

Write your name here

Surname

Other names

Pearson
Edexcel GCSE

Centre Number

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Candidate Number

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Computer Science

Paper 1: Principles of Computer Science

Wednesday 3 June 2015 – Morning
Time: 2 hours

Paper Reference

1CP0/01

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- Use of a calculator is **prohibited**.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 90.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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P 4 7 3 4 0 R A 0 1 2 4

PEARSON

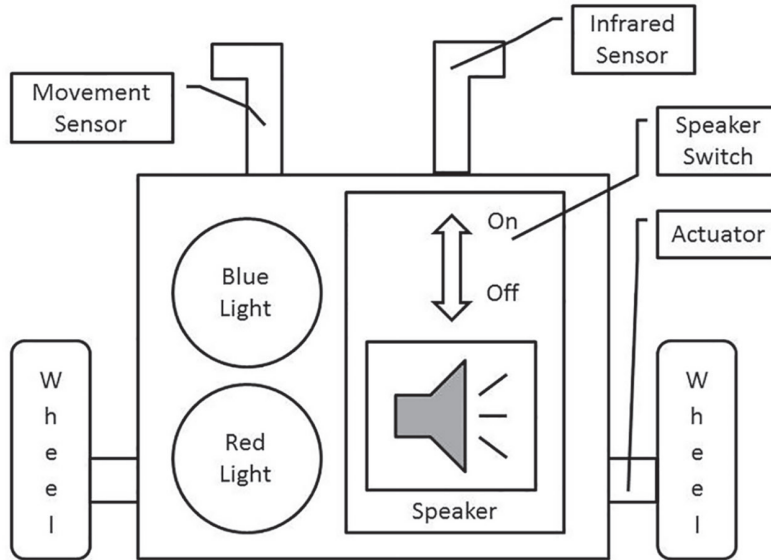
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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 This is a block diagram of a robot.



(a) Put a cross to identify whether each of these is an input, process, output, or none.

(3)

	Input	Process	Output	None
Actuator	☒	☒	☒	☒
Infrared Sensor	☒	☒	☒	☒
Wheel	☒	☒	☒	☒
Calculate Distance	☒	☒	☒	☒
Programming Language	☒	☒	☒	☒
Movement Sensor	☒	☒	☒	☒

(b) The robot stores information as binary sequences.

State **two** types of information that binary sequences can represent in the fetch-decode-execute cycle.

(2)

1

2



(c) The robot can process these assembly code instructions.

Operation	Assembler	Action
Add	ADD {condition} Rd, Rn, Rm	Adds the contents of Register m to the contents of Register n and stores the result in Register d
Subtract	SUB {condition} Rd, Rn, #<value>	Subtracts <value> from the contents of Register n and stores the result in Register d
Move	MOV {condition} Rd, #<value>	Moves <value> into Register d
	MOV {condition} Rd, Rm	Moves the contents of Register m into Register d
Compare	CMP {condition} Rn, #<value>	Compares <value> with the value in Register n
Branch	B {condition} label	Branch

Condition – Mnemonic	Description
EQ	Equal
NE	Not equal
GE	Greater than or equal
GT	Greater than
LE	Less than or equal
LT	Less than



Here is a section of assembly code from the robot's program. The line numbers are **not** part of the program code.

Line Number				
115	LAB01:	MOV	R5,	#4
116		MOV	R7,	#0
117	LAB02:	SUB	R6,R5,	#1
118		MOV	R5,	R6
119		ADD	R8,R7,	R5
120		MOV	R7,	R8
121		CMP	R5,	#0
122		BNE	LAB02	
123	LAB03:	MOV	R8,	#0

(i) State the line number that contains an instruction to perform a test. (1)

(ii) State the line number that contains an instruction to change the flow of execution. (1)

A test that can change flow is the same as a high-level programming construct.

(iii) State the name of the construct. (1)

(d) The robot is 12 metres from an obstacle. 12 is positive denary.

Fill in the table to show the number 12 (denary) in 8-bit binary, using a sign and magnitude representation.

(1)

--	--	--	--	--	--	--	--

(e) The robot travels 14 metres. -14 is negative denary.

Fill in the table to show the number -14 (denary) in 8-bit binary, using a two's complement representation.

(1)

--	--	--	--	--	--	--	--



(f) (i) Add these two 8-bit binary integers and write the result in the last row of this table.

(1)

0	1	0	1	0	1	1	0
0	0	1	0	1	0	1	1

Another 8-bit addition generates an overflow error.

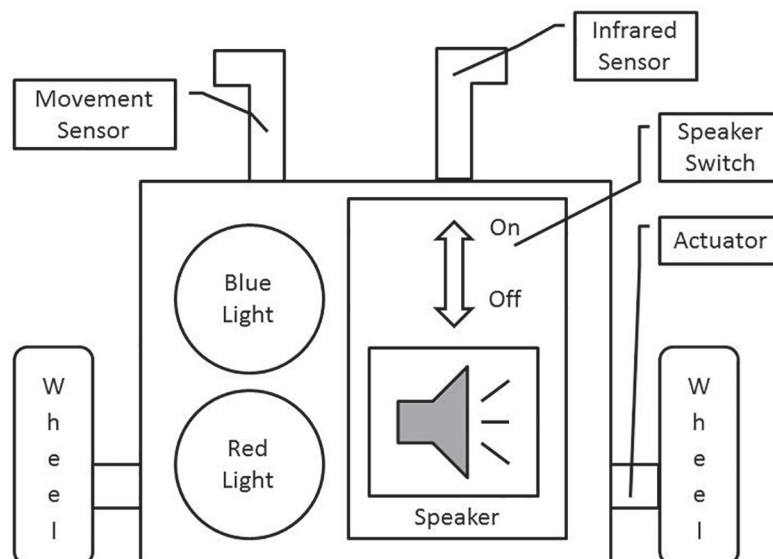
(ii) State what is meant by the term overflow error.

(1)

(iii) State what happens if the overflow error is ignored and the result is used in other calculations.

(1)

Here is the block diagram of the robot.



(g) Construct a truth table for a NOT operator that is used to reverse the state of a single light. Use any familiar notation.

(1)

(h) Refer to the robot diagram.

Assume **R** is the red light, **B** is the blue light, and **S** is the speaker switch.

(i) Complete the table to show the Boolean expression **$Q = (\text{NOT } R) \text{ AND } B$** .

(3)

R	B	NOT R	Q
0	0		
0	1		
1	0		
1	1		

(ii) Construct a Boolean expression to determine **if either light is on** at the same time as the **speaker switch is on**.

(1)

(Total for Question 1 = 18 marks)



2 A biologist uses application software to help him in his work.

For example, the biologist uses spreadsheet software to model the behaviour of bee colonies.

(a) Identify **two other** types of application software and give an example of how the biologist could use them in his work.

(4)

Type 1

Use

Type 2

Use

Software may be classified as open source or proprietary.

(b) State **four** features of open source software licensing.

(4)

1

2

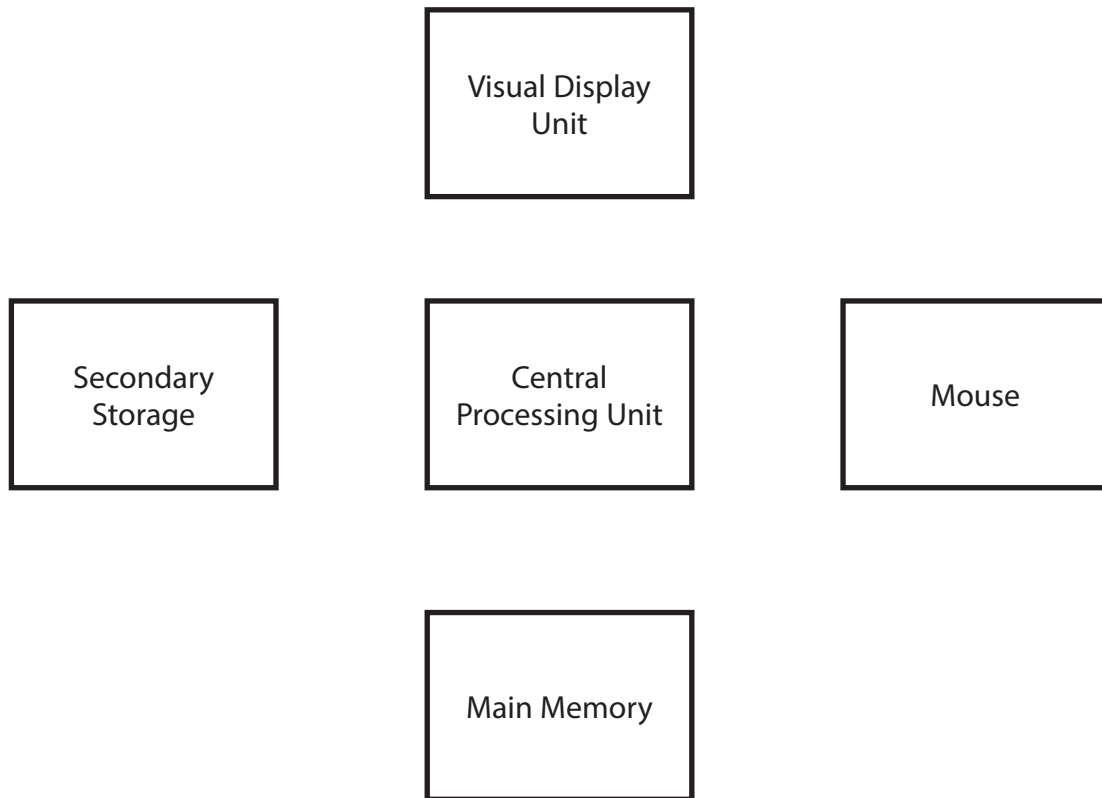
3

4



(c) Complete the diagram by adding **six** arrows to indicate the input and output relationships between the devices.

(3)



The microprocessor inside a computing device is made up of several individual components. These components work together to implement the fetch-decode-execute cycle in the device.

(d) Identify **one** component and its function in the fetch-decode-execute cycle.

(2)

Component

Function



(e) Explain how the operating system manages processes on a computer with a single microprocessor.

(3)

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The biologist collects data on a single bee colony each day. This includes the amount of available food, the number of bees in the colony, the amount of honey produced, the hours of sunshine, and the hours of rain. The biologist could use software to model the behaviour of the colony.

(f) Give **two** examples of how software could be used in this situation to model the real world.

(2)

1.....

.....

2.....

.....

(Total for Question 2 = 18 marks)



3 John has decided to set up a website to promote the local youth football club.

(a) Bit-mapped images of the club uniform are taken with a digital camera and put on the website.

Complete these statements.

(i) are the smallest elements of a bit-mapped image and the smallest element that can be displayed on a screen. (1)

(ii) The of an image is based on the number of elements used to represent the full image. The higher the number of elements for a given size, the better the quality of the image. (1)

(iii) indicates the number of bits used to represent the colour of a picture element. The higher the number of bits used, the greater the range of colours. (1)

(b) Files for the website are stored on secondary storage media.

Complete this table with the name of the category of secondary storage described in each row.

(3)

Category of secondary storage	Description
	Uses metal platters coated in iron oxide. The platters rotate at high speeds.
	Small pits are burned in patterns onto a flat surface. A laser can be used to interpret light reflected from the flat or pitted surface.
	No moving parts; data is stored as an electrical charge.



(c) Network protocols break the files into packets before transmission.
Three fields in a network packet are source, destination, and check sum.

Give **two** additional fields found in a network packet.

(2)

1

2

(d) State the purpose of a check sum.

(1)

.....

.....

(e) John needs to convert the file sizes from megabytes (MB) to gigabytes (GB).

State how John could convert 4096MB to GB.

(1)

.....

.....

(f) The end user will use a browser to view the club's website.

Describe **one** difference between the Internet and the World Wide Web.

(2)

.....

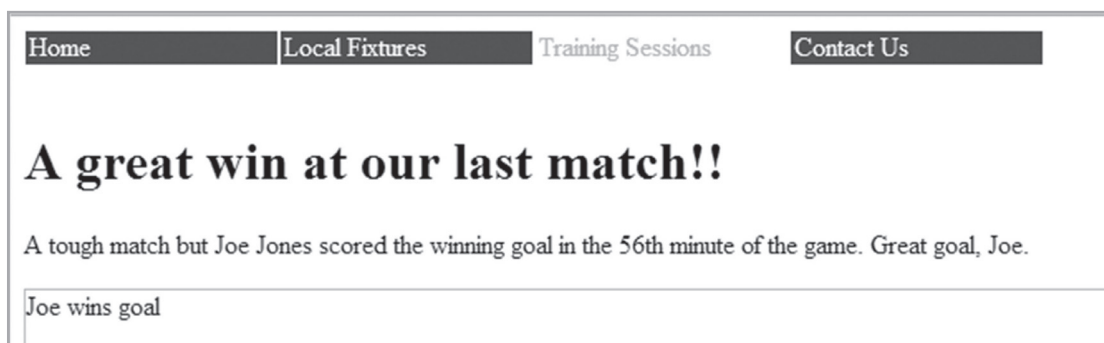
.....

.....

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(g) John has created a sample page for the website. Here is the page displayed in a browser together with the code for the page.



```
1 <html>
2 <head>
3 <title>Local Football Club</title>
4 <style>
5     ul { list-style-type:none; margin:0; padding:0;}
6     a { display:block; width:150px; background-color:blue;
7         color:white; text-decoration: none; padding-left:2px;
8         border:2px; border-color:black; cursor:pointer; }
9     a:hover { color: orange; background-color: white; }
10    li { display:inline; float:left; margin:1px;}
11 </style>
12 </head>
13 <body>
14     <ul>
15         <li><a href="home.html">Home</a></li>
16         <li><a href="local_fix.html">Local Fixtures</a></li>
17         <li><a href="training.html">Training Sessions</a></li>
18         <li><a href="contact.html">Contact Us</a></li>
19     </ul>
20 <br/><br/>
21 <h1>A great win at our last match!!</h1>
22 <p>A tough match but Joe Jones scored the winning goal in
23     the 56th minute of the game. Great goal, Joe.</p>
24 
25 </body>
26 </html>
27
```

(i) State the **line numbers** that show Cascading Style Sheet information. (1)

(ii) Here is line 18 of the code.

```
<li><a href="contact.html">Contact Us</a></li>
```

Explain how it is connected to the Cascading Style Sheet information. (1)



(h) Audio interviews with the club's coach are converted to a digital format.

(i) State the aspect of the analogue signal that must be sampled and stored as binary data during the analogue to digital conversion.

(1)

(ii) State how increasing the **sampling frequency** affects the digital representation of the original audio.

(1)

(i) The club has a simple black and white logo. The image is compressed using a lossless, run-length encoding (RLE) algorithm.

Explain how a run-length encoding algorithm works.

(2)

(Total for Question 3 = 18 marks)



4 AJ's is a fast-food company with five outlets. The outlets are connected via the Internet to the head office. Data from each outlet is transmitted to the head office computers at the end of each day.

(a) AJ's chief executive is concerned about the environmental impact of using computers.

Give **three** possible **environmental** impacts of using computing devices.

Suggest **one** possible action AJ's could take to reduce the environmental impact.

(4)

Impact 1

.....
.....

Impact 2

.....
.....

Impact 3

.....
.....

Action

.....
.....

(b) AJ's uses a database to structure its business data.

Give **two** reasons for choosing to **structure** the business data.

(2)

1

2



(c) AJ's head office has constructed a **relational database** to hold the data.

Here are three tables for the relational database.

tblEmployee

?	Emp_ID	AutoNumber
	Emp_Last_Name	Text
	Emp_First_Name	Text
	Emp_Post_Code	Text
	Emp_Date_Of_Birth	Date/Time
	Emp_National_Number	Number

A

tblOutlet

?	Outlet_ID	AutoNumber
	Outlet_Name	Text
	Outlet_Address	Text
	Outlet_Town	Text
	Outlet_Post_Code	Text

tblWorksAt

?	WA_ID	AutoNumber
	WA_Employee	Number
	Outlet_ID	Number

B

(i) The field at **A**, Emp_ID, has a specific function in tblEmployee.

State the name of this specific function.

(1)

(ii) The field at **B**, Outlet_ID, has a specific function in tblWorksAt.

State the name of this specific function.

(1)

(iii) The field at **B**, Outlet_ID, has a specific function in the **database**.

State why this field is necessary.

(1)



AJ's Grill has relocated to 360 Pinnacle Place. The database must be changed to reflect this address change.

The original record for AJ's Grill is shown in tblOutlet.

tblOutlet				
Outlet ID	Outlet Name	Outlet Address	Outlet Town	Outlet Post Code
1	AJ's Fountain	15 Marshall Avenue	Marwell	FAD 3958
2	AJ's Grill	356A Winston Place	Waterstone	VBE 5110

(d) Construct an **SQL query** to update the location of AJ's Grill to 360 Pinnacle Place.

(3)

.....

.....

.....

.....

The characters in Emp_Last_Name are stored in **Unicode** representation rather than ASCII.

(e) Give a reason why this is the appropriate choice.

(1)

🔑	Emp_ID	AutoNumber
	Emp_Last_Name	Text
	Emp_First_Name	Text
	Emp_Post_Code	Text
	Emp_Date_Of_Birth	Date/Time
	Emp_National_Number	Number

.....

.....



(f) Emp_National_Number is a **positive** number, **8 bits** in length.

Identify the **range** of values that can be represented.

(1)

	Field Name	Data Type
🔑	Emp_ID	AutoNumber
	Emp_Last_Name	Text
	Emp_First_Name	Text
	Emp_Post_Code	Text
	Emp_Date_Of_Birth	Date/Time
	Emp_National_Number	Number

(g) The head office of AJ's has decided to use server-side scripting to allow the individual outlets to access the new database.

Give **three** features of server-side scripting.

(3)

1

2

3

(Total for Question 4 = 17 marks)



(b) The student has written an algorithm. This image shows the algorithm in pseudocode.

```
1  FUNCTION myFunction
2
3      SET anArray TO [78, 83, 72, 80, 83]
4      SET f TO FALSE
5      SET c TO -1
6      SET i TO 0
7      SET b TO 75
8
9      WHILE (NOT f) DO
10         IF anArray[i] = b THEN
11             SET f TO TRUE
12             SET c TO i
13         ELSE
14             SET i TO i + 1
15         END IF
16     END WHILE
17
18     RETURN c
19
20 END myFunction
```

(i) State the line number that shows the initialisation of a data structure.

(1)

(ii) State the range of line numbers that show a repetition.

(1)



(c) Complete the trace table to find an error in the algorithm.

(2)

b	f	i	anArray[i]	c
75	FALSE	0		-1

(d) There is a bug in line 9. Write a line of code that will fix this bug.

(1)

.....

(e) State the purpose of the algorithm.

(1)

.....

.....



(f) The student is writing an algorithm to solve a problem.

- The user will provide a series of numbers, representing the weights in grams of individual fruits.
- The weights are always **whole positive numbers**.
- The number of weights to be entered will also be provided by the user.
- The solution should calculate and report the **mean** weight of the fruits to **two decimal places**.

Two examples of the executing solution are shown below:

```
How many weights do you want to enter?  
3  
Enter a weight:  
138  
Enter a weight:  
135  
Enter a weight:  
285  
Average weight is: 186.00
```

```
How many weights do you want to enter?  
4  
Enter a weight:  
279  
Enter a weight:  
135  
Enter a weight:  
145  
Enter a weight:  
138  
Average weight is: 174.25
```

Write an algorithm for this solution using a programming language you are familiar with.

Do not use a flowchart.

(7)

Answer space continues on the next page.



(Total for Question 5 = 19 marks)

TOTAL FOR PAPER = 90 MARKS



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