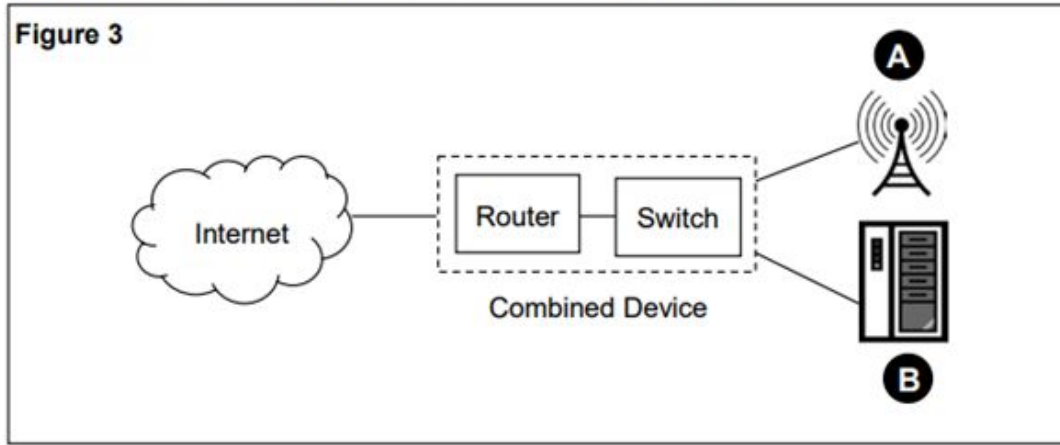


AQA Computer Science A-Level
4.9.4 The Transmission Control
Protocol/Internet Protocol (TCP/IP)
protocol
Past Paper Questions

Additional Specimen Paper 2

0 | 5 |

Figure 3 shows the physical topology of a typical home Local Area Network (LAN) and its connection to the Internet. The LAN uses the IPv4 protocol.



Device A is a Wireless Access Point. A range of devices, including laptop computers and mobile phones connect to the network through the Wireless Access Point.

Device B is a Network Attached Storage device which is a server used to store files that can be accessed by other devices connected to the network.

0 | 5 |

1

The devices that are used within the home have private IP addresses. The combined device has both a private IP address and a public IP address.

Explain the differences between private and public IP addresses, and why the Combined Device has both.

[3 marks]

0 5 . **2** The Combined Device performs Network Address Translation (NAT) when a device in the home communicates with a host on the Internet.

Explain what NAT is and why it is performed.

[3 marks]

0 6

A dynamic web page allows users to search for books in a library so that their details can be viewed online.

The web page uses the Websocket protocol and is able to update the list of books found by a query without having to reload the entire page.

The details of the books that the library owns, library members and loans are stored using the three relations in **Figure 4**.

Figure 4

Book (BookID, Title, Author, Price, Category, Publisher)

Member (MemberID, Forename, Surname, MaxBooks, DateOfBirth)

Loan (LoanID, BookID, MemberID, DateLoaned, Returned)

0 6

. 1

Write the SQL instructions that are required to create the Member table.

[3 marks]

```
CREATE TABLE Member (
```

0 6 . 2 Write an SQL query to retrieve the BookID, Title, Author, Price and Category of all books written by "David Ferguson" that cost less than £25.00. The books should be listed in order, with the most expensive book at the top of the list and the cheapest at the bottom.

[4 marks]

0 6 . 3 Which of the four functions of CRUD would the query that you have written in part 0 6 . 2 map to?

[1 mark]

The SQL query from part 0 6 . 2 is executed on the server and finds the following two records:

BookID	Title	Author	Price	Category
10324	The life of a tiger	David Ferguson	19.50	Wildlife
16294	Living with lions	David Ferguson	12.99	Wildlife

These records could be sent from the server to the client using XML or JSON.

Figure 5 shows the query results encoded using each of these methods.

Figure 5

Representation 1	Representation 2
<pre>{ "Books": [{ "BookID": 10324, "Title": "The life of a tiger", "Author": "David Ferguson", "Price": 19.50, "Category": "Wildlife" }, { "BookID": 16294, "Title": "Living with lions", "Author": "David Ferguson", "Price": 12.99, "Category": "Wildlife" }]}</pre>	<pre><Books> <Book> <BookID>10324</BookID> <Title>The life of a tiger</Title> <Author>David Ferguson</Author> <Price>19.50</Price> <Category>Wildlife</Category> </Book> <Book> <BookID>16294</BookID> <Title>Living with lions</Title> <Author>David Ferguson</Author> <Price>12.99</Price> <Category>Wildlife</Category> </Book> </Books></pre>

0 6 . 4 Identify which of Representation 1 or Representation 2 is encoded using JSON by shading in one lozenge below.

[1 mark]

JSON is: Representation 1 Representation 2

0 6 . 5 State **two** advantages of JSON over XML:

[2 marks]

Advantage 1

Advantage 2

January 2010 Comp 2

8 Computers connected to the Internet use the TCP/IP suite of protocols for data transmission.

8 (a) What is a protocol?

.....

.....

(1 mark)

- 8 (b) The TCP/IP stack is divided into four layers. One of these is the application layer protocol.

Table 2 shows four different scenarios that all use the TCP/IP protocol.

Complete **Table 2** by writing the name of the particular application layer protocol that would be used to transfer data during each operation. You must give a different answer in each case.

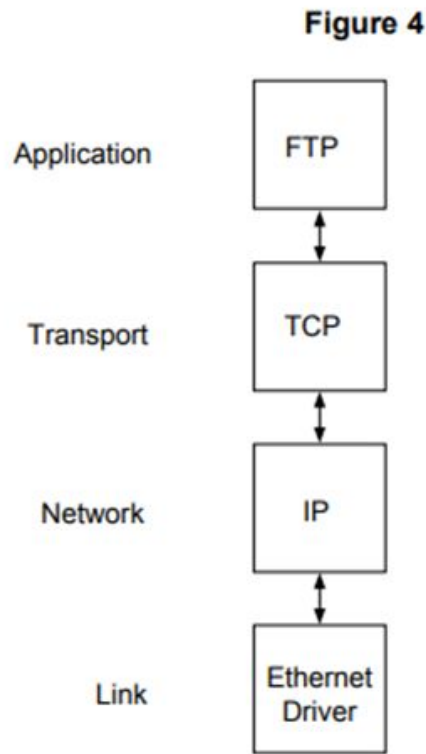
Table 2

	Operation	Application Layer Protocol
(i)	Managing a server remotely	
(ii)	Retrieving e-mail from an e-mail server	
(iii)	Viewing a sports news web page using a web browser	
(iv)	Accessing your online bank account using a web browser	

(4 marks)

January 2011 Comp 2

9 **Figure 4** shows the TCP/IP protocol stack as applied to a network.



9 (a) Describe **two** tasks that the transport layer performs.

1.....
.....

2.....
.....

(2 marks)

9 (b) FTP is an application layer protocol.

Name another application layer protocol.

.....
(1 mark)

- 9 (c) A router is a vital component in the structure of the Internet.
In which layer of the TCP/IP protocol stack does a router operate?

.....
(1 mark)

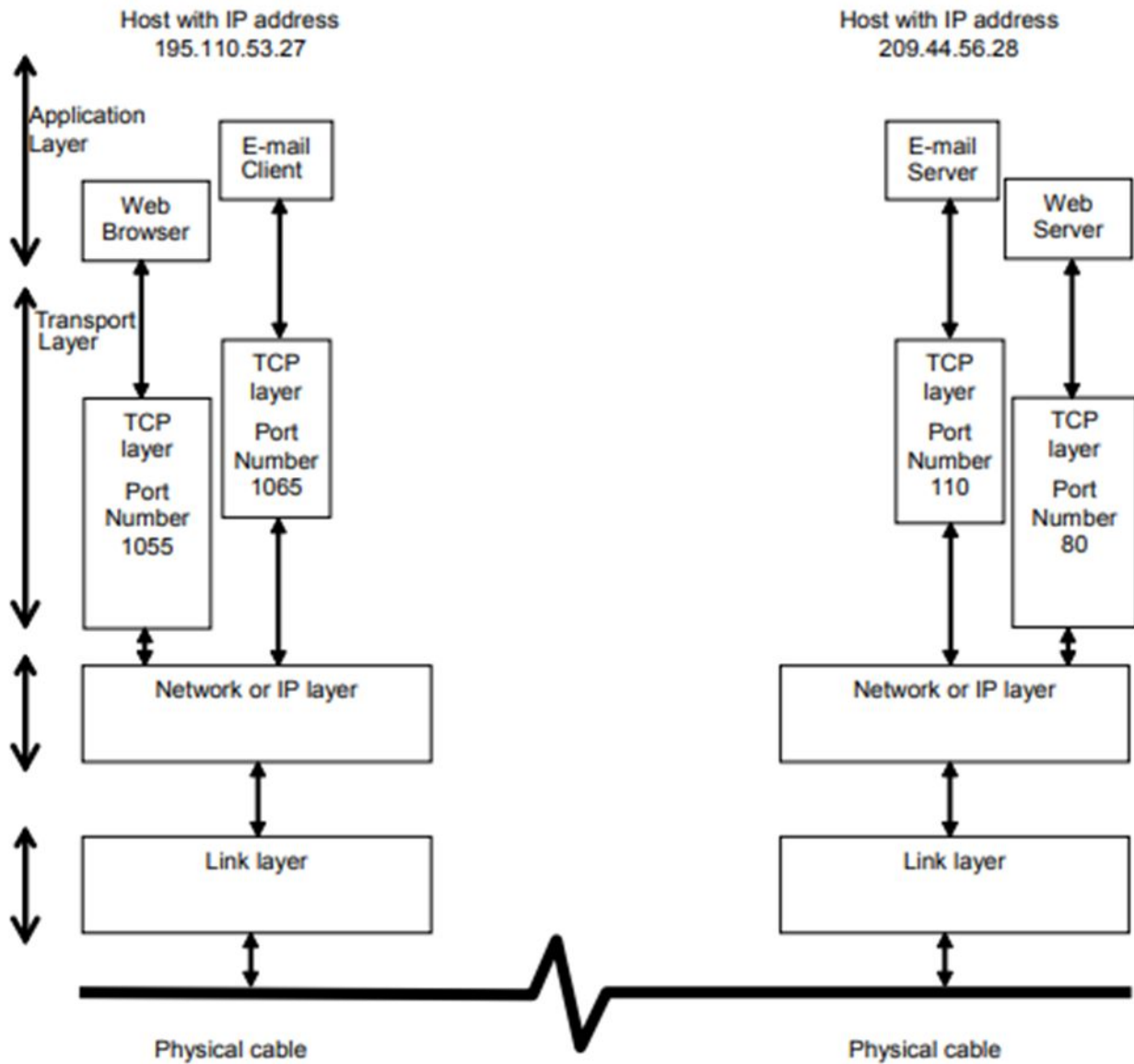
January 2012 Comp 2

- 5 (b) Name **one** of the application protocols associated with e-mail.

.....
(1 mark)

5 (c) **Figure 6** below shows the TCP/IP stack for two computers (hosts) connected via a network.

Figure 6



Explain how the TCP/IP stack in each host supports an e-mail client to e-mail server request at the same time as a web browser to web server request. You should cover in your explanation:

- the steps from the initiation of a request to the receipt of a response
- the role of the different TCP/IP layers in the stages of client-server operation
- the use of packets.

In your answer you will be assessed on your ability to use good English and to organise your answer clearly in complete sentences, using specialist vocabulary where appropriate.

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(6 marks)

June 2010 Comp 2

2 (a) (i) What does HTTP stand for?
(1 mark)

2 (a) (ii) What is the difference between HTTP and HTTPS?
.....
.....
(1 mark)

2 (a) (iii) Describe a typical website that might be accessed using HTTPS.
.....
.....
(1 mark)

2 (b) The computer that is retrieving a web page from a web server is known as a client. It will use a client port for the communication.

What is a *client port*?
.....
.....
(1 mark)

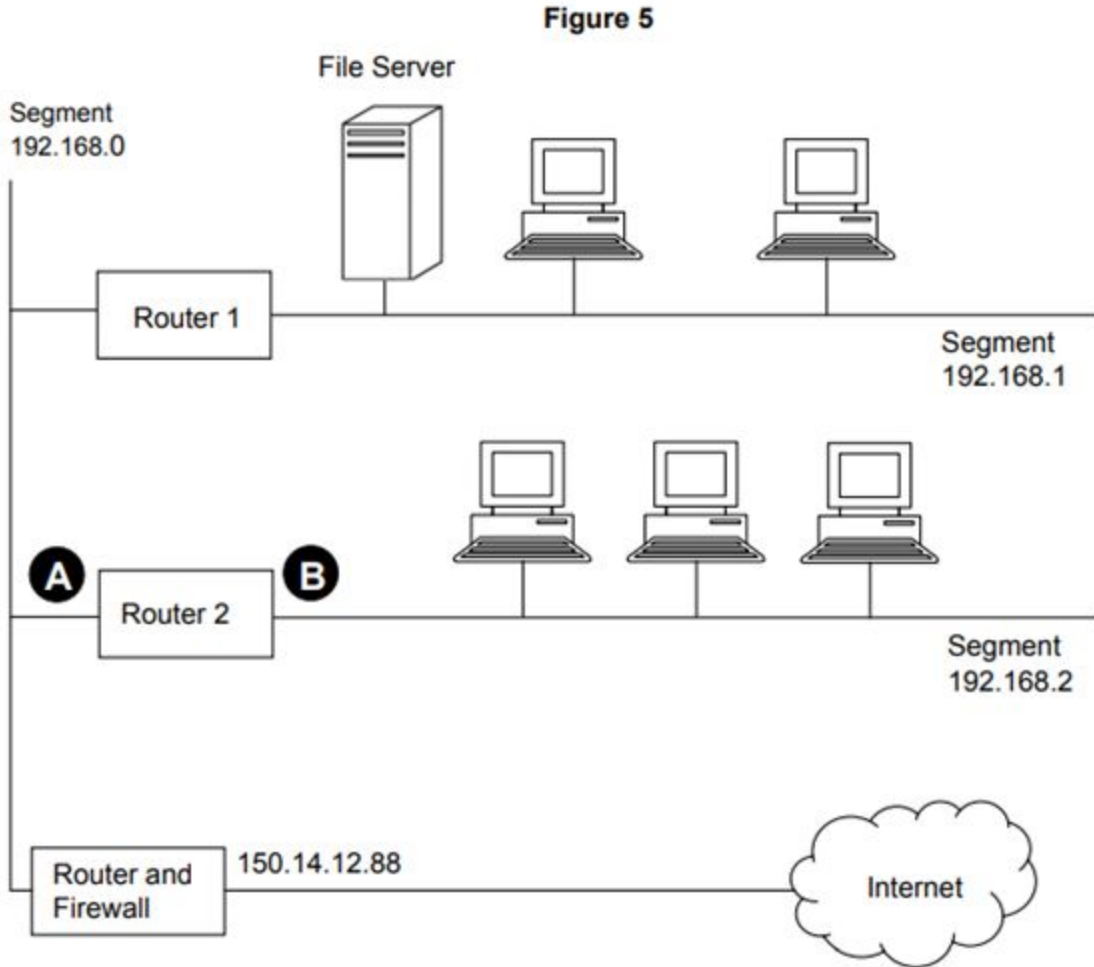
2 (c) A web server uses well known port numbers to provide a service to client computers.

Why must these port numbers be well known?
.....
.....
.....
(2 marks)

June 2011 Comp 2

June 2011 Comp 3

- 8 **Figure 5** shows the topology of a particular computer Local Area Network (LAN) that is divided up into segments.



8 (a) Suggest suitable IP addresses for:

8 (a) (i) the Router 2 port labelled **A** :

8 (a) (ii) the Router 2 port labelled **B** :
(2 marks)

8 (b) When the computers in segment 192.168.2 were configured on the LAN, they were programmed with a subnet mask.

What subnet mask should have been used?

.....
(1 mark)

June 2012 Comp 2

3 An ICT technician at a secondary school has access to a variety of programs that she uses to manage a group of servers.

3 (a) State **one** use for each of the protocols listed below.

3 (a) (i) SSH :
(1 mark)

3 (a) (ii) FTP:
(1 mark)

3 (a) (iii) POP3:
(1 mark)

3 (b) Whilst remotely connecting to one of the servers the technician executes a command that displays the current network connections. **Figure 1** shows these network connections.

Figure 1

Active Internet Connections						
Proto	Recv-Q	Send-Q	Local Address	Foreign Address	(state)	
tcp4	0	0	192.168.3.205:80	74.125.4.148:58539	ESTABLISHED	
tcp4	0	0	192.168.3.205:80	208.43.202.29:57458	ESTABLISHED	
tcp4	37	0	192.168.3.205:25	208.43.202.29:57459	CLOSE_WAIT	

From **Figure 1** provide an example of the following:

3 (b) (i) IP address:
(1 mark)

3 (b) (ii) Port:
(1 mark)

3 (b) (iii) Socket:
(1 mark)

3 (c) State **two** reasons why the technician uses remote management software from her computer rather than going to the actual servers.

Reason 1:
.....

Reason 2:
.....

(2 marks)

4 There are many third generation programming languages available. Some of these can be classified as imperative high level languages.

4 (a) Explain what is meant by the term *imperative high level language*?

.....

.....

.....

.....

(2 marks)

June 2012 Comp 3

8 (b) After considering other alternatives, the analyst finally decides to use a thin-client network.

Explain how a thin-client network works and how the use of a thin-client network instead of a traditional rich-client (thick-client) network will affect the selection of the hardware to be used by the system.

In your answer you will be assessed on your ability to use good English, and to organise your answer clearly in complete sentences, using specialist vocabulary where appropriate.

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(4 marks)

June 2013 Comp 2

5 A company wishes to use the unregistered domain name *learncomputing.co.uk* for a new website. They use a server which has the public IP address 123.45.67.100.

At present, the server only has an operating system and Telnet server software installed. The Telnet server allows the company to connect remotely to and control the server.

The company intends to upload files to the server using FTP (File Transfer Protocol).

Explain the steps the company will need to take so that a customer using the Internet can browse the company's new website *http://www.learncomputing.co.uk*.

You may wish to make reference to the following in your answer:

Website creation, Domain Name Server (DNS), Web server, FTP server, Ports, Telnet, Internet Registrar

In your answer you will be assessed on your ability to use good English and to organise your answer clearly in complete sentences, using specialist vocabulary where appropriate.

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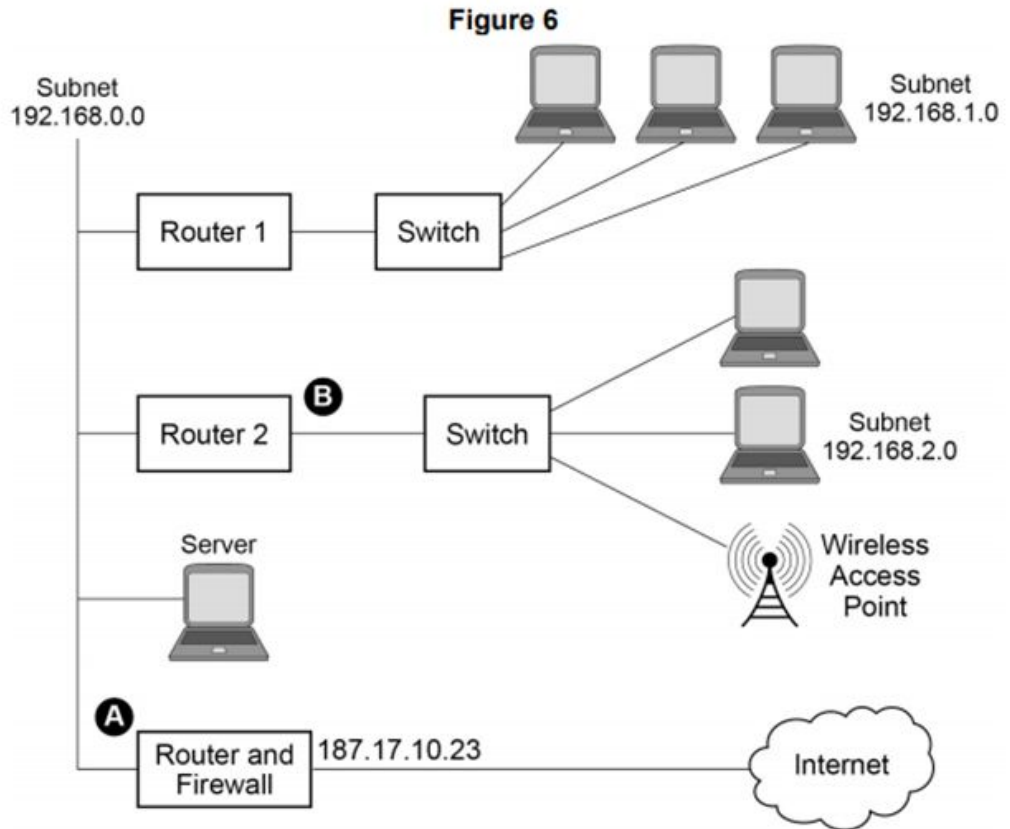
(6 marks)

7 (d) A parent also noted that the website was using HTTP (HyperText Transfer Protocol).
Why should the school be concerned about the use of this protocol and which protocol would you recommend that the school should use instead?
Why concerned
.....
Suggested protocol
(2 marks)

June 2017 Paper 2

0 9

Figure 6 shows the physical topology of a local area network (LAN) and its connection to the Internet. The LAN uses the IPv4 protocol.



0 9 . 1

State suitable IP addresses for:

[2 marks]

The 'Router and Firewall' port labelled **A** _____

The 'Router 2' port labelled **B** _____

June 2009 Comp 2

10 (b) Computers connected to the Internet use the TCP/IP suite of protocols for data transmission.

10 (b) (i) What is a protocol?

.....
.....
.....

(1 mark)

10 (b) (ii) Name **two** of the layers in the TCP/IP protocol stack.

Describe **one** function of each of the layers that you have named.

	Layer name	Description of layer function
1		
2		

(4 marks)

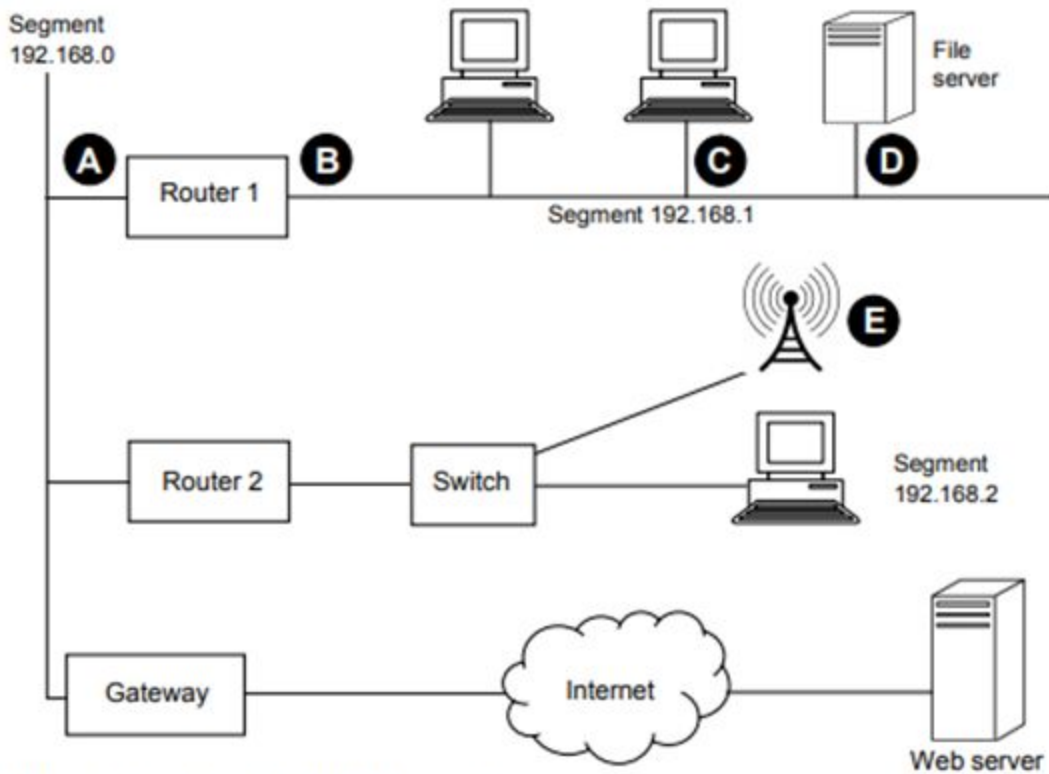
June 2013 Comp 3

5 A student is using her computer at school.

Figure 8 shows the physical topology of the Local Area Network (LAN) to which her computer is connected. The LAN is divided up into segments. It also shows a web server that her computer connects to through the Internet.

The student is using computer **C**.

Figure 8



5 (a) Suggest suitable IP addresses for:

5 (a) (i) the "Router 1" port labelled **A**

5 (a) (ii) the "Router 1" port labelled **B**

5 (a) (iii) the network adapter card in the student's computer, labelled **C**

(3 marks)

5 (c) When the computers in segment 192.168.1 were configured on the network, they were programmed with a subnet mask.

What subnet mask would have been used?

.....

(1 mark)

5 (g) The web server has a routable IP address.

The student's computer has a non-routable IP address.

Explain **two** differences between routable and non-routable IP addresses.

Difference 1:

.....

Difference 2:

.....

(2 marks)

Specimen Paper 2

0	4
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The phrase "Internet of Things" is used to describe the connection of many everyday devices such as home heating controls, utility meters, cars and environmental sensors to the Internet. It is believed that tens of billions of devices will be connected to the Internet of Things by the end of the decade.

One anticipated use of the Internet of Things is to monitor the food that consumers have inside their fridges. This data could be gathered automatically from consumers' devices by retailers who sell food. Retailers could use the data to analyse consumer consumption habits or automatically prepare deliveries for customers.

In the context of an Internet connected fridge, discuss the technologies that will be required to make the Internet of Things work.

You may wish to consider how the data might be captured, how networking technologies are changing to provide the necessary infrastructure, and how the data gathered by retailers could be stored and processed, from a hardware and software viewpoint.

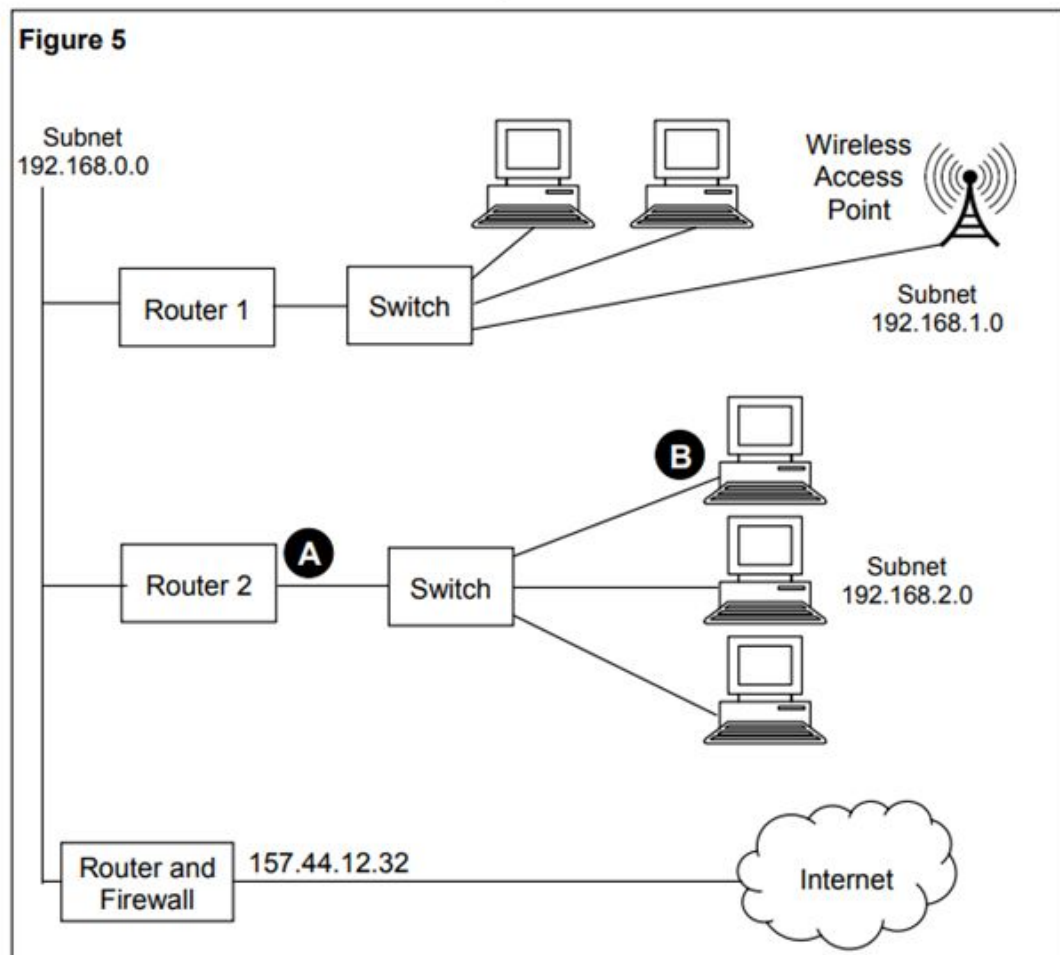
[12 marks]

The JavaScript programming language can be used to write programs that are executed in a web browser on any Internet user's computer.

0 6 . 6 Explain why programs written in the JavaScript language, to be executed in a web browser, are interpreted rather than compiled.

[2 marks]

0 7 | **Figure 5** shows the physical topology of a local area network (LAN) and its connection to the Internet. The LAN uses the IPv4 protocol.



07 . **1** State suitable IP addresses for:

[2 marks]

The 'Router 2' port labelled **A**: _____

The computer network interface card labelled **B**: _____