

## Pearson BTEC Level 3 Nationals

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Level

      
      
 **3**

# Computing

## Unit 2: Fundamentals of Computer Systems

Certificate/Diploma in Computing

Sample assessment material for first teaching September 2016

**Time: 1 hour 45 minutes**

Total



marks

**You do not need any other materials.**

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration 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 80.
- The marks for **each** question are shown in grey boxes – *use this as a guide as to how much time to spend on each question.*
- You may use a calculator.

### 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.

**Paper reference**  
31769H  
S52560A

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Turn over ►

**PEARSON**

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

1 CyberRide Systems is a computing manufacturer that specialises in physical computing and robotics. It is currently developing a self-driving car.

(a) CyberRide is going to use a real-time operating system in the car.

Describe how **one** characteristic of a real-time operating system makes it suitable for use in the self-driving car.

2 marks

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(b) Real-time operating systems are often embedded in the hardware they control.

The designers of the self-driving car control system are going to embed the operating system to improve processing speeds.

Explain **two** reasons why an embedded operating system would improve processing speeds.

4 marks

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(c) State **two** drawbacks of choosing to embed an operating system.

2 marks

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(d) The software for the user interface that the driver will see is encoded using the ASCII character set.

Explain why ASCII may not be a good character set to use.

2 marks

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(e) The self-driving car contains a large number of sensors that constantly monitor what is happening around the car.

The role of one subsystem is to make sure that the car does not crash.

Describe how this subsystem would use external data and system interrupts.

4 marks

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(f) State the type of communication channel that would be used by the sensors in the self-driving car. Give **one** reason why this communication channel would be used.

2 marks

Channel

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Reason

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(g) The processor for the self-driving car supports multi-threading.

Explain why multi-threading would be necessary in the self-driving car.

2 marks

Four horizontal dotted lines for writing the answer.

Total for Question 1 = 18 marks



2 Dragon Web Sales is an online retailer. The company has a large distribution centre where stock is stored and goods are packaged and sent to customers.

(a) The company's computer system calculates the cost of a customer's order.

The data is stored in two arrays.

The arrays are represented by these matrices.

$$\text{Quantity} = \begin{bmatrix} 6 & 10 & 1 \\ 5 & 5 & 4 \\ 9 & 13 & 78 \end{bmatrix}$$

$$\text{Price} = \begin{bmatrix} 19.0 & 89.5 & 657.0 \\ 1.5 & 72.2 & 36.1 \\ 99.8 & 53.0 & 33.7 \end{bmatrix}$$

The data is written to memory using row-major order.

Quantity is written to array a.

Price is written to array b.

Calculate the outcome of the formula  $\text{Total} = \text{Quantity} * \text{Price}$  using the data in locations a[7] and b[4]

Show your working out.

3 marks

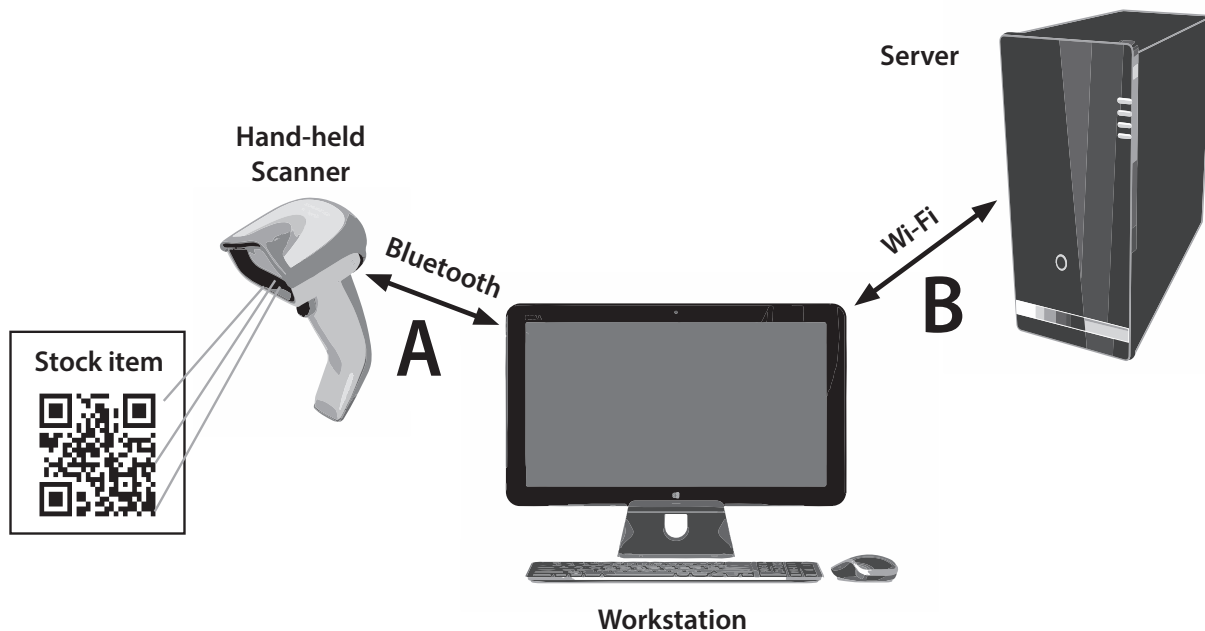
Answer .....



Dragon Web Sales uses a range of different computer hardware to fulfil different tasks in the distribution centre.

**Figure 1** shows a workstation used to complete and dispatch orders.

Each distribution centre has at least 10 of these stations at different places in the building



**Figure 1**

(b) Explain **one advantage** to Dragon Web Sales of using Bluetooth as the connection type at point A in **Figure 1**.

3 marks

Four horizontal dotted lines for writing the answer.

(c) Explain **one disadvantage** to Dragon Web Sales of using Wi-Fi as the connection type at point B in **Figure 1**.

3 marks

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(d) The data on the server is stored on hard drives that are configured to use RAID.

Give **three** reasons companies use RAID configurations.

3 marks

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(e) Dragon Web Sales requires customers to register online for an account.

Describe how encryption is used to protect customers' personal information when they are using the website.

6 marks

Area for writing the answer, consisting of a large rectangular box with horizontal dotted lines for writing.

Total for Question 2 = 18 marks

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3

J.L. Associates provides financial advice and invests money for clients all over the UK.

The company has a head office in a large city centre and a number of local offices in different locations around the country.

The company employs a large number of staff; each office location employs:

- an office director who manages all other staff in the office
- investment and advice staff who work with customers to invest money and handle a range of financial issues
- IT technical support staff
- admin staff who provide support for the day-to-day tasks carried out by the office director and investment staff.

(a) The company gets its technical support staff to develop a custom IT system.

The system will need to store data about the company's customers, their investments and financial transactions.

The database will be required to hold data relating to hundreds of customers.

The technical support staff must choose suitable data structures to implement the database.

Explain why a 'stack' would **not** be an appropriate structure for the intended data.

4 marks

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(b) J.L. Associates wants to deploy a new server in the company's head office that will hold the new database.

Analyse the factors that would affect the company's implementation of the new server.

8 marks

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(c) Each local office has a server for storing each member of staff's data and files. The content of each server is backed up to a central server at the company's head office.

Staff regularly travel to other local offices for meetings and require access to their files.

Analyse the impact on J.L. Associates of storing data across multiple computer systems.

10 marks

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Total for Question 3 = 22 marks



**4** Sporean UK is a small electronics manufacturer. The company is developing a new handheld device designed for playing games.

(a) Sporean UK has chosen to use a system on a chip (SoC) CPU architecture in the handheld gaming device.

Discuss the suitability of this type of microcomputer architecture for the intended purpose.

10 marks

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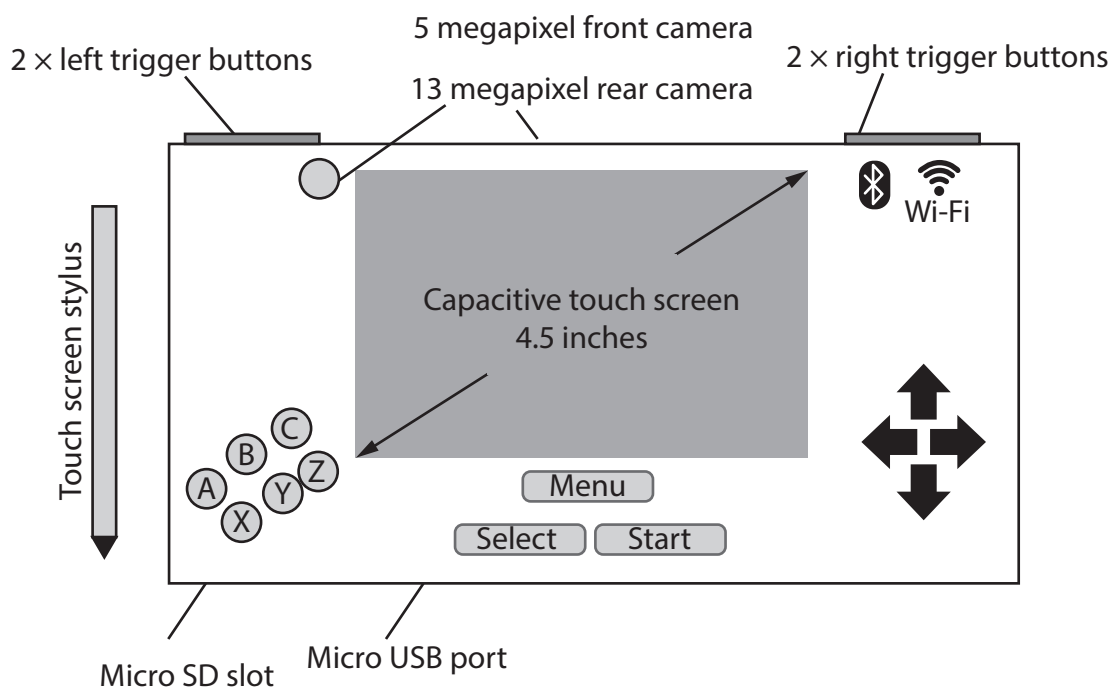
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(b) **Figure 2** shows a simple design sketch the manufacturers are using to show some of the key features of the device.



**Figure 2**

In addition to games, the manufacturers are developing a range of application software for use on the device.

Evaluate the extent to which the features of the device will support this decision.

12 marks

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Total for Question 4 = 22 marks

**END OF EXAM**

**TOTAL FOR PAPER = 80 MARKS**

