

INFORMATION TECHNOLOGY

Paper 9626/11
Theory

There were insufficient candidates for this exam to enable a reliable report to be written.

INFORMATION TECHNOLOGY

Paper 9626/12
Theory

Key messages

Candidates' performance was on a par with that seen in recent years. Generally, responses showed that candidates had some understanding of the syllabus areas being examined, but this was sometimes lacking in detailed knowledge. As has previously been the case, candidates tended to fare better with questions based on recall rather than analysis or development.

Candidates are reminded that in order to develop responses, structured answers rather than individual points, should be employed. Furthermore, the scenario within which each question is set is central to any answers that may be accepted. The scenario, by definition, will exclude certain answers that might be accepted in a more general paper. Therefore, candidates must be prepared to apply their knowledge and understanding to the scenario within which of the questions are set.

A Cambridge International list of command words that are used in questions is published and explains what each word requires from candidates. It is very important that, when answering questions, candidates read the rubric and answer the questions in the appropriate manner. For example, evaluation requires candidates to judge or calculate the quality or importance of something. A detailed answer is needed, which cannot be achieved by writing bullet points. To gain full credit, candidates must produce a reasoned evaluation that weighs up the advantages and disadvantages for the given scenario/context. Similarly, questions that ask candidates to 'analyse' or 'discuss' require detailed responses that include a proper analysis or discussion, rather than short or bullet-pointed responses.

General comments

Candidates are reminded that brand names for software should not be used in responses.

Work at this level assumes a level of technical understanding. This understanding should be employed in answering questions, and general, unfocused, answers should be avoided. Unfortunately, many comments were too vague to be awarded any marks.

Candidates are recommended to work to the marks available for each question, as indicated beneath each answer space. Where, for example, a question is worth four marks, the candidate should be expecting to make four points in their answer. The focus of these points will, of course, depend of the focus of the question and the command word used in that question,

Comments on specific questions

Section A

Question 1

This question was well answered, with the vast majority of candidates achieving at least two marks. Generally, these marks were for identifying why **this** data was not information and how the data could become information.

However, many candidates missed the opportunity to expand their answer by discussing the actual data presented, whilst other candidates discussed data in general terms and did not address how **this** data could become information.

Question 2

The question was attempted by virtually all candidates, and it was clear that the vast majority of candidates were aware of the term. A few candidates gave very clear and concise answers that were worth full marks, but many gave extremely vague answers that candidates were possibly not as clear on their definitions as they should have been.

Typically, where a mark was awarded, this was for stating that one aspect of serviceability was the ability of a mainframe computer to self-identify and remedy faults.

Question 3

- (a) This answer was very strongly answered by many candidates. However, candidates are reminded that for questions where differences have to be presented, differences are best presented together, perhaps joined by the use of 'whereas'. In some cases, candidates wrote two separate descriptions one of phishing and the other of vishing. Where it was clear that these were presented as comparisons, marks were awarded if possible. However, this clarity was sometimes lacking and so marks were not awarded.
- (b) A small number of candidates repeated aspects of their answer for **Question 3a**, or gave vague answers that really were not worthy of merit. However, others gave good answers that fully justified at least two marks for this question.

Question 4

- (a) The key points for this question are, firstly, that candidates were given four variables that could change and affect the profit and, secondly, that candidates were instructed to refer to specific cells from the spreadsheet in their answer. The expectation was that these cells would be the individual cells where 'what if' analysis could be applied, or the cell where profit was shown.

Despite these instructions, candidates chose to apply what if analysis to many other cells on the spreadsheet. As these cells were not those where the candidates were told there was the possibility for a change, such answers could not be awarded. This is an example of where the scenario given by the question limits the possible answers that can be accepted.

Other candidates did not refer to cells at all. Unfortunately, as these answers failed to address a fundamental focus of the question, such answers were not awarded marks.

- (b) The answers given by candidates would suggest that very few candidates were aware of the goal seek function with spreadsheet software. Clearly, some candidates did understand the use of the function and applied this knowledge well to give some clear answers, but most candidates gave general answers which really went no way towards answering the question asked.

The expansion mark – for identifying why the result may be unsatisfactory, provided something of a safety net for some, as they realised that the numbers given by the process may exceed the capacity of the venue, or that the numbers on which sales were based were estimates and so prone to inaccuracy. However, where candidates gave subjective answers, such as 'the band may not be able to sell that many tickets', this was not accepted, as it would not affect the efficacy of goal seek analysis.

Question 5

- (a) Where candidates worked with the sample from the database, they did very well, and a considerable number scored very highly for this question. For example, the ISBN numbers given were consistently 13 characters long, or the book type only had two options. Both suggested very specific validation checks that could be applied. Candidates were also told that the selection showed both the minimum and maximum values. As one of the fields shown was 'copies' with a maximum value of 5 and a minimum value of 2, this then gave the range of acceptable values.

Of those who did less well, this was generally because they failed to identify the field to which the validation check on which they were focussing, would be applied.

- (b) In questions such as these, candidates must be aware of the requirements of the question. In this case, candidates were asked to explain why verification was needed in addition to validation. Therefore, candidates needed to address why **both** were needed. Many candidates appeared to think that the question was asking the purpose of verification and gave an answer to that question.

Where candidates did correctly identify the focus, they tended to give good answers, but then ignore the requirement to use examples from the three fields used in answer to **part A**.

Question 6

The majority of candidates were aware that super computers are capable of dealing with huge amounts of data and complex calculations, but few were able to expand their answers further. Some candidates attempted to base an answer on the ability of super computers to carry out calculations quickly, but failed to state why this was important and so were not awarded. In answers where candidates rely on speed as their answer, it is always advisable that such answers include some indication of why speed is importance.

Question 7

- (a) Some candidates gave some very good answers to this question, and focused on the use of malware to steal secrets which could then be used by a competing firm to their advantage.

However, the majority of candidates misinterpreted industrial espionage as being equivalent to industrial sabotage. Therefore, unfortunately, their answers were largely irrelevant.

- (b) Candidates, in the main, showed quite a good understanding of the term 'root kit' and were able to give a number of features. The answers generally focused on a rootkit allowing remote access or administrative rights to a hacker, but some candidates did state that Root kits were hidden deep within the computer or that a root kit can be difficult to get rid of.

This question is an example of one where candidates would be advised to work with the number of marks given. Many candidates gave two marks – typically, those identified above – with very little embellishment. This is despite the question clearly indicated as being worth four marks. Typically, one would expect a four mark question to require four individual points to be made. Obviously, this will depend on the question being asked, and some of the points made may be in support or clarification of those points already made.

Question 8

- (a) This question might have been rewritten 'why is encryption used' and as such was generally a low demand question that allowed candidates to explore their understanding of this area of study.

Despite this question being intended to be low demand, many candidates failed to score more than single marks. When answering a question that is based on an attempt to mitigate risks, it is sometimes best if that risk is stated as a starting point. In the context of this question, a starting point would be that data may be intercepted whilst in transit. From this initial statement of risk, the rest of the answer then naturally flows. Without this initial statement, the candidate is struggling with an answer where a risk is being mitigated against, but that risk has not been identified.

- (b) Pleasingly, the majority of candidates realised that the specific reference to **symmetric encryption** in the question meant that the focus of the question was on that particular type of encryption, rather than on encryption itself, and gave answers which, generally, answered the question well. Typically, candidates identified that for symmetric encryption, the same key is used for encryption and decryption, and therefore this represented a security risk, as the key needed to be transferred and could be intercepted. Depending on how the candidate wrote their answer, four marks could be easily obtained for an in-depth answer based on this understanding.

Question 9

- (a) This question really divided candidates into two camps. On one side, there were those who had prepared for a question where they would be asked to write a procedure and were therefore able to do so with a fair degree of accuracy, whilst on the other, there were candidates who seemed surprised to see the question and either had a weak attempt at answering using a version of pseudocode, or wrote a descriptive answer.

Where candidates had prepared for the question, there was some strength. Typically, candidates knew to declare and end the procedure, and many used suitable variable names within their work. It should be noted that where variable names are made up of two or more words, there should be no gap between these words.

- (b) Some candidates were able to answer this question well, and correctly used the procedures and variables to create an effective and succinct answer to the question. However, as with the previous question, this question caused some issues for candidates. Despite being told that both the `BeforeTax ()` and the procedure created in **part (a)** were part of the calculation, very few candidates attempted to use these to answer the question, with many candidates attempting to recreate the whole calculation from scratch.

Question 10

Many candidates did well on this answer and were able to discuss a range of advantages and disadvantages to using a computerised weather station rather than candidates to manually collect data from weather monitoring devices. Candidates tended to focus on accuracy and the ability of computerised systems to work without a break, or to take readings frequently, thereby giving a more even spread of results.

However, there were a number of misapprehensions. Firstly, candidates assumed that the computerised system was responsible for the measurement of data, rather than collection of the measured data and so focused on safety, stating, for example, that computers would be able to take readings in extreme conditions. As the question was about the collection of data rather than data measurement, this answer was not accepted. Furthermore, some candidates claimed that using computerised systems was expensive, without giving any further indication of what may be the cause of that expense. Where candidates use 'expense' as an answer, they are advised to be very clear on which area they are focussing. For example, were they referring to the cost of purchase, management or day-to-day running? With so many possible variables, answers that relied on 'expense' but did not state on which area, were not accepted.

INFORMATION TECHNOLOGY

Paper 9626/13
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Comments on specific questions

Question 1

Candidates were given two of the factors identified as affecting the quality of information in the syllabus and asked to describe the other factors. Where candidates worked with the remaining factors, they tended to do very well, with many candidates achieving at least four marks for the question.

However, some candidates attempted to introduce other factors into the answer and so gave factors which were irrelevant to the answer

Question 2

Virtually all candidates attempted this question, although not always successfully. When presented with a question that asks candidates to explain a concept within a certain scenario, candidates may be awarded one or two marks for generic answers. In order to achieve anywhere near full marks, candidates must be apply their understanding of both the concept and the scenario. Therefore, whilst candidates may have achieved a mark for stating that the system responds to inputted data instantaneously, and therefore got a mark for a fairly generic comment, further marks could only be achieved by, for example, stating that an air conditioning system works continuously until it is turned off.

Question 3

- (a) When asked to describe features of a type of software, candidates need to be able to describe how that software does what is intended to do. Across the whole of anti-virus software, there are many aspects on which candidates could have focussed and many candidates did so successfully. For example, candidates identified that anti-virus software scans the computer to find viruses, or stated that scans could happen automatically, both of which were acceptable answers.

The failing was not that candidates did not know the answer to the question, or were stuck for answers, but that they failed to work with the marks available. Many candidates gave one or two points and stopped. The question was worth three marks and, without three individual points being made, three marks were not achieved. Candidates must focus both on the actual question being asked and on the tariff for the question to answer accordingly.

- (b) This question proved something more of an issue than did the previous. Whilst it was clear that many candidates fully understood what was meant by back-up software, many focused on how backups could be used, rather than on the software itself. Whilst some marks were available for stating that backups could be used to replace data in the event of a loss, this was very much part of an answer about back-up software and what it did, rather than its implication. As an explanation, had candidates answered question 3a in a similar fashion, answers such as 'The users can use their computers safe from viruses' would have been given.

Candidates needed to answer either in terms of partial or full copies of data being made or describe stages in the process of the back-up process, rather than concentrate on how users would benefit from the use of back-up software.

Question 4

This question was generally poorly answered. This was usually because of a lack of understanding of the term MIS, as well as a lack of understanding of what is included in an MIS. In some cases, where candidates did know about an MIS, they mis interpreted the question to be about what an MIS does for an organisation.

Unfortunately, such a lack of understanding in such a high tariff question did adversely affect many candidates' performance overall.

Question 5

- (a) Where candidates had studied route scheduling in preparation for the examination, there were some very clear and successful answers. Unfortunately, such answers were in the minority. The use of expert systems within route scheduling for delivery vehicles is one of the eight scenarios listed in the syllabus. Despite this, a significant proportion of candidates thought the question was about planning a route from A to B. They then discussed features such as the system being able to tell the user when to turn left or right, for example. A route scheduling system takes intended locations and using variables, some of which will be real-world real time variables, plots a sequence that the deliveries will then follow, in order to achieve a route that is effective both in terms of distance and time.

As indicated above, where candidates appreciated this, there were some very good answers that covered the main points well.

- (b) Some candidates appreciated that backward chaining was a goal-based process, but, generally, very few were able to explain the concept with any great accuracy.

Question 6

There was a good level of understanding of this question. Generally, candidates fully appreciated that off-the-shelf software was generic software produced for a more generic audience and gave answers that worked on this theme and its implications.

Where there were issues, this was more to do with exam practice than understanding. For example, it is incorrect to claim that off-the-shelf software is quick to produce. It is not, and the process of development can be just as long as for custom written software. The correct statement is that off-the-shelf software is currently available, whilst custom written would need to be written, which would itself mean a wait. Furthermore, off-the-shelf software is not free. Stating that such software is free is a worrying claim from candidates at this level, yet it was suggested on a number of occasions.

Question 7

The answers to this question suffered from a lack of clarity of description. Candidates generally gave vague answers about every aspect of the process. For example, the syllabus states that infrared sensors detect movement of human bodies in burglar alarm systems. Despite this, very few candidates mentioned infrared sensors, but introduced 'movement sensors', which is not correct. Similarly, very few candidates appreciated that the triggering of an alarm system is generally only achieved once a comparison is made between an expected result – a background reading or base level reading – and what has been measured. For example, in a sound based system, a certain level of background sound must be accepted by the system, or every day background noise would continuously trigger the system.

Having dealt with the issue of how the presence of an intruder might be identified, candidates failed to use the input-process-output model to explain the output. For example, 'an alarm' does not ring. The alarm is the system, a bell rings.

Overall, at this level, description of any system must show a far higher degree of accuracy than was displayed in this question.

Question 8

Answers to this question were quite pleasing, with many candidates able to identify at least three errors. It is clear that some candidates used the code provided and analysed it line by line in order to identify logical inaccuracies and this proved to be very effective.

Question 9

This question was deliberately open so that candidates could explore the issue in its widest sense. Many candidates took full advantage of the opportunity and wrote expansive answers that dealt with many issues. Typically, candidates talked about the impact of an attack on a network's functionality, but some did then develop their answer to consider data theft, although, surprisingly, very few actually then addressed any legal consequences of such an event.

Question 10

Again, candidates were deliberately given an open question to allow them to explore the issue in some depth. What was clear, was that candidates generally understood the term digital divide and were then able to use it with some accuracy. Where candidates did so, answers tended to focus on young and old, or rich and poor, with candidates occasionally considering geographical groups.

In some cases, candidates only identified one side of a divide. In such cases, this was treated as being too vague, as a divide cannot be referenced by one side. Similarly in other cases, candidates split up their comparisons, so that they discussed one side of a divide and then the other. Where the comparisons were clear, and both sides clearly identified, marks were awarded. However, for comparisons, it is often easier to join points of comparison, so that both sides of the argument are provided together.

Question 11

- (a) This question did not provide any real challenge to the majority of candidates, who were able to either explain what the term meant or give clear examples.
- (b) This question was answered with mixed accuracy. In some cases, there were some very clear answers that scored well. However, other candidates apparently took the question as the opportunity to give as many points about e-safety as they could, often with no relevance to the actual question. Therefore, candidates could describe the use of anti-malware, as this would warn users of the possibility of a threat, but then could not describe how users should not go to 'dodgy' websites. Not only is the term 'dodgy' to be avoided, but going to such a website does not inexorably lead to the loss of personal data held by a company. It **might** lead to some personal data about the individual being lost, but this is not what the question was asking.

INFORMATION TECHNOLOGY

Paper 9626/02
Practical

Key messages

For this examination, the main issues to note are as follows:

- Candidates need to take greater care to ensure that text added to their video is both accurate and placed as specified with no adjustment or movement to existing text.
- Candidates need to ensure that appropriate font styles are selected to ensure that text can be easily read, for example the font, its size and colour to give good contrast with the background.
- Candidates need to understand the requirements of the different types of entity relationship diagrams, both in terms of structure and content.
- Candidates need to create a database to the Third Normal Form from their Entity Relationship Diagram rather than allowing the wizard within the software to make decisions on their database structure.

General comments

The video questions were frequently answered well, although greater care was required with text entry, selecting appropriate colours that contrasted with the background and displaying all appropriate information in the credits.

The question requiring the drawing of a physical Entity Relationship Diagram was found challenging by many candidates, although some performed well on this. There were many different solutions to the database to Third Normal Form, few resembled the candidates attempts at the Entity Relationship Diagram.

Comments on specific questions

Question 1

Many candidates set the required aspect ratio for their video, but fewer candidates saved it with the required resolution. Most candidates removed the end of the clip as specified but many candidates found the removal of the soundtrack from the clip more challenging. Many candidates made appropriate use of pan and zoom to remove the crowd from the left of the frames, but fewer kept the entire elephant in the frames at all times. Most candidates saved the clip as specified.

Question 2

Most candidates completed this task as specified.

Question 3

This question appeared more challenging to candidates with many having a frame from almost the end of their video clip but not the final frame, so that when this was added to the clip (in **Question 4**) there was a noticeable transition/jerky movement between the video and still image.

Question 4

Although most elements of **Question 4** were completed as specified, a significant number of candidates needed to take greater care to ensure that text added to their video was accurate. The placing of this text was frequently seen with movement to the existing text. A small number of candidates used transitions for the text despite clear instructions that stated 'Do **not** use transitions'. Many candidates did not ensure that

appropriate font styles are selected to ensure that text can be easily read, for example the font, its size and colour to give good contrast with the background. Most candidates set the timings as specified, although some used the default settings from their packages. The audio clip was added at 9 seconds by most candidates although it was not always complete or running at the correct speed. Most candidates placed their background image teo3 after 31 seconds but not all candidates retained this for the credits. Some of the required text for the credits was explicit in the question but other information was not always distilled from the other information given and used within the credits, for example who filmed the original video clip and recorded the audio track.

Question 5

Most candidates completed this task as specified, although a number of candidates did not export their video into mp4 format, leaving their files in vendor specific formats like *.wlmv* and *.ppro* formats. These (and many other vendor specific) formats could not be assessed by Examiners.

Question 6

This step was often completed well by candidates who used an efficient method like paste transpose, but a significant number of candidates attempted this manually and introduced errors into the data. Fewer candidates showed evidence of their method, with some before and after screen shots (with no method shown) and other describing their method rather than showing it with screenshots.

Question 7

This step was completed as specified by most candidates although a few placed the 4 source files in random places in the spreadsheet rather than merging them into a single data set.

Question 8

This step was found challenging by most candidates. Many understood that ERDs were drawn with rounded rectangles with the entity name at the top and the attributes listed below. Far fewer drew a physical ERD which included attributes such as (field) names, data types, key field, field lengths etc. Even fewer candidates were able to design the entities and attributes so that they met the requirements of Third Normal Form for translation into a relational database. It would appear that few candidates had analysed the two files effectively and realised that a many-to-many relationship would be required, meaning that a link entity (and eventually a link table) was required. A number of candidates pasted the relationship diagram from their database into the evidence document rather than doing the planning and producing an ERD.

Question 9

Many candidates created a database, but some did not use their Entity Relationship Diagram, instead relying on the wizards within the software to determine what was required. This method of solution gained the candidates some marks but as a number of marks were allocated for this matching their ERD few candidates scored highly on this question. A very small number of candidates enforced referential integrity in their relationships.

INFORMATION TECHNOLOGY

Paper 9626/31
Advanced Theory

Key messages

Centres are again reminded to advise their candidates to target their responses to the command word in the question. For example, where a question asks how a topic point or process operates or is used, there is usually little or no credit given for describing what the point or process is since this does not answer the question 'how'. In Paper 3, it is expected that candidates have a depth of knowledge of the subject topics and are able to customise their responses according to the command words in the questions. The different command words given in the syllabus (p. 45) are used in questions to give candidates the opportunity to show their wider understanding of the syllabus topics by providing answers that focus on the various aspects of the topics. Questions can be set on any, and all, areas of the A Level topic syllabus so it is important that Centres ensure that their candidates study the content of all the topic areas.

General comments

While fewer candidates were omitting whole questions, centres are again advised to continue to encourage their candidates to attempt all questions. Even if the candidate knows little about the topic, a few sentences may gain valuable marks towards the overall total.

Candidates should read the whole of each question carefully and apply their knowledge to the scenario set in the question. The full range of marks is only available to candidates for answers referring to the scenario in the questions.

Candidates should be encouraged to write full sentences and discouraged from writing bulleted, short statements in their responses. Descriptions or explanations can only be conveyed in full sentences. Analyses, discussions and evaluations should also be in full sentences to properly answer the question.

Centres are advised to remind their candidates that they should not write answers based solely on words that they have 'spotted' or on 'key words' in the question. To do so usually means that the response does not answer the question and will score few, if any, marks.

Comments on specific questions

Question 1

This question was about how different servers are used in networks. Responses that described what each server was did not answer the question. The command word 'explain' is defined on p. 45 of the current syllabus and explanations require that expansions e.g. reasons be given.

- (a) Vague responses such as '*store web sites*' were not sufficient to be awarded marks. Good answers should have stated that a web server stores html documents so that these can be provided to clients as web pages or the server uses HTTP(S) to receive and send communications with clients which are web browsers.
- (b) Vague responses such as '*send emails*' were not sufficient to be awarded marks. Good answers referred to the management of email accounts enabling the sending and receiving of emails, the use of email protocols such as SMTP for receiving of emails from clients and IMAP for allowing clients to access email messages.

- (c) Vague responses such as *'for printing'* were not sufficient to be awarded marks. Good answers could have referred to the acceptance of print jobs from client devices and forwarding them to networked printers, queuing print jobs if the printer is busy and allowing the accounting and enforcing of print quotas.

Question 2

This question was about the technical details of UDP which is used for data transmission. UDP is listed in **section 14.7** of the current syllabus as a protocol to be studied so candidates were expected to be able to produce detailed answers. Most, however, could only give superficial answers without the necessary detail to score many marks.

- (a) While the very fine, intricate details of the structure of the header was not required, it was expected that candidates be able to explain that the header contained data about the addressing required to deliver the packet, its content e.g. the length of packet i.e. the header plus data and a checksum field used to check for errors in the packet when it is received. Specific details such as the specific number of bytes used for a particular purpose were rewarded with marks as this indicates an understanding of how UDP is used.
- (b) This question was not well answered as many candidates confused UDP with other protocols or even with routers. Centres are reminded that candidates must study all of the topics in the syllabus. Answers should have included drawbacks such as UDP does not provide any acknowledgement of the receipt of a packet so it is deemed unreliable because packets may be lost and there is no provision for the ordering of packets so there is no tracking of messages/data sent using UDP.

Question 3

This question was about the phases in the process of data mining. **Section 12.2** of the current syllabus lists the phases of data mining that candidates should study. Most candidates appeared not to understand the phases or to confuse the tasks that are carried out in each of the phases. Most answers were vague and lacked any detail of the phases.

- (a) The business understanding phase includes identifying business goals and assessing the reasons for carrying out the data mining. Good answers should have referred to these and e.g. the production of a plan for the data mining process.
- (b) Good answers should have included e.g. references to the gathering and documenting of the data required for the process, listing the sources of the data and verifying the quality of the data that has been gathered.

Question 4

The question asked candidates about the impact of the use of cryptocurrency on individuals. Answers should have been focused on how the use of cryptocurrency affects individuals and not on businesses or governments. The command word *'discuss'* is defined (p.45 of the current syllabus) as *'write about issue(s) or topic(s) in depth in a structured way'* so candidates are expected to expand on statements and give greater detail. When discussing 'impacts', candidates should include both positive and negative impacts. Many vague answers e.g. *'can lose money easily'* were seen which indicates that candidates were aware of cryptocurrencies but did not understand the specifics of its impact on individuals. Good answers could have included references, amongst others, to e.g. the encryption of currency records and transactions are for security which assures the privacy and the anonymity of the user and the currencies are not regulated or subject to fees during transactions. Negative impacts on individuals include transactions not being irreversible so cannot be cancelled and if the currency can be sent to the wrong person the value is lost and the fact that some countries do not allow cryptocurrency so goods cannot be purchased from or in these countries using cryptocurrency.

Question 5

The comments about the command word *'discuss'* in **Question 4** also apply here. When answering this type of question, candidates are expected to be able to expand their responses to show that they not only know about the facts but understand the topic in depth. This question asked about the agile method of software development so good answers should have stated some facts about the method with the facts being used to expand the answer. For example, the satisfaction of the client is the highest priority in the agile method from

the earliest stages to the completion of the development of the app so and changes in client's requirements can be accommodated at any stage up to, and including, the moment of the final handover of app, but design specifications and project plans are often not accurate because the design changes over time. Short statements or bulleted responses that do not expand on facts cannot be awarded the higher marks because these are not discussions.

Question 6

The comments about the command word '*discuss*' in **Questions 4 and 5** also apply here. In this question, a discussion of the advantages and disadvantages of microwave transmission was required. A few candidates confused microwave transmission with Wi-Fi/wireless networking and so did not answer the question. Some candidates could describe microwave transmission technology in outline but few could further expand on the advantages and disadvantages of its use. Good answers should have referred to e.g. its large bandwidth which enables it to carry a greater amount of data compared to other media, the use of narrow microwave beams so they do not interfere with other equipment and enable the use of small antennae or devices for mobile operations e.g. TV sporting transmissions but the requirement for line of sight means antenna cannot be 'over horizon' and are limited to 50 to 80 km apart is a disadvantage compared to e.g. satellite communications systems. Again, short statements or bulleted responses that do not expand on facts cannot be awarded the higher marks because these are not discussions.

Question 7

This question was specifically about decentralised banking systems with Bitcoin used as an example.

- (a) Most candidates could describe what 'decentralised' meant but few could expand on this. Explanations require a statement and an expansion, which is often a reason but can be additional facts, to fully answer the question. A good answer would have stated that there is no central governing authority which means that there is no oversight or regulation to keep a check on, or record of, financial transactions.
- (b) This question asked specifically about the use of Bitcoin. Some candidates confused its use with online shopping methods but some correctly referred to Bitcoin 'wallets', exchanges, peer-to-peer transactions and blockchain technologies.

Question 8

Some candidates confused MOOCs with other technology-enhanced learning delivery methods. The current syllabus, p. 26, clearly lists different types so it expected that candidates be able to distinguish between them.

- (a) Some candidates produced good answers referring to the participation of very large numbers of candidates, the use of a range of multimedia, videos etc., but some focused on the use of the internet and remote learning, neither of which are *features* of a MOOC.
- (b) This question as only about drawbacks but some candidates described benefits as well as, or instead of, the drawbacks. As noted above, explanations require more than brief statements. A good answer should have made a statement and then expanded with more information e.g. the very large amount of content that is available can be difficult to navigate and learn due the lack of readily available guidance from a teacher or lecturer.

Question 9

This question was about bit rates in data communications.

- (a) Most candidates appeared to understand the concept of bit rates when used to express how fast data is transmitted e.g. as the number of bits transmitted per second or unit of time in kbps/kilobits per second (other valid SI, metric or decimal prefixes were acceptable). A few candidates correctly described this in some detail. Credit was also given for valid descriptions of how an IT technician might actually measure this on a network.
- (b) Most candidates could not answer this question. Most produced vague answers which were either incorrect or failed to include any detail. A good answer should have made reference to factors that

affect data transmission e.g. the available bandwidth or the level of noise or interference on the communication channel.

Question 10

Threat detection is an important feature of network security. Many candidates appeared to be aware of the threats and how to deal with the consequences but few were able to explain how the threats could be detected before any damage occurred. While the use of anti-malware to scan existing and incoming data, files or client requests was often seen in answers, few candidates could go further and explain about e.g. the use of firewalls to filter data packets and report or block any suspicious findings, the analysis of user actions to establish a baseline of normal activity and then monitor for abnormal activities to detect threats from users or the use of logs which are then analysed. As noted previously, explanations should go further than listing facts in brief, short statements if high marks are to be achieved.

INFORMATION TECHNOLOGY

Paper 9626/32
Advanced Theory

Key messages

Centres are again reminded to advise their candidates to target their responses to the command word in the question. For example, where a question asks how a protocol or process operates or is used, there is usually little or no credit given for describing what the protocol or process is since this does not answer the question 'how'. In Paper 3, it is expected that candidates have a depth of knowledge of the subject topics and are able to customise their responses according to the command words in the questions. The different command words given in the syllabus (p. 45) are used in questions to give candidates the opportunity to show their wider understanding of the syllabus topics by providing answers that focus on the various aspects of the topics. Questions can be set on any, and all, areas of the A Level topic syllabus so it is important that centres ensure that their candidates study the content of all the topic areas.

General comments

While fewer candidates were omitting whole questions, centres are again advised to continue to encourage their candidates to attempt all questions. Even if the candidate knows little about the topic, a few sentences may gain valuable marks towards the overall total.

Candidates should read the whole of each question carefully and apply their knowledge to the scenario in the question set. The full range of marks is only available to candidates for answers referring to the scenario in the questions.

Candidates should be encouraged to write full sentences and discouraged from writing bulleted, short statements in their responses. Descriptions or explanations can only be conveyed in full sentences. Analyses, discussions and evaluations should also be in full sentences to properly answer the question.

Centres are advised to remind their candidates that they should not write answers based solely on words that they have 'spotted' or on 'key words' in the question. To do so usually means that the response does not answer the question and will score few, if any, marks.

Comments on specific questions

Question 1

This question was about tunneling which is a method of communicating over public networks. The questions focused on the 'why' and 'how' and descriptions of tunnelling were not required.

- (a) Many candidates described tunnelling which did not answer the question. The question required candidates to give reasons why it would be used. Answers could have included allowing data to be kept secure when working remotely, allowing the use of 'foreign' protocols on networks that do not support that protocol or its use in providing the VPN services that keep data private on public networks.
- (b) This question was about how tunnelling transfers data over the internet. Descriptions of VPNs did not properly answer this question. Descriptions of the process of e.g. data being broken into packets for transfer over an IP network and the encapsulation of the packets by the Tunneling Protocol/L2TP sending out over the internet) were required.

Question 2

This question was about data mining. Many candidates appeared to confuse data mining with modelling or data analysis with spreadsheets. Data mining attempts to discover patterns and trends in very large data sets. It is not used to model finances or staffing ratios. Good answers should have referred to the pattern or trend discovery in large data sets for comparing symptoms to analyse disease causes, determining the effectiveness of drugs for illnesses to determine most effective course of treatment or determining unusual patterns in medical claims by patients or doctors which may identify fraudulent medical claims. In this type of question, answers that refer to the scenario in the stem of the question are more likely to be awarded the higher marks.

Question 3

This question was about how FTP servers carry out their role in a network. Answers referring to what it is used for did not answer the question. Good answers should have referred to using the file transfer protocol to transfer data across a network between a client and a server and how this is accomplished, e.g. the server listening for USER and PASS commands from a client, using a control connection on port 21, using port 22 for STPS or FTPS when the exchange is encrypted and the server sending an acknowledgement to the client if its credentials are accepted and then opening a session. These details answer the question 'how' rather than 'what' or 'why'.

Question 4

The question asked candidates about NFC and Bluetooth.

- (a) This question to describe then uses of NFC so any valid use of NFC in mobile devices was acceptable. However, many candidates gave three very similar answers instead of choosing responses from different areas of use. Good answers should have referenced the exchange of e.g. personal data, use with *smart* locks (not just door locks) or then use in gaming to exchange details required for entering online games or using contactless payment systems.
- (b) Only the differences were required for this question. Most candidates focused on the disparity in the useful distance between devices, the faster set up time of NFC, and the lack of the need for pairing codes by NFC. However, most did not expand these into discussion which required further comments, e.g. NFC has a maximum working distance of about 20 cm whereas Bluetooth is significantly more (e.g. 10 m or more) which means that the NFC devices have to be very close and this, in turn, enhances privacy or security. Answers to 'discuss'; questions require more than descriptions.

Question 5

In this question, candidates were asked about document analysis. Responses that described other methods of analysing systems were not required unless they were a part of a valid comparison with document analysis. When answering questions that require an evaluation, it is important to include in the response both points of view i.e. those points that support the use and those that do not. A proper evaluation gives both and often, but not necessarily, comes to a formal conclusion. While a formal conclusion is no longer required, an evaluation does require a judgment to be made as stated in the Command Word definitions on p. 45 of the current syllabus. This can be achieved by making statements and expanding upon them e.g. document analysis is the systematic process of reviewing and evaluating the printed and computer-based documents which provides a large amount of information about the system, the document analysis uses data that has already been collected so only selection of the data is needed so may require less time than other methods but there may be vast quantities of documents to read which can take up a great deal of time, the documents are produced only as a record of an event so may lack insufficient detail to be useful in the research by the analyst. Also, the data may be inaccurately recorded so it may not reflect actual events or contain all the data so the analysis may not produce accurate results. Answers that lack further expansion on statements cannot access the higher marks.

Question 6

While questions about 'how' the client-server model is used in various scenarios have appeared before, this question asked for a justification of its use. The syllabus defines the command word 'justify' as 'support a case with evidence/argument' so candidates were required to show that they understood the use of client-server model and to explain why it would be used. Responses that explained why it would not be used

did not answer the question. Some candidates appeared to misunderstand the question and gave answers that referred to clients as customers and included details of project management techniques. The question included details of where the client-server model was being used as a means of providing a scenario for candidates to write about different uses of the model centres are reminded to ensure that their candidates read questions properly as the actual question line is quite clear as to what was required. Good answers could have included references to e.g. the centralisation of data or files or applications on a file or applications server so only one copy has to be maintained, updated and backed up, the servers can be set up to carry out different roles and allow different access rights for different client devices and the system is easily scalable without any disruption to users and without the need to update or upgrade user devices. Answers that did not give a valid justification or reason for the use could not access the higher marks.

Question 7

Thus question was about the use of prototyping in the development of a smartphone app. While many candidates produced good answers, a significant number confused the different prototyping methods.

- (a) Good answers should have referred to how prototyping is used to detect and correct problems during the app development and allows users try out the app during its development in order to provide feedback and suggest new features to be incorporated in the app.
- (b) While this question did not specifically demand that candidates include both similarities and differences, centres are reminded that the command word (p.45 of the current syllabus) '*compare*' is defined as '*identify/comment on similarities and/or differences*'. This means that candidates could have included both similarities and differences but were not penalised if they did not. Centres are minded to ensure that their candidates read questions carefully as, often, in these types of questions both are demanded. However, in this case, full marks could have been achieved with only similarities or only differences in the answers. Similarities include both types of prototyping develop early prototypes that do not feature the full requirements of the users and developers and interact frequently with end-users during when creating both types of prototypes. Differences that could have been included are that throw-away prototypes are discarded at any stage whereas evolutionary prototype become part of the final product and time scales are easier to set in throw-away prototyping than in evolutionary prototyping.

Question 8

The symbols to be used in DFDs for this syllabus are clearly shown on p. 42 of the current syllabus. Candidates were asked to draw the correct symbols in six places on the diagram. To do this, candidates had to correctly identify the elements and then draw the correct symbols over them. Many candidates were able to do this and score the full six marks. However, those candidates that added elements e.g. lines, arrows or additional elements did not answer the question. Some candidates confused the symbols, drew the same ones for every element or did not identify the elements correctly and so did not score the marks.

Question 9

This question was about the use of strings in JavaScript.

- (a) JavaScript strings are for storing characters. The essential point here is 'storing' and many candidates scored the mark. However, many candidates described a string rather than its purpose. Centres are again reminded to ensure that their candidates read the question carefully.
- (b) Coding in JavaScript demands precision and accuracy in the syntax. This question was about the use of quotes and how the lack of attention to the syntax can produce unexpected results. Some candidates ignored the reference to the error being in line 10 of the code and described other (non-existent) errors so did not score any marks. Correct answers referred to the misuse of double quotes in that the use of same type of quotes causes code to stop executing so the string is not displayed and the code returns the focus to HTML stopping the browser from executing the remainder of page code.
- (c) The comments about the command word '*compare*' made in **Question 7 (b)** also apply here. This question was not well answered with a common mistake by candidates being to repeat the

question e.g. both delay the start of the code. Good answers should have referred to common features in the syntax e.g. both requiring two parameters, both using milliseconds as the timing unit or both being interruptible by the `clearInterval`. Differences in the effect on the code were not clearly described by most candidates but should have referred to e.g. `setTimeout()` delaying the execution of code which runs only once while `setInterval()` is used for repeated execution of the code at (pre-set) intervals.

Question 10

It was clear that this topic was not well understood by candidates. Both **parts (a)** and **(b)** were not well answered and candidates struggled to score marks. The question was about the layering and flatten tools as used in image editing software. Many candidates did not appear to understand these tools or incorrectly referred to their use in animations.

- (a) A few candidates described animation techniques which did not answer the question. Some candidates could briefly explain the use of the layering tool for separating objects in an image for separate editing but most could not elaborate on this. A good answer would have given a reason, such as being able to edit an object without affecting other objects, for this. Other explanations could have included being able to move objects independently around the canvas or to be able to undo actions more readily.
- (b) There were some totally incorrect responses which referred to *'flattening 3D images for better viewing'* which indicated that many candidates appeared not to know about this tool. The most common reason for using the flatten tool is to combine or merge all layers of the image into one single layer but others include reducing the file size or discarding any hidden layers so that all the layers become visible. Good answer should have referred to these.

INFORMATION TECHNOLOGY

Paper 9626/33
Advanced Theory

Key messages

Centres are again reminded to advise their candidates to target their responses to the command word in the question. For example, where a question asks how a topic point or process operates or is used, there is usually little or no credit given for describing what the point or process is since this does not answer the question 'how'. In Paper 3, it is expected that candidates have a depth of knowledge of the subject topics and are able to customise their responses according to the command words in the questions. The different command words given in the syllabus (p. 45) are used in questions to give candidates the opportunity to show their wider understanding of the syllabus topics by providing answers that focus on the various aspects of the topics. Questions can be set on any, and all, areas of the A Level topic syllabus so it is important that Centres ensure that their candidates study the content of all the topic areas.

General comments

While fewer candidates were omitting whole questions, centres are again advised to continue to encourage their candidates to attempt all questions. Even if the candidate knows little about the topic, a few sentences may gain valuable marks towards the overall total.

Candidates should read the whole of each question carefully and apply their knowledge to the scenario set in the question. The full range of marks is only available to candidates for answers referring to the scenario in the questions.

Candidates should be encouraged to write full sentences and discouraged from writing bulleted, short statements in their responses. Descriptions or explanations can only be conveyed in full sentences. Analyses, discussions and evaluations should also be in full sentences to properly answer the question.

Centres are advised to remind their candidates that they should not write answers based solely on words that they have 'spotted' or on 'key words' in the question. To do so usually means that the response does not answer the question and will score few, if any, marks.

Comments on specific questions

Question 1

This question was about how different servers are used in networks. Responses that described what each server was did not answer the question. The command word 'explain' is defined on p. 45 of the current syllabus and explanations require that expansions e.g. reasons be given.

- (a) Vague responses such as '*store web sites*' were not sufficient to be awarded marks. Good answers should have stated that a web server stores html documents so that these can be provided to clients as web pages or the server uses HTTP(S) to receive and send communications with clients which are web browsers.
- (b) Vague responses such as '*send emails*' were not sufficient to be awarded marks. Good answers referred to the management of email accounts enabling the sending and receiving of emails, the use of email protocols such as SMTP for receiving of emails from clients and IMAP for allowing clients to access email messages.

- (c) Vague responses such as *'for printing'* were not sufficient to be awarded marks. Good answers could have referred to the acceptance of print jobs from client devices and forwarding them to networked printers, queuing print jobs if the printer is busy and allowing the accounting and enforcing of print quotas.

Question 2

This question was about the technical details of UDP which is used for data transmission. UDP is listed in **section 14.7** of the current syllabus as a protocol to be studied so candidates were expected to be able to produce detailed answers. Most, however, could only give superficial answers without the necessary detail to score many marks.

- (a) While the very fine, intricate details of the structure of the header was not required, it was expected that candidates be able to explain that the header contained data about the addressing required to deliver the packet, its content e.g. the length of packet i.e. the header plus data and a checksum field used to check for errors in the packet when it is received. Specific details such as the specific number of bytes used for a particular purpose were rewarded with marks as this indicates an understanding of how UDP is used.
- (b) This question was not well answered as many candidates confused UDP with other protocols or even with routers. Centres are reminded that candidates must study all of the topics in the syllabus. Answers should have included drawbacks such as UDP does not provide any acknowledgement of the receipt of a packet so it is deemed unreliable because packets may be lost and there is no provision for the ordering of packets so there is no tracking of messages/data sent using UDP.

Question 3

This question was about the phases in the process of data mining. **Section 12.2** of the current syllabus lists the phases of data mining that candidates should study. Most candidates appeared not to understand the phases or to confuse the tasks that are carried out in each of the phases. Most answers were vague and lacked any detail of the phases.

- (a) The business understanding phase includes identifying business goals and assessing the reasons for carrying out the data mining. Good answers should have referred to these and e.g. the production of a plan for the data mining process.
- (b) Good answers should have included e.g. references to the gathering and documenting of the data required for the process, listing the sources of the data and verifying the quality of the data that has been gathered.

Question 4

The question asked candidates about the impact of the use of cryptocurrency on individuals. Answers should have been focused on how the use of cryptocurrency affects individuals and not on businesses or governments. The command word *'discuss'* is defined (p.45 of the current syllabus) as *'write about issue(s) or topic(s) in depth in a structured way'* so candidates are expected to expand on statements and give greater detail. When discussing 'impacts', candidates should include both positive and negative impacts. Many vague answers e.g. *'can lose money easily'* were seen which indicates that candidates were aware of cryptocurrencies but did not understand the specifics of its impact on individuals. Good answers could have included references, amongst others, to e.g. the encryption of currency records and transactions are for security which assures the privacy and the anonymity of the user and the currencies are not regulated or subject to fees during transactions. Negative impacts on individuals include transactions not being irreversible so cannot be cancelled and if the currency can be sent to the wrong person the value is lost and the fact that some countries do not allow cryptocurrency so goods cannot be purchased from or in these countries using cryptocurrency.

Question 5

The comments about the command word *'discuss'* in **Question 4** also apply here. When answering this type of question, candidates are expected to be able to expand their responses to show that they not only know about the facts but understand the topic in depth. This question asked about the agile method of software development so good answers should have stated some facts about the method with the facts being used to expand the answer. For example, the satisfaction of the client is the highest priority in the agile method from

the earliest stages to the completion of the development of the app so and changes in client's requirements can be accommodated at any stage up to, and including, the moment of the final handover of app, but design specifications and project plans are often not accurate because the design changes over time. Short statements or bulleted responses that do not expand on facts cannot be awarded the higher marks because these are not discussions.

Question 6

The comments about the command word '*discuss*' in **Questions 4 and 5** also apply here. In this question, a discussion of the advantages and disadvantages of microwave transmission was required. A few candidates confused microwave transmission with Wi-Fi/wireless networking and so did not answer the question. Some candidates could describe microwave transmission technology in outline but few could further expand on the advantages and disadvantages of its use. Good answers should have referred to e.g. its large bandwidth which enables it to carry a greater amount of data compared to other media, the use of narrow microwave beams so they do not interfere with other equipment and enable the use of small antennae or devices for mobile operations e.g. TV sporting transmissions but the requirement for line of sight means antenna cannot be 'over horizon' and are limited to 50 to 80 km apart is a disadvantage compared to e.g. satellite communications systems. Again, short statements or bulleted responses that do not expand on facts cannot be awarded the higher marks because these are not discussions.

Question 7

This question was specifically about decentralised banking systems with Bitcoin used as an example.

- (a) Most candidates could describe what 'decentralised' meant but few could expand on this. Explanations require a statement and an expansion, which is often a reason but can be additional facts, to fully answer the question. A good answer would have stated that there is no central governing authority which means that there is no oversight or regulation to keep a check on, or record of, financial transactions.
- (b) This question asked specifically about the use of Bitcoin. Some candidates confused its use with online shopping methods but some correctly referred to Bitcoin 'wallets', exchanges, peer-to-peer transactions and blockchain technologies.

Question 8

Some candidates confused MOOCs with other technology-enhanced learning delivery methods. The current syllabus, p. 26, clearly lists different types so it expected that candidates be able to distinguish between them.

- (a) Some candidates produced good answers referring to the participation of very large numbers of candidates, the use of a range of multimedia, videos etc., but some focused on the use of the internet and remote learning, neither of which are *features* of a MOOC.
- (b) This question as only about drawbacks but some candidates described benefits as well as, or instead of, the drawbacks. As noted above, explanations require more than brief statements. A good answer should have made a statement and then expanded with more information e.g. the very large amount of content that is available can be difficult to navigate and learn due the lack of readily available guidance from a teacher or lecturer.

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affect data transmission e.g. the available bandwidth or the level of noise or interference on the communication channel.

Question 10

Threat detection is an important feature of network security. Many candidates appeared to be aware of the threats and how to deal with the consequences but few were able to explain how the threats could be detected before any damage occurred. While the use of anti-malware to scan existing and incoming data, files or client requests was often seen in answers, few candidates could go further and explain about e.g. the use of firewalls to filter data packets and report or block any suspicious findings, the analysis of user actions to establish a baseline of normal activity and then monitor for abnormal activities to detect threats from users or the use of logs which are then analysed. As noted previously, explanations should go further than listing facts in brief, short statements if high marks are to be achieved.

INFORMATION TECHNOLOGY

Paper 9626/04
Advanced Practical

Key messages

The level of skill and experience necessary for this paper was not unduly high but a number of candidates clearly found parts of it difficult. It was apparent that it was the problem-solving element of each task with which candidates struggled. This prevented many achieving the higher grades. Centres would benefit from developing a library of practice tasks that involve the necessary skills in problem solving contexts.

General comments

Complete solutions to all the tasks were not often seen but most candidates were able to demonstrate an appreciation of the skills and stages required for each task.

Comments on specific questions

Task 1a – Spreadsheet and database

The first part of the task involved using a spreadsheet to compare candidate responses to test questions with the correct answers. Few candidates realised that if the answers file was opened in a spreadsheet and the values transposed, a simple, carefully referenced and replicated IF() statement was all that was needed to generate the marks for totalling.

Creating the database required for the next parts of the task posed few problems for candidates but it was clear from the question paper that to create the form shown, candidates would need to use fields from more than one table. This was easily achieved by creating a query. The candidates who realised this were able to gain the marks for creating the form but not all were familiar enough with the form design tools to create the correct inclusions, layout and formatting.

Adding the calculated control source for displaying the 'Pass/Resit Test/Retake Course' result was completed by very few.

Centres would benefit from emphasising the use of form design tools and calculated control sources when covering this topic.

Task 1b – Mail merge

Almost all candidates were familiar with mail merge techniques and most gained the marks for inserting mergefields and using conditional fields correctly. The task, however, required the creation a data source that contained not just the IDs, names, classes and scores, but also a list of the incorrect answers given by each candidate. This last requirement proved to be beyond many candidates despite the method being illustrated in the question paper 'Hint'.

Once again it was the problem-solving challenge that only the better candidates were able to address.

Task 2 – Vector Graphics

The task required candidates to create a vector drawing based upon a bitmap image of a plane. Accurately outlining the bitmap image was sufficient for the first part of the task. Many candidates succeeded in creating a similar shape for the plane but many lost marks for the accuracy of their contours of the wings and the cockpit.

Also worth noting is that creating the required perspective for the designs on the wings proved tricky for some candidates. Centres would benefit from providing exercises in the use of distortion tools to achieve suitable perspectives.

Creating the ribbon streamer was completed satisfactorily by most candidates but very few managed to make the text follow the path required to make the letters fit the shape accurately. Fitting text to a path is an essential skill for this sort of task.

Task 3 – Animation

The task required candidates to create an animation of a plane following a prescribed path on a layered background. The cloud layer had to have the opacity of the cloud adjusted so the plane could be seen as it went behind the cloud. This element of the task proved beyond the experience of some candidates. In general, though, the use of a layered background caused problems for very few candidates.

For the first pass of the animation the plane had to enter on a downward trajectory, ‘loop the loop’ and exit on an upward trajectory. Most candidates managed to create and use an appropriate path but very few managed to maintain the correct orientation of the plane throughout the path. Maintaining the orientation is not difficult so centres would benefit from giving candidates experience of a range of path-following tasks.

Task 4 – Programming for the web

This was a straightforward task that required candidates to create variables to hold the given text and write the functions to display the text. The names of the variables and the functions were evident in the html page provided.

Even without previous experience of using ‘onmouseover’ and ‘onmouseout’ events, candidates should have been able to discern the method from the html.

Many candidates managed to provide appropriate code and whilst several submissions did not work properly, most of these candidates were able to gain a fair number of marks.

In conclusion

For this session, the main issues for centres to bear in mind are:

- The importance of developing a library of practice tasks that involve the necessary skills in problem solving contexts.
- Candidates need to develop skills in the creation of database forms; particularly the use of calculated control sources.
- Candidates must pay attention to accuracy and small details when attempting graphics tasks.
- The need to provide exercises in the use of distortion tools to achieve suitable perspectives.
- Fitting text to a path and adjusting the opacity of layers are essential skills in vector graphic design.
- The need to develop a range of path-following tasks when covering animation techniques.