1**

(b) State the result if the sensor detects a pressure of 110. **1**

(c) Explain why this algorithm is not *fit for purpose*. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

7. Explain the difference between a *breakpoint* and a *watchpoint*. **2**

8. A company employs a designer to create a new logo. The logo will be used on all its paperwork, promotional pens, identity badges and advertising posters.

(a) State **two** advantages in this case of using a *vector* rather than a *bit-mapped* graphic. **2**

Advantage 1 _____

Advantage 2 _____

(b) Describe a situation where the use of a bit-mapped graphic would be more appropriate than a vector. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

9. The members of the English department of a school are shown in the table below.

EnglishDept				
staffID	**title**	**forename**	**surname**	**salaryPoint**
34	Mr	James	Mclean	6
35	Ms	Sabrina	Duff	8
36	Mrs	Claire	Norton	6
37	Miss	Sally	Gunn	7

The two new members of staff are joining the school next term. Their details are:

- Mr Jack Collins at salary point 5 and Staff ID 77
- Miss Mary Jackson at salary point 7 and Staff ID 78

Write an SQL statement to include the details of these two new members of staff in the EnglishDept table. **3**

[Turn over for next question

DO NOT WRITE ON THIS PAGE

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Section 2—85 marks

Attempt ALL questions

10. A furniture sales company uses a relational database to administer all of its customer orders. Customers are restricted to no more than 10 of each item in a single order. Extracts from the database are shown below.

Customer			
custID	**customerName**	**address**	**phone**
1	Ian McNab	2 Park Lane	07443503761
2	Paul Barr	11 Dew Ave	07423608751
3	Lisa Chan	9 Brent Gdns	07343704366
4	Sue Pollock	4 Bell Rd	07313403770
...	...	...	...

Products		
itemID	**itemName**	**price**
1	Oak Dining Table	£750
2	Pine Work Desk	£200
3	Carver Chair	£95
4	Corner Table	£120
...	...	...

OrderLine		
orderNo	**itemID**	**quantity**
100	3	4
100	1	1
100	4	2
103	1	1
...	...	...

OrderForm			
orderNo	**orderDate**	**deliveryDate**	**custID**
100	12/02/19	07/03/19	1
101	12/02/19	05/03/19	2
102	13/02/19	12/03/19	4
103	14/04/19	12/05/19	2
...	...	...	...

(a) Identify the *compound key* in the database. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

10. (continued)

(b) An extract from the *data dictionary* is given below. It is incomplete and contains an error.

Entity	Attribute	Key	Data Type	Unique	Validation
OrderLine	orderNo		Number(int)	Y	
	itemID		Number(int)	N	
	quantity		Number(int)	N	

(i) Complete the data dictionary by adding the missing entries for the OrderLine entity. **4**

(ii) State the error which has been made in the OrderLine entity above. **1**

_____

(c) Draw an e*ntity relationship diagram* to show the relationships between the four tables. **3**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

10. (continued)

(d) A query is used to produce the order lines for each customer. The query for Ian McNab is shown below and saved as "Ian McNab Bill".

customerName	deliveryDate	productName	quantity	cost
Ian McNab	07/03/2019	Carver Chair	4	£380·00
Ian McNab	07/03/2019	Corner table	2	£240·00
Ian McNab	07/03/2019	Oak Dining Table	1	£750·00

(i) Identify the *calculated field* and state its formula. **2**

(ii) An *alias* has been used in the above query. Write only the first line of SQL which includes the alias. **3**

(iii) An SQL statement is to be written to calculate the final bill for Ian McNab. Using the above query, write this SQL statement below. **2**

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11. A dog racing track stores details of each greyhound. A sample is shown below. The names of the dogs and their owners, along with their best race times, are stored as three lists.

Dog	Fast Eddie	Jack the Lad	Queenie	Goliath	Mazzie
Times (seconds)	28·55	28·05	27·95	28·01	28·66
Owners	T Wilson	M Jones	D Tong	P Howard	J Grundie

(a) (i) Use pseudocode to write an algorithm which will display the name of the **fastest** dog, its time, and owner. **4**

(ii) The time for the **slowest** dog is also to be found. Other than changes to any variable names, state **one** simple alteration to your algorithm that would achieve this. **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

11. (continued)

(b) The following algorithm is written after a request from the dog owners. There are two errors in the algorithm.

```
Line 1  RECORD greyhounds IS {STRING name,INTEGER time}
Line 2  SET count TO 0
Line 3  RECEIVE target FROM(STRING) KEYBOARD
Line 4  FOR person FROM 0 TO <End of List(owners)> DO
Line 5      IF owners(person) = target THEN
Line 6          count = count + 1
Line 7          SET greyhounds[count] TO (times[person],dog[person])
Line 8      END IF
Line 9  END FOR EACH
```

(i) Explain the purpose of this algorithm. **3**

(ii) Explain the purpose of line 1 in the algorithm. **1**

(iii) Explain the purpose of line 7 in the algorithm. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

11. (b) (continued)

(iv) Identify **two** errors in the algorithm. **2**

Error 1 _____

_____

Error 2 _____

_____

(c) Two memory locations are shown below, along with their contents.

NumA
6

NumB
2

Write an algorithm which will swap the values in the memory locations **without using another memory location**. The first step has been done for you. **5**

		Trace Table	
Step		**NumA**	**NumB**
0		6	2
1	NumA = NumA + NumB	8	2
2			
3			
4			
5			

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

12. A school allocates a network username to each pupil.

Pupil Name	Primary School	Primary Code	Username
Karen Hunter	Crookston	A	KHunterA12
James Doby	Bridgegate	B	JDobyB10

The function below generates the username.

```
Line 1   FUNCTION generate (STRING Name,STRING PCode) RETURNS STRING
Line 2    DECLARE surname,username,char INITIALLY ""
Line 3    DECLARE found INITIALLY false
Line 4    SET first TO Name[0]
Line 5    SET Addon TO <convert to string>LEN[Name]
Line 6    FOR EACH letter FROM Name DO
Line 7         IF found = false DO
Line 8              SET char TO letter
Line 9              IF char = <space character> THEN
Line 10                  SET found TO true
Line 11             END IF
Line 12        ELSE
Line 13             SET surname TO surname & letter
Line 14        END IF
Line 15   END FOR EACH
Line 16   SET username TO first & surname & PCode & Addon
Line 17   RETURN username
Line 18  END FUNCTION
  ...
  ...
Line 40  SET username TO generate(Pupil,Primary)
Line 41  SEND username TO DISPLAY
```

(a) Identify an *actual* and a *formal* parameter used above. **2**

Actual parameter: _____

Formal parameter: _____

MARKS | DO NOT WRITE IN THIS MARGIN

12. (continued)

(b) Explain the purpose of the following lines of code.

(i) Line 4 **2**

(ii) Line 5 **3**

(c) Examine the code and answer the following.

(i) Explain, in detail, the purpose of the code from line 6 to line 11. **3**

(ii) Describe how the code from line 8 to line 11 could be made more efficient. **2**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

12. (continued)

(d) The function makes use of *local* variables.

(i) Identify **one** local variable. **1**

_____

(ii) State **two** benefits of using local variables in a program. **2**

1 _____

_____

2 _____

_____

(e) During debugging, the execution of the program is interrupted at line 9 if the conditional statement is true.

(i) Identify the name given to this debugging tool. **1**

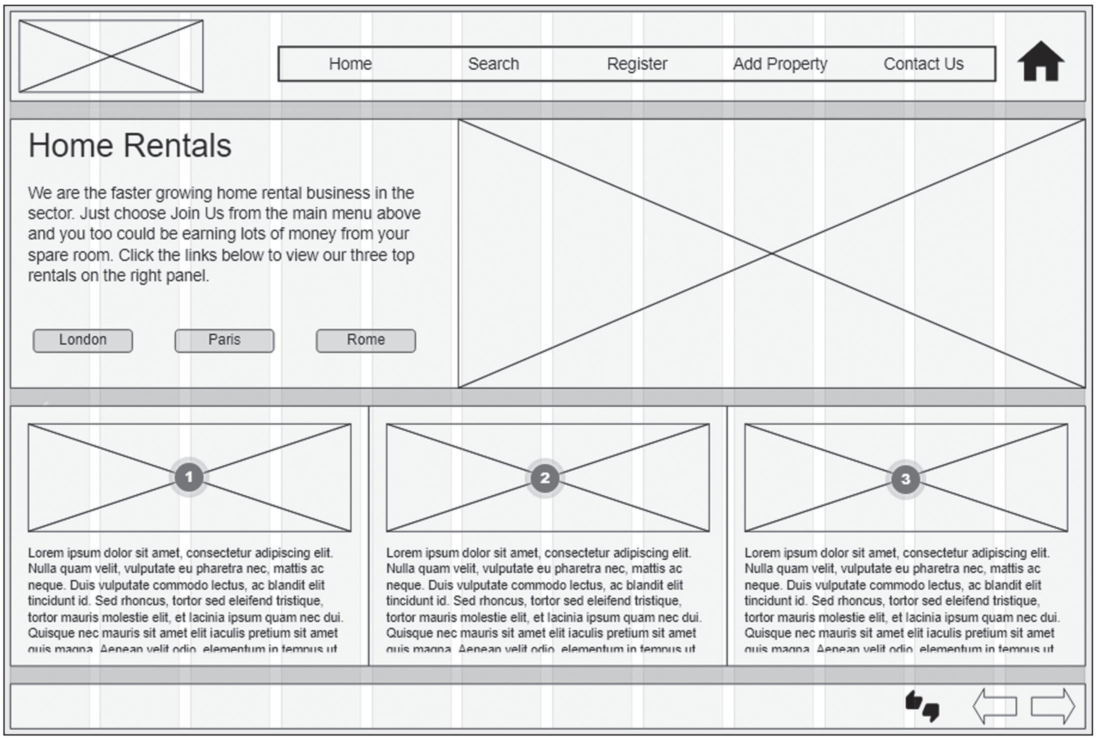
_____

(ii) State the value of the variable `found` when the interrupt is made. **1**

_____

MARKS DO NOT WRITE IN THIS MARGIN

13. The design below is the layout of a new website for a home rental agency.



(a) State the name given to this type of design. **1**

____

(b) Identify **three** means of navigating the website, indicated on the design, which will form part of a template for all pages on the site. **3**

1 ____

____

2 ____

____

3 ____

____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

13. (continued)

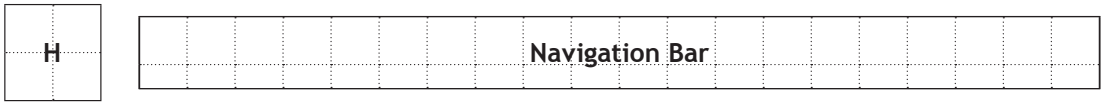
(c) Write the following CSS code in a more efficient manner in the box below. **4**

CSS Code	More efficient version
{margin-top:20px; margin-bottom:10px; margin-left:5px; margin-right:15px;}	

(d) The image and navigation bar must be positioned within the header element. These are shown below, drawn to help with the scale, along with the initial coding and CSS.

```
<header class="top" style="height:80px;">Header text
      <ul class="nav" style="background-color:blue;">
            <li><a href="#home">Home</a></li>
            <li><a href="#about">About Us</a></li>
            <li><a href="#clients">Our Clients</a></li>
            <li><a href="#contact">Contact Us</a></li>
      </ul>
      <img class="imgIconRight" src="images/home.png"/>
</header>
```

```
.nav{
      float:right;
      height:30px;
      width:400px;
      background-color:black;
      text-align:center;
      margin-top:40px;
      margin-right:20px;
}
.nav li{
      display:inline;
      font-size:18px;
      color:black;
      padding:10px;
}
.imgIconRight{
      height:40px;
      width:40px;
      float:right;
      margin-left:20px;
      margin-top:30px;
}
```

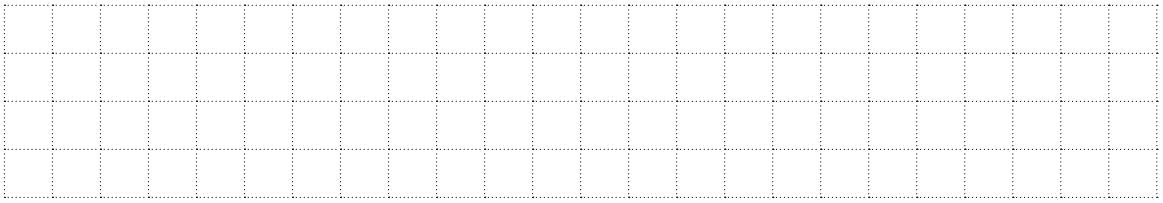


MARKS | DO NOT WRITE IN THIS MARGIN

13. (d) (continued)

(i) Use the CSS, coding and scale indicated opposite to draw the positions of the image and navigation bar on the grid below. **4**

Right-hand part of the header Section



(ii) State the background colour of the navigation bar. **1**

_____

(e) The three elements numbered 1, 2 and 3 in the design (shown on *page 17*) have identical properties apart from their background colours, which differ.

(i) Explain how they can be created most efficiently using external CSS. **2**

_____

_____

_____

_____

(ii) Explain how the different background colours can be enabled. **2**

_____

_____

_____

_____

(f) The buttons in the design labelled 'London', 'Rome' and 'Paris', when clicked, change the image displayed on the right. Explain how this is done. **1**

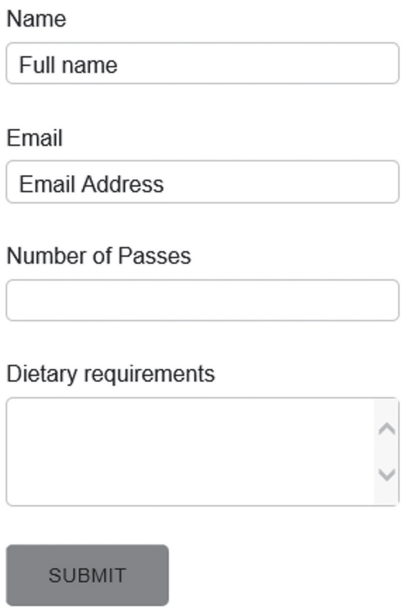
_____

_____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

14. A computer games conference is scheduled in Edinburgh. The organisers have set up a website to allow people to book tickets. The registration page is shown below along with the form code.

Registration Page	Form Code
	`<form>` `Name ` `<input type="text" value="Full name" maxlength="15"/> ` `Email ` `<input type="text" value="Email Address" maxlength="15"/> ` `Number of Passes ` `<input type="text" maxlength="5" "required"/> ` `Dietary requirements ` `<textarea></textarea> ` `<input type="submit" name="submit"` `onclick="alert('Form Entered')"` `value="Submit"/>` `</form>`

(a) Describe what happens when the following details are entered and why.

(i) Name: Michael Peterson
Email: mp@mymail.com
Number of passes: 2
Dietary requirements: none **2**

(ii) Name: Alan Pettie
Email: ap@mymail.com
Number of passes: 7
Dietary requirements: none **2**

MARKS | DO NOT WRITE IN THIS MARGIN

14. (continued)

(b) The website is first tested by the developers and then by *persona*.

(i) State **one** problem that may be identified when performing device type compatibility testing. **1**

(ii) Explain what is meant by "persona" testing. **1**

(c) The developers decide to include 'receive emails' as an additional object on the form.

Suggest the most suitable type of form element and justify your choice. **2**

Form element _____

Justification _____

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

14. (continued)

(d) The following script is written to improve the form.

```
function check(string){
  var correctformat = /^\w+([\.-]?\w+)*@\w+([\.-]?\w+)*(\.\w{2,3})+$/;
  if(string.value.match(correctformat))
  {
    return true;
  }
  else
  {
    alert("The value you have entered is invalid!");
    return false;
}
```

Explain the purpose of the function. **3**

(e) Once the website is complete, one of the developers suggests using *cookies* to enhance individual user experiences by storing their preferences. However, this raises the issue of sending data in a secure manner.

(i) State the name given to this type of cookie. **1**

(ii) Explain how such cookies can be misused and present a security issue. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

14. (e) (continued)

(iii) State the law which would be broken if cookies did pose a security problem. **1**

(iv) Explain how a digital signature is created. **2**

[END OF QUESTION PAPER]

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ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS