X206/301

NATIONAL QUALIFICATIONS 2007

MONDAY, 28 MAY
1.00 PM – 3.30 PM

COMPUTING
HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 10	Questions 22 to 26
Part B	Computer Networking	Page 14	Questions 27 to 31
Part C	Multimedia Technology	Page 17	Questions 32 to 36

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

SA X206/301 6/3/8670

SCOTTISH QUALIFICATIONS AUTHORITY

Marks

SECTION II

Attempt all questions in this section.

17. John uses his digital camera to take photographs. It has a 512 Megabyte memory card. His camera uses 16,777,216 colours and is set to a *resolution* of 3000 × 2000 pixels.

(*a*) (i) Calculate the file size of a single image. Your answer should be in appropriate units. Show **all** working. **3**

(ii) What is the maximum number of images of this size that can be stored on John's memory card? **2**

(*b*) State **two** reasons why digital images are stored as *JPEGs*. **2**

(*c*) He changes the setting in his camera to reduce the *bit-depth*.

Describe **one** effect that this will have. **1**

(*d*) He connects his camera to his computer. One function of the interface is the handling of *status signals*. Describe what is meant by the term "status signals". **2**

(*e*) There are a large number of pictures on his hard disk. The combined size of all of his photographs is 3 Gb.

He can use a *solid-state storage device* or Rewritable DVD to take **all** of his photographs to his chemist shop for printing. Recommend one of these devices and justify your choice. **1**

18. Crawford Construction Ltd has employed a *systems analyst* to investigate the possibility of networking all of the computers in the company.

(*a*) Describe **one** technique the systems analyst could use at the analysis stage. **1**

(*b*) The systems analyst recommends a *client-server* network.

State **two** benefits of a client-server in terms of network management. **2**

(*c*) Describe **two** technical factors that have contributed to the growth of *local-area networks* (LANs). **2**

(*d*) LANs may use a *hub* or a *switch*.

Explain the difference between a hub and a switch. **2**

(*e*) The LAN is to be connected to the Internet.

(i) State **one** benefit of installing a *web server*. **1**

(ii) Describe **two** possible problems which could arise from connecting the LAN to the Internet. **2**

SECTION II (continued)

19. Hazeltown Basketball Club would like to set up a computer system to manage their membership details. The Secretary already has a computer but does not have any suitable software.

(*a*) Before purchasing the new software the Secretary must ensure that the software is compatible with his computer. Processor speed is one hardware factor which should be considered when making the purchase.

(i) Name **one** other hardware factor which should be considered. **1**

(ii) Name and describe **one** piece of documentation likely to be provided with the software. **2**

(*b*) The secretary decides to buy a new computer. He has a choice of either the Mercury ZX or the Phantom IV.

Mercury ZX
3·7 GHz Ami Processor
1 Mb Cache memory
32 bit Data Bus
24 bit Address Bus
512 Mb RAM
400 Gb Hard Disk

Phantom IV
3·9 GHz Storm Processor
2 Mb Cache memory
32 bit Data Bus
24 bit Address Bus
512 Mb RAM
320 Gb Hard Disk

(i) Explain **one** technical reason why the Phantom IV may give the best performance. **2**

(ii) State **one** technical reason why the Mercury ZX may give the best performance. **1**

(iii) Calculate the maximum amount of memory which the Phantom IV computer can address. Give your answer in appropriate units. Show **all** working. **3**

[Turn over

SECTION II (continued)

20. Scientists are interested in studying the possible effects of global warming. Devices are placed at various locations to record temperatures. Each device takes one thousand temperature readings per day. Sample readings are shown below.

Temperature
2·04
1·62
0·04
1·42
2·56
3·52

A program has been written to perform some analysis on the data collected.

(*a*) The temperature readings are stored in a 1-D array.

(i) What is meant by a 1-D array? **2**

(ii) Which data type is suitable for the array? **1**

(*b*) The program must find how many of the 1000 readings are above zero and less than ten degrees. Use *pseudocode* to write an algorithm which would determine the number of readings in this range. **5**

(*c*) The data is imported into a spreadsheet to perform additional analysis using a *scripting language*.

(i) Describe **two** features of a scripting language. **2**

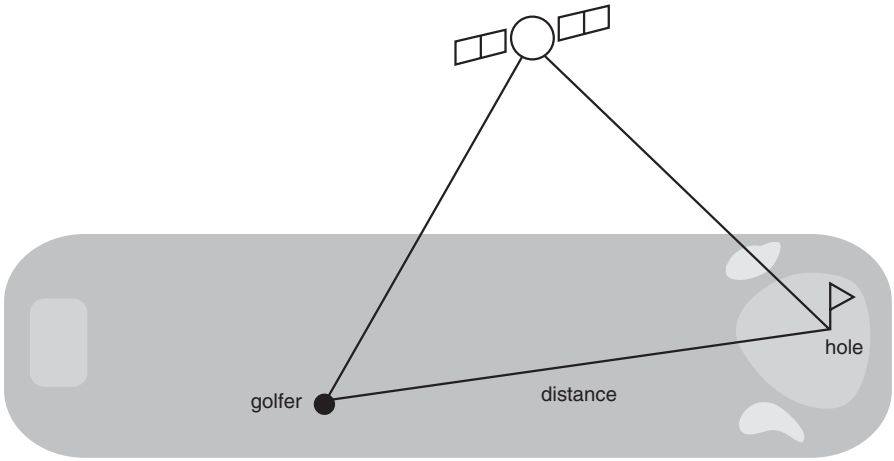
(ii) Describe **two** advantages of using a scripting language within the spreadsheet compared to developing all of the code using a high level programming language. **2**

(iii) Other than importing data suggest another use for a script. **1**

(*d*) Another device records air pressure as a 16 bit positive integer. Calculate the range of numbers that this device can store. **2**

SECTION II (continued)

21. A manufacturer of palmtop computers with a global positioning system wishes to offer its customers the facility to obtain distances when playing golf. It is helpful for golfers to know the distance from where they are to the hole. This helps the golfer play the next shot.



They appoint a software development company to create the software for this new system.

(*a*) The software company appoints a project manager. Describe **two** aspects of the role of the *project manager*. **2**

(*b*) (i) Name and describe a document that the systems analyst will produce as a result of the analysis stage. **2**

(ii) Describe **two** ways in which this document could be used later in the software development process. **2**

(*c*) The software company uses *stepwise refinement*. Describe what happens during stepwise refinement. **2**

(*d*) The software company is keen that the software written should be *efficient*. Give **two** reasons why it is important that software written for a handheld computer should be efficient. **2**

(*e*) The software is released to customers but the golfers complain that the calculated distances are very inaccurate.

(i) Which type of maintenance is required? Give a reason for your answer. **2**

(ii) Explain why documenting the testing stage of the software development process will aid maintenance. **1**

(*f*) The software could be translated using a *compiler* or an *interpreter*. State **two** reasons why a compiler is a more suitable translator for this application. **2**

(60)

[*END OF SECTION II*]

X206/301

NATIONAL QUALIFICATIONS 2008

MONDAY, 2 JUNE 9.00 AM – 11.30 AM

COMPUTING HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 11	Questions 18 to 22
Part B	Computer Networking	Page 15	Questions 23 to 26
Part C	Multimedia Technology	Page 18	Questions 27 to 30

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

Marks

SECTION II

Attempt all questions in this section.

13. When designing a new computer the manufacturer could improve system performance by increasing the *clock speed* or adding more *RAM*.

(*a*) (i) Describe one **other** way to improve the system performance **and** explain why it would be effective. **2**

(ii) Explain why it is **not** possible to keep improving performance by increasing clock speed. **1**

(*b*) (i) Describe how *FLOPS* **and** *application based tests* are used to measure system performance. **2**

(ii) Explain why application based tests could be described as the best measure of system performance. **1**

(iii) Explain why FLOPS could be described as the best measure of system performance. **1**

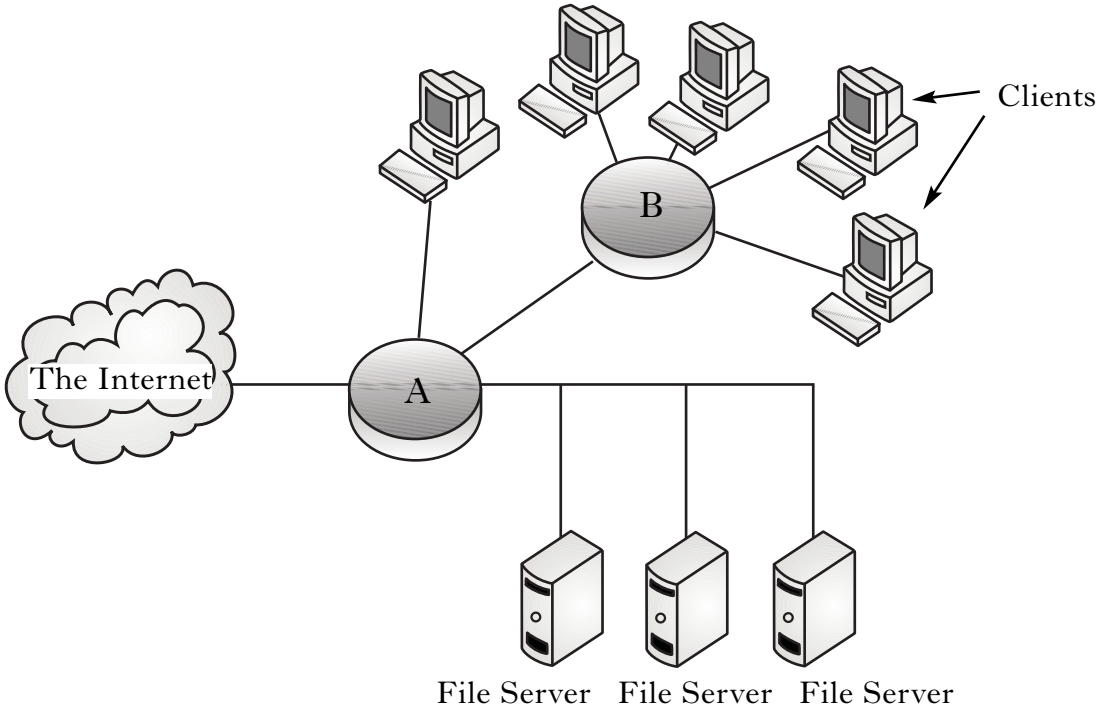
(*c*) A new computer system has a 3 GHz processor with a 64-bit data bus and a 32-bit address bus. Calculate the maximum amount of memory that can be addressed by this computer. Show all working and express your answer in appropriate units. **3**

(*d*) Describe how a processor distinguishes one memory location from another. **1**

[Turn over

SECTION II (continued)

14. The proposed layout of a new office network is shown below. Cables are used to connect the network.



(*a*) A router and a hub are used in the above network.

(i) State which device, A or B, is the router. State **one** reason to justify your choice of device. **2**

(ii) State which device, A or B, is the hub. State **one** reason to justify your choice of device. **2**

(*b*) After the network has been installed, it is discovered that data traffic on the network is slow.

(i) State **one** technical change which could be made to improve network performance. **1**

(ii) Explain how this change will improve network performance. **1**

(*c*) Name a **type** of server that allows Web pages to be accessed within a LAN. **1**

SECTION II (continued)

15. James wants to make copies of some photographs. He intends to use a scanner to capture the photographs and an ink jet printer to print the final images.

(*a*) State the function of the operating system that is responsible for the data transfer between the processor and scanner. **1**

(*b*) (i) Explain why saving the scanned image as a *gif* would **not** be appropriate in this case. **1**

(ii) State a suitable file format for saving the file. **1**

(*c*) The scanner is set to a resolution of 1200 dpi using *24 bit colour depth* and the photographs are 6 inches by 8 inches. Calculate the uncompressed size of the file. Express your answer in appropriate units. Show all working. **3**

(*d*) One function of the printer interface is to inform the processor that it is ready to receive the next photograph. State the name of this function. **1**

(*e*) State **one** advantage of using *serial* over *parallel* transmission when sending data to a printer. **1**

(*f*) State **one** technical characteristic that the printer should have. Justify your answer. **2**

(*g*) When James prints his images he discovers lines across some of them. The lines are where the original photographs had been folded over.

Explain why he would use a bit-mapped package to remove the lines. **2**

[Turn over

SECTION II (continued)

16. An international athletics competition between eight countries has a number of events. Here are the results for one race.

Lane Number	Country	Time (secs)
1	Ireland	40·23
2	Italy	41·05
3	England	42·88
4	France	39·89
5	Germany	40·55
6	Poland	40·01
7	Scotland	39·87
8	Wales	42·55

The stadium's computer system has a program which processes and displays the results.

(*a*) State **two** system requirements that would have been specified for the installation of the program. **2**

(*b*) The program is modular. State **two** benefits of creating modular code. **2**

(*c*) At the end of a race, messages are displayed. For example:

Winner: Sco 39·87

The winning country for a race is stored in a string variable called **winner**.

Using code from a programming environment with which you are familiar, show how to extract the first three characters from the variable **winner**. **2**

(*d*) The program stores the list of race times in a single data structure.

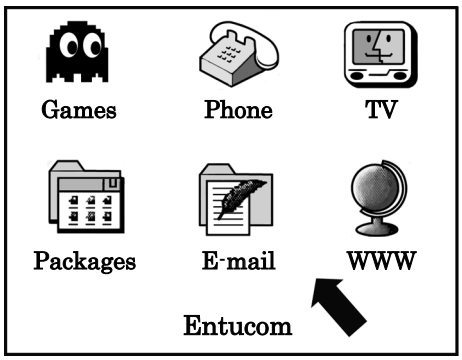
(i) State the data structure and data type used to store the race times. **2**

(ii) The program must find the fastest time for a race. Use pseudocode to design an algorithm to find the fastest time. **4**

(iii) It is suggested that it would be preferable for the algorithm to find the **lane number** of the fastest time rather than the fastest time. Explain how this could be achieved. **1**

SECTION II (continued)

17. Entucom is a television broadcaster that gives customers access to various services. Customers will access these services using their television and a set-top box with wireless keyboard and mouse.



The television broadcaster employs a software development company to provide the range of software required.

(*a*) The software development company appoints a *systems analyst* during the analysis stage of the software development process.

(i) Describe **two** tasks carried out by the systems analyst. **2**

(ii) State **two** benefits that the analysis stage has for the **remaining** stages of the software development process. **2**

(*b*) During implementation, the software development company consider the use of either a *procedural* or an *event-driven* language.

(i) Describe **two** similarities of **procedural** and **event-driven** languages. **2**

(ii) State **two** reasons why a programmer would use an **event-driven** language to develop software. **2**

(*c*) During the development of the software, *module libraries* are used. The modules limit the *scope* of certain variables.

(i) What is a **module library**? **1**

(ii) Describe **one** way in which the **scope** of a variable may be limited. **1**

(iii) Explain why the programmer might want to **limit** the scope of a variable. **2**

(*d*) The software developed should be subject to testing using a comprehensive set of **test data**. State **two** other methods of testing comprehensively. **2**

(*e*) Entucom insist that the software is *portable*. Explain why portability is important in this situation. **1**

(*f*) New set-top boxes may be developed in the future. State which type of maintenance could be required to ensure the software works with the new boxes. Explain your answer. **2**

(60)

[*END OF SECTION II*]

X206/301

NATIONAL QUALIFICATIONS 2009

THURSDAY, 4 JUNE 9.00 AM – 11.30 AM

COMPUTING HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 11	Questions 24 to 28
Part B	Computer Networking	Page 15	Questions 29 to 32
Part C	Multimedia Technology	Page 19	Questions 33 to 36

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

Marks

SECTION II

Attempt all questions in this section.

18. A palmtop computer has a processor with a 24 bit address bus, 32 bit data bus and 8 control lines. The palmtop computer accepts *flash cards* as additional storage.

(*a*) The processor receives a signal on an *interrupt* control line. Explain what happens when the processor receives the signal. **2**

(*b*) Calculate the **maximum** amount of memory that the palmtop computer can address.

Express your answer in appropriate units. Show all working. **3**

(*c*) Data is to be transferred from the processor to main memory using a *write* operation.

Describe how a processor would perform a **write** operation. Your answer should mention the *buses* or *control lines* used at **each** stage. **4**

(*d*) A file created on the palmtop is to be stored on the flash card. The *file management* and *input/output management* functions of the palmtop's operating system are used during the transfer.

Describe **one** task carried out by **each** of these functions. **2**

(*e*) The price of *flash cards* has decreased in recent years as their capacity has increased.

State **one** other recent trend in the development of flash cards. **1**

19. Pat has a *wireless enabled* laptop in his house. He uses this to **illegally** access his neighbour's wireless network.

(*a*) Name the Act of Parliament that makes this network access illegal. **1**

(*b*) Pat's computer has anti-virus software installed. One technique used by anti-virus software to **detect** a virus is *virus signature recognition*.

(i) Name **one** other virus **detection** technique. **1**

(ii) Describe how the technique you named in part (i) detects a virus. **1**

(iii) Describe how a virus might use *camouflage* to **avoid** virus signature recognition. **1**

[Turn over

SECTION II (continued)

20. A network is configured as a *star* topology. It contains **four** computers and a *switch*.

(*a*) Draw a **labelled** diagram of this star topology. You should **clearly** show the location of the **switch**. **2**

(*b*) Describe **one** advantage of using a *star* topology compared to a *bus* topology. **1**

(*c*) Explain why using a *switch* rather than a *hub* may improve the performance of a network. **2**

(*d*) Explain why the addition of a print server to a large network contributes to an improvement in network performance. **1**

(*e*) Developments in *browser software* have contributed to the increase in the use of networks.

Describe **two** of these developments. **2**

21. One function of an *interface* is to store data in transit between the computer and a peripheral.

(*a*) State **one** other function of an interface. **1**

(*b*) (i) Describe how data is transferred using a *serial interface*. You may include a diagram in your answer. **2**

(ii) Describe how data is transferred using a *parallel interface*. You may include a diagram in your answer. **2**

(*c*) State **one** advantage of a serial interface over a parallel interface. **1**

SECTION II (continued)

22. NoTow is a company running a city centre car park. The company requires software to control the operation of the car park. The software will have modules for actions such as "recognising a car is at a barrier", "printing an entry ticket" and "calculating ticket charge".

(*a*) Name the most suitable **type** of programming language to implement this software. Explain your answer. **2**

(*b*) The software is written using modules. Describe **two** benefits to the programmer of writing modular code. **2**

(*c*) After the software is written, testing is carried out.

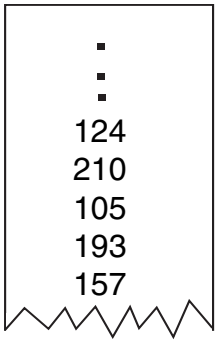
(i) "Testing should be planned in advance with the creation of a test plan containing the test data to be used and the expected results."

State the **aspect** of testing being described here. **1**

(ii) "Testing should be as thorough and complete as possible covering every part of the program with all kinds of test data and testers."

State the **aspect** of testing being described here. **1**

NoTow would like the software to calculate the number of cars on a particular day that spent more than three hours in the car park. The number of whole minutes each car is parked in the car park is stored in a list, as shown on the right.



(*d*) Use *pseudocode* to design an algorithm to carry out this calculation. **4**

(*e*) The output from part (*d*) is turned into a percentage of the total number of cars using the car park in a day. This is stored in a variable called **percent**.

Using a programming language with which you are familiar, show how to format the output to **two** decimal places. **2**

(*f*) Identify the **type** of *maintenance* used to add the module described in part (*d*). Justify your answer. **2**

[Turn over

SECTION II (continued)

23. A cinema ticket system allows customers to select and pay for their own tickets.

The top level algorithm is:

1. Get ticket details
2. Calculate cost
3. Display cost and accept payment

The module **CalculateCost** uses the number of tickets and the category of ticket to calculate the total payment due. It uses the *parameters* described below.

Parameter	Description
Amount	Number of tickets
Category	Adult, child, student, OAP
Cost	Total cost of required tickets

(*a*) State the most suitable *data type* for the parameter called **Cost**. **1**

(*b*) Parameters can either be passed by *value* or by *reference*.

(i) Identify **one** parameter that is passed **by value** to the module **CalculateCost**. Justify your answer. **2**

(ii) Identify **one** parameter that is passed **by reference** to the module **CalculateCost**. Justify your answer. **2**

(*c*) A program may use *local* variables and *global* variables.

(i) What is the *scope* of a **global** variable? **1**

(ii) State **two** advantages of using *parameter passing* rather than *global* variables when programming. **2**

(*d*) State **one** reason why *portability* of software is an important factor for developers to consider. **1**

SECTION II (continued)

23. (continued)

(*e*) To calculate the total cost, the program must check the category of each ticket against the four possible categories. The programmer could use **a series of IF statements** or a **nested IF** as shown below.

Series of IF statements:

```
IF category = 'adult' THEN Price=5.50
IF category = 'child' THEN Price=3.50
IF category = 'student' THEN Price=4.50
IF category = 'OAP' THEN Price=4.00
```

Nested IF:

```
If category = 'adult' THEN
    Price=5.50
ELSE IF category = 'child' THEN
    Price=3.50
ELSE IF category = 'student' THEN
    Price=4.50
ELSE IF category = 'OAP' THEN
    Price=4.00
END IF
```

(i) The programmer decides to use a nested IF. Explain why this is a more **efficient** method. **2**

(ii) State **one** other *multiple outcome selection* statement that the programmer could have used. **1**

(*f*) The program will make use of a *1-D array*.

(i) When creating, or declaring, a 1-D array for use in a program, a name must be given to the array.

State **two** other items that should be specified when the array is created. **2**

(ii) Explain why it is a more *efficient* use of system resources to pass an array **by reference** rather than **by value**. **2**

(60)

[*END OF SECTION II*]

[Turn over

X206/301

NATIONAL QUALIFICATIONS 2010

THURSDAY, 3 JUNE 9.00 AM – 11.30 AM

COMPUTING HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 10	Questions 18 to 22
Part B	Computer Networking	Page 16	Questions 23 to 26
Part C	Multimedia Technology	Page 20	Questions 27 to 31

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

Marks

SECTION II

Attempt all questions in this section.

14. Carolyn uses a computer to edit photographs that she has taken with her digital camera.

(*a*) When Carolyn switches on her computer, system software in ROM finds and loads the operating system. Name this system software in ROM. **1**

(*b*) Carolyn transfers the photographs from her camera to her computer using a *serial interface*.

(i) Two functions of the interface are *data format conversion* and *handling of status signals*. Describe how each of these functions would be involved in this data transfer. **2**

(ii) State **two** other functions of an interface. **2**

Carolyn reduces the *bit-depth* of the photographs from 24 bits to 16 bits before saving the photographs onto the hard disk of her computer system.

(*c*) (i) Describe **one** advantage of reducing the bit-depth of the photographs from 24 to 16. **2**

(ii) Describe **one** disadvantage of reducing the bit-depth of the photographs from 24 to 16. **2**

(iii) A 4 inch by 6 inch photograph with a resolution of 600 dpi and using 16-bit colour depth is stored. Calculate the file size of the photograph.

State your answer using appropriate units. Show all your working. **3**

(*d*) Two functions of the operating system are *memory management* and *input/output management*. Describe the roles of each of these **two** functions when a photograph is saved on to the hard drive. **2**

(*e*) Carolyn's camera uses *solid state storage*. Explain **one** reason why solid state storage is used in digital cameras. **2**

(*f*) Carolyn uses photo editing software that allows her to store a photograph using *JPEG* or *GIF* file format. Describe **one** difference between these two file formats. **2**

[Turn over

SECTION II (continued)

15. Ernie has bought a new computer with 24 *control lines*, a 32-bit *address bus* and a 64-bit *data bus*.

(*a*) Calculate the **maximum possible** amount of memory that Ernie's computer can address. State your answer using appropriate units. Show all your working. **3**

(*b*) Ernie's computer has 16 megabytes of *cache* memory. Describe how the use of cache memory may improve system performance. **2**

(*c*) Ernie requires new word processing software to use on his computer system. Describe **one** *compatibility issue* that should be considered when buying new software. **2**

(*d*) Two methods of measuring performance are *application based tests* and *MIPS*.

(i) Explain why MIPS may be the better measure of **processor** performance than application based tests. **2**

(ii) State **one** other measure of processor performance. **1**

Ernie's computer is part of a small *peer-to-peer network* of computers in his family home. There are three other computers in the house.

(*e*) Explain **one** reason why the family created a *peer-to-peer* network instead of a *client-server* network. **2**

SECTION II (continued)

16. Mrs Laird sets her Higher Computing class the task of writing a program that will take in three items – day, month and year. These three variables will have the same data type. The program will then output a "DateofBirth" variable with six characters, as shown below.

Input Variables		
day	month	year
15	Jun	1992

Output Variable
DateofBirth
150692

(*a*) State the only *data type* that the pupils can use for **all three** of the "day", "month" and "year" variables. Justify your answer. **2**

(*b*) Name the operation used to extract the last two characters from the contents of the "year" variable. **1**

(*c*) Part of the program will take the contents of **month** e.g. "Jun" and turn this into the corresponding **two** character value for that month e.g. "06". Mrs Laird tells the pupils they must **not** use IF statements to implement this part of the program.

Use pseudocode to design an algorithm for this part of the program. You should show only the first two months in your algorithm. **3**

(*d*) Name the operation used to join the three values together to produce the six characters for "DateofBirth". **1**

(*e*) The contents of the "DateofBirth" variable are to be held in memory in ASCII format. Calculate the mininum amount of memory required to store the contents of this variable. **2**

(*f*) The pupils are using a *procedural* language to write their programs.

(i) State **two** features of procedural languages. **2**

(ii) State **one** feature of *event-driven* languages that is **not** commonly found in procedural languages. **1**

(*g*) Mrs Laird tells the pupils that their programs must be easily *maintainable*. Describe **two** characteristics of a program that make it easily "maintainable". **2**

(*h*) Mrs Laird also tells the pupils that they must avoid the use of *global variables* in their programs where possible.

(i) State the meaning of the term "global variable". **1**

(ii) Explain why the pupils have been asked to avoid the unnecessary use of global variables when programming. **2**

[Turn over

SECTION II (continued)

17. Henry works for a company that maintains office buildings. He decides to write a program to print labels for the room keys in a new office block. The block has 38 floors, each with 25 rooms. The label will consist of the floor number and the room number. The design for the program is shown below alongside a sample section of output.

```
For each of 38 floors
    For each of 25 rooms
        Display "Floor Number:" and floor_no
        Display "Room Number:" and room_no
    Next room
    Display two blank lines
Next floor
```

```
Floor Number: 12
Room Number: 3


Floor Number: 12
Room Number: 4
```

(*a*) Once the program has been written it must be translated. Describe clearly why using a *compiler* to translate the code produced from **this** algorithm would be more efficient in terms of **processor usage** than using an *interpreter* to translate the same code. **2**

(*b*) State **one** example of how text output from a program could be *formatted*. **1**

(*c*) The company decide to include Henry's code as a new function in their building management software.

State the **type** of maintenance being carried out on the building management software by adding this section of code as a subprogram. **1**

(*d*) In order for Henry's program to operate correctly for **any** office building **two** parameters would have to be passed to it.

(i) State what these **two** parameters would be. **2**

(ii) State whether these parameters would be passed to the subprogram by *value* or by *reference*. Justify your answer. **2**

(*e*) Another subprogram in the building management software is used to find the range of temperatures in a building in one day. The temperature is recorded every 15 minutes within a 24 hour period and stored in a list.

Use pseudocode to design **one** algorithm to find **both** the **highest** and **lowest** temperatures in this list. **5**

(60)

[*END OF SECTION II*]

X206/301

NATIONAL QUALIFICATIONS 2011

FRIDAY, 3 JUNE 9.00 AM – 11.30 AM

COMPUTING HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 10	Questions 17 to 20
Part B	Computer Networking	Page 14	Questions 21 to 24
Part C	Multimedia Technology	Page 18	Questions 25 to 28

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

Marks

SECTION II

Attempt all questions in this section.

13. Paula buys a new laptop computer which has 4 Gigabytes of *main memory* and 12 Megabytes of *cache* memory.

(*a*) State **two** differences between main memory and cache memory. **2**

(*b*) The computer has a **maximum** addressable memory of 16 Gigabytes. Its *address bus* width is 32.

(i) Calculate the width of the *data bus*. **3**

(ii) State why computers do not come with the maximum addressable memory installed. **1**

(iii) State the effect that adding **one** new line to the address bus would have on the maximum addressable memory. **1**

(*c*) Describe the function of each of the following in a memory *read* operation:

- address bus.
- data bus.
- control lines. **3**

(*d*) The laptop computer has several *utility programs* including a *disk defragmenter*.

(i) State what is meant by the term "utility program". **1**

(ii) Fragmentation of the hard disk decreases the performance of the computer. Explain why performance decreases. **2**

(*e*) The laptop computer has anti-virus software. State an *anti-virus software detection technique*. **1**

SECTION II (continued)

14. Murray Components is a small business that sells computer hardware. They have a shop that employs four people.

(*a*) Networks can be set up as either *peer-to-peer* or *client server*.

(i) In terms of data backup, describe **one** difference between a peer-to-peer network and a client server network. **2**

(ii) Murray Components have a peer-to-peer network with four workstations. Describe **one** reason why they may have chosen a peer-to-peer network. **2**

(*b*) Murray Components is advised that a *ring topology* is not the most suitable topology to use for their LAN.

(i) Draw a **labelled** diagram of a ring topology. **2**

(ii) State a more suitable topology and state **one** advantage it has over a ring topology. **2**

(*c*) Murray Components requires a network printer to print advertising leaflets.

(i) State **two** technical requirements that should be considered when selecting a suitable printer. **2**

(ii) State **two** roles of the *operating system* and describe how each is used to ensure that data is printed correctly. **4**

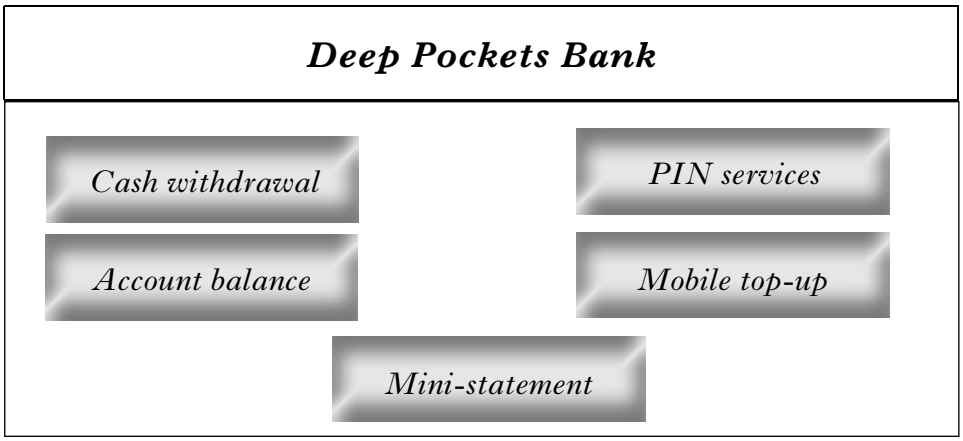
(*d*) State **one** function of a *print server*. **1**

(*e*) Murray Components starts to sell much more *solid state* storage. State **two** reasons why solid state storage is becoming more popular. **2**

[Turn over

SECTION II (continued)

15. RightIT, a software company, is currently developing a cash machine program for a bank. The cash machine will offer five options to customers.



(*a*) RightIT decided to use an *event-driven* programming language to write the software. State **two** reasons why an event-driven programming language is suitable for this software. **2**

(*b*) (i) State **one** other type of programming language RightIT could have used for this software. **1**

(ii) Justify why it would also have been suitable. **1**

(*c*) The options selected during a day are stored as a list. The bank would like the software to calculate the number of times the **mobile top-up** option appears on this list. Use pseudocode to design an algorithm to carry out this calculation. **4**

(*d*) Once the software has been written RightIT carries out *systematic* testing. Explain how systematic testing is carried out. **2**

(*e*) The bank is anxious that RightIT also carries out *comprehensive* testing on the software. State what is meant by comprehensive testing. **1**

(*f*) The final version of the software is ready to be distributed to the bank. A *compiler* is chosen as the most suitable translator. Explain why a compiler is suitable at this stage. **2**

(*g*) Several months after the software has been in use, the bank asks RightIT to include another option in the menu. This option should allow customers to withdraw cash in Euros. Name the **type** of *maintenance* required and justify your answer. **2**

SECTION II (continued)

16. Sidney is an experienced programmer. He decides to write a book called "The Good Programming Guide".

(*a*) Chapter one of the book is entitled "Characteristics of a well written program". Two characteristics of a well written program are *reliability* and *efficiency*.

(i) Define the term "reliable". **1**

(ii) Explain **one** way in which a program can be written to make it efficient in terms of **processor** usage. **2**

(*b*) A well written program should make use of *parameter passing*.

(i) State the **purpose** of an *in parameter*. **1**

(ii) State the **purpose** of an *out parameter*. **1**

(*c*) Chapter two of the book is entitled "Being a team player". Sidney is keen to emphasise that on most projects there will be a team of programmers writing the software. Describe **one** example of how a programming team can ensure they will work together effectively. **2**

(*d*) Another chapter is entitled "Saving time whilst programming". A *module library* will save programmers time as they will not have to code or test these modules independently. State **one** further benefit of making use of a module library. **1**

(*e*) When working with data, the use of *1-D arrays* can save time.

(i) State **two** characteristics of a 1-D array. **2**

(ii) Data can be stored using individual variables or using a 1-D array. Describe how the use of a 1-D array can save time when writing a program compared to several individual variables. **2**

(*f*) Sidney sets a short programming challenge at the end of each chapter. One of these programs involves identifying a computing term from another computing related word. For example, "ram" from "program".

Using code from a programming environment with which you are familiar, show how you would extract the term **"ram"** from **"program"**, when "program" has been assigned to the variable called "word". **2**

(60)

word
program

[*END OF SECTION II*]

[Turn over

X206/12/01

NATIONAL QUALIFICATIONS 2012

THURSDAY, 31 MAY 9.00 AM – 11.30 AM

COMPUTING HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 12	Questions 23 to 27
Part B	Computer Networking	Page 18	Questions 28 to 31
Part C	Multimedia Technology	Page 22	Questions 32 to 35

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

SECTION II

Marks

Attempt all questions in this section.

17. Tara, who works for Consumer Friend Magazine, has produced the following table.

Consumer Friend Magazine				
Processor	Clock Speed (GHz)	MIPS	MegaFLOPs	Data Bus Width (Bits)
Inrel Core Gi	3·2	72,495	63,933	64
Atheton E	2·8	73,665	63,105	64
Motorilla T	2·0	49,924	51,150	128

NOTE: One MegaFLOP = One Million FLOPs

(*a*) Explain why clock speed alone is not considered a good measure of **processor** performance. **1**

(*b*) Tara states that the Atheton E is better than the Inrel Core Gi as it has a higher MIPS result. Explain why Tara may be incorrect. **2**

(*c*) A computer containing the Motorilla T has a 32 bit address bus, a 128 bit data bus and 24 control lines. Calculate the maximum addressable memory of this computer.

Show all working. State your answer using appropriate units. **3**

(*d*) All processors contain an *ALU* and a *control unit*.

(i) State **one** logic operation performed by the ALU. **1**

(ii) Describe the purpose of the control unit. **1**

(*e*) The manufacturers of the Inrel Core Gi are considering using a wider data bus in a new processor design. State **one** reason why this will improve processor performance. **1**

[Turn over

18. A system called EarthWatch gathers data from weather stations all over the world. Each station uses a *terminal* to enter data into the EarthWatch *mainframe*.

(*a*) Apart from the physical size or the cost of a mainframe, explain **one** difference between a mainframe with terminals and a network of computers. **2**

(*b*) The mainframe's hard disk system has been continually storing weather data for 5 years. A message appeared on the main screen stating that the data file could not be stored on the hard disk due to lack of storage space. However there is enough space on the mainframe's hard disk system.

(i) Explain the **most likely** cause of this apparent lack of storage. **2**

(ii) Name a piece of software which could solve the problem identified in (i). **1**

(iii) State the **class** of software that the item named in (ii) belongs to. **1**

(*c*) Each EarthWatch weather station contains 10 terminals connected to a file server situated 80 metres from the terminals. State a suitable transmission medium to connect the terminals to the server. Explain your reasoning. **2**

(*d*) The EarthWatch mainframe performs many memory read operations per second. Write down the steps involved in a single memory read operation. Name the *bus* or *control line*s involved at each step. **3**

19. Harry is an expert on human linguistics. He is currently studying a **data file** on his computer containing 3000 ancient Chinese characters.

(*a*) State whether this file is an *ASCII* file or a *UNICODE* file. Explain your reasoning. **2**

(*b*) Harry buys a printer to print the characters. Apart from cost, name **two** other relevant characteristics of a printer. **2**

(*c*) Harry is concerned that this data file may contain a *file virus*.

(i) Explain whether Harry's concern is justified. **2**

(ii) State what is meant by a computer virus. **1**

(iii) State **one** action of a virus. **1**

(*d*) Harry saves a picture of each character in GIF format. State **two** characteristics of the GIF format. **2**

[Turn over

20. Martin is a systems analyst. He has just been given a new project to work on.

(*a*) (i) Explain why Martin will interview the client during the *analysis* stage. **1**

(ii) State **two** other techniques that Martin may use during the analysis stage. **2**

(*b*) Martin is responsible for producing a document at the **end** of the analysis stage.

(i) Name this document. **1**

(ii) State **two** reasons why this document has to be agreed with the client before it is finalised. **2**

(*c*) Explain how a systems analyst could be involved in the **testing** stage of a project. **1**

(*d*) When Martin was at University, he earned money by being part of *independent test groups*. Explain why he cannot be part of the independent test group assigned to **this** project. **1**

(*e*) Effective testing of the software needs to be both *systematic* and *comprehensive*. Explain the terms "systematic" and "comprehensive". **2**

(*f*) Towards the end of the project, Martin is told that the project is running over budget. State the **job title** of the person who has the responsibility for the project budget. **1**

21. Over the summer, a garden centre has been running a "tallest sunflower" competition.

Entrants have completed an online entry form to provide their name and the height of their sunflower. These have been collated into two lists. Samples from these lists are shown below.

Name of entrant
Eildih Brown
Helen Atkins
Mark Ames
Jenna Wylie

Height of sunflower (metres)
2·15
1·79
2·32
1·41

(*a*) State the *data structure* and *data type* used to store the list of heights. **2**

(*b*) Using *pseudocode*, design an algorithm to find and display the **name** of the person growing the tallest sunflower. **6**

(*c*) The garden centre wants to give a consolation prize to the grower of the **shortest** sunflower. A number of changes need to be made to the pseudocode you wrote in part (*b*).

(i) State **one** change that you would make to your pseudocode from part (*b*). **1**

(ii) Explain **why** this change is necessary. **1**

[Turn over

22. A travel agent uses a suite of software to help advertise holidays and make bookings. Part of the pseudocode that was written for the software is:

```
if cost per person is less than 500
        set band to 'cheap'
end if
if cost per person is greater than or equal to 500 AND cost per person is less than 2000
        set band to 'medium'
end if
if cost per person is greater than or equal to 2000
        set band to 'expensive'
end if
```

(*a*) By using a holiday cost per person of £495, explain why this pseudocode would not produce *efficient* code. **2**

(*b*) Show how these lines could be rewritten in a more efficient way. **2**

(*c*) When the above is implemented as a subroutine, state whether the variable "cost per person" would be passed by *reference* or *value*. Justify your answer. **2**

Each holiday booking is assigned a unique reference code. The software which creates this code uses *concatenation* within a *user-defined function*.

(*d*) Explain the term *concatenation*. **1**

(*e*) Explain the term *function*. **2**

(60)

[*END OF SECTION II*]

X206/12/01

NATIONAL QUALIFICATIONS 2013

TUESDAY, 28 MAY 9.00 AM – 11.30 AM

COMPUTING HIGHER

Attempt **all** questions in Section I.

Attempt **all** questions in Section II.

Attempt **one** sub-section of Section III.

Part A	Artificial Intelligence	Page 12	Questions 23 to 28
Part B	Computer Networking	Page 18	Questions 29 to 31
Part C	Multimedia Technology	Page 24	Questions 32 to 35

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

SECTION II

Marks

Attempt all questions in this section.

18. Formula One cars make use of computing technology during races. Every Formula One car is equipped with an on-board computer which records information during a race.

(*a*) The on-board computer makes use of *solid state storage*. Other than robustness and cost, state **two** reasons why solid state storage is used. **2**

(*b*) During a race, measurements are made from temperature sensors. These sensors are connected to the on-board computer using interfaces. Name **two** functions of an interface that will be needed to transfer these measurements to the on-board computer and describe the operation of each during the transfer. **4**

Wiktoria regularly visits races to take photographs of the cars. She transfers them from her camera to her computer, edits them and uploads them to her website.

(*c*) Wiktoria has bought a 12 Gigabyte flash card. She takes 4 inch by 6 inch photographs with a resolution of 1024 dpi and using 24-bit colour depth. Calculate the maximum number of photographs which can be stored on this card.

Show all working. **4**

(*d*) Wiktoria transfers all of her pictures from the flash card to her hard disk. Name **two** functions of an operating system and describe how each will be involved in this process. **4**

(*e*) The writer of a new Formula One book discovers Wiktoria's website. He copies the pictures and puts them into his new book, which he then sells. Name the law which this writer has broken. **1**

[Turn over

19. Colin recently started to work at a university. He was given funds to select a suite of computers for his lab. The IT department gave him two options to choose from.

	MegaPCII	PeartronIII
Clock Speed	3·4 GHz	3·6 GHz
Installed RAM	4 Gigabytes	8 Gigabytes
Maximum addressable RAM	32 Gigabytes	32 Gigabytes
Hard Disk	2 Terabytes	2 Terabytes
Cache Memory	8 Megabytes	8 Megabytes
Data bus	8 bit	64 bit

(*a*) Looking at the **MegaPCII**, Colin spots an obvious typing mistake in the information given. Identify the mistake and explain why it is incorrect. **2**

(*b*) Calculate the width of the **address** bus for the **PeartronIII.** **3**

(*c*) Both systems have *cache memory*. Explain how cache memory improves system performance. **2**

(*d*) In order to make his choice, Colin uses the results of *application based tests*. State **two** reasons why Colin chose to use application based tests. **2**

Computer systems in the university are networked in a *client/server network*.

(*e*) Explain one reason why a **peer-to-peer** network may not be suitable for the university. **2**

(*f*) *Hubs* and *switches* are used in the university network. Explain **one** difference between a hub and a switch. **2**

(*g*) All university computers have *anti-virus* software installed. Anti-virus is classed as *utility software*. State **two** other utility programs which are likely to be installed. **2**

20. DeskCom create mathematics software for schools. A systems analyst from DeskCom has been sent to visit an interested school.

(*a*) Describe **two** methods the systems analyst may use to gain knowledge of the school's current system for teaching mathematics. **2**

(*b*) After the school visit, the systems analyst produces the *software specification* for creating new mathematics software for the school. State **two** purposes of this document. **2**

(*c*) The initial design for the new mathematics software was created using a *graphical design notation*. Name **one** graphical design notation. **1**

(*d*) *Top down design* and *stepwise refinement* will also be used in the design of the mathematics software. Explain the terms "top down design" and "stepwise refinement". **2**

(*e*) DeskCom programmers will consider many factors when deciding which programming language to use to code the new software. Describe **one** factor they should consider when choosing a programming language. **1**

(*f*) It is important that the new mathematics software is *efficient*. Describe **two** items of **evidence** that could be gathered to support measurement of the efficiency of code. **2**

[Turn over

21. ModernCorp manufacture tablet computers. Their recent sales initiative is shown.

Tablet Computer Price	Discount Rate %
<=£500	10
>£500 and <£1000	12
>=£1000	15

A program is to be created to calculate the **discount rate** due.

(*a*) The price of a tablet computer is held in the variable **price**. The discount to be applied is stored in the variable **discountRate**. Use **pseudocode** to design an algorithm, which uses a *CASE* statement (or equivalent) to assign the correct discount rate. **3**

MoodyZak is software which comes free with a ModernCorp tablet computer. MoodyZak creates a song list from stored music based on data entered about the user's mood. Mood data is entered into MoodyZak, through a touch screen, on a list of check boxes.

(*b*) State a *data structure* and *data type* that could be used to record the mood list for a single song. **2**

(*c*) The use of a *declarative* programming language was considered for the creation of MoodyZak. Explain why a declarative programming language might be suitable in this case. **2**

(*d*) The use of check boxes as the input for MoodyZak is an *event driven* feature. State the meaning of the term "event driven". **1**

(*e*) The author of the MoodyZak code did not provide any supporting documentation. Only the compiled program, the program listing and a software licence were provided. Describe **two** examples of problems that this missing documentation could cause. **2**

22. A horse race produced the set of results shown below. The names and times are held as two lists.

Name	Mister McGee	Kelly's Hero	Fred's Folly	The Tool Inns	Fizzy Lizzie
Time: *Minutes*	8·15	7·12	8·65	9·15	7·08

(*a*) (i) Use **pseudocode** to design an algorithm that would store the **time** of the **winning** horse in the variable **Fastest**. **4**

(ii) The time for the **Slowest** horse is also to be identified. Other than the change of variable name, state **one** change that would have to be made to your algorithm for part (i) to achieve this. **1**

(iii) The number of horses who have a race time greater than 8 minutes is also to be identified. State the name of a *standard algorithm* that could achieve this. **1**

(*b*) Explain why a *compiler* makes more efficient use of the processor when compared to an *interpreter* during translation/execution of a loop. **2**

(*c*) *Systematic* and *comprehensive testing* can be used to test progams.

(i) State the meaning of **systematic** testing. **1**

(ii) State the meaning of **comprehensive** testing. **1**

(60)

[Turn over

[*END OF SECTION II*]