COMPUTER SCIENCE

Paper 9608/11
Written Paper

Key messages

Candidates must use appropriate technical terminology and precision in answering questions. At this level of study only precise answers can receive credit.

Candidates should be encouraged to write their answers clearly in the spaces provided on the examination paper. Candidates using additional sheets or blank spaces within the examination paper must indicate that the answer is continued on the additional sheets. Candidates must also cross out earlier attempts or clearly indicate the answer to be marked.

There were two questions where candidates were asked to write SQL statements. The best way to prepare candidates for questions on this topic is to use simple databases which they can query by writing straightforward SQL scripts. It is not advisable to set up the query using a QBE grid and then examining the SQL code automatically produced by the database software. This code is unnecessarily complex for the level of answers that candidates would be expected to provide on this paper. If suitable software is not available, there are a number of excellent online resources that could be used.

Some candidates continue to answer in pencil and then overwrite their answers in ink which results in a double image and so makes some responses very difficult to read when the scripts are scanned. Pencil marks should be completely removed. It is preferable that candidates complete all rough work on blank areas within the question paper or on a separate sheet and that this rough working is crossed through. The use of fibre tipped pens is also to be avoided as often the ink soaks through to the other side of the page.

General comments

It is very important that the question stem is read carefully and the key words highlighted. Some of these key words will indicate the type of answer required, either a single statement or more extended prose, and others indicate the context in which the question has been set. Identifying and understanding these key words will help candidates to give more appropriate answers to the questions on the examination paper. Several questions on this paper, for example, **Question 2(b)**, and **Question 7(c)** required answers or examples in a particular context. Generalised responses or responses in a different context are unacceptable.

Careful reading of the question stem will often indicate to candidates, the answers that should be avoided, as for example in **Question 7(c)(v)** where one of the possible answers is provided as an example in the stem of the question.

It is important that instructions given in questions are followed correctly. For example, in **Question 2(b)** and **Question 5(b)(i)**, specific instructions were given about how the question should be answered.

There is still considerable misunderstanding regarding the terms **data** and **information**. Candidates need to be aware of the difference and make sure that they use the correct terminology when answering questions.

Comments on specific questions

Question 1

(a) This question was very well answered, with the majority of candidates able to correctly identify the relationship as many-to-one.

(b) (i) The majority of candidates correctly identified the missing attribute in the table design.

(ii) This question was very well answered with the majority of candidates able to correctly explain how the relationship was implemented.

(c) (i) This question was very well answered with the majority of candidates able to correctly identify the relationship as many-to-many.

(ii) Many candidates found this question challenging. Candidates need to improve their understanding of the construction of the link entity used when a many-to-many relationship is implemented in a relational database. They also need to realise that as well as being included as foreign keys, the primary keys of the other two entities are, usually, combined to construct a composite primary key for the linking table. A common incorrect answer included Specialism in the link table as the primary key.

(iii) Many candidates need to improve their understanding of the implementation of a many-to-many relationship in a relational database. The 'many' end of both of the two one-to-many relationships required is at the link entity, not at the original entity. The most common incorrect answer was to reverse these relationships. Candidates should be aware credit will not be given for re-drawing a relationship that has been given on the question paper, as in part **(c)(i)**.

(d) (i) This SQL question was well answered with a number of candidates providing completely correct solutions. The most common mistakes were to write the clauses in the wrong order and omitting the final semi-colon. Candidates must understand that where table definitions are given in the question attribute names used in answers must be copied exactly as given.

(ii) Many candidates understood how to update a record in a database using SQL. Others did not understand this even though the initial keywords were given in the question. Candidates need to improve their understanding of the `UPDATE` command; the most common errors in otherwise correct statements were the omission of quotation marks on 'Chi' and '076'.

Question 2

(a) (i) The majority of candidates were able to correctly identify statement **C** as the one missing from position 2. Many of the candidates need to improve their understanding of the operation of a laser printer. The most common incorrect sequence for steps 5, 6 and 7 was **D B A**, thus discharging the drum before the permanent image is formed.

(ii) A significant number of candidates correctly identified the most appropriate printer as an inkjet printer. Candidates need to be careful with the spelling of technical terms; a common mistake was to write 'inject printer' instead of 'inkjet printer'.

(b) This is a question where the context needed to be considered carefully. Candidates were told in the question that a user is considering the purchase of a new laptop and is considering **internal** secondary storage, so they should understand that answers must be devices suitable for this scenario. A common misunderstanding was to use some variation of a USB pen drive, which is not appropriate as internal storage.

Many of the answers given for the second part of the question were not **advantages** of the device chosen, but were equally applicable to both devices. Answers such as 'a hard disk has a large capacity' are simply too vague and imprecise for credit at this level.

There was a clear instruction given in the stem of this question to circle the device chosen. Candidates must ensure that they read the question carefully and follow such an instruction otherwise the choice of device could be misinterpreted.

Question 3

(a) Many candidates correctly defined the term 'sampling rate' and were able to expand on the definition. The question asked for an explanation which required additional information. Many candidates realised that improving the sampling rate would result in a more accurate representation of the sound, but statements were often given in terms of sound quality, which is too vague. There was considerable confusion between **sampling rate** and **sampling resolution**. Candidates should be aware that at this level of study answers which just reword the terminology such as 'sampling rate is the rate of taking samples' are not enough to gain credit.

(b) (i) Many candidates found defining a pixel quite challenging. A common theme was to give a circular definition that used the term 'pixel' to try to describe a pixel. The definition for the screen resolution was much better understood, with the majority of candidates giving a correct definition.

(ii) The majority of candidates need to understand that a monochrome bitmap has just two colours, black and white, so only one bit is required to store each pixel, hence eight pixels may be stored in one byte.

(iii) As calculators are not allowed on this paper, it is not expected that extended calculations will be carried out. Most of the marks are awarded for the method rather than the answer. All the numbers used in this question were powers of 2 and so simplification of the final calculation should have been straightforward. Most candidates correctly multiplied the width and height of the bitmap to obtain the total number of pixels, but a greater understanding is needed of how to convert the number of pixels to file size in kilobytes.

(iv) Candidates must read questions carefully. The majority of candidates understood that one of the reasons that the file size would be bigger than the calculated value was because of the file header, but the question asked for a **data item** stored in the file. The file header is not a single data item.

Question 4

(a) (i) There were many correct answers to this part question. Others appeared to be confused and had loaded the contents of address 500, giving the answer 496 instead of loading the denary value 500.

(ii) The majority candidates provided the correct answer.

(iii) A number of candidates will need to improve their understanding of indexed addressing. The most common incorrect answer to this part question was 499, found by adding the contents of the index register (3) to the **contents** of address 500 (496) rather than taking the contents of address (500 + 3).

(iv) The majority of candidates provided the correct answer.

(b) The majority of candidates able to correctly convert the instructions and denary values into 8-bit binary.

(c) The majority of candidates understood that the biggest number that could be stored in 8-bit binary was 1111 1111, that is, 255 in denary. Others need to improve their understanding of the number of different values that this represents. The most common incorrect answer was 255, where candidates omitted to include zero as a possible memory location.

(d) (i) Many candidates able to correctly convert the binary values to hexadecimal. Some candidates need to improve their understanding of the hexadecimal number system. Common errors were to omit the leading zero in the first value and to put B2 instead of C2.

(ii) Many candidates were correctly able to convert the hexadecimal value to the correct assembly language instruction. A number of candidates will need to improve their understanding of the format of assembly language instructions; a common incorrect answer was `LDR #63`. Candidates must be aware that where a table of assembly language instructions is given in the question, answers should conform to the syntax of those instructions.

Question 5

(a) (i) Many candidates were able to correctly describe the meaning of **odd parity**, and how the data logger would calculate the parity bit for each byte. Many candidates confused odd and even parity and the value of the parity bit when the number of ones in the other seven bits was odd. Many candidates need to improve their understanding in this area.

(ii) The majority of candidates correctly gave the missing parity bits.

(iii) In general, candidates found this question challenging. Candidates need to improve their understanding of the way in which a parity byte can be used to check a block of data after transmission. A common incorrect response described a checksum rather than a parity check.

(b) (i) Some candidates found this question challenging. A frequent error was to circle the bit corresponding to the incorrect column in the parity byte, but then not to repeat the parity checking exercise with each byte in the data block in order to complete the intersection.

(ii) Some candidates who found part **(b)(i)** challenging also had difficulty explaining how they arrived at the answer. Many candidates were able to correctly explain how to check the parity both vertically and horizontally. An area where candidates need to improve their understanding is when describing the significance of the intersection of the rows and columns with incorrect parity.

Question 6

(a) The majority of candidates correctly linked each task to the appropriate user action. There was some confusion between the action that would be completed by the memory management and that completed by the secondary storage management.

(b) A small number of candidates used the brand names of software rather than the generic name for this question. These candidates should be aware of the instruction on the front cover of the examination paper that states that 'No marks will be awarded for using brand names of software packages or hardware'.

(i) The majority of candidates correctly answered this question.

(ii) The majority of candidates correctly answered this question.

(iii) The majority of candidates need to understand that it is disk repair software that is required in this instance.

(iv) The majority of candidates correctly answered this question.

Question 7

(a) Some candidates found this question challenging. Candidates should be aware that answers that re-write the question such as, 'client-side scripting means running a script on the client' will not gain credit at this level. There needs to be some identification of the client and what is meant by a script within a web page.

(b) There were some excellent, detailed answers to this question, and some candidates clearly understood exactly how a URL and DNS are used to locate the address of a resource. There appeared to be considerable confusion about exactly what the DNS was returning. Candidates need to improve their understanding of how the DNS operates and that it is an IP address that is returned, not the actual resource, and what happens when the IP address is used to request the web page and the web page containing the script is subsequently returned to the user's web browser.

(c) (i) The majority of candidates able to correctly identify the variables used. Care must be taken to ensure that spelling, case etc.… are copied exactly when using identifiers given in the question.

(ii) The majority of candidates correctly identified the lines of code. Others need to improve their understanding of the difference between HTML and JavaScript. A common incorrect answer included line 33, which is HTML.

(iii) The majority of candidates were able to correctly identify the line number of the condition.

(iv) A small number of candidates correctly described the validation check as checking that the product code input had not been left empty. Candidates need to understand that when given a coded example such as this answers should be specific to the code given, generic answers such as, 'checking that the input is acceptable' are just too vague to be awarded any marks.

(v) The majority of candidates were able to name two suitable validation checks. The question clearly states, '...validation check which could be appropriate **for this data capture form**'. Descriptions of the checks were very often generic and did not relate to the context given in the question. A description of a range check that says, 'checking that the value is in the correct range' is far too generalised and vague for credit at this level. There was considerable confusion between a presence check and an existence check. Often, an existence check was named, but a presence check described.

COMPUTER SCIENCE

Paper 9608/12
Written Paper

Key messages

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There were two questions where candidates were asked to write SQL statements. The best way to prepare candidates for questions on this topic is to use simple databases which they can query by writing straightforward SQL scripts. It is not advisable to set up the query using a QBE grid and then examining the SQL code automatically produced by the database software. This code is unnecessarily complex for the level of answers that candidates would be expected to provide on this paper. If suitable software is not available, there are a number of excellent online resources that could be used.

Some candidates continue to answer in pencil and then overwrite their answers in ink which results in a double image and so makes some responses very difficult to read when the scripts are scanned. Pencil marks should be completely removed. It is preferable that candidates complete all rough work on blank areas within the question paper or on a separate sheet and that this rough working is crossed through. The use of fibre tipped pens is also to be avoided as often the ink soaks through to the other side of the page.

General comments

It is very important that the question stem is read carefully, and the key words highlighted. Some of these key words will indicate the type of answer required, either a single statement or more extended prose, and others will indicate the context in which the question has been set. Identifying and understanding these key words will help candidates to give more appropriate answers to the questions on the examination paper. Several of the questions on this paper, for example, **Question 2 (c)**, and **Question 6 (a)** required answers or examples in a particular context. Generalised responses or responses in a different context are unacceptable.

Careful reading of the question stem will also indicate to candidates, answers that should be avoided. For example, in **Question 4 (a)(ii)**, one of the possible answers is provided as an example in the stem of the question.

It is important that instructions given in questions are followed correctly. For example, in **Question 1 (b)(ii)** and **Question 2 (c)(ii)**, specific instructions were given about how the question should be answered.

There is still considerable confusion between the terms **data** and **information**. Candidates need to be aware of the difference and make sure that they use the correct terminology when answering questions.

Comments on specific questions

Question 1

(a) This question was very well answered with the majority of candidates able to correctly identify the relationship as many-to-many.

(b) (i) The majority of candidates were able to correctly identify the entities. Care must be taken to ensure correct spelling when copying names given in the question. Many candidates need to improve their understanding of the implementation of a many-to-many relationship in a relational database. The 'many' end of both of the two one-to-many relationships required is at the link entity, not at the original entity. The most common incorrect answer was to reverse these relationships.

(ii) The majority of candidates were able to correctly identify the primary keys of the `SHOP` and `SUPPLIER` tables and a foreign key in the `SHOP-SUPPLIER` table. Candidates need to improve their understanding of the construction of the link entity used when a many-to-many relationship is implemented in a relational database, and understand that as well as being included as foreign keys, the primary keys of the other two entities are, usually, combined to construct a composite primary key for the linking table. Candidates also need to be aware that at this level of study, simply saying as an explanation of a foreign key that, 'it is a primary key in another table' is not enough. There needs to be at least some reference to the links formed.

There was a clear instruction given in the stem of this question to write 'None' if there was no foreign key in a table. Candidates must ensure that they read the question carefully and follow such an instruction otherwise empty cells in the table could be interpreted as no attempt having been made to give an answer.

(iii) Only a very few candidates recognised that a secondary key is used for efficient searching. Many candidates need to improve their understanding of secondary keys. There was considerable confusion between a **secondary** key and a **foreign** key.

(c) (i) This SQL question was well answered with a number of complete, correct solutions. The most common mistakes were to use `Specialism` instead of `RetailSpecialism` in the `WHERE` clause and omitting the final semi-colon (;). Candidates must understand that where table definitions are given in the question attribute names used in answers to questions must be copied exactly as given.

(ii) A small number of candidates understood how to add data to a database using SQL. Candidates need to improve their understanding of the `'INSERT INTO'` command. The most common incorrect answer was to try to amend the existing data instead of adding a new record.

Question 2

(a) The majority of candidates knew that an inkjet printer is a line printer and that a laser printer is a page printer. There was considerable confusion about whether either of them is an impact printer.

(b) (i) There were a few excellent answers to this question, with some candidates giving very complete answers regarding the use of the print head during operation of an inkjet printer. Other candidates need to improve their understanding of this topic. There was considerable confusion with the operation of laser printers and other printer technologies. Candidates also need to be aware of the need to answer the question set on the examination paper. Many candidates offered vague generic descriptions about data being sent to printer buffers and the print head printing the document, which did not answer the question.

(ii) Candidates generally seemed to understand the role of the stepper motor a little better. Many candidates were able to give an answer referring to the movement of paper through the printer. There is a need for better understanding of the other uses of a stepper motor in an inkjet printer.

(c) (i) This is a question where the context needed to be considered carefully. Candidates were informed in the question that a student has a laptop and needs an external storage device, so they should understand that answers must be devices suitable for this scenario. It is also a question where the terminology used must be carefully chosen. A considerable number of candidates offered just 'USB' or 'Universal Serial Bus' as a device, which is clearly not a storage device.

(ii) Many of the answers given for this part question were not **advantages** of the device chosen, but were equally applicable to many other devices. Answers such as 'a hard disk has a large capacity' or 'a pen-drive is portable' are simply too vague and imprecise for credit at this level.

There was a clear instruction given in the stem of this question to circle the device chosen. Candidates must ensure that they read the question carefully and follow such an instruction otherwise the choice of device could be misinterpreted.

Question 3

(a) Many candidates correctly defined the term 'sampling resolution' and were able to expand on the definition. The question asked for an explanation, so additional information was required. Some candidates realised that improving the sampling resolution would result in a more accurate representation of the sound. Statements were often provided in terms of sound quality. There was considerable confusion between sampling resolution and sampling rate.

(b) (i) The majority of candidates were able to correctly define the term 'image resolution'. Others provided an incorrect answer such as 'bits per pixel'.

(ii) The majority of candidates need to understand that a 16-colour bitmap does not mean that 16 bits are used to store each colour, but that 16 different values are required, one for each colour.

(iii) Candidates are not allowed to use calculators on this paper, so it is not expected that extended calculations will be carried out. The majority of the marks are awarded for the method rather than the answer. Simplification of the final calculation should have been straightforward as all the numbers used in this question were powers of 2. Most candidates correctly multiplied the width and height of the bitmap to obtain the total number of pixels. Candidates need a greater understanding of how to convert the number of pixels to file size in kilobytes.

(iv) Most candidates were able to state at least one and usually two items of data stored in the file header.

Question 4

(a) (i) The majority of candidates were able to give one good reason why a personal computer (PC) needs an operating system. Many candidates need to be aware that in order to achieve both marks it is necessary to provide either a second reason or an expansion of the first. Answers such as 'the operating system helps programs run' are too imprecise for credit at this level. The most popular correct answer was the provision of an interface. The question asked **why** a PC needs an operating system, so listing the functions of the operating system did not answer the question.

(ii) Many candidates were able to correctly name two **other** operating system management tasks. Others did not fully read the question and so included management of the processor as one of their answers. Candidates need to improve their understanding of the purpose of each of the management functions. Descriptions were often too vague and imprecise to be given credit at this level. There was considerable confusion between 'memory management' and 'secondary storage management', with candidates often putting memory management as the name of the task, and then describing the management of secondary storage.

(b) A small number of candidates used the brand names of software rather than the generic name in this question. These candidates should be aware of the instruction on the front cover of the examination paper that states that 'No marks will be awarded for using brand names of software packages or hardware'.

(i) The majority of candidates correctly answered this question.

(ii) The majority of candidates correctly answered this question.

(iii) Many candidates correctly identified a defragmenting program as the required utility software. Many candidates need to improve their understanding of how a disk formatting program works. There seemed to be little understanding that re-formatting the disk would delete all the existing data. Care must be taken too to write the name of the software correctly. A significant number of candidates wrote 'disc/disk fragmentation software' instead of 'disk **de**fragmentation software'.

(iv) The majority of candidates correctly answered this question.

Question 5

(a) (i) The majority of candidates correctly answered this question.

(ii) There were many correct answers to this part question. Some candidates loaded the contents of address 355 and gave the answer 351 instead of loading the denary value 355.

(iii) Some candidates need to improve their understanding of indexed addressing. The most common incorrect answer to this part question was 92, where the contents of the index register (6) had been added to the **contents** of address 351 (86) rather than taking the contents of address (351 + 6).

(iv) The majority of candidates correctly answered this question.

(b) The majority of candidates were able to correctly convert the instructions and denary values to 8-bit binary. A common incorrect answer was the conversion of 7 in denary to `000 1101` in binary.

(c) (i) Many candidates able to correctly convert the binary values to hexadecimal. Some candidates need to improve their understanding of the hexadecimal number system. Common errors were to convert the leftmost 8-bit binary pattern to denary and to put 22 instead of 14 or to put 5D rather than 5E.

(ii) Many candidates were correctly able to convert the hexadecimal value to the correct assembly language instruction. Some candidates need to improve their understanding of hexadecimal to denary conversion. A common incorrect answer was LDR 413, where the hexadecimal 4D had been incorrectly converted to 413 in denary.

Question 6

(a) **C**andidates were given a specific context in the question and responses were expected in that context. The question clearly states 'Describe what is meant … **for this application**'. Most candidates overlooked that instruction and gave generic responses that did not answer this question.

(b) The majority of candidates correctly identified the first three missing steps in the sequence. Others need to improve their understanding of the process to display a web page consisting of just HTML tags and text. The most common answers for the last step in the sequence were **A** or **C**, both of which are incorrect because they were concerned with the translation of a script.

(c) (i) The majority of candidates able to correctly identify the variables used.

(ii) The majority of candidates were able to correctly identify the lines of code. Others need to improve their understanding of the difference between HTML and JavaScript. A common incorrect answer included line 35, which is HTML.

(iii) The majority of candidates correctly answered this question.

(iv) A very small number of candidates correctly described the validation check as looking for the letters VAR or CAM at the beginning of the `RunnerID`. The majority of candidates need to understand that when given a coded example such as this answers should be specific to the code given, generic answers such as, 'checking that the input is acceptable' are just too vague to be awarded any marks.

(v) The majority of candidates were able to name two suitable validation checks. The question clearly says, '…validation check which could be appropriate **for this data capture form**'. Descriptions of the checks were very often generic and did not relate to the context given in the question. A description of a range check that says, 'checking that the value is in the correct range' is far too generalised and

vague for credit at this level. There was considerable confusion between a presence check and an existence check. Often, an existence check was named, but a presence check described.

COMPUTER SCIENCE

Paper 9608/13
Written Paper

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Careful reading of the question stem will often indicate to candidates, the answers that should be avoided, as for example in **Question 7(c)(v)** where one of the possible answers is provided as an example in the stem of the question.

It is important that instructions given in questions are followed correctly. For example, in **Question 2(b)** and **Question 5(b)(i)**, specific instructions were given about how the question should be answered.

There is still considerable misunderstanding regarding the terms **data** and **information**. Candidates need to be aware of the difference and make sure that they use the correct terminology when answering questions.

Comments on specific questions

Question 1

(a) This question was very well answered, with the majority of candidates able to correctly identify the relationship as many-to-one.

(b) (i) The majority of candidates correctly identified the missing attribute in the table design.

(ii) This question was very well answered with the majority of candidates able to correctly explain how the relationship was implemented.

(c) (i) This question was very well answered with the majority of candidates able to correctly identify the relationship as many-to-many.

(ii) Many candidates found this question challenging. Candidates need to improve their understanding of the construction of the link entity used when a many-to-many relationship is implemented in a relational database. They also need to realise that as well as being included as foreign keys, the primary keys of the other two entities are, usually, combined to construct a composite primary key for the linking table. A common incorrect answer included Specialism in the link table as the primary key.

(iii) Many candidates need to improve their understanding of the implementation of a many-to-many relationship in a relational database. The 'many' end of both of the two one-to-many relationships required is at the link entity, not at the original entity. The most common incorrect answer was to reverse these relationships. Candidates should be aware credit will not be given for re-drawing a relationship that has been given on the question paper, as in part **(c)(i)**.

(d) (i) This SQL question was well answered with a number of candidates providing completely correct solutions. The most common mistakes were to write the clauses in the wrong order and omitting the final semi-colon. Candidates must understand that where table definitions are given in the question attribute names used in answers must be copied exactly as given.

(ii) Many candidates understood how to update a record in a database using SQL. Others did not understand this even though the initial keywords were given in the question. Candidates need to improve their understanding of the `UPDATE` command; the most common errors in otherwise correct statements were the omission of quotation marks on 'Chi' and '076'.

Question 2

(a) (i) The majority of candidates were able to correctly identify statement **C** as the one missing from position 2. Many of the candidates need to improve their understanding of the operation of a laser printer. The most common incorrect sequence for steps 5, 6 and 7 was **D B A**, thus discharging the drum before the permanent image is formed.

(ii) A significant number of candidates correctly identified the most appropriate printer as an inkjet printer. Candidates need to be careful with the spelling of technical terms; a common mistake was to write 'inject printer' instead of 'inkjet printer'.

(b) This is a question where the context needed to be considered carefully. Candidates were told in the question that a user is considering the purchase of a new laptop and is considering **internal** secondary storage, so they should understand that answers must be devices suitable for this scenario. A common misunderstanding was to use some variation of a USB pen drive, which is not appropriate as internal storage.

Many of the answers given for the second part of the question were not **advantages** of the device chosen, but were equally applicable to both devices. Answers such as 'a hard disk has a large capacity' are simply too vague and imprecise for credit at this level.

There was a clear instruction given in the stem of this question to circle the device chosen. Candidates must ensure that they read the question carefully and follow such an instruction otherwise the choice of device could be misinterpreted.

Question 3

(a) Many candidates correctly defined the term 'sampling rate' and were able to expand on the definition. The question asked for an explanation which required additional information. Many candidates realised that improving the sampling rate would result in a more accurate representation of the sound, but statements were often given in terms of sound quality, which is too vague. There was considerable confusion between **sampling rate** and **sampling resolution**. Candidates should be aware that at this level of study answers which just reword the terminology such as 'sampling rate is the rate of taking samples' are not enough to gain credit.

(b) (i) Many candidates found defining a pixel quite challenging. A common theme was to give a circular definition that used the term 'pixel' to try to describe a pixel. The definition for the screen resolution was much better understood, with the majority of candidates giving a correct definition.

(ii) The majority of candidates need to understand that a monochrome bitmap has just two colours, black and white, so only one bit is required to store each pixel, hence eight pixels may be stored in one byte.

(iii) As calculators are not allowed on this paper, it is not expected that extended calculations will be carried out. Most of the marks are awarded for the method rather than the answer. All the numbers used in this question were powers of 2 and so simplification of the final calculation should have been straightforward. Most candidates correctly multiplied the width and height of the bitmap to obtain the total number of pixels, but a greater understanding is needed of how to convert the number of pixels to file size in kilobytes.

(iv) Candidates must read questions carefully. The majority of candidates understood that one of the reasons that the file size would be bigger than the calculated value was because of the file header, but the question asked for a **data item** stored in the file. The file header is not a single data item.

Question 4

(a) (i) There were many correct answers to this part question. Others appeared to be confused and had loaded the contents of address 500, giving the answer 496 instead of loading the denary value 500.

(ii) The majority candidates provided the correct answer.

(iii) A number of candidates will need to improve their understanding of indexed addressing. The most common incorrect answer to this part question was 499, found by adding the contents of the index register (3) to the **contents** of address 500 (496) rather than taking the contents of address (500 + 3).

(iv) The majority of candidates provided the correct answer.

(b) The majority of candidates able to correctly convert the instructions and denary values into 8-bit binary.

(c) The majority of candidates understood that the biggest number that could be stored in 8-bit binary was 1111 1111, that is, 255 in denary. Others need to improve their understanding of the number of different values that this represents. The most common incorrect answer was 255, where candidates omitted to include zero as a possible memory location.

(d) (i) Many candidates able to correctly convert the binary values to hexadecimal. Some candidates need to improve their understanding of the hexadecimal number system. Common errors were to omit the leading zero in the first value and to put B2 instead of C2.

(ii) Many candidates were correctly able to convert the hexadecimal value to the correct assembly language instruction. A number of candidates will need to improve their understanding of the format of assembly language instructions; a common incorrect answer was `LDR #63`. Candidates must be aware that where a table of assembly language instructions is given in the question, answers should conform to the syntax of those instructions.

Question 5

(a) (i) Many candidates were able to correctly describe the meaning of **odd parity**, and how the data logger would calculate the parity bit for each byte. Many candidates confused odd and even parity and the value of the parity bit when the number of ones in the other seven bits was odd. Many candidates need to improve their understanding in this area.

(ii) The majority of candidates correctly gave the missing parity bits.

(iii) In general, candidates found this question challenging. Candidates need to improve their understanding of the way in which a parity byte can be used to check a block of data after transmission. A common incorrect response described a checksum rather than a parity check.

(b) (i) Some candidates found this question challenging. A frequent error was to circle the bit corresponding to the incorrect column in the parity byte, but then not to repeat the parity checking exercise with each byte in the data block in order to complete the intersection.

(ii) Some candidates who found part **(b)(i)** challenging also had difficulty explaining how they arrived at the answer. Many candidates were able to correctly explain how to check the parity both vertically and horizontally. An area where candidates need to improve their understanding is when describing the significance of the intersection of the rows and columns with incorrect parity.

Question 6

(a) The majority of candidates correctly linked each task to the appropriate user action. There was some confusion between the action that would be completed by the memory management and that completed by the secondary storage management.

(b) A small number of candidates used the brand names of software rather than the generic name for this question. These candidates should be aware of the instruction on the front cover of the examination paper that states that 'No marks will be awarded for using brand names of software packages or hardware'.

(i) The majority of candidates correctly answered this question.

(ii) The majority of candidates correctly answered this question.

(iii) The majority of candidates need to understand that it is disk repair software that is required in this instance.

(iv) The majority of candidates correctly answered this question.

Question 7

(a) Some candidates found this question challenging. Candidates should be aware that answers that re-write the question such as, 'client-side scripting means running a script on the client' will not gain credit at this level. There needs to be some identification of the client and what is meant by a script within a web page.

(b) There were some excellent, detailed answers to this question, and some candidates clearly understood exactly how a URL and DNS are used to locate the address of a resource. There appeared to be considerable confusion about exactly what the DNS was returning. Candidates need to improve their understanding of how the DNS operates and that it is an IP address that is returned, not the actual resource, and what happens when the IP address is used to request the web page and the web page containing the script is subsequently returned to the user's web browser.

(c) (i) The majority of candidates able to correctly identify the variables used. Care must be taken to ensure that spelling, case etc.… are copied exactly when using identifiers given in the question.

(ii) The majority of candidates correctly identified the lines of code. Others need to improve their understanding of the difference between HTML and JavaScript. A common incorrect answer included line 33, which is HTML.

(iii) The majority of candidates were able to correctly identify the line number of the condition.

(iv) A small number of candidates correctly described the validation check as checking that the product code input had not been left empty. Candidates need to understand that when given a coded example such as this answers should be specific to the code given, generic answers such as, 'checking that the input is acceptable' are just too vague to be awarded any marks.

(v) The majority of candidates were able to name two suitable validation checks. The question clearly states, '...validation check which could be appropriate **for this data capture form**'. Descriptions of the checks were very often generic and did not relate to the context given in the question. A description of a range check that says, 'checking that the value is in the correct range' is far too generalised and vague for credit at this level. There was considerable confusion between a presence check and an existence check. Often, an existence check was named, but a presence check described.

COMPUTER SCIENCE

Paper 9608/21
Written Paper

Key messages

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There were some excellent programming solutions. It was clear that a significant number of candidates did not have sufficient practical programming experience prior to this examination.

This is a technical subject and makes use of many technical words and phrases. These have specific, defined meanings and it is important that these are used correctly. It is also important that candidates use the correct syntax when writing or explaining algorithms using pseudocode. They particularly need to appreciate when it is appropriate to use the assignment operator '←' as opposed to the equality operator '='.

General comments

If a candidate writes the answer to a question on an additional page or booklet, they must indicate where their revised answer is to be found. If answers have been crossed out, the new answers must be written clearly so that Examiners can easily read the text and award the appropriate mark. Many candidates make use of blank pages for rough work when preparing their final answer. In these cases, it is extremely helpful if this text is crossed out.

Visual Basic (console mode) and Python were equally popular languages, with only a very small minority using Pascal (console mode). As stated in the pre-release material, no marks were awarded for programming answers that did not use one of these three languages.

Python solutions were often the clearest, but there were also a number of excellent Visual Basic responses.

Candidates who offer solutions using Python need to take care to maintain the correct indentation, as this is crucial to defining the program structure.

It is recommended that the following specific comments be read in conjunction with the published mark scheme for this paper.

Comments on specific questions

Question 1

(a) The majority of candidates appeared to be unfamiliar with the terminology. A significant number of candidates could not name the last two stages.

Descriptions were generally inadequate, with many candidates simply repeating the name of the stage. Effective exam technique requires candidates to be able to describe something without using the word itself.

Many candidates were able to give correct examples, although often the syntax was incorrect. The following erroneous example was seen on several occasions:

```
INPUT "Your name"
```

(b) (i) Most candidates answered this correctly. The most common mistake was to suggest the data type should be string.

(ii) Many candidates answered this correctly, but a significant number lost the mark by adding the word 'gate'. Candidates should understand that a logic gate is a piece of hardware.

Several candidates incorrectly suggested 'selection' as the operator type.

(iii) Most candidates achieved full marks for this question. A small number of candidates gave '1' or '0' instead of 'True' or 'False'. This is ambiguous and should be discouraged.

(c) Many candidates are either unfamiliar with the concept of a pre-condition loop, or did not understand that this was what the question asked for.

The majority of candidates opted for using the `MOD()` function for deciding whether a number was even, rather than adopting the simpler solution of starting with an even number and adding 2 each time around the loop. Many candidates used the `MOD()` function incorrectly even though the definition was given in the appendix.

A common mistake was to only increment the counter in the '`ELSE`' clause as shown which then resulted in an infinite loop which output the same number repeatedly.

```
MyCount ← 100

WHILE MyCount < 201
   IF MOD(MyCount, 2) = 0
      THEN
         OUTPUT MyCount
      ELSE
         MyCount ← MyCount + 1
   ENDIF
ENDWHILE
```

The incorrect use of '=' in place of '←' for an assignment was seen frequently.

Question 2

(a) This question was not answered well. There were a wide variety of incorrect terms suggested.

(b) The majority of candidates correctly identified the data type of Boolean for `UserIDFound` and `PasswordValid`, and many also correctly identified the other two identifiers as strings. Some candidates thought that the ID field could be an Integer but as the question does not specify the format it cannot be assumed that it is numeric.

Most candidates gained the mark for the description of `PasswordInput`, as this was a simple variant of the description given in the question. Only a few candidates gave detailed enough descriptions for the last two identifiers, omitting to say *where* the `UserID` had been found or what the `PasswordInput` matched. Candidates should be reminded that a description needs to be more than simply a repeat of the identifier name in sentence form.

Several candidates incorrectly attributed an action to an identifier.
For example, `PasswordValid` outputs `TRUE` if the input password matches the one in the file.

(c) This question allowed those candidates who could construct algorithms but are not able to write actual programs an opportunity to gain marks.

The majority of candidates did not seem to appreciate that a problem needs to be broken down into smaller steps. Many offered pseudocode solutions and a few gave answers written in program code. These were given credit on this occasion.

Some answers commonly included very vague statements, such as "search for UserID in the file", further indicating that the candidate did not appreciate the concept of stepwise refinement.

More able candidates realised that a loop was needed to successively read lines from the file. Here, the loop often included tests for end of file and a check on whether the ID had been found.

Question 3

There were mixed responses to this question. The majority of candidates had no problem understanding the pseudocode and "filling in the gaps".

Common problems included:

- parameter declaration
- the use of a large space within quotation marks to indicate an empty string
- syntax errors in assignment and concatenation
- the use of `OUTPUT` instead of `RETURN`

Question 4

(a) This question was generally not answered well. Those candidates that gained marks usually did so by referring to 'parameters / variables passed between modules'. References to program hierarchy or the relationship between modules were rare.

A significant number of candidates appeared to offer programming terms which did not relate to this question.

(b) Another question that attracted mixed responses. Those that understood what was required usually gained three marks, and a common mistake was to attempt to use an integer to pass the decimal data item.

Question 5

This question attracted a wide range of responses.

Weaker candidates often gained marks only for the procedure header and declaration of an index variable. More able candidates included a loop, although many of these were count-controlled rather than conditional on some form of `EOF()` test. A surprising number of candidates were unable to produce program code for simple file and array handling. The 'Open file' syntax often lacked the detail for 'read mode'.

There was a noticeable tendency for candidates to use non-existent 'shortcut' functions to implement a solution. This was particularly noticeable in the case of Python solutions. Candidates should be made aware that these questions are designed to have solutions that do not involve obscure or exotic functions.

A small number of candidates provided perfect solutions, usually in Python or VB.

Question 6

(a) This question also attracted a wide range of responses.

Although the question stated that the function takes a password as a parameter, many solutions went on to ask the user to input the password using a different variable.

Most candidates were able to initialise the 3 counters and / or declare them as integers.

A minority of candidates were able to correctly identify upper-case, lower-case or numeric characters.

In general, candidates made life difficult for themselves when it came to checking individual characters. Many candidates attempted to convert each character to its ASCII value but often the values used were incorrect. Candidates generally seemed unaware that operators <, >, and = could be used for character comparison.

There were very many instances of candidates using functions that didn't exist in their chosen language.

VB solutions often had an incorrect function heading or lacked the `EndFunction` statement.

In Python solutions, slicing errors were common.

(b) (i) Generally well answered, with most candidates gaining full marks.

Candidates were sometimes vague about which rule they were testing and a small number attempted to describe 'normal', 'boundary' and 'extreme' values.

The most common reasons for candidates not securing full marks for Strings 2 to 5 were:

- specifying a valid string so the result would be TRUE
- giving two or more data strings which broke the same rule
- giving a string that broke more than one rule

(ii) Most candidates provided a correct response. 'Dry run' was an incorrect answer that was seen on several occasions.

(iii) There were few correct answers for this question. Those candidates who gained a mark usually did so by referring to the module including some form of 'known response'.

Many candidates wrote 'testing code in modules before putting it together' but only a very small number referred to the concept of testing before the program was fully developed.

COMPUTER SCIENCE

Paper 9608/22
Written Paper

Key messages

Candidates are expected to work through the pre-release material that had been circulated to Centres. This material included a range of tasks designed to help candidates develop their problem-solving and programming skills. In addition, past papers give a clear indication of the types of question that candidates can expect.

There were some excellent programming solutions. It was clear that a significant number of candidates did not have sufficient practical programming experience prior to this examination.

This is a technical subject and makes use of many technical words and phrases. These have specific, defined meanings and it is important that these are used correctly. It is also important that candidates use the correct syntax when writing or explaining algorithms using pseudocode. Candidates particularly need to appreciate when it is appropriate to use the assignment operator (←) as opposed to the equality operator (=).

General comments

If a candidate writes the answer to a question on an additional page or booklet they must indicate where their revised answer is to be found. If answers have been crossed out, the new answers must be written clearly so that Examiners can easily read the text and award the appropriate mark. Many candidates make use of blank pages for rough work when preparing their final answer. In these cases it is extremely helpful if this text is crossed out.

Visual Basic (console mode) and Python were equally popular languages, with only a very small minority using Pascal (console mode). As stated in the pre-release material, no marks were awarded for programming answers that did not use one of these three languages.

Candidates who offer solutions using Python need to take care to maintain the correct indentation, as this is important when defining the program structure.

It is recommended that the following specific comments be read in conjunction with the published mark scheme for this paper.

Comments on specific questions

Question 1

(a) A minority of candidates answered this question well.

A common mistake was to indicate that the statement `String1 = "Hello World"` was an example of an input.

Many candidates placed fewer ticks than was required by the question.

(b) (i) This was answered well by a minority of candidates. Many answers were unrelated to the question. Several candidates gave examples of values rather than types.

(b) (ii) Most candidates scored full marks for this question. A small number of candidates gave '1' or '0' in place of 'True' or 'False'. This is ambiguous and should be discouraged.

(c) Many candidates appeared unfamiliar with the concept of a post-condition loop, or did not understand this was what the question asked for.

The majority of candidates opted for using the `MOD()` function for deciding whether a number was odd, rather than adopting the simpler solution of starting with an odd number and adding 2 each time around the loop. Many candidates used the `MOD()` function incorrectly even though the definition was given in the appendix.

A common mistake was to only increment the counter in the '`ELSE`' clause as shown. This resulted in an infinite loop that then output the same number repeatedly.

```
MyCount ← 101

REPEAT
   IF MOD(MyCount, 2) = 1
      THEN
         OUTPUT MyCount
      ELSE
         MyCount ← MyCount + 1
   ENDIF
UNTIL MyCount > 199
```

The incorrect use of '=' in place of '←' for an assignment was seen frequently.

Question 2

(a) Many candidates gave an answer describing the scenario rather than the process.

Many candidates did not understand the concept of stepwise refinement. A common mistake was to describe the 'program' being broken down rather than the problem. Very few candidates identified the programming objective. Several candidates referred to making the problem 'simpler' but did not mention breaking it down into smaller parts.

(b) The majority of candidates correctly identified the data type of Boolean for `IDFoundFlag`. A number of candidates correctly identified the other three identifiers as strings. Many candidates thought that the ID fields could be integers, but as the question does not give the format of the ID, it cannot be assumed that this is numeric. Furthermore, two of the identifiers relate to data from the text file, so this data would be of type string.

Only a few candidates gave detailed enough identifier descriptions. They had been given the first description as an example, but many did not state that, for example, the second and third identifiers were used to store values read from the file. Candidates should be reminded that a description needs to be more than simply a repeat of the identifier name in sentence form.

Several candidates incorrectly attributed an action to an identifier. For example, rather than 'stores the `UserID` from the file', they would write 'searches for the `UserID` from the file'.

(c) Man candidates who could construct algorithms but not able to write actual programs were able to gain marks.

The majority of candidates seemed not to appreciate the need to break the problem down into small steps. Many offered pseudocode solutions and a few gave answers written in program code. These were given credit on this occasion.

Some candidates used vague statements such as 'search for `UserID` in the file', which indicated the candidate did not appreciate the concept of stepwise refinement.
More able candidates realised that a loop was needed to successively read lines from the file. Here, the loop often included tests for end of file and a check on whether the ID had been found.

The process to output the final welcome message was often confused or incomplete.

Question 3

This question seemed to attract mixed responses. The majority of candidates had no problem understanding the pseudocode and 'filling in the gaps'.

Common problems included:

- parameter declaration
- the use of a large space within quotation marks to indicate an empty string
- syntax errors in assignment and concatenation
- the use of `OUTPUT` rather than `RETURN`

Question 4

(a) This question was not answered well. Those candidates that gained marks usually did so by referring to functions and procedures and less often, through reference to global or local variables.

A significant number of candidates appeared to misunderstand the question and described various computing terms. Often these included IDE features such as pretty-print and context-sensitive prompts.

(b) This question had mixed responses. Some candidates knew enough to refer to 'by Ref' and 'by Val' but only a handful correctly explained the methods.

Question 5

(a) (i) Most candidates gained the first mark for suggesting a suitable character. Some suggested the Space character or some other character that was clearly in the example data. Only a small number of candidates gave as a reason, the choice of character that was not used in the data items.

A common response was to use the '`&`' symbol but to then explain that this was the symbol used to join strings, so describing its use as a language operator rather than a separator.

(a) (ii) Almost all candidates gained a mark for stating that the array was of type `STRING`. Many candidates omitted the word `ARRAY` before the indices brackets.

(b) This question attracted a wide range of responses.

A significant number of candidates seemed to misunderstand the question and included code for populating the array, often with values derived from Input statements. This may have been an attempt to 'copy and paste' code fragments from classroom activities in an effort to gain marks.

A small number of candidates provided perfect solutions, usually in Python or VB.

Weaker response often gained marks only for the procedure header and declaration of an index variable. More able candidates included a loop, although many of these were conditional on some form of `EOF()` test rather than simply count-controlled. A significant number of candidates were unable to produce program code for simple file and array handling. The 'Open file' syntax often lacked the detail for 'append mode'.

Question 6

(a) This question also attracted a wide range of responses. Many candidates attempted to compare a group of characters rather than one at a time.

Many candidates attempted to convert each character to its ASCII value but often the values used were incorrect. Candidates generally seemed unaware that operators '<', '>', and '=' could be used for character comparison.

There were very many instances of candidates using functions that did not exist in their chosen language.

VB solutions often had an incorrect function heading or lacked the `EndFunction` statement.

In Python solutions, slicing errors were common.

(b) Generally well answered, with most candidates gaining full marks.

Sometimes candidates were vague about which rule they were testing and a small number attempted to describe 'normal', 'boundary' and 'extreme' values.

The most common reasons for candidates not securing full marks for Strings 2 to 5 were:

- specifying a valid string so the result would be TRUE
- giving two or more data strings which broke the same rule
- giving a string that broke more than one rule

COMPUTER SCIENCE

Paper 9608/23
Written Paper

Key messages

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There were some excellent programming solutions. It was clear that a significant number of candidates did not have sufficient practical programming experience prior to this examination.

This is a technical subject and makes use of many technical words and phrases. These have specific, defined meanings and it is important that these are used correctly. It is also important that candidates use the correct syntax when writing or explaining algorithms using pseudocode. They particularly need to appreciate when it is appropriate to use the assignment operator '←' as opposed to the equality operator '='.

General comments

If a candidate writes the answer to a question on an additional page or booklet, they must indicate where their revised answer is to be found. If answers have been crossed out, the new answers must be written clearly so that Examiners can easily read the text and award the appropriate mark. Many candidates make use of blank pages for rough work when preparing their final answer. In these cases, it is extremely helpful if this text is crossed out.

Visual Basic (console mode) and Python were equally popular languages, with only a very small minority using Pascal (console mode). As stated in the pre-release material, no marks were awarded for programming answers that did not use one of these three languages.

Python solutions were often the clearest, but there were also a number of excellent Visual Basic responses.

Candidates who offer solutions using Python need to take care to maintain the correct indentation, as this is crucial to defining the program structure.

It is recommended that the following specific comments be read in conjunction with the published mark scheme for this paper.

Comments on specific questions

Question 1

(a) The majority of candidates appeared to be unfamiliar with the terminology. A significant number of candidates could not name the last two stages.

Descriptions were generally inadequate, with many candidates simply repeating the name of the stage. Effective exam technique requires candidates to be able to describe something without using the word itself.

Many candidates were able to give correct examples, although often the syntax was incorrect. The following erroneous example was seen on several occasions:

```
INPUT "Your name"
```

(b) (i) Most candidates answered this correctly. The most common mistake was to suggest the data type should be string.

(ii) Many candidates answered this correctly, but a significant number lost the mark by adding the word 'gate'. Candidates should understand that a logic gate is a piece of hardware.

Several candidates incorrectly suggested 'selection' as the operator type.

(iii) Most candidates achieved full marks for this question. A small number of candidates gave '1' or '0' instead of 'True' or 'False'. This is ambiguous and should be discouraged.

(c) Many candidates are either unfamiliar with the concept of a pre-condition loop, or did not understand that this was what the question asked for.

The majority of candidates opted for using the `MOD()` function for deciding whether a number was even, rather than adopting the simpler solution of starting with an even number and adding 2 each time around the loop. Many candidates used the `MOD()` function incorrectly even though the definition was given in the appendix.

A common mistake was to only increment the counter in the '`ELSE`' clause as shown which then resulted in an infinite loop which output the same number repeatedly.

```
MyCount ← 100

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      THEN
         OUTPUT MyCount
      ELSE
         MyCount ← MyCount + 1
   ENDIF
ENDWHILE
```

The incorrect use of '=' in place of '←' for an assignment was seen frequently.

Question 2

(a) This question was not answered well. There were a wide variety of incorrect terms suggested.

(b) The majority of candidates correctly identified the data type of Boolean for `UserIDFound` and `PasswordValid`, and many also correctly identified the other two identifiers as strings. Some candidates thought that the ID field could be an Integer but as the question does not specify the format it cannot be assumed that it is numeric.

Most candidates gained the mark for the description of `PasswordInput`, as this was a simple variant of the description given in the question. Only a few candidates gave detailed enough descriptions for the last two identifiers, omitting to say *where* the `UserID` had been found or what the `PasswordInput` matched. Candidates should be reminded that a description needs to be more than simply a repeat of the identifier name in sentence form.

Several candidates incorrectly attributed an action to an identifier.
For example, `PasswordValid` outputs `TRUE` if the input password matches the one in the file.

(c) This question allowed those candidates who could construct algorithms but are not able to write actual programs an opportunity to gain marks.

The majority of candidates did not seem to appreciate that a problem needs to be broken down into smaller steps. Many offered pseudocode solutions and a few gave answers written in program code. These were given credit on this occasion.

Some answers commonly included very vague statements, such as "search for UserID in the file", further indicating that the candidate did not appreciate the concept of stepwise refinement.

More able candidates realised that a loop was needed to successively read lines from the file. Here, the loop often included tests for end of file and a check on whether the ID had been found.

Question 3

There were mixed responses to this question. The majority of candidates had no problem understanding the pseudocode and "filling in the gaps".

Common problems included:

- parameter declaration
- the use of a large space within quotation marks to indicate an empty string
- syntax errors in assignment and concatenation
- the use of `OUTPUT` instead of `RETURN`

Question 4

(a) This question was generally not answered well. Those candidates that gained marks usually did so by referring to 'parameters / variables passed between modules'. References to program hierarchy or the relationship between modules were rare.

A significant number of candidates appeared to offer programming terms which did not relate to this question.

(b) Another question that attracted mixed responses. Those that understood what was required usually gained three marks, and a common mistake was to attempt to use an integer to pass the decimal data item.

Question 5

This question attracted a wide range of responses.

Weaker candidates often gained marks only for the procedure header and declaration of an index variable. More able candidates included a loop, although many of these were count-controlled rather than conditional on some form of `EOF()` test. A surprising number of candidates were unable to produce program code for simple file and array handling. The 'Open file' syntax often lacked the detail for 'read mode'.

There was a noticeable tendency for candidates to use non-existent 'shortcut' functions to implement a solution. This was particularly noticeable in the case of Python solutions. Candidates should be made aware that these questions are designed to have solutions that do not involve obscure or exotic functions.

A small number of candidates provided perfect solutions, usually in Python or VB.

Question 6

(a) This question also attracted a wide range of responses.

Although the question stated that the function takes a password as a parameter, many solutions went on to ask the user to input the password using a different variable.

Most candidates were able to initialise the 3 counters and / or declare them as integers.

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There were very many instances of candidates using functions that didn't exist in their chosen language.

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In Python solutions, slicing errors were common.

(b) (i) Generally well answered, with most candidates gaining full marks.

Candidates were sometimes vague about which rule they were testing and a small number attempted to describe 'normal', 'boundary' and 'extreme' values.

The most common reasons for candidates not securing full marks for Strings 2 to 5 were:

- specifying a valid string so the result would be TRUE
- giving two or more data strings which broke the same rule
- giving a string that broke more than one rule

(ii) Most candidates provided a correct response. 'Dry run' was an incorrect answer that was seen on several occasions.

(iii) There were few correct answers for this question. Those candidates who gained a mark usually did so by referring to the module including some form of 'known response'.

Many candidates wrote 'testing code in modules before putting it together' but only a very small number referred to the concept of testing before the program was fully developed.

COMPUTER SCIENCE

Paper 9608/31
Written Paper

Key messages

Candidates must write their answer in the spaces provided. Candidates should specify where the answer has been written if they are not written in the spaces provided.

General comments

In general, the performance of candidates showed knowledge of all of the topics examined on the paper. In many cases, candidates did not apply this knowledge in the context given by the question. There was evidence of this in a number of questions on the paper. Many questions are designed in order for candidates to apply their knowledge, rather than just require them to state their knowledge.

Comments on specific questions

Question 1

(a) (i) The majority of candidates were able to write the correct statement. Candidates commonly used an incorrect syntax, for example, 'as' instead of ':'.

(ii) The majority of candidates were able to write the correct statement. Candidates commonly used an incorrect syntax, for example, '=' instead of '←'.

(b) Most candidates gained marks in this question as a variety of methods of assigning the values was credited. Common errors were not to include the `ISBN` or the `Title` as declarations.

(c) (i) The majority of candidates gave the correct answer.

(ii) The majority of candidates gave the correct answer.

(iii) The majority of candidates gave the correct answer.

(iv) Most candidates did not appreciate that the answer would evaluate to a `TRUE`/`FALSE` value.

(d) (i) The majority of candidates gave the correct answer.

(ii) The majority of candidates gave the correct answer.

(iii) The majority of candidates gave the correct answer.

Question 2

(a) (i) The majority of candidates were able to identify the term, Worm.

(ii) The majority of candidates were able to identify the term, Phishing.

(iii) The majority of candidates knew that a virus can replicate by inserting a copy of itself, but many did not state that it affected a file or data.

(b) The majority of candidates appeared to misunderstand the term "vulnerability" in the stem. They tended to give the consequences or threats caused by pharming and phishing.

(c) (i) The majority of candidates were able to identify the correct key.

(ii) The majority of candidates did not mention digital certificate and this was key to the answer. They tended to talk about the exchange of public and private keys. They could not gain any marks without mentioning digital certificate.

(iii) The majority of candidates demonstrated a clear understanding of the sequence of actions between Anna and Bob to communicate confidential information.

Question 3

(a) The majority of candidates were able to write the Boolean algebraic expression corresponding to the logic circuit.

(b) The majority of candidates were able to correctly complete the truth table.

(c) (i) The majority of candidates were to complete the K-map. Some candidates only inserted the 1s and omitted the 0s.

(ii) Most candidates were able to draw loops around the appropriate groups.

(iii) Around half of the candidates managed to simplify the sum-of-products.

(d) Many candidates managed to write the correct expression $X = \overline{A} . (B + C)$ but then did not complete the answer by giving the outcome from this which was $X = A . \overline{B} + A . C$

Question 4

(a) The majority of candidates appeared to focus on the number of records and gave answers relating to storage rather than the importance of speed of access to the file.

(b) (i) The majority of candidates understood the MOD function and were able to perform the necessary calculation.

(ii) The majority of candidates gave the correct range. A common error was using 1 instead of 0 for the minimum value.

(iii) The full range of marks was evident here. Most candidates knew RecordKey ← RecordKey + 1. Many gave the incorrect term for "empty"

(c) (i) Even though many candidates knew why PINs are encrypted, many did not give enough detail for the second mark, for example, for security purposes. A small number of candidates mentioned that only encrypted PINs are transmitted and compared.

(ii) The majority of candidates provided the correct step 6. Many provided the correct step 3. Few mentioned that the Customer ID is hashed in step 4.

Question 5

(a) (i) The majority of candidates demonstrated an understanding of a packet. Many of these candidates did not mention that the web page and the web page request are split into packets. Many gave generic answers relating to packets but needed to relate their answer to the context of the web page.

(ii) The majority of candidates demonstrated an understanding of how a router is used in transmitting data.

(iii) Although candidates knew that TCP/IP is a protocol, they needed to state it contains rules for communication between web server and browser.

(b) (i) Many candidates stated that there would be a lag or problem with timing which implied that the video was not continuous. Only one or two candidates mentioned that the picture and sound would not be synchronised.

(ii) Many candidates had an understanding of circuit switching in terms of a dedicated channel between two devices. They did not mention that it was established prior to the start of the communication with the link removed at the end.

(iii) Many candidates gave a description of how circuit switching works without addressing the problems that they mentioned in **part (i)**.

Question 6

(a) (i) A small number of candidates recognised this as a control system.

(ii) Candidates did not generally mention the use of actuators.

(b) (i) The majority of candidates did not get the concept of a processor constantly checking sensors that are not changing, which results in a waste of processor time.

(c) (i) The majority of candidates knew the processes involved in dealing with interrupts.

(ii) The majority of candidates knew the processes involved in dealing with interrupts

(iii) Although many candidates mentioned a stack, only some knew that it was the content of the registers that are placed on the stack.

(iv) Many candidates gave the benefit of dealing with the value from the sensor immediately. A minority of candidates gave the benefit as only needing to check a sensor when an interrupt occurs.

(v) A small number of candidates appeared to understand the concept of bitwise operations. Candidates were often careless and omitted the symbol # before the 'B'. No candidate gave the binary or hexadecimal alternative answers.

COMPUTER SCIENCE

Paper 9608/32
Written Paper

Key messages

Candidates must write their answer in the spaces provided. Candidates should specify where the answer can be found if they are not written in the spaces provided.

General comments

In general, the performance of candidates showed knowledge of all of the topics examined on the paper. In many cases, candidates did not apply this knowledge in the context given by the question. There was evidence of this in a number of questions on the paper. Many questions are designed in order for candidates to apply their knowledge, rather than just require them to state their knowledge.

Comments on specific questions

Question 1

(a) (i) Most candidates followed the exemplar given. Other candidates often gave the type as `STRING` or did not include a colon (:). Candidates were not always careful in their use of case when writing variable names.

(ii) A wide range of answers were seen here as this question did not have an exemplar and relied on candidates' knowledge. Candidates need to pay careful attention to the presentation of their pseudocode. Candidates were not always careful in their use of case when writing variable names. The majority of candidates were able to write the correct statement. Candidates commonly used a '=' instead of a '←'.

(b) Most candidates gained marks in this question as a variety of methods of assigning the values was credited. Common errors which lost marks were to not include the `Name` as a declaration or to have a fourth declaration for `NewFriend`. Candidates had to appreciate that the `Area` and `HouseNumber` would now require an enumerated type in place of the types `STRING` and `INTEGER` respectively.

(c) (i) This question was generally answered well. Common issues here involved candidates missing out special characters, for example, '`@` '.

(ii) The majority of candidates provided the correct answer.

(iii) This question was generally answered well. Common issues here included candidates missing out special characters, for example, ' `^`'.

(iv) Only a small number of candidates understood that the answer would evaluate to a `TRUE`/`FALSE` value.

(d) (i) The majority of candidates provided the correct answer.

(ii) The majority of candidates provided the correct answer.

(iii) This proved to be more challenging than the previous two questions shown by the number of candidates providing an incorrect answer.

Question 2

(a) (i) This question part was generally answered well. Many candidates confused pharming with phishing.

(ii) This question part was generally answered well. Some candidates confused phishing with pharming.

(iii) A significant number of candidates knew that a worm can replicate itself. Some candidates needed to state that it is a standalone or independent piece of software

(b) The majority of candidates misunderstood the term 'vulnerability' in the question. They tended to give the consequences or threats caused by pharming and phishing.

(c) (i) Full range of marks was seen on this question. Many candidates knew at least one data item. Some included digital signature which is mentioned in the question. A large number of candidates were unsure who the public key belonged to. Many candidates needed to be more specific in their answers to avoid confusion, for example, subject public key and not just public key, or subject name and not just name. Candidates should have used words such as 'subject' and avoided 'sender' to avoid confusion as to whom they are making reference.

(ii) A minority of responses scored the full three marks. Answers were often imprecise with mention of a private key (without clarifying whose key this was). Candidates who understood this technique scored the full three marks. An example of a good response seen was *'The CA hashing algorithm is applied to the text to produce a message digest. This message digest is encrypted with the CA's private key.'*

(iii) Candidates need to be clearer here that the signature within the certificate is to ensure the certificate is genuine, not the sender, or to authenticate that the certificate came from the CA.

Question 3

(a) The majority of candidates were able to write the Boolean algebraic expression corresponding to the logic circuit. Some candidates missed important brackets to define the priority of solution.

(b) The majority of candidates were able to correctly complete the truth table.

(c) (i) This question was answered well, apart from a few candidates who missed out the 0 values. A small number of candidates did not understand this concept and filled the boxes with binary expressions, for example, 000, 010, etc.

(ii) Most candidates were able to draw loops around the appropriate groups.

(iii) This part was not as well answered as the other parts. It was also clear that many candidates had not read the question properly, and had simplified the terms presented on their K-Map.

(d) Due to an issue with this question, a discussion took place at the examiner's meeting before marking began, and examiners considered the impact on candidates in the light of answers seen. Changes to the marking approach for this question were agreed to ensure that no candidates were disadvantaged.
A significant number of candidates successfully applied the De Morgan's law.

Question 4

(a) The majority of candidates were able to draw the correct links. Many candidates omitted the second link from sequential.

(b) (i) The majority of candidates scored two marks for this question. Some did not state that meter readings are submitted over time or that they are stored chronologically. Some candidates gave the incorrect organisation type. A second justification mark was very rare with most candidates either stating the records were stored chronologically or they were appended to the file.

(ii) A small number of candidates scored three marks on this question. Many candidates did not include the account number as a key. A common error after correctly stating the organisation would

be sequential was to state that the key field would be the customer name. Only a few candidates mentioned hit rate. Some candidates gave the incorrect organisation type. Some candidates gained the batch processing/high hit rate mark. The 'unique account number' or 'sorted on account number' marks were rare.

(iii) The majority of candidates scored two marks as they mentioned the importance of fast direct access to the required record. Candidates rarely mentioned low hit rate or the suitability for access to individual records. Some candidates gave the incorrect organisation type. Candidates recognised the need to login without waiting. Many of these candidates were not able to gain the second justification mark.

Question 5

(a) (i) Candidates who scored full marks tended to use the model in option 2 which was Transport layer, Network layer, Data Link layer. Those who used the model in option 1 did not include the word 'Interface' with 'Network' and so only scored 2 out of 3.

(b) (i) The majority of candidates knew the network model was peer to peer.

(ii) A significant number of candidates did not gain the mark for this question.

(iii) Candidates need to show a better understanding of BitTorrent . Candidates often provided descriptions that could have applied to packet switching. Some candidates were familiar with the technical descriptors associated with peer-to-peer file sharing. Candidates were awarded marks for what they had written and the full range of marks was awarded. Candidates often misunderstood the meaning of the term 'leaching', suggesting that this applied to all downloaders. They also misunderstood 'seeding', often stating that a 'seed' uploaded files once they had downloaded the whole file, rather than they could upload the parts of the file they had downloaded.

(c) This question part was generally answered well. Most candidates correctly identified two protocols, even if examples given were often vague. Weaker responses could not correctly distinguish between SMTP and POP3. Some marks lost due to the stated protocols being from layers other than the Application layer. Some of the examples given were not precise enough.

Question 6

(a) (i) Most candidates appreciated that this was a monitoring (only) system. Control was a common incorrect answer.

(ii) Many candidates needed to be more precise in stating that there is no element of control in a monitoring system. Many imprecise answers described what the system did. The responses did not mention or even imply the lack of control/feedback, etc.

(iii) The majority of candidates were able to identify two sensors. The only real issue here was candidates who lost out by giving two names for the same sensor, for example, Infra-red and motion.

(b) (i) Many candidates gained two marks. A common error was to include a ← in step 16. Issues included the misspelling or not applying case correctly in variable names. Some candidates also just put the word `ForEver` as their answer for the third mark.

(ii) Candidates did not generally perform well on this question part. Candidates lost marks on a number of factors such as not having a large enough number as the upper limit, not using the arrow to assign the value, not using `ENDFOR` or simply not having the second line at all.

(iii) Clear division between those who understood the reason for the loop and those who thought it was to do with some maintenance requirement or time for storage etc. Candidates often confused 'one clock cycle of the CPU' with one iteration of the loop. Responses often described a processor which would overheat/was overworked, etc.

(c) (i) The majority of candidates misinterpreted what was required and gave 'low level' answers that described what the hardware/software would be doing, and not the 'outcome' from the step being completed. A large number of candidates simply repeated or rephrased the words from box 3 of the diagram.

(ii) A minority of candidates applied their answers to the scenario. A small number of candidates focused on the sensor needing attention. The majority of answers focused on handling interrupts. Some candidates rephrased the text from box 4 of the diagram. Others gave long descriptions of what might happen, but many were not able to recognise that a warning message would be displayed on a monitor.

COMPUTER SCIENCE

Paper 9608/33
Written Paper

Key messages

Candidates must write their answer in the spaces provided. Candidates should specify where the answer has been written if they are not written in the spaces provided.

General comments

In general, the performance of candidates showed knowledge of all of the topics examined on the paper. In many cases, candidates did not apply this knowledge in the context given by the question. There was evidence of this in a number of questions on the paper. Many questions are designed in order for candidates to apply their knowledge, rather than just require them to state their knowledge.

Comments on specific questions

Question 1

(a) (i) The majority of candidates were able to write the correct statement. Candidates commonly used an incorrect syntax, for example, 'as' instead of ':'.

(ii) The majority of candidates were able to write the correct statement. Candidates commonly used an incorrect syntax, for example, '=' instead of '←'.

(b) Most candidates gained marks in this question as a variety of methods of assigning the values was credited. Common errors were not to include the `ISBN` or the `Title` as declarations.

(c) (i) The majority of candidates gave the correct answer.

(ii) The majority of candidates gave the correct answer.

(iii) The majority of candidates gave the correct answer.

(iv) Most candidates did not appreciate that the answer would evaluate to a `TRUE`/`FALSE` value.

(d) (i) The majority of candidates gave the correct answer.

(ii) The majority of candidates gave the correct answer.

(iii) The majority of candidates gave the correct answer.

Question 2

(a) (i) The majority of candidates were able to identify the term, Worm.

(ii) The majority of candidates were able to identify the term, Phishing.

(iii) The majority of candidates knew that a virus can replicate by inserting a copy of itself, but many did not state that it affected a file or data.

(b) The majority of candidates appeared to misunderstand the term "vulnerability" in the stem. They tended to give the consequences or threats caused by pharming and phishing.

(c) (i) The majority of candidates were able to identify the correct key.

(ii) The majority of candidates did not mention digital certificate and this was key to the answer. They tended to talk about the exchange of public and private keys. They could not gain any marks without mentioning digital certificate.

(iii) The majority of candidates demonstrated a clear understanding of the sequence of actions between Anna and Bob to communicate confidential information.

Question 3

(a) The majority of candidates were able to write the Boolean algebraic expression corresponding to the logic circuit.

(b) The majority of candidates were able to correctly complete the truth table.

(c) (i) The majority of candidates were to complete the K-map. Some candidates only inserted the 1s and omitted the 0s.

(ii) Most candidates were able to draw loops around the appropriate groups.

(iii) Around half of the candidates managed to simplify the sum-of-products.

(d) Many candidates managed to write the correct expression $X = \overline{A} . (B + C)$ but then did not complete the answer by giving the outcome from this which was $X = A . \overline{B} + A . C$

Question 4

(a) The majority of candidates appeared to focus on the number of records and gave answers relating to storage rather than the importance of speed of access to the file.

(b) (i) The majority of candidates understood the MOD function and were able to perform the necessary calculation.

(ii) The majority of candidates gave the correct range. A common error was using 1 instead of 0 for the minimum value.

(iii) The full range of marks was evident here. Most candidates knew RecordKey ← RecordKey + 1. Many gave the incorrect term for "empty"

(c) (i) Even though many candidates knew why PINs are encrypted, many did not give enough detail for the second mark, for example, for security purposes. A small number of candidates mentioned that only encrypted PINs are transmitted and compared.

(ii) The majority of candidates provided the correct step 6. Many provided the correct step 3. Few mentioned that the Customer ID is hashed in step 4.

Question 5

(a) (i) The majority of candidates demonstrated an understanding of a packet. Many of these candidates did not mention that the web page and the web page request are split into packets. Many gave generic answers relating to packets but needed to relate their answer to the context of the web page.

(ii) The majority of candidates demonstrated an understanding of how a router is used in transmitting data.

(iii) Although candidates knew that TCP/IP is a protocol, they needed to state it contains rules for communication between web server and browser.

(b) (i) Many candidates stated that there would be a lag or problem with timing which implied that the video was not continuous. Only one or two candidates mentioned that the picture and sound would not be synchronised.

(ii) Many candidates had an understanding of circuit switching in terms of a dedicated channel between two devices. They did not mention that it was established prior to the start of the communication with the link removed at the end.

(iii) Many candidates gave a description of how circuit switching works without addressing the problems that they mentioned in **part (i)**.

Question 6

(a) (i) A small number of candidates recognised this as a control system.

(ii) Candidates did not generally mention the use of actuators.

(b) (i) The majority of candidates did not get the concept of a processor constantly checking sensors that are not changing, which results in a waste of processor time.

(c) (i) The majority of candidates knew the processes involved in dealing with interrupts.

(ii) The majority of candidates knew the processes involved in dealing with interrupts

(iii) Although many candidates mentioned a stack, only some knew that it was the content of the registers that are placed on the stack.

(iv) Many candidates gave the benefit of dealing with the value from the sensor immediately. A minority of candidates gave the benefit as only needing to check a sensor when an interrupt occurs.

(v) A small number of candidates appeared to understand the concept of bitwise operations. Candidates were often careless and omitted the symbol # before the 'B'. No candidate gave the binary or hexadecimal alternative answers.

COMPUTER SCIENCE

Paper 9608/41
Written Paper

Key messages

It is essential that candidates have practical experience of programming (including object-oriented programming) using one of the following languages: Pascal / Delphi (console mode), VB.NET (console mode) or Python. Programming and pseudocode questions from previous syllabus past papers and the tasks in the pre-release material provide some topics for practical work.

General comments

Candidates need to have experience of developing and programming object-oriented solutions in one of the three stated programming languages. The pre-release material can provide scenarios and topics to aid this teaching. Some candidates wrote solutions, or partial solutions using pseudocode code or languages other than those stated. Candidates need to produce program code in the language they declare at the beginning of the question part.

Comments on specific questions

Question 1

(a) Most candidates had a reasonable attempt on this question and gained a range of marks. The common error was not adding the `LOOP` label, or adding it to an unsuitable row. Some candidates mistakenly added `JPE END` instead of `ENDFOR`.

(b) Most candidates were able to give the correct mask. Candidates often gave the correct denary values in the operand space but on occasions did not add '#' to identify it is a denary number.

Question 2

(a) Most candidates declared an array correctly in pseudocode. Many did not correctly declare it as of type `CustomerRecord`. Candidates were often able to give a suitably loop with correct values, and assign `0` to `CustomerID`. Fewer candidates put this value in the correct location in the `Customer` array.

(b) (i) This question was often answered well, with many candidates able to manipulate the value of Pointer and give a suitable error message.

(ii) Responses to this question were varied. Few candidates were able to give suitable loop conditions, but most candidates could correctly return Index or `-1`. Some candidates incorrectly tried to output these values instead of returning them.

(iii) The majority of candidates did not do well in this question. Many candidates stated that there would be an error, or that the records would all need moving. They did not identify what the problem would be. Some candidates were able to demonstrate some understanding but were not able to adequately describe the problem.

Question 3

This question was answered well by many candidates. Some common errors included the use of division rather than an appropriate `DIV` function, and not adjusting the middle values when calling the recursive function.

Question 4

(a) (i) This question was not answered well. Many candidates gave answers such as inheritance and database relationships.

(ii) Candidates who gave the correct answer to **part (i)** were usually able to give the correct symbol. Many candidates did not include the values, or provided incorrect ones.

(b) Most candidates made a reasonable attempt at this question. Many candidates declared the class correctly. Fewer candidates could correctly declare the constructor in their chosen language. Many candidates attempted to write a separate method to set the data value and pointer value to the parameters, which was not required by the question that only asked for the class declaration and the constructor.

(c) (i) This question was answered well, with a range of answers from candidates all identifying that there was no further node for it to point to.

(ii) Answers to this question were mixed. Many candidates incorrectly gave the value `0` or `7` as the null value, which both would have pointed to values in the list. The most common correct and appropriate value was `-1`. When candidates gave the correct value, they often struggled to justify their choice, often stating why `0` could not be used instead of why their value was appropriate.

(iii) There was a mixed range of responses. Many candidates were unable to write a constructor in their chosen language. Candidates often declared an array but were unable to add new nodes to each element within the array. Many candidates had a good attempt at setting the final pointer to `-1`, but often did this without using the appropriate method.

(iv) Responses to this question were mixed. Some candidates were able to correctly instantiate a new object. Many candidates made minor errors, and a significant number of candidates were not able to create a new object in their chosen language.

(v) Candidates often had a good attempt at answering this question, with many correctly starting with the `HeadPointer` value as given in the question. Few candidates used the appropriate Get methods to access the data, but they were able to access the correct array element.

(vi) Most candidates did reasonably well at this question, correctly converting a number of lines. Some candidates attempted to access the data and pointer values without the use of the Get and Set methods, often using an inappropriate null pointer value. A minority of candidates were able to use the `FindInsertionPoint` function correctly and were able to use the returning values.

COMPUTER SCIENCE

Paper 9608/42
Written Paper

Key messages

It is essential that candidates have practical experience of programming (including object-oriented programming) using one of the following languages: Pascal / Delphi (console mode), VB.NET (console mode) or Python. Programming and pseudocode questions from previous syllabus past papers and the tasks in the pre-release material provide some topics for practical work.

General comments

Candidates need to have experience of developing and programming object-oriented solutions in one of the three stated programming languages. Candidates need to be aware of the terminology used in object-oriented programming, including the use of constructors in their chosen language, and the use of get and set methods.

Comments on specific questions

Question 1

(a) Most candidates were able to identify the correct Operand and Op codes for the input and storing of `CHAR1` and `CHAR2`. Fewer candidates identified that the `LOOP` label needed to be added, and those that did, often put this in the wrong place.

(b) Many candidates were able to give the correct value for `NUMBER2` by working out the two's complement value. Many candidates did not get the correct `MASK` Op code, and the first `LDD` statement was often left out. Where candidates provided values, they often did not add a '`B`' to identify it as a binary number.

Question 2

(a) Most candidates understood that the null pointer does not point to another node. Many candidates gave incorrect answers such as "it points to the end of the list", or "the end of the tree".

(b) Responses to this question were mixed. Many candidates were able to put the correct null pointers in the new box, but the box was often put in different places, most commonly to the left of **Copenhagen.**

(c) (i) Most candidates were able to gain some marks on this question. Candidates often left the null pointer values blank, without a value. Other candidates replaced the null pointer with the value `0` which would point to the start of the list. Many candidates did not add pointer values to list elements `7`, `8` and `9`.

(ii) Many candidates gave the value `0` as the null pointer. They did not realise that this would point back to the start of the list. Candidates need to understand the purpose of a null pointer, and that it needs to be a value (any value) that is not part of the list. Those candidates who gave a suitable answer were often unable to justify it, and instead stated a reason why `0` could not be used (which was not the question), rather than explaining why their value should be used.

(d) (i) Most candidates made a good attempt at this question. They declared identifiers correctly, and assigned suitable values. Some candidates did not identify the record type of `Node` and its requirements, and then attempted to access the `Tree` data and pointers through other methods.

(ii) Candidates gave suitable comparisons. Those candidates who did not identify the `Node` data type were unable to access the correct values.

(e) Some candidates correctly checked the pointer value before starting, and then checked the left pointer of the null pointer which would not exist. Candidates who had not identified the `Node` data type were not able to access the correct values. Some candidates gave two outputs instead of one, which meant the order would not work. Some candidates did not attempt a recursive solution, and instead tried to write a loop to perform the function.

Question 3

(a) Candidates were asked to write this pseudocode in **program code**. A significant number of candidates were unable to convert the pseudocode to their chosen language, and instead repeated elements from the pseudocode that were not appropriate for their chosen language. A number of candidates were able to instantiate the object and use their own language's constructor. Many candidates copied `ENDFOR` to close the `FOR` loop, which was not appropriate in their language. Most candidates were able to call the two final procedures.

(b) Many candidates knew how to write a constructor method in their language, and attempted to write a procedure named constructor. Most candidates were able to declare a class, but there were often loop errors such as incorrect end statements, or incorrect values. A number of candidates had read the question carefully and understood that they needed to declare the value representing sand as a constant.

(c) (i) Many candidates were able to write a function that returned an appropriate value. The parameters were often missed out, despite being given in the question. There were a variety of ways that the grid value could be returned, but a common error was to return the parameter values, and not the value at that location in the grid.

(ii) Candidates need to understand the difference between using a method for a class, and a procedure or function in the main program. Few candidates identified that `GetSquare` is a method of the class and therefore needs to be called using the object `Island`. A significant number of candidates were able to output one row without forcing a new line, and then forced a new line break outside the inner loop. Some candidates had minor error in the loops, such as incorrect loop values.

(d) Most candidates made a good attempt at this question, with many correctly checking the grid value and writing appropriate values. Most candidates had read the question carefully and declared the value representing treasure as a constant.

(e) (i) Most candidates made suitable comparisons to check whether the grid location held treasure or not, and then wrote appropriate values. A small number of candidates correctly declared the constant values and made use of these in the appropriate place.

(ii) Most candidates were able to prompt the user for the two values as input, and read them. Many candidates converted these to integers, or attempted to catch exceptions if they were not integers. Many candidates were unable to get the correct conditions for the validation, often giving '<' instead of '<=' and so on. Many candidates put these comparisons in a loop to repeatedly ask for input, and a small number performed a recursive call on the procedure.

(f) (i) This question had mixed responses, with a range of answers from candidates, such as many-to-many and inheritance.

(ii) Candidates who correctly identified containment or aggregation usually gained a mark for the correct shape on the diagram. Only a small number of candidates gave correct values for `IslandClass` and `Square`.

COMPUTER SCIENCE

Paper 9608/43
Written Paper

Key messages

It is essential that candidates have practical experience of programming (including object-oriented programming) using one of the following languages: Pascal / Delphi (console mode), VB.NET (console mode) or Python. Programming and pseudocode questions from previous syllabus past papers and the tasks in the pre-release material provide some topics for practical work.

General comments

Candidates need to have experience of developing and programming object-oriented solutions in one of the three stated programming languages. The pre-release material can provide scenarios and topics to aid this teaching. Some candidates wrote solutions, or partial solutions using pseudocode code or languages other than those stated. Candidates need to produce program code in the language they declare at the beginning of the question part.

Comments on specific questions

Question 1

(a) Most candidates had a reasonable attempt on this question and gained a range of marks. The common error was not adding the `LOOP` label, or adding it to an unsuitable row. Some candidates mistakenly added `JPE END` instead of `ENDFOR`.

(b) Most candidates were able to give the correct mask. Candidates often gave the correct denary values in the operand space but on occasions did not add '#' to identify it is a denary number.

Question 2

(a) Most candidates declared an array correctly in pseudocode. Many did not correctly declare it as of type `CustomerRecord`. Candidates were often able to give a suitably loop with correct values, and assign `0` to `CustomerID`. Fewer candidates put this value in the correct location in the `Customer` array.

(b) (i) This question was often answered well, with many candidates able to manipulate the value of Pointer and give a suitable error message.

(ii) Responses to this question were varied. Few candidates were able to give suitable loop conditions, but most candidates could correctly return Index or `-1`. Some candidates incorrectly tried to output these values instead of returning them.

(iii) The majority of candidates did not do well in this question. Many candidates stated that there would be an error, or that the records would all need moving. They did not identify what the problem would be. Some candidates were able to demonstrate some understanding but were not able to adequately describe the problem.

Question 3

This question was answered well by many candidates. Some common errors included the use of division rather than an appropriate `DIV` function, and not adjusting the middle values when calling the recursive function.

Question 4

(a) (i) This question was not answered well. Many candidates gave answers such as inheritance and database relationships.

(ii) Candidates who gave the correct answer to **part (i)** were usually able to give the correct symbol. Many candidates did not include the values, or provided incorrect ones.

(b) Most candidates made a reasonable attempt at this question. Many candidates declared the class correctly. Fewer candidates could correctly declare the constructor in their chosen language. Many candidates attempted to write a separate method to set the data value and pointer value to the parameters, which was not required by the question that only asked for the class declaration and the constructor.

(c) (i) This question was answered well, with a range of answers from candidates all identifying that there was no further node for it to point to.

(ii) Answers to this question were mixed. Many candidates incorrectly gave the value `0` or `7` as the null value, which both would have pointed to values in the list. The most common correct and appropriate value was `-1`. When candidates gave the correct value, they often struggled to justify their choice, often stating why `0` could not be used instead of why their value was appropriate.

(iii) There was a mixed range of responses. Many candidates were unable to write a constructor in their chosen language. Candidates often declared an array but were unable to add new nodes to each element within the array. Many candidates had a good attempt at setting the final pointer to `-1`, but often did this without using the appropriate method.

(iv) Responses to this question were mixed. Some candidates were able to correctly instantiate a new object. Many candidates made minor errors, and a significant number of candidates were not able to create a new object in their chosen language.

(v) Candidates often had a good attempt at answering this question, with many correctly starting with the `HeadPointer` value as given in the question. Few candidates used the appropriate Get methods to access the data, but they were able to access the correct array element.

(vi) Most candidates did reasonably well at this question, correctly converting a number of lines. Some candidates attempted to access the data and pointer values without the use of the Get and Set methods, often using an inappropriate null pointer value. A minority of candidates were able to use the `FindInsertionPoint` function correctly and were able to use the returning values.