INFORMATION TECHNOLOGY

Paper 9626/11
Theory 11

Key messages

At this level of study, candidates are expected to demonstrate more than just general knowledge and should be able to provide more detailed answers than would be expected at GCSE. Most questions require a better technical understanding of the ICT terms and their applications than at the GCSE level. Some of the questions proved to be more challenging this year for all candidates, although the paper's difficulty level was similar to previous years. It is important that the correct technical terms are used appropriately, and the correct steps are used in analysing the ICT processes.

A gentle reminder to the candidates is that structured answers are preferred to individual points in order to develop correct and complete responses to the questions on a paper. Furthermore, the scenario within which each question is set 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 the question is set and to reject answers that do not fit that scenario and context.

While there were some answers that gave clear explanations in some depth on this paper, many of them could benefit from a more structured approach and gain more marks. For example, if a question asks for the benefits of a particular router, no marks will be awarded for just describing how the router operates. The marks will be awarded for describing the advantages of using that router in the circumstances outlined in the question.

Finally, 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 of 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 and other items should not be used in responses. This is unlikely to change, and therefore candidates should be learning the proper terms for software and specialist items of hardware. Where trade names are found, these are ignored. This often resulted in marks being lost, as, without the trade name, answers often made no sense. The use of brand names by candidates remains one aspect of candidates' performance that has a disproportionally high impact on candidates' performance.

As with previous sessions, work at this level assumes a level of technical understanding. Some candidates showed good problem solving skills, and their answers showed a deep understanding of ICT concepts and techniques. Other candidates' answers to these questions were either too general to be awarded anything other than single marks or the answers addressed ICT topics other than the question asked. In the latter case, some candidates were writing about something they knew rather than focussing on the actual question asked.

Candidates are again recommended to work the marks available for each question, as indicated beneath each answer space. In some cases, candidates appear to be targeting these marks correctly and writing answers that make as many points as marks available, but in other cases, we have seen little or too much work for these marks. Furthermore, in an apparent attempt to fill their answers with points, some candidates

repeat their arguments with different wording or explanations. Any valid point may only be awarded once, so we recommend a better strategy for using the time during the examination.

Candidates are also reminded that where handwriting cannot be read, whilst every effort is made to interpret the candidate's answer, where the answer is illegible, marks cannot be awarded.

Comments on specific questions

Question 1

(a) Most candidates gave good answers to this question. One common mistake is considering that encrypted data is unreadable without a key, which is one advantage of encrypting the data. Since encrypted data is a sequence of letters, numbers, or other characters, it is actually readable. However, because the original data is scrambled, its meaning is hidden, making it impossible to understand or interpret.

(b) This question was actually about how data may be misused. Most candidates realised this and gave answers that focused on identity theft. However, candidates lost marks despite showing some understanding because they did not give the right explanation. Typically, candidates missed some marks by suggesting that losing bank account details would cause losing funds. This answer is not enough. Candidates need to be, at least, talking about bank accounts and credit card numbers for this answer to be acceptable. Having correctly identified that loss of a, for example, credit card number would have an implication, candidates need to state something more than 'money will be lost'.

Question 2

This question is one instance where using trade names directly hindered candidates. As mentioned above, trade names are ignored in examination. Therefore, giving an answer solely based on the trade name, the sentence made little sense or not. However, where the trade name was used as an example of an already identified generic device, removing the trade name did not affect the clarity of the answer.

Candidates generally had some idea of what was meant by a Smart Home, and some candidates' answers showed a deep understanding and an approach one would expect to work at this level. However, there were instances where the answers were quite vague about how the devices are controlled within the Smart House.

Question 3

Few candidates scored marks on this question, showing a good understanding of compilers. Typically, candidates stated that a compiler was slow, expensive, or had to compile every time the program was being run.

Sometimes, candidates knew fully that compilers only compile for one operating system, and gave excellent answers that fully justified the award of three marks.

Question 4

(a) As with other questions that focus on the digital divide and its causes, few candidates attempted to answer the question as written. The most common mistake is introducing different causes with little or no reference to the impact of the level of industrialisation. No marks are awarded on those answers, so candidates lost valuable time during the examination.

Where candidates were aware that different causes for the digital divide exist and were able to focus on the impact of industrialisation, answers were fair, although often quite vague. Typically, candidates achieved marks for mentioning differences in infrastructure but then failed to expand on the nature of the infrastructure.

(b) Many candidates seemed to feel that this question was an opportunity to either repeat their previous answer or give answers that were so vague as to have been able to fit any scenario. This is disappointing, because amongst the vague answers, there were some that were on their way to being correct. For example, some candidates focused on an inability to talk to family members. This is clearly not enough, but if, as is probably the case, the candidate meant to say that people

are unable to communicate with family members via web enabled devices, for example, this would have been awarded the mark. In fact, in many cases, had candidates approached this question with more concentration and more fully answered the question, far more marks would have been awarded.

In all such questions where candidates have to describe the effects of a form of digital divide, candidates would be advised to consider whether an answer based on the divide getting ever wider may be the basis of a suitable answer.

Question 5

(a)   Few candidates identified validation and sorting for this answer.

(b)   Questions such as this are asked fairly regularly. The question clearly states that the candidate should list the steps involved when a master file is updated using a transaction file.

Despite this, few candidates described the steps, and few described a process of updating a master file from a transaction file. This would suggest that very few understood the relationship between the two.

This may be disappointing, as the actual process of comparison, identification and updating is relatively straightforward and the range of possible answers and marks far outweighed the actual marks available for the question.

Where candidates did attempt the question with a degree of understanding, the answers were often very confused. Candidates tended to ignore Product ID numbers as the identifying factor for each record and tended to confuse the term file for record.

Question 6

(a)   This question appeared to cause some confusion.

At its most simple, the question is about what needs to be decided before one backs up data held on a server. In such a case, what, where, and when would appear to be fairly straightforward foci for the answer to the question. Where candidates focused on all or some of these themes, there were some good answers. Unfortunately, some candidates included superfluous content, including an in-depth discussion of what is meant by the term 'back-up', as well as a discussion of choosing the software to do the back up and from where this was best downloaded.

Candidates also discussed the need for compression as part of the back-up process. Again, this discussion was irrelevant to the question asked here.

(b)   Arguably, this question's focus on compression may have led to some of the confusion shown by candidates in the previous question. However, the question clearly states that compression will be carried out before the back-up process begins. This should have served to remove any doubt in candidates' minds that compression was a constituent part of the process of creating a back-up.

This question requires a better technical understanding of compression. In a few cases, candidates mentioned lossy and lossless compression, but then, generally, failed to give any further technical understanding of the processor their impact on the audio files.

Question 7

This question required candidates to be able to describe the collection, processing, and display of data. As a question, it posed various problems for candidates, many of which are fairly easily remedied.

Firstly, candidates should avoid repeating the question. As candidates were asked to describe how a system collects data, their answer had to avoid relying on the word 'collect'. Terms such as 'gather' were acceptable. The repetition of the question is a common error in this paper, and candidates are recommended to have a range of alternative terms they can use to explain simple concepts such as data gathering.

Secondly, not all candidates linked the context of the question to the main focus. Measurement of pollution is a frequent focus for this paper. Few candidates were able to clearly describe the variables that would be

measured, or the sensors that would do so. As a result, descriptions of the process of data collection were not gaining all marks.

Some candidates addressed the process by which data would be processed and then gave the results of any processing far more authority than it deserved. Typically, sensors collect values. These values may trigger events, such as in an alarm system, or may be collated into sets so statistical analysis may be carried out. In the case of pollution, data that is collected can be analysed to measure maximum, minimum and average values. From these, further analysis may be carried out, but this is not part of the process of collecting or processing data.

Question 8

Where candidates had a good understanding of how flowcharts are constructed, they did very well on this question. However, where they did not, they tended to score very poorly, if at all.

Candidates are reminded that all decision boxes must have a Yes and a No output (True and False are acceptable) and that they should use mathematical expression rather than text in their boxes. For example, the term 'is x between 5 and 10' is not acceptable.

Question 9

Some candidates knew this topic in great depth and gave full answers that fully deserved the high marks awarded. This is an important part of this syllabus and candidates would be advised to ensure that they have a sound understanding of different ways in which they may protect themselves in a range of differing scenarios.

Question 10

This question again requested an adequate level of technical understanding by candidates. Few candidates were able to give a working definition of sampling resolution and to describe how it was used.

Question 11

This question gave candidates the opportunity to show what they knew about methods of collecting data and many took the opportunity in their stride. There were some very good answers to the question, albeit occasionally beset by the issue of repetition. Repetition of points is a frequent issue with this paper and this instance was no exception.

Some candidates attempted to define the term 'direct data source' and of those about half gave a good definition.

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Comments on specific questions

Question 1

(a) Most learners understood what indirect and direct sources are or the difference between them. Learners identified that any data may be out of date; this may be considered a generic answer to any question about the validity of data. However, fewer candidates focused on the context of the question.

When faced with a question that has a clear context, learners should take this as an opportunity to apply their understanding in the particular context. In this case, learners' understanding should be about the factors that affect the relevance of data, while the context was to create a study of the average number of family members in a local area. Therefore, the candidates had to explain why an electoral register would not give the statistics required.

In a few cases, candidates expanded on their discussions of the electoral register to consider who would actually be on it. Sometimes, they mistakenly argued that people who choose not to vote would not be on it, while also realising that younger people would not.

Other candidates expanded on their realisation that data would be out of date by stating that some people may have moved to a different address or died, both of which were acceptable. Their discussion on whether the people who had been born should be included or not, was not acceptable, as these people would not be included on the electoral register until many years after their birth.

(b) Indirect sources given were often inexact or wrong.

Question 2

The question was generally well answered, although there was sometimes some confusion between private and public keys. The majority of candidates were aware that the process involved a single, private key and that this was shared between the sender and the receiver, with a few achieving an extra mark for a suitable description of encryption.

However, having completed an introductory paragraph on symmetric encryption, many candidates then went on to compare symmetric and asymmetric encryption, despite this not being the question.

Question 3

This question required candidates to compare two key concepts within the syllabus in an almost academic exercise. Typically, candidates knew that batch processing collected data together and then dealt with groups of data, although some candidates attempted to describe this by referring to the term 'batch' which was not accepted. This was then compared to online processing, which was recognised as being a more immediate process.

Occasionally, candidates discussed error handling, or focused on the direct communication between the user and a central computer. Where they did so, explanations of these points tended to be lacking in detail.

Question 4

This question was intended to explore reasons why personal data should be kept confidential. Whilst the question was presented within the context of the use of personal media, this was of secondary importance, but still relevant.

Some candidates answered this question well, however, there were answers which required more details. For example, candidates who wish to argue that sharing bank card numbers and associated details can be

problematic, need to be precise in their terminology. Referrals to 'card details' are too vague, as this could be anything, including colour and size of such cards.

Most candidates identified identity theft as a consequence of personal data loss, whilst others focused on the consequence of a person's address becoming known. Whilst there is an answer based on an address being known – specifically when one also comments that one is also on a foreign holiday – many highly inventive consequences were wrongly claimed as being a potential direct consequence of sharing an address on social media.

Question 5

Most marks were achieved for identifying that a device driver is a piece of software that allows communication between the printer and the computer, without which the printer would not be able to carry out its allotted task, but few answers went beyond this.

Where candidates did progress beyond these introductory points, their answers focused on the role of a device driver in acting as a translator between the device and the computer.

The most common mistake here is to consider a device driver to be a piece of hardware.

Question 6

(a) Few candidates answered this question well, and they understood what infrared and ultrasonic sensors measured. Other learners mentioned a burglar alarm for the infrared sensor use, which indicated they were aware of it but not in the detail needed to answer the question. A few learners were able to state that an ultrasonic sensor is used to measure distance. Many incorrectly quoted they are used in scanning unborn babies. A few thought that the sensors were emitting sound or heat.

(b) This was another question where an awareness of context was vital to candidates achieving higher marks. Candidates could see this question as having two separate foci. Firstly, the focus was on the replacement of human beings by control technologies, whilst the second focus was on the use of control technology to operate car park barriers and traffic lights.

Candidates generally appreciated that control technologies are expensive to install and maintain, and that they were able to work 24 hours a day without a break, but then answers became quite vague. For example, there was a great deal of reference to workers being made unemployed, with no indication as to which workers would be affected. Clearly, for some workers, the widescale introduction of control technology would lead to an increase in employment and so generalised reference to unemployment without any identification of the workers affected, was not awarded.

Other candidates focused on traffic accidents, or accuracy of movement around a car park, both of which were irrelevant.

Question 7

This question proved to be confusing for some candidates. Some of their answers were not focused on different socioeconomic groups. A lot of answers were on comparing urban and rural areas, old and young and different classes.

Some candidates did mention rich and poor people and access to technology, but then failed to expand on this to discuss types of technology affected by differing levels of income.

Question 8

(a) This was another question that relied heavily on a technical understanding of the syllabus and could realistically be expected to be answered from definitions learnt as part of the course overall. Most candidates achieved a mark for identifying forms of normalisation and their answers missed other details. Some candidates were aware that normalisation reduced duplication of data within a database, but many candidates simply identified a reduction in duplication, without referring to 'data'. Other candidates stated that normalisation broke data up into separate tables and then attempted to describe the atomisation of data, but such answers were frequently not detailed enough to get all the marks.

(b)   Candidates struggled with this answer. Some candidates identified that a normalised database would require reduced storage space and gave good answers. Other candidates identified this, but then gave vague answers that were not awarded. Where candidates confused 'memory' and 'storage', marks were not awarded.

        Candidates were allowed to again state that there was no redundant/duplicate data, and many did.

        Quite a few candidates identified that if data is changed in one table, the related field is updated in other tables, but this answered again suffered from a lack of clarity.

Question 9

The topic of expert systems is frequently assessed in this paper, albeit in different guises and with different foci. Most learners attempted this question and scored marks, so it was generally well answered, and the theme understood. Common answers stated that doctors entered the symptoms into the system; the system asked questions and then gave a diagnosis.

Many were also successful in correctly identifying a number of the components of an expert system, although some had issues with their spelling of inference engine, mistaking it for an interference engine.

A good number of candidates were aware of the If... then... rules and were able to explain how these were used to come to a reasoned conclusion. However, many mistakes were made in trying to explain how the diagnoses are output to the doctor and what the doctor does to choose or reject the answer. Where candidates stated that the expert system only producing one diagnosis, this was not awarded.

A few learners discussed this as a general answer and failed to go into any detail, so therefore gained few marks if any.

Question 10

Where candidates had a fair degree of knowledge about algorithms, this question was fairly accessible and was generally answered well. For the other candidates, this question proved to be difficult.

Of those who did attempt the question with a degree of understanding, common mistakes were:

- Repeating the code from the start. Whilst this did not affect marks overall, this was not required.
- Placing items in the wrong order, so, for example, the OUTPUT not being the final statement.
- Confusing variables, so that the variable **smallest**, identified in the given section of code, was not used as the value holder for the smallest value.
- Failure to close IF statements with ENDIF statements.
- Failure to use mathematical reasoning in the pseudocode.

INFORMATION TECHNOLOGY

Paper 9626/13
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Comments on specific questions

Question 1

This question required a fair understanding of data logging and the ability to describe it. As such, four single comments in a reasonable depth would have achieved all four marks.

However, few candidates appeared to know what data logging meant. Some common mistakes include logging onto a system, entering data into a database, or keylogging carried out by spyware.

Where candidates did show a good understanding of data logging, their answers were not explained in detail, for example, by relating it to sensors or devices.

Question 2

Most marks were achieved by expanding on the terms SSL or TLS for one mark.

Most students understood this was a system to protect websites, although some considered it a method of encryption and described it in some depth. This method was not the focus of the question, so no marks gained here.

This question would have benefited from a better technical understanding of the concepts and processes involved and gain more marks.

Question 3

(a) This question required candidates to describe batch processing for three marks, and exclude any mention of master files and transaction files. As such, three comments about batch processing would have sufficed.

Candidates showed some understanding of batch processing, although the descriptions needed to be more detailed. When asked to describe a process or concept, candidates should not repeat the latter in their attempt. Therefore, any attempt to describe batch processing using the term 'batch' was unlikely to have achieved marks. Processing is a generic term, and so could be accepted.

Some candidates focused on the aspect of a group of data being processed all at once and achieved a mark. Other candidates focused on real-time processing for their answers or attempted to compare real-time and batch processing.

(b) This question is clearly one where context was important.

When faced with a question such as this one, candidates would benefit from analysing the question using the context. This question combined two concepts: real-time processing and rocket guidance systems. Many candidates knew what was meant by real-time processing, but then failed to link this to the context of a rocket guidance system.

If the candidates had contemplated why a rocket guidance system had been chosen between other systems, this would have led the candidates to consider that rockets travel extremely fast, and so the impact of any delay in the decision-making process, however automated, would result in massive distances being covered.

For future examinations, when there is a context in the question, our suggestion is to consider the area the syllabus is covering, and then ask oneself why the particular context has been chosen. Candidates should consider whether the context brings any specific considerations because it is likely to be the basis of a mark.

Question 4

An operating system has many functions, and the mark scheme accommodates a range of possible answers. Most candidates focused on the management of software, hardware, and memory. However, this question asks for a deeper analysis of the concept of an operating system, which would have given them more marks.

We advise the candidates to reflect on questions like these, where many marks are involved. We recommend sketching a few points on the concepts and the processes applied before developing an answer. For example, a common mistake was to involve anti-virus functions and other security roles, which results in a loss of marks. The question stated to exclude the security of a computer system, as a function of an operating system, which should have helped the candidates to look for different answers.

Many candidates repeated some points made earlier in their answers. It may have been an attempt to provide more clarity, or it may have been an attempt to fill time and space on the paper. Whatever the motivation, these repetitions rarely, if ever, gained the candidate any marks.

Question 5

Some candidates attempted this question and gave an appropriate answer. However, other candidates described in detail how IT can be used rather than explaining the use of IT to monitor the environment. In doing so, the candidates managed to include some justification, but they were not consistent in doing this.

Where candidates are asked to justify the use of technology in a context, this should be an opportunity to explain why a certain technique, for example, has been adopted. This justification may, for example, include why an alternative method has not been adopted. In our case, the bases of the justification were actually fairly straightforward concepts, including the fairly standard answer about monitoring equipment being better suited for more dangerous conditions, such as in a volcano.

Question 6

This question required candidates to apply their understanding of inputs, outputs, and processing to the context of a computer-controlled traffic light system.

The question seemed to present two specific issues.

Firstly, candidates needed to identify the output without relying on the term 'traffic light.' This task was done well in general, as candidates mentioned red, amber, and green lights, which was acceptable.

Secondly, candidates had to apply their understanding of the context in a meaningful way. This task proved to be challenging, as candidates generally appeared to have had little exposure to such a system. Many candidates based their answers on an automated system where lights for traffic or pedestrians would change after a certain amount of cars had passed, or pedestrians were 'sensed.' Such sensing of cars and pedestrians was sometimes achieved by using a pressure plate on the approach to the crossing.

Such a system would make little sense, especially when there was a light traffic, or during times of heavy but slow-moving traffic. Even where candidates realised that such a system was fundamentally based on requests from pedestrians to interrupt a steady flow of traffic, inputs were insufficiently described and processing largely ignored.

Question 7

Questions such as this come up fairly frequently, and, in this instance, the standard of answers was similar to that seen previously. Where candidates focused on the digital divide between the old and the young, the answers were of a good standard. However, many candidates chose to discuss the 'digital divide' in more general terms, or simply focus on a different comparison.

While candidates did focus on the divide between young and old, some gave answers that were difficult to support. For example, it was often argued that older people are somehow uniquely hardwired to find technology threatening. This is a generalisation, at best. Where candidates focused on physical issues, such as failing eyesight, or experience over a lifetime, such as that young people have had modern technology available for their whole lives and so are more immersed, or even that older people already had systems that

precluded the use of modern technology and therefore did not feel the need for alternative methods, they scored well.

Question 8

Candidates answered this question well. Candidates focused on the impacts of access to private information. Their answers sometimes identified the consequences rather than giving developed answers based on these consequences.

A small number focused on the consequences on an individual of using spyware.

Question 9

This question highlighted some candidates' misunderstandings of this concept of gesture-based user interfaces. Some candidates gave good answers about their impact within a hospital scenario, where the answers focused on the benefits of not touching a screen, whilst a few mentioned that the system would benefit those with disabilities. However, few learners were able to give any real explanation of how those with disabilities would benefit from a gesture-based user interface.

Question 10

(a)   A few candidates correctly identified forward chaining.

(b)   This question required candidates to show their understanding of the stages of reasoning through which the inference engine concluded. Essentially, the question asked candidates to follow the three steps in the rule base to explain how the inference engine decided that Hortense is yellow.

This question was slightly different from the normal expert system questions in the past, so it proved to be more challenging for the learners. The answers to this question may suggest how candidates' exam practice may be improved. By not using the mass of information that had been provided, the question is difficult to answer. Therefore, candidates should have been wondering why the question included such a weight of unnecessary information.

In short, only by answering the question as intended would the candidate have used the information given. When candidates are given so much information, it is almost always for a specific reason. Where the information, for example, includes the rules held in the rule base, these rules should likely form the basis of an answer.

Question 11

Some candidates appeared to be familiar with the concept of flowcharts. Other candidates appeared to understand the concept, but then used prose in the boxes instead of mathematical expressions. Where candidates did understand both the use of flowcharts and the use of mathematical expressions, they did well on this question.

For future exams in this subject, candidates should:

- Be fully aware of the role of each shape – as shown in the syllabus.
- Be aware that decision boxes always have a Yes and a No output (True and False are acceptable).
- Use mathematical expressions rather than text. As an example, 'is x between 5 and 10' is not acceptable.

INFORMATION TECHNOLOGY

Paper 9626/02
Practical

Key messages

To be successful in this examination, candidates need to demonstrate a thorough understanding of the core syllabus requirements and have completed full syllabus coverage.

Candidates should have particular care when dealing with databases designed to Third Normal Form (3NF). While working databases, candidates should be able to identify and remove duplicate data from data files, and naming tables and fields in a relational database according to the conventions. Candidates should also be able to apply appropriate validation rules to fields in a database and understand the difference between validation rules and input masks. It is equally important that when candidates work their audio files, they are prepared to mix both stereo into mono, two mono tracks into stereo, and to amplify an audio clip without it being clipped or distorted.

General comments

Several candidates seemed well prepared for this paper. They were able to answer most of the questions correctly and their solutions to the tasks were generally sound. However, there were a few issues with applying general syllabus knowledge throughout multiple tasks, namely on databases where the knowledge of normalisation to the third normal form was lacking.

Despite these minor errors, most candidates demonstrated appropriate levels of skill and submitted solutions to all the tasks.

Comments on specific questions

Task 1

Many candidates successfully identified the five tables required to create the database to 3NF. Fewer candidates placed the fields in the most appropriate table for each data item. The cars table was usually created with the correct records imported. A significant number of candidates only produced three table from the three source files without realising that the data supplied in j23 cars had lots of duplicate data which needed refining into new tables with appropriate one-to-many relationships. Some candidates set appropriate table names and field names, the j23 part of the source files was not appropriate for this and should have been removed from the table names, and spaces should not be evident in either table names or field names. Many candidates created Relationships between their tables, these were often created correctly with one-to-many relationships, but fewer candidates enforced referential integrity on the appropriate relationships.

Data types were often appropriately set for all of the tables by many candidates. Very few candidates changed the field lengths from the default values set by their package. The question paper required candidates to use appropriate field lengths, these should have been evident to candidates as they carefully examined the provided data files. The most successful candidates did set appropriate field lengths for all tables, not just their cars table. Very few candidates set appropriate validation rules, simple rules such as the year being greater than 0 (or greater than 1900) were seen. Sometimes more complex rules to test the extras codes only contained those from the source files or the drive types matched only the 5 identified in the question paper were created by a small number of candidates.

The specifications provided in the question paper also required a query with calculated fields for the manufacturing cost and sale price. Some candidates completed this as specified but a number of candidates calculated these externally and presumably imported these calculations into fields created in the tables. A small number of candidates also erroneously used calculated fields in one (or more) of their tables. Those candidates who performed the calculations had often completed them correctly, although the most common error was the omission of brackets in the sales price calculation that was required to ensure the correct results.

Task 2

Many candidates who produced a report did not refine the list of cars correctly in a query. Most restricted the cars to those produced in 2019 but fewer included wildcard searches for the LED lighting or the colour. This frequently resulted in more (or less) than the 11 required records. The formatting of the report also appeared to be challenging to many candidates, few candidates replaced the A candidate and ZZ999_9999 with their own candidate details and some candidates did not set the report title to white text on a black background. The diagram in the question paper also required grouping at 2 levels on colour then on model. This was not evident in the work of all candidates attempting the report. One of the most significant errors seen by candidates was in the selection of the correct data for the report with many candidates including the extras code rather than displaying the extras field in full. Where the correct fields had been selected, not all candidates aligned the data as shown in the diagram, both horizontally and vertically. A significant number of candidates did not display their data and labels in full. Although many candidates attempted to export their report in portable document format, this had to be a professional looking document. A significant number of candidates had blank pages, split controls (over 2 pages) or controls too small to hold the available data.

Task 3

Many candidates completed this task as specified. Frequently seen errors in the work included not amplifying the sound to maximum without clipping occurring to the waveform, or in some cases not amplifying at all and not exporting the file with the given filename.

Task 4

A number of candidates did not edit clip 2 as specified (and often not at all). Where candidates had attempted to edit this clip they often lacked precision with the 6.8 seconds and 8.25 seconds, sometimes moving part of the wrong voiceover or placing the voiceover to start at the wrong time.

Many candidates mixed down the two clips into mono and then set the clips into the correct channels, although a number erroneously placed the female voice in the left channel and the male voice in the right channel. Some candidates mixed these two tracks down and produced either single mono track or duplicated this so that both voices appeared in both tracks of a stereo clip. Most candidates exported the clip as specified. A number of candidates merged the 2 stereo tracks together without mixing them down to mono and placing each mono track together to create the final stereo track. Several candidates also appended the two tracks rather than mixing them.

INFORMATION TECHNOLOGY

> **Paper 9626/31**
> **Advanced Theory 31**

Key messages

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Centres must ensure that their candidates study the content of all areas of the A-Level topic syllabus. The paper's questions may address any of these topics each year. In Paper 3, it is expected for the candidates to have an A-Level depth of knowledge and understanding of the subject topics. Moreover, the candidates must have the ability to customise their responses according to the command words in the questions.

The standard of candidates' handwriting was noticeably worse in this series. It is rare to comment on this issue, but it is important to note that answers that cannot be read or deciphered due to poor or illegible handwriting will not be awarded marks. The reason is that the Examiner simply does not know what is written. Therefore, we advise the centres to ensure that their candidates are not disadvantaged by illegible handwriting.

General comments

Candidates should be encouraged to write answers in full sentences and be discouraged from writing bulleted, short statements in their responses. Short, brief statements do not usually adequately provide descriptions or explanations. Analyses, discussions, and evaluations should be in free response with full sentences to properly answer the question.

Candidates should apply their knowledge to the scenario in the question set because the full range of marks is only available to candidates for answers referring to the question scenario. For example, **Question 1** referred to social media use by individuals and organisations in accessing government issues so, while references to social media being used for sharing videos and images to draw a governments attention to a regional issue may be valid, sharing personal videos and images of holidays/vacations and family is not answering the question.

Centres are advised to remind their candidates to carefully read the whole question before answering, to ensure that they understand exactly what the question is asking from them to complete. This would help the candidates to avoid writing answers based solely on 'key' words that they have 'spotted'. For example, **Question 8** did not require a description of a personal blog but was about the use of blogs for advertising purposes. Candidates who gave responses solely about how people use blogs could not score the full range of marks.

As noted in some previous reports, it is essential that those candidates that make use of the blank spaces or of additional sheets of paper place accurate cross-references to their additional answers. This is so that Examiners can find the answers and mark them. Examiners do not by default see blank spaces and extra pages so candidates who do not cross-reference their answers risk having some work unseen.

Comments on specific questions

Question 1

This question was about the use of social media by individuals and organisations for access to Governments.

Good answers included descriptions of raising awareness of government issues, changes to regulations, allowing feedback by individuals and organisations direct to government, the use of social media by social minority groups in overcoming social divides in the access to government, encouraging governments to be more responsive to public opinions or to organised groups of people by the active monitoring of government activities.

Weaker answers referred to the use of social media in general terms or in scenarios not related to the question, for example, its use in advertising. Centres are advised to remind their candidates that the whole range of marks is only available to those answers that refer to the scenario given in the question.

Question 2

Candidates were expected to explain how using a data entry online form makes entering data easier for clerks.

Good answers should have referred to the inclusion of concise instructions directing the clerk on where the data is to be entered, providing a means for correcting inaccurate entries without having to restart the whole process, suggestions for corrections to invalid entries, use of shortcuts or dropdown lists, the use of validation routines to check the entries, the logical layout of the form and the provision of helpful error messages.

It is essential that candidates restrict their answers to the question so answers that referred to the subsequent processing of the data were not given credit because the question was only about data entry.

Question 3

When answering questions that require comparisons, candidates must ensure that the answers include both similarities and differences. The command word compare (see p. 45 of the current syllabus) is defined as *identify/comment on similarities and/or differences* and this is interpreted as both being required. Therefore, centres are reminded to ensure that their candidates include both. Answers that do not include both are unable to access the full range of marks.

Many candidates were confused over what constitutes a stored value card (SVC) and they confused an SVC with a debit card. An SVC has the monetary value stored on the card and is not linked to an external financial account. Money can be added from an account, but the SVC does not link to it. Most candidates, however, correctly described a credit card as a means of borrowing money from the issuing bank with a view to later repayment.

Good answers referred to these differences as well as to the limitations on amounts that could be spent using the two types of card. Similarities that could have been included the fact that both usually require a PIN, can be used for contactless payments and both have a means of storing data, for example, a magnetic strip and/or a RFID chip.

Weaker answers referred to both being plastic cards and, inaccurately, both being used for online shopping.

Question 4

This question was about botnets. Candidates were asked to describe a botnet and then explain how they can be used to gain access to data.

Centres are reminded to ensure their candidates answer the questions as set and not to mix their answers between questions. Only the description was required in **part (a)** and not what botnets are used for. Conversely, descriptions given in **part (b)** were not awarded marks.

(a)   Most candidates could describe a botnet as 'malware' but could not provide the detailed description of a device that is used and controlled by a third party using malicious software to connect to other, similar, controlled devices over the internet.

At A-Level, detailed answers are required. Superficial, vague answers do not demonstrate the depth of knowledge required.

(b)   Marks were awarded for detailed explanations of the setup and operation of botnets in order to gain unauthorised access to data. An explanation is more extensive than a description and requires candidates to give reasons (see p. 45 of the current syllabus).

In this question, a good answer would explain that a group of devices would have malware installed without the owner's knowledge or permission so that a third party could gain remote control over the devices. The third party, called a botherder, would then use the devices to collect data about user credentials in order to gain access to data, or to send data back to the herder. Botnets can also be used to carry out DoS attacks and a good explanation of how this would be achieved would have been awarded marks.

Weaker answers did not give explanations but listed points only.

Question 5

Given that mail merge is a main topic in the syllabus (see Topic 17.1, p. 35), it was expected that candidates would have a good knowledge of how to set up rules to automatically select recipients.

Most candidates did not show the expected understanding of the process. Vague answers with references to the *'use of filters on the spreadsheet'* were not awarded more than one, or possibly, two marks.

Good answers should have described in some detail the use of rules such as nested Ifs, SKIPIF/SKIPRECORDIF or NEXT RECORD IF in merge fields in a master document that imported data from a source file.

Question 6

This question was designed to allow candidates to show their understanding of the impact of IT on emerging technologies. IT is used in the development and use of prosthetics from the initial design and manufacture all the way through to the end use.

Good answers should have referred to the use of CAD/CAM to design and manufacture, use of IT in precision construction and fitting to the use of sensors and microprocessor at the end user stage.

Question 7

UHD television systems are an emerging technology that requires investment in the production, distribution, and reception systems.

Credit was given for a brief description of UHD television but the command word (see. p. 45 of the syllabus) analyse requires candidates to *'examine in detail to show meaning, identify elements and the relationship between them'* so this question demanded more.

Good answers should have made references to the need for greater bandwidth, for example, so IT infrastructure has to be upgraded which increases costs taking money from other needs, the increased use of streaming services to provide the content which in turn adds to the costs. Balanced against this is the greater sense of realism and enjoyment due the enhanced resolution and sound systems that UHD television systems can provide.

Question 8

Both benefits and drawbacks of using blogs for advertising were required to gain access to the full range of marks. Discussions require points to be made and expanded upon.

Good answers could have referred to blogs being started by almost anyone to sell almost anything if the content is relevant and appealing to attract readers and customers, customers can leave feedback to inform new customers which may or may not increase sales, the data from blogs can be analysed to learn more about the customer base who can be targeted with sales offers.

Drawbacks could have included the requirement to regularly update blogs so they do not get boring and ignored, amateur blogs are often not well constructed or written which puts off customers, and customers may find that relevant items or services can be difficult to locate or do not turn up in search results, so sales are lost.

To access the higher marks, good discussion points and a balance of benefits and drawbacks were required from candidates.

Question 9

This question was about the use of software methods to protect data transmitted on networks or stored on servers.

Any reference to physical methods, such as guards, locks, or security cameras, did not answer the question and was not given credit.

Good answers could have analysed the use of anti-malware software, for example, or encryption methods, access control lists, biometrics and the use of firewalls, updates and backups to keep data secure.

The weaker answers did not go beyond listing points so could not gain many marks. At A-level, candidates are expected to write in depth about the topics.

Question 10

This question focused on the threats to data.

(a)   Data destruction and modification (and manipulation) have an impact on individuals and organisations but, in this question, candidates were only asked to describe them. and to give a sensible example of each.

   (i)   Data destruction results in data being permanently irretrievable or unavailable to users by e.g. erasing or deleting it. An example would be the deletion of database records.

   (ii)   Data modification is the changing or alteration of data and the overwriting of the original. An example would be changing the value in a spreadsheet cell.

(b)   In this question, similar answers to those for **Question 9** were acceptable but, in this case, the focus was on preventing data destruction and modification by unauthorised users. To access the full range of marks, an indication of how this would be achieved was required.

INFORMATION TECHNOLOGY

Paper 9626/32
Advanced Theory 32

Key messages

As noted in most previous reports, the command words (p. 45 of the current syllabus) are carefully chosen in questions to provide the opportunity for candidates to demonstrate their understanding of IT topics and issues. Centres are once again reminded to advise their candidates to target their responses to the command word in the question so that they can access the full range of marks.

Centres must ensure that their candidates study the content of all areas of the A-Level topic syllabus. The paper's questions may address any of these topics each year. In Paper 3, it is expected for the candidates to have an A-Level depth of knowledge and understanding of the subject topics. Moreover, the candidates must have the ability to customise their responses according to the command words in the questions.

The standard of candidates' handwriting was noticeably worse in this series. It is rare to comment on this issue, but it is important to note that answers that cannot be read or deciphered due to poor or illegible handwriting will not be awarded marks. The reason is that the Examiner simply does not know what is written. Therefore, we advise the centres to ensure that their candidates are not disadvantaged by illegible handwriting.

General comments

Candidates should be encouraged to write answers in full sentences and be discouraged from writing bulleted, short statements in their responses. Short, brief statements do not usually adequately provide descriptions or explanations. Analyses, discussions, and evaluations should be in free response with full sentences to properly answer the question.

Candidates should apply their knowledge to the scenario in the question set because the full range of marks is only available to candidates for answers referring to the question scenario. For example, **Question 5** referred to social media use by individuals and organisations in accessing government issues so, while references to social media being used for sharing videos and images to draw a governments attention to a regional issue may be valid, sharing personal videos and images of holidays/vacations and family is not answering the question.

Centres are advised to remind their candidates to carefully read the whole question before answering, to ensure that they understand exactly what the question is asking from them to complete. This would help the candidates to avoid writing answers based solely on 'key' words that they have 'spotted'. For example, **Question 9** did not require a description of the stages of the system life cycle but asked candidates to explain how the stages were related to each other. Candidates who gave responses that only described the stages could not access more than one or two marks.

As noted in some previous reports, it is essential that those candidates that make use of the blank spaces or of additional sheets of paper place accurate cross-references to their additional answers. This is so that Examiners can find the answers and mark them. Examiners do not by default see blank spaces and extra pages so candidates who do not cross-reference their answers risk having some work unseen.

Comments on specific questions

Question 1

This question required candidates to explain the use of JavaScript constructs to evaluate conditions and produce an appropriate output in web-based forms

(a)   Candidates were expected to be able to explain how if…then statements are used. Answers that explained how the conditions are set up and how the statements work were awarded most marks, but some credit was also given for valid examples. However, in this type of question, candidates are not asked to create JavaScript code so examples of code without an explanation will not access the full range of marks. A good answer would have given an example and then explained it's working.

(b)   Descriptions of the ternary operator (?) were not required unless these were used to explain *why* it would be used. Answers that repeated **part (a)** by describing *how* it works were not given credit. Good answers referred to: the reduction in complexity of the code making it easier to understand, the reduction in the actual number of lines of code which reduces the time taken to code and for it to execute, and the reduction in errors when coding.

Question 2

This question should have been relatively easy for candidates to score more marks. However, there was confusion over the operation of switches and routers and some confusion with hubs. Networking constitutes a major part of the current syllabus (topic 14), so it was expected that candidates would be able to demonstrate some basic knowledge of networking devices.

When answering questions requiring comparisons, candidates must ensure that the answers include both similarities and differences. The command word compare (see p. 45 of the current syllabus) is defined as 'identify/comment on similarities and/or differences' and this is interpreted as both being required. Therefore, centres are reminded to ensure that their candidates include both. Answers that do not include both are unable to access the full range of marks.

Centres should also remind their candidates that answers that repeat the question, in this case stating that both exchange data in networks, will not be given credit. Good answers could have added more detail to the point about networks by mentioning both being used in LANs and adding that both deal with data packets. Differences could have included the use of switches by MAC addresses whereas routers use IP addresses to direct data packets.

At A-Level, candidates are expected to have a detailed knowledge of the operation of network devices. It should also be noted by centres that candidates who provide lists of points, bulleted or in tables, are unlikely to gain full marks because the question asks for comparisons which are best written in free response.

Question 3

This question required candidates to demonstrate their technical knowledge of networking protocols. In this question, the focus was upon those protocols concerned with security of data. Answers that repeated or rephrased the question, e.g. *'Secure shell (SSH) is used for security'* did not gain credit. While it is correct that both SSH and IPsec make use of encryption, more detail was required for both parts of **part (a)** to gain full marks.

(a) (i)   While weaker answers mentioned only 'encryption', the good answers also referred to the creation of a secure *link* between applications, using the client-server model, so that any interception of data is pointless as the data cannot be understood without the relevant keys.

(ii)   IPsec also encrypts data, but more detail of its operation was required. Good answers should have included the establishment of the encryption keys at the start of a session/connection so that all data is encrypted for exchange and that new sets of keys are generated for each session.

(b)   Most candidates correctly pointed out that Telnet does not by default encrypt login details. However, the better answers explained why this puts data at risk e.g. login details are sent in plain text, can be intercepted and subsequently used to access stored data.

Question 4

(a)   The command word 'contrast' requires only that the differences are described (see p. 45 of the syllabus). Any references to similarities were ignored and not given credit because these did not answer the question. Again, centres are reminded to ensure that their candidates address their

answers to the command word in the question. Most candidates could answer this question well and demonstrated that they understood the differences.

(b) Answers to this question showed that most candidates understood and could describe how Bluetooth connections are established between two devices.

Question 5

This question was about how the use of social media impacts the health of individuals.

Good answers included describing and explaining the positive and negative affect(s) that use of social media may have on aspects of an individual's health e.g. by reducing stress by providing entertainment or a break from other tasks, improving health by encouragement from others to lead a healthy lifestyle with more exercise, or helping isolated or senior individuals to connect to families or others or, conversely, increasing the incidence of depression or psychological disorders when comparing the lifestyle with that of others or the increase in feelings of jealousy when comparing the successes of an individuals with those of others.

To achieve the highest marks in *discuss* questions (i.e., from p. 45, *discuss: write about issue(s) or topic(s) in depth in a structured way*) which ask for *impacts*, candidates are expected to produce a free response answer which covers both positive and negative impacts. Answers that do not provide both do not access the highest marks because a proper discussion should look at both sides of an issue.

Weaker answers repeated the same theme e.g. prolonged use of social media may affect the eyesight, cause headaches and backaches. These are all effects on physical health. Also, poorer answers referred to the use of social media in general terms or in scenarios not related to the question e.g. its use in advertising by governments. Centres are advised to remind their candidates that the whole range of marks is only available to those answers that refer to the scenario given in the question.

Question 6

This question asked candidates for the similarities and differences between the two networking reference models.

Most candidates could attempt both parts of the question but there was a number of candidates that appeared not to fully understand that the OSI and TCP/IP models are *conceptual* models that help describe communications in networks.

A number of candidates erroneously gave the same answers for both **parts (a)** and **(b)**.

(a) Most candidates could point out that both models are logically arranged in layers, but few could expand this into a description of the use in defining standards that can reference these layers.

(b) Good answers described the differences in the number, arrangement, and function of the various layers.

Question 7

This question was not about digital currencies and what they are or how they work. It was about the risks to an economy that might occur as a result of the use of digital currencies.

When answering questions that require an analysis (p. 45, *Analyse: examine in detail to show meaning, identify elements and the relationship between them*), candidates should produce answers that make a point and then expand on the point.

Good answers could have referred for example to the risk to monetary stability due to an increase in the use of digital currency which is not controlled by a government, and which may cause inflation or a devaluation of base currency. Weaker answers described digital currencies with little or no attempt to go further than state that their values is volatile, and individuals may lose their money.

Also, some candidates confused digital currencies with digital wallets. These answers did not score many marks because they did not refer to the risk to an economy.

Question 8

Given that Project Management (topic 15) is major topic in the current syllabus, it is expected that candidates would, at least, be able to describe terms that are explicitly shown in the syllabus.

(a)   The most common answer was that dependencies are link between tasks (in a project) and describe the reliance of one project task upon another. A description of one task not being able to start before another finishes was also given credit.

(b)   Many candidates focused on the word 'deliverables' and incorrectly described them as, for example, resources that had to be *delivered* for a task. In Project Management 'deliverables' are *output* in a logical or tangible form from a task or project. Good answers could have referred for example to physical objects created as result of a project or a product agreed by the stakeholders.

(c)   Good answers described tasks as a collection of activities carried out to produce an outcome from a project. Weaker answers used the term 'talks' to describe tasks, for example, 'it is a task that needs to be done' – this did not gain credit.

Question 9

This question asked candidates to explain (see. p. 45, *explain*: *set out purposes or reasons/make the relationships between things evident/provide why and/or how and support with relevant evidence*) how the different stages of the system life cycle are related to each other.

Descriptions of the stages were not required unless these were relevant when explaining *how* a stage interact with other stages. For example, it was not sufficient to describe the analysis stage as gathering information about the existing system and the design stage as creating the designs. The question required candidates to explain how the results of the analysis are used to inform the designs and, for example, the specifications.

Weaker answers listed the stages by name but did not describe accurately the processes that occur in each stage or explain how they are related. It was disappointing to note that many candidates could not accurately name the stages or confused the system life cycle with the project life cycle.

Therefore, this question demonstrates the need for candidates to study the syllabus topics in sufficient depth to acquire the basic knowledge that they can apply to the questions. At A-Level it is expected that candidates can apply their knowledge and understanding as well as recall the facts.

In order to achieve the higher marks on this type of question, basic facts about the stages in the system life cycle should have been used to explain, with appropriate examples from the stages, how each stage has to be completed before the next stage can begin and that the outcomes from each stage are required for use in the next stage and that these can be used to revisit previous stages for amendment.

Question 10

Similar comments apply to this question as for **Question 9**.

Descriptions of the use and working of computer-assisted translation did not score more than a few marks at best. The question asked candidates to consider and discuss the *impact* of CAT on scientific research.

As noted for **Question 5**, to achieve the highest marks in discuss questions which ask for impacts, candidates are expected to produce a free response answer which covers both positive and negative impacts. Answers that do not provide both do not access the highest marks because a proper discussion should look at both sides of an issue.

Weaker answers that did not access the full range of marks were those that only listed the use of CAT or described a benefit or drawback but did not explain how these had an impact on scientific research.

For this question, a good answer would have included such positive impacts as CAT can increase the speed of translation of research documents so that research and data is made available faster for reference by the scientist and that technical terms are translated correctly because these are stored in databases so the scientists can be reassured that they are being used correctly. Negative impacts could include the fact that contextual errors can occur when translating new research material so it may not be fully understood by

other scientists and repeated translations using CAT can result in loss of inaccurate translations when the documents pass through several languages. Further, security can be compromised when document content is stored by machine translation systems for comparison against other databases leading to a loss of confidentiality or credit in the research.

Good answers take the basic facts and expand on them to illustrate how these have an impact.

INFORMATION TECHNOLOGY

Paper 9626/33
Advanced Theory 33

Key messages

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This question was about botnets. Candidates were asked to describe a botnet and then explain how they can be used to gain access to data.

Centres are reminded to ensure their candidates answer the questions as set and not to mix their answers between questions. Only the description was required in **part (a)** and not what botnets are used for. Conversely, descriptions given in **part (b)** were not awarded marks.

(a)   Most candidates could describe a botnet as 'malware' but could not provide the detailed description of a device that is used and controlled by a third party using malicious software to connect to other, similar, controlled devices over the internet.

At A-Level, detailed answers are required. Superficial, vague answers do not demonstrate the depth of knowledge required.

(b)   Marks were awarded for detailed explanations of the setup and operation of botnets in order to gain unauthorised access to data. An explanation is more extensive than a description and requires candidates to give reasons (see p. 45 of the current syllabus).

Attach: In this question, a good answer would explain that a group of devices would have malware installed without the owner's knowledge or permission so that a third party could gain remote control over the devices. The third party, called a botherder, would then use the devices to collect data about user credentials in order to gain access to data, or to send data back to the herder. Botnets can also be used to carry out DoS attacks and a good explanation of how this would be achieved would have been awarded marks.

Weaker answers did not give explanations but listed points only.

Question 5

Given that mail merge is a main topic in the syllabus (see Topic 17.1, p. 35), it was expected that candidates would have a good knowledge of how to set up rules to automatically select recipients.

Most candidates did not show the expected understanding of the process. Vague answers with references to the *'use of filters on the spreadsheet'* were not awarded more than one, or possibly, two marks.

Good answers should have described in some detail the use of rules such as nested Ifs, SKIPIF/SKIPRECORDIF or NEXT RECORD IF in merge fields in a master document that imported data from a source file.

Question 6

This question was designed to allow candidates to show their understanding of the impact of IT on emerging technologies. IT is used in the development and use of prosthetics from the initial design and manufacture all the way through to the end use.

Good answers should have referred to the use of CAD/CAM to design and manufacture, use of IT in precision construction and fitting to the use of sensors and microprocessor at the end user stage.

Question 7

UHD television systems are an emerging technology that requires investment in the production, distribution, and reception systems.

Credit was given for a brief description of UHD television but the command word (see. p. 45 of the syllabus) analyse requires candidates to *'examine in detail to show meaning, identify elements and the relationship between them'* so this question demanded more.

Good answers should have made references to the need for greater bandwidth, for example, so IT infrastructure has to be upgraded which increases costs taking money from other needs, the increased use of streaming services to provide the content which in turn adds to the costs. Balanced against this is the greater sense of realism and enjoyment due the enhanced resolution and sound systems that UHD television systems can provide.

Question 8

Both benefits and drawbacks of using blogs for advertising were required to gain access to the full range of marks. Discussions require points to be made and expanded upon.

Good answers could have referred to blogs being started by almost anyone to sell almost anything if the content is relevant and appealing to attract readers and customers, customers can leave feedback to inform new customers which may or may not increase sales, the data from blogs can be analysed to learn more about the customer base who can be targeted with sales offers.

Drawbacks could have included the requirement to regularly update blogs so they do not get boring and ignored, amateur blogs are often not well constructed or written which puts off customers, and customers may find that relevant items or services can be difficult to locate or do not turn up in search results, so sales are lost.

To access the higher marks, good discussion points and a balance of benefits and drawbacks were required from candidates.

Question 9

This question was about the use of software methods to protect data transmitted on networks or stored on servers.

Any reference to physical methods, such as guards, locks, or security cameras, did not answer the question and was not given credit.

Good answers could have analysed the use of anti-malware software, for example, or encryption methods, access control lists, biometrics and the use of firewalls, updates and backups to keep data secure.

The weaker answers did not go beyond listing points so could not gain many marks. At A-level, candidates are expected to write in depth about the topics.

Question 10

This question focused on the threats to data.

(a) Data destruction and modification (and manipulation) have an impact on individuals and organisations but, in this question, candidates were only asked to describe them. and to give a sensible example of each.

  (i) Data destruction results in data being permanently irretrievable or unavailable to users by e.g. erasing or deleting it. An example would be the deletion of database records.

  (ii) Data modification is the changing or alteration of data and the overwriting of the original. An example would be changing the value in a spreadsheet cell.

(b) In this question, similar answers to those for **Question 9** were acceptable but, in this case, the focus was on preventing data destruction and modification by unauthorised users. To access the full range of marks, an indication of how this would be achieved was required.

INFORMATION TECHNOLOGY

Paper 9626/04
Advanced Practical

Key messages

To be successful in this examination, candidates need to demonstrate a thorough understanding of the core syllabus requirements and have completed full syllabus coverage.

One of the most crucial aspects that centres need to highlight to candidates is the importance of finding and demonstrating efficient solutions to all tasks. It is essential to be able to think critically and creatively to identify the most efficient way to complete a task. This requires taking the time to understand the task and its requirements, thinking of potential solutions, identifying the best one, and creating and refining until it is optimal.

By emphasising the importance of finding and demonstrating efficient solutions, training centres can help candidates develop the skills and knowledge they need to be successful with this paper and with today's workplace, where time and resources are often limited.

General comments

Overall, candidates seemed well prepared for this paper. They were able to answer most of the questions correctly and their solutions to the tasks were generally sound. However, there were a few issues, identified throughout this report, where they could improve their precision and attention to detail.

Despite these minor errors, most candidates demonstrated appropriate levels of skill and submitted solutions to all the tasks.

Comments on specific questions

Task 1 – Vector Graphics

The 'BasicWheel' part of the task was completed successfully by most candidates. There were some common issues where marks were not gained. The best practice for creating the wheel was to accurately complete one spoke as a radius and reposition the centre of rotation at the centre of the circle. The spoke could then be replicated every 60°. Candidate submissions were dropped onto a template where the accuracy of their work could be assessed. It was clear that many candidates positioned the duplicated spokes manually.

As with all vector graphics tasks, accuracy and precision in matching the example and specifications shown in the question paper was important. The marking template allowed a few pixels as a tolerance for the required size and most candidates were within the margin allowed. For the colours, however, whilst nearly all managed to set the colour of the wheel and spokes within the tolerance for #505050, very few set the hub to pure red, #ff0000. The reason for this error may lie in a default 'red' in the application palette since many gave the same erroneous code.

The 'NewWheel' design required candidates to redesign the spokes and the hub. Candidates often failed to achieve the correct level of accuracy and precision with this part of the task. Ideally one spoke should be carefully re-designed and positioned and then replicated. There was tolerance in the shape of the spokes, but the ends had to match the shape and position shown in the paper. Not many candidates were careful enough with this element.

All candidates created the hexagonal hub but surprisingly, many did not ensure it was precisely regular.

The central spoke junction was hidden behind the hub but where the spokes were visible at the centre, they had to look consistent and overlap or meet tidily.

With such simple designs precision is important, candidates must match the design, size and colours of examples in the question paper very closely.

Task 2 – Stop Motion Animation

To say at the start that this task was not done well by many candidates is an understatement. Timeline animations allow candidates to set a start and a finish for positions shapes and colours. The application will smoothly 'tween' the changes.

This stop motion animation required candidates to carefully position the elements in a number of frames. Very few were careful enough about the number of frames and the precision of the incremental changes. This meant that few animations were smooth with elements appearing to move at an even speed. To make the yellow patch appear to bend round the wheel at the ends, candidates had to create curved versions of the patch. Many did not attempt this so there were unacceptable 'jumps' in many animations.

This is an area where centres might benefit from providing more experience for candidates. It important that the animation of objects is smooth and at an appropriate speed. Many submissions showed the belt and wheels at inconsistent speeds.

Task 3 – Spreadsheet

For the first part of the task, candidates had to extract a 'country' code from a branch code that showed the three characters in different positions within the branch code. The efficient solution was to use SEARCH() or FIND() functions to determine the position of the three digit code and apply the MID() function to display it. Most candidates managed to display the correct country code and many used the efficient formula. Some used the text to column feature and gained the marks for the correct results but others had clearly just used the MID() function and rewritten the parameters to suit each row. These candidates often achieved the correct results but obviously the formula was not replicable and not at all efficient.

The next stage required candidates to extract a list with a single occurrence of each country code. Providing evidence of any methods used that were not formula based was required and should have been presented in an evidence document. Evidence of using the text to columns and the remove duplicate tools was required if candidates had not used a method that could be tested in the spreadsheet submitted. The few candidates who used the UNIQUE() function found the simplest and most efficient method but obviously the formula is not available in all versions of the software.

To display the country denoted by the three digit code, candidates had to use a method to lookup the country code in another worksheet. If the XLOOKUP() function was not available, using INDEX() and MATCH() was the most efficient method. Many candidates, however, chose to swap the order of the columns so a VLOOKUP() function could be used. In this case, this was acceptable but normally candidates would lose efficiency marks since this method required manipulation of the data. Centres should stress that manipulation of data like this will usually not gain marks if a more efficient method is possible.

The formula also had to be replicable. For this task, because of the order of the data, the formula was replicable without the need to configure the referencing as absolute. It is still an error to accept default referencing without considering the principles of the task. The formula should have referenced the whole column for every row. Candidates need to recognise when absolute referencing is appropriate even when it is not necessary to get the correct answer in a particular case.

The same issue applied if candidates used a SUMIF() formula for the Total sales.

A number of candidates used a pivot table for the task. A pivot table was an efficient method in that it gave the list of unique country codes and the individual sums for the sales.

It is not relevant in this case but one thing candidates should bear in mind when choosing to use a pivot table is that the result data will not automatically refresh if the source data is changed. In a task when data is required to be amended, a pivot table may not be the appropriate method. When testing candidate solutions, Examiners had to alter some sales value to observe how the Totals were affected. This test was not applied if a pivot table had been used.

The formula for determining the number of countries that met the sales target caused problems for many candidates. The formula had to reference a cell rather than a value and the syntax clearly proved problematic. Many candidates just entered a value in the formula so when testing their solution with other sales target values, the results did not change. The correct formula was '=COUNTIF(J9:J29,">="&H3)'. Candidates would benefit from experience of examples of the use of 'text' and references in COUNTIF() and related formulae.

Almost all candidates demonstrated experience of conditional formatting but very few completely correct solutions were seen. It seemed that some candidates struggled with the use of a formula to determine which cells to format. This often resulted in the creation of multiple criteria and multiple ranges. This was not efficient but some credit could be allowed for working solutions. For solutions that did work, efficient or otherwise, the formatting of the cells was important. The cells had to be filled red, use white text, use italic text and show the cell borders. In general, and in any task, candidates need to determine all requirements when formulating a solution.

Task 4 – Programming for the web

An important issue with this task was the use of an external JavaScript file. Copying the code and pasting it into the html page was not what the task required. The task specified the candidates should '*Amend the StopotionAnimation.html page to use the Animate.js script.*' It is possible that candidates misunderstood the instruction but centres need to ensure that candidates are aware of the need to use external scripts in their solutions.

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.

The task required each image to display for 1 tenth of a second, (100 milliseconds). A common problem for candidates was that the code for the timer function provided in the external file was set at the default setting of 1 second (1000 milliseconds). Only a handful of candidates changed the value.

There are several methods to cycle through the images and most candidates produced a valid attempt. Almost all candidates gained credit for using document.getElementById () method and the 'ImageDisplay' bookmark.

The addition of a new 'Stop' button proved no problem for most but very few managed to make the code it invoked stop the animation. The simplest method to achieve this was to use the Window Location object. Using *onclick= 'location.reload()'* was a simple solution.

It is worth noting that a little experience beyond the syllabus is very useful in teaching JavaScript since the required knowledge and understanding can be fortified by more challenging programming experience.

The Window Object properties, in particular, provide extremely simple methods to open, close and reload windows. There were many ways to stop the animation but centres would benefit from providing candidates with challenges that require them to research efficient methods.

In conclusion

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

- **Challenges that develop problem-solving skills:** Candidates need to experience challenging tasks that will help them develop their problem-solving skills. These tasks should be designed to be open-ended and require the use of critical thinking and creativity.

- **Duplication and replication of shapes:** Candidates should have practice with duplicating and replicating shapes, with an understanding of how to change the centre of rotation. This will help them develop their spatial reasoning skills and their ability to manipulate objects in a digital environment.

- **Avoidance of data manipulation:** Candidates should understand that data manipulation should be avoided if a more efficient method is possible. This will help them develop their understanding of algorithms and their ability to choose the most efficient solution to a problem.

- **Use of count functions:** Candidates should have opportunities to use count functions with mixed text, number, and cell reference parameters. This will help them develop their understanding of how to manipulate data in spreadsheets.

- **Conditional formatting using a formula:** Candidates should be challenged to use conditional formatting using a formula. This will help them develop their understanding of how to use formulas to control the appearance of data in spreadsheets.

- **Absolute references in formulae:** Candidates should be able to recognize when they ought to use absolute references in formulae, even when not necessary for a working solution. This will help them develop their understanding of how to make their formulas more robust and reusable.

- **Configuration of Stop Motion animations:** Candidates should be aware of the importance of configuring the number of frames, the length, and the precision of incremental changes in Stop Motion animations in order to display smooth movements and precise timings. This will help them develop their understanding of how to create animations that are visually appealing and engaging.

- **Experience with external .js files:** Candidates should have experience using external .js files in programming for the web. This will help them develop their understanding of how to use JavaScript to add functionality to web pages.

- **Challenging programming tasks:** Candidates should be given challenging programming tasks that involve research into the most efficient method of manipulating webpages with JavaScript. This will help them develop their problem-solving skills and their ability to use JavaScript to create efficient and effective web applications.