

INFORMATION TECHNOLOGY

Paper 9626/11 Theory

Key messages

Candidates must not use trade names in the examination. Where trade names are used, these will be ignored, and the answer read as if the trade name was not present. Where the trade name has been given for a piece of software, for example, and the software type has not also been given in conjunction with the trade name, this removal of the trade name usually renders the given answer meaningless. In many cases, where candidates have given trade names, the points made by the candidate would have earned marks had a software type, rather than a trade name, been used.

Candidates are reminded that answers need to be legible. Whilst the number of illegible answers remains very small, and every effort is made to read them, where answers cannot be read, examiners are unable to give marks.

Candidates are also reminded that this examination is intended to assess their knowledge of Information Technology to a high level of understanding. Therefore, it is a reasonable expectation that candidates will be able to use technical terms from across the syllabus accurately and employ suitably technical terms in their answers. The use of what may be considered slang often renders answers meaningless. Terms such as 'sketchy', for example are not acceptable at this level.

General comments

As is usually the case, a number of questions were not attempted. This is understandable, especially when the concept is a difficult one, but individual questions tend to be structured so that they have a variety of levels of demand within them. In effect, questions tend to have a range of answers, some of which may be considered more accessible than others. This is especially true of questions that carry more marks. Therefore, candidates should be advised to attempt to answer all questions. Whilst they may not know the whole answer, they may still pick up some of the more easily accessed marks that are available within a question. That having been said, the number of questions without any form of answer is diminishing.

Interpretation of command words is improving. Increasingly, questions that require an explanation are being answered correctly. In very general terms, where a question requires an explanation, the use of "because" or "therefore" in an answer will improve the candidate's chances of providing an explanation where required. However, candidates still struggle with the concept of justifying a concept. In order to justify, candidates should be presenting arguments in support of a concept. Arguments that attempt to argue that a particular concept is useless are not justifying.

Finally, candidates should be reminded to focus on the context of a question. If the question is set within a particular context, candidates need to consider the opportunities and restrictions that this context provides and structure their answers accordingly. They should then consider which aspect of that concept is being examined. The command word used can usually give a guidance here.

Comments on specific questions

Due to the very small number of candidates who attempted this paper, it is impossible to give meaningful feedback on candidates' performance on individual questions.

The general comments (above) should be referred to, along with the question paper, in order to analyse candidate performance.

INFORMATION TECHNOLOGY

Paper 9626/12 Theory

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Comments on specific questions

Question 1

This first question focused on the use of a hierarchical database. Candidates were given a hierarchical staffing structure as a prompt.

- (a) The first question required candidates to explain what is meant by a hierarchical database management system. The question was worth three marks and so candidates had to make three points. In order to 'explain' they had to link the answer to the concept of a hierarchy, as given in the question.

This question was poorly answered by many candidates. A significant minority answered about hierarchies and based their answer on the diagram. The question itself was a theoretical question and so, in effect, candidates were expected to give a definition of a hierarchical database management system, rather than a description of the hierarchy in existence.

- (b) The second part of the question asked candidates to describe how the company's records would be stored. As the question referred to 'the company', this was candidates' opportunity to link their understanding of hierarchical databases with the diagram given. In effect, candidates were being asked to interpret the diagram given in the question, although they could also answer with more general answers.

Candidates scored better on this question than the previous, although marks were still low overall.

Question 2

This question assessed candidates' understanding of factors affecting the quality of information, and its impact on any decision made based on that information.

A fair proportion of candidates realised that the question was asking candidates to discuss both the impact of the factor on the quality of information and the quality of decisions based on that factor. However, many candidates simply focussed on the impact of the factor on the quality of information.

- (a) The first factor was the age of information. Virtually all candidates stated that old information may be irrelevant or useless, although some candidates stated that the age of information meant that information was outdated, which was not accepted, as it was effectively, a repeat of the question. Of those who then linked this to the quality of decision, virtually all achieved the second mark.
- (b) The second factor was the relevance of information. This question was worth three marks, and so candidates could focus on what was meant by relevance of information, and then make a relatively simple comment about the impact of this on decisions, or could choose to explore the area of the quality of decisions.

As with answers to **part (a)** of this question, this question posed little challenge to those candidates who attempted both aspects.

Question 3

This question focused on the use of control technologies. Candidates were asked to evaluate their use as part of traffic management systems.

This question caused candidates some issues. Where candidates responded to the need to evaluate, there were some good answers. For example, candidates discussed the benefits of traffic light systems, specifically, usually, as means by which traffic flows may be controlled in cities, which, in turn, leads to more free-flowing traffic. Others considered the use of pedestrian controlled crossings, focusing on the impact on road safety.

However, others misinterpreted the question. In some cases, candidates described how control technologies worked. Typically, this involved an in-depth discussion of sensors. Occasionally, candidates only focused on sensors and ignored any form of control technology.

Where candidates are asked to evaluate, this should be a process by where value judgements are made. This may be an evaluation of a process, or of a system, but there should be a two sided, hopefully balanced, discussion. Such discussions should end with a conclusion that revisits and brings together the points made.

Question 4

Candidates were given a description of a program and were asked to create a flowchart of that program. In a very small number of cases, candidates gave a form of pseudocode, instead of a flowchart for the answer, but, overall, this area of the syllabus has shown great improvement over the past few series. The vast majority of candidates used the correct symbols for the flow chart and showed good understanding of the logic involved. In a small number of cases, candidates confused input symbols with process symbols, but overall, performance on this question was very good.

Question 5

Question 5 allowed candidates to explore one of the causes of the digital divide. Where candidates did this well, they did very well indeed and gave some really clear and convincing answers. However, the question required candidates to be clear about what they were trying to argue, and this did cause some problems. Candidates, for example, stated that highly educated people had more disposable income than poorly educated people. There is no real intuitive link between one's level of income and one's education. However, what does exist is a link between the job a person does and the income they receive, which then, in turn, affects their disposable income. Similarly, people with a higher level of education do not necessarily have greater access to technology. What is true, that they may have been surrounded by technology whilst they were training, or, in their jobs, there is more likely to be more technology, but these answers are more complex than simply stating that more highly educated people have greater access to technology.

Question 6

Computer models differ from simulations. This question focussed on computer models. Where candidates answered about computer models, they did well. Answers ranged from models about weather through to models to show stresses and strains on bridges as part of the design process.

However, other candidates discussed simulations. Whilst there is a degree of cross over between the two, this fundamental difference caused some problems for candidates.

Question 7

This question focused on the reasons why personal information should be kept confidential. A single mark was available for a generic answer about the results of personal information not being kept confidential, but any further marks had to be based on the use of clear examples of personal data and impacts.

Typically, candidates gave quite vague answers with largely unsupported claims. Candidates should avoid claiming that access to 'bank details' means that a criminal can steal money. Bank details could be anything, including the name of your bank and their phone number. If a candidate means bank account number, PIN and security answer, they should state this. Similarly, knowing where someone lives does not mean that the house will be burgled. However, knowing where someone lives and that they are on holiday would be a risk.

Questions such as these initially appear straight forward, but, in many cases, candidates give very vague answers that do not achieve marks. This was definitely the case for this series.

Question 8

This question focussed database structure.

- (a) The first question asked candidates to identify the most appropriate data type for each of five fields. For numeric fields, candidates were asked to state which type of numeric field would be used.

Whilst some candidates did achieve all five marks, these candidates were relatively few. Typical issues included stating that the field was numeric, but not stating what type of numeric field was best, or simply confusing the data types. As a point for future reference, telephone numbers are not stored in numeric fields.

- (b) For the second question, candidates were asked to state and describe suitable validation checks that could be carried out on the data as it is entered.

Some candidates attempted to answer without stating which fields they were discussing. In such cases, it is impossible to ascertain whether the validation check was appropriate and so no marks were given.

Furthermore, as is standard practice, candidates are expected to identify the field which they are considering, with some accuracy. Whilst minor spelling or formatting mistakes were ignored, where candidates had given vague field names, these answers were also not awarded.

- (b) The final question asked candidates to describe how two databases could be combined together as one. Where candidates approached this question in an organised manner, some very good answers were given, especially from those who realised that a linking table would be required.

However, other candidates gave very confused answers. Some argued that once combined, both databases would still exist as separate databases, rather than fields, whilst others confused the role of foreign and primary keys.

Overall, it is clear that candidates have some good understanding of relational database, but are poor at answering questions based on relational databases.

Question 9

Candidates were asked to discuss the benefits and drawbacks of the use of telephone interviews to gather information for an article.

The first point to make is that in virtually all cases, candidates adopted a good structure for this question, and discussed both benefits and drawbacks, often in a very balanced manner. This is a significant improvement on even a few series ago.

The second point is rather like that made for **Question 8** and others. Candidates clearly have a grasp of the concepts involved, but struggle to write answers that are not vague and therefore achieve few marks. For example, where candidates wrote that this method was cheaper, this was not sufficient for a mark. Had the candidate stated that a telephone interview avoids the need to travel to far flung places, which saves the cost of, for example, petrol, this was sufficient. Answers such as 'quicker', 'easier' and 'cheaper' on their own are extremely unlikely to achieve marks.

Question 10

The final question asked candidates to describe four benefits of using an expert system to identify animals. In some cases, candidates restated the question as an answer, stating that it helped to identify animals, or similar. Such answers did not achieve marks.

Other candidates realised that such a system was quicker than any other, or that such a system was the collective understanding of many scientists, and so, effectively, represented a mass of knowledge, whilst other candidates argued, correctly, that the use of an expert system gave consistent results.

However, some candidates attempted to argue that an expert system was a cheaper method. As no information was given about costs in the question, this answer is, at best, a supposition and therefore no marks were given.

INFORMATION TECHNOLOGY

Paper 9626/13 Theory

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Comments on specific questions

Question 1

This question required candidates to draw and describe the use of four flowchart symbols. This proved little challenge to the vast majority of candidates. However, some candidates continue to confuse process symbols and input symbols.

Due to the nature of the question, fairly vague answers about the use of individual symbols were accepted. For example, a decision symbol could be described as helping to make a decision, deciding an outcome or simply coming up with a Yes/No answer. Centres are advised that candidates should know the function of individual flowchart symbols as shown in the syllabus.

Question 2

For this question, candidates were asked to describe the features of an MIS. To a limited degree, the features of an MIS include its purpose, but they also go much further. As has been the case when questions have been based on MIS in the past, a small but significant number of candidates gave the impression that they knew very little indeed about MIS.

Of the remaining candidates, most attempted to describe the purpose of an MIS, but did not go beyond that, other than to state that it produced graphs and charts.

Question 3

This question focused on normalising databases.

- (a) This required candidates to state what is meant by 2NF. Most marks were achieved by candidates stating that it is based on 1NF, with a good proportion also stating that 2NF has no partial dependencies.
- (b) This question asked candidates to discuss the benefits and drawbacks of normalisation. Whilst the vast majority of candidates gave both sides of the argument, negative aspects of normalisation were typically based on the process of normalisation being complicated.

Positives included that a normalised database is usually smaller. Some candidates chose to express this as 'space is saved'. This answer is frequently given on this paper and is not accepted. Storage space may be saved, but space is not saved. At this level, candidates should be able to answer with a high degree of accuracy. Stating space, rather than storage space, is inaccurate.

Question 4

Question 4 focussed on validation and verification.

- (a) The question asked candidates to compare validation and verification by describing the differences between the two concepts. As the question stated 'differences' candidates had to give at least two differences between the two concepts in order to achieve full marks.

Candidates are clearly well practiced in these sort of questions, and answers were good, with most candidates achieving two marks, and a large number achieving all three.

- (b) This question focused on methods of validating and verifying. In both cases, a mark was available for correctly identifying the method as either a form of validation or a form of verification. Where candidates are asked to describe methods, for example, which may be classified as a type of, for example, verification, marks are usually available for correctly identifying the relevant classification.

Range check did not present much of a challenge to candidates. This is an improvement on recent series, as previous candidates typically confused range and limit checks.

However, double data entry caused problems, with candidates giving some very vague answers that, in many cases, were simply too unclear to award. Whilst candidates were aware that the process was somehow related to having two copies, the answers became very unclear.

It is also worth stressing that the question itself focused on using validation and verification to check data. Where candidates discussed double data entry as a method of confirming passwords, this was often confused and so marks were not always awarded.

Question 5

Historically, any question about encryption was answered by candidates giving everything they know about encryption, as an answer. The answers to this question suggest that we have now moved on from this. Candidates gave answers that were clearly thought out and selected, to give answers that were, in many cases, clear, concise and quite successful. The improvement in answer to questions about encryption is particularly pleasing to see.

Question 6

This question asked candidates to describe how a spreadsheet formula would calculate a result. The formula itself used the NOT and OR key words as part of the formula. The question could be answered in two ways – either by the value NOT being outside a range, or by the value being within the range.

Most candidates scored full marks for this question.

Question 7

For this question, candidates were asked to describe the term goal driven when used as part of an expert system. A few candidates became confused about whether goal driven was backward or forward chaining, but overall, most candidates were aware of this aspect.

In order to score highly, candidates had to be able to describe the role of the inference engine and be able to describe how it uses the rules base. Whilst candidates showed some awareness of this, answers were quite vague. Candidates would benefit from a greater technical understanding of how the individual parts of an expert system work together.

Question 8

This question focused on the role of access to information technology in creating the digital divide.

This question proved to be quite complicated for candidates, as the question was a different style and focus to similar questions asked on this topic over the past few series. Candidates had to be able to describe what the information technology gap was, and how this itself led to the digital divide. Whilst candidates were aware of the information technology areas, they often struggled to describe how this created or widened the digital divide.

The majority of candidates scored no more than three marks for this question.

Question 9

This question focused on two types of malware.

The first, spyware, is often confused with keyloggers, and this was the case for this question as well. Whilst spyware focuses on the content of emails, for example, or what activities the user completes whilst on the computer, including browsing history, a keylogger carries out a subtly different task.

For a worm, candidates gave slightly better answers, but as shall be discussed below, again gave some misleading and vague answers.

Overall, candidates' understanding of malware is lacking in focus. Whilst worms, for example, do impact on the ability of a computer network to carry out tasks, this impact is in the specific area of bandwidth. As has been stated, above, spyware operates in a different way to keyloggers. Answers to both questions lacked the depth required for marks to be awarded but showed that candidates had some understanding. As a further example, the information that spyware gathers is sent to the hacker or third party, but is sent by the internet, rather than just 'sent'.

Question 10

Candidates were asked to justify the use of online processing in stock control. As online processing was not defined in the question, marks were available for stating what is meant by stock control.

Answers to the question suffered from a high degree of repetition. As a fundamental concept, online processing allows for direct access to a central computer by the user. From this, stems many advantages, including the ability to check remotely on stock levels, and to achieve accurate stock level figures. Similarly, candidates could have stated that online processing results in improve stock control and minimum stock levels.

Whilst candidates were aware of some advantages, these were often narrow and repeated from different angles in an apparent attempt to achieve more marks.

Question 11

The final question focused on one-point calibration. This is a relatively simple concept that nonetheless proved to be a good differentiation between candidates. Almost all candidates stated that one-point calibration was based on a single measurement, but fewer candidates then describe the process of comparing this value to a fixed, known, value. Even fewer candidates then completed the answer by describing how this offset could be applied to take account of any inaccuracy in the system.

INFORMATION TECHNOLOGY

Paper 9626/02 Practical
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Key messages

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

- Candidates need to make sure the spreadsheet is formatted as instructed in the question and that it also matches the formatting shown in the diagram(s) provided in the question paper.
- Candidates need to consider when to apply absolute and relative references within a formula in order to make it fully replicable.
- Candidates must use the spreadsheet functions stated when they are specified in the question.
- Candidates need to understand the components and requirements of a data dictionary and apply this knowledge to the data provided in the source files for the scenario presented.
- Candidates need a better understanding of the conventions for naming tables and fields within a database.

General comments

Some candidates performed well when creating their spreadsheet, with a full range of marks seen on this task. Fewer candidates were successful with the modelling using their spreadsheet.

Some candidates performed well in the production of their data dictionary, while most candidates performed well on the audio editing task.

Comments on specific questions

Question 1

Many candidates completed all of this task as specified although some found this task challenging. The specified cells were often merged as instructed and formatted in the specified font style and background colour. The instruction to format rows 2, 3, 4, and 18 to look like the diagram proved more challenging to some candidates, who did not always centre align the cells as shown. Some candidates did not use a sans-serif font style. At this level candidates should be able to distinguish between the typeface categories of serif and sans-serif font types and select an appropriate font for the type specified. A significant number of candidates did not change the worksheet name to something more appropriate than the n24chain set by the software. The use of n24 was deemed inappropriate for the given scenario. Most candidates saved the workbook with the specified name, although a small number omitted their centre and candidate numbers from the file name.

Question 2

Many candidates successfully used a simple formula such as =E5*\$U\$19 to solve this task. Some candidates identified the correct cells but did not consider the absolute or relative referencing required for this formula in order to make it replicable for all other chain styles and sizes. A number of candidates used a function (above level) to convert ounces into grams.

Question 3

There were a range of responses to this question, some used the formula =E5*HLOOKUP(E\$2,\$T\$2:\$V\$3,2,0) that was shown in the mark scheme, others used appropriate solutions with XLOOKUP in place of HLOOKUP. Some candidates provided valid solutions using nested IF statements or the IFS function. The most significant omission was to follow the instruction to make the formula replicable, which could be accomplished by setting the absolute reference on **only** the 2 of E2. The references to cells T2 and T3, along with V2 and V3 if used, should all have been set to absolute references for both elements although some candidates omitted this.

Question 4

Most candidates used A5*2.54, or PRODUCT(A5,2.54), to solve this task. A number of candidates used a function (above level) to convert inches into centimetres. Fewer candidates included a ROUNDDOWN (or INT) function to round the value down to the nearest whole centimetre. Many erroneous attempts to perform the round down were seen using the ROUND function. The formulae used were not always replicated into the appropriate cells between rows 6 and 42.

Question 5

Despite a clear instruction to not use the concatenate function (either CONCATENATE or CONCAT depending on the software) many candidates used this function in their formulae. Most successful candidates used a LEFT or MID function to extract the first character of E2 and the & to join it to the contents of cell E3. Some candidates used the TEXTJOIN function to produce a working solution. Other solutions were seen using nested IF functions, these were not particularly efficient for this task. Most candidates who attempted this task replicated it as specified in the question paper.

Question 6

This step was completed well by the majority of candidates with weights being formatted to 3dp and currency values in dollars with 2dp as given in the scenario. Some candidates formatted some of the appropriate cells but not all, cells T3 to V3 were sometimes not formatted to dollars and 2dp.

Question 7

Most candidates created a new worksheet in the workbook with the correct worksheet name. Some errors in case were seen. A few candidates incorrectly created a separate workbook for this task.

Question 8

Row 1 was usually formatted to match the image in the question paper. Cells A2 and B2 were frequently merged but the text placed in this merged cell was often inaccurate, not italicised and not always wrapped as shown in the question paper. Row 3 was often narrowed as shown in the diagram and the contents of A3 to A9 frequently right aligned. Text was not always added as shown, with case errors particularly prevalent.

Question 9

Most candidates who attempted this step used data validation with references to cells in their 'Chain' worksheet for both cells B4 and B5. A small number of candidates used the wrong ranges for cells or typed a list within the rule rather than referencing a range of cells in the separate worksheet.

Question 10

This question specifically required candidates to look up, so solutions involving nested IF statements or IFS function were not deemed valid. Correct solutions were seen in many responses using the XLOOKUP function as identified in the mark scheme or functions such as INDEX and MATCH with solutions like =INDEX(chains!E2:R2,1,MATCH(B4,chains!E4:R4,0)).

Question 11

Many candidates who attempted this task used valid INDEX and MATCH functions as instructed to create a working solution. The most common error was getting the horizontal and vertical matches the right way round inside the INDEX function.

Question 12

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Question 13

Not all candidates set the weight in cell B8 into 3 decimal places and the cost in cell B9 into 2 decimal places in dollars as given in the scenario.

Question 14

A significant number of candidates did not save this file with the specified file name and/or in rich text format. Many candidates attempted the modelling, most of these entered the correct data but far fewer attained the correct results.

Question 15

Like step 14 most candidates showed evidence of changing the data for the modelling, but some did not show evidence that the price of gold had been changed. A number of candidates attained the correct values for this modelling.

Question 16

Many candidates successfully changed the speed of the track to twice the original speed. Changing the pitch from the key of B to C#/D $\flat$, appeared to be challenging to a significant number of candidates. Several managed to change the pitch but not always to the key specified. Almost all candidates trimmed the clip but not all were precise in trimming to exactly 35 seconds. Many candidates presented a mono track having mixed it down from stereo and most had applied a 2-second fade-out to the track. The tracks were usually exported into both .wav and .ogg format although there were a small number of errors in the file names.

Question 17

Many candidates successfully created a data dictionary for the customer data in the supplied source file. A significant number of candidates did not identify the table name or gave the table an inappropriate name for the data such as n24cust. Most added field names that were suitable although some candidates used very long field names and/or included spaces in their field names which were not suitable. A few candidates did not include fields for all the data with some omitting the Email field. Most candidates identified the customer number field should be numeric with fewer also indicating it should be an integer sub-type. Many correctly identified this field as the primary key. Most candidates identified the 'Order date'/'First order' field needed to be in Date format and that the other six fields needed to be in text format.

INFORMATION TECHNOLOGY

Paper 9626/32
Advanced Theory

Key messages

Candidates are expected to have a depth of knowledge of the subject topics. Questions can be set on any, and all, areas of the A Level syllabus topic areas.

Questions are designed to give candidates the opportunity to demonstrate their wider understanding of the syllabus topics to the Examiners. The different command words are used enable candidates to show that they can not only recall, select, and communicate their knowledge of IT but can also, analyse and evaluate IT issues using that knowledge.

It is important that candidates are able to customise their responses according to the command words in the questions so that they can access the full range of marks available. Centres are reminded to advise their candidates to target their responses to the command word used in the question and to ensure that they actually answer the question as set. For example, where a question asks how a process is carried out e.g. **Question 2(a)** where a description of how the reflection from eyes in a digital image taken by flash photography can be removed in image editing software there is no credit available for an explanation of how the reflection was caused since this does not answer the question. Credit is only available for describing the removal of the reflection. The command word 'explain' requires reasons whereas a description does not require these. For example, **Question 6(a)** requires reasons why tunnelling protocols increase data security so a description of a protocol without e.g. a reason why/how it works would not gain full credit.

General comments

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. Candidates must 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. For example, **Question 8** was about the implementation of a replacement system by parallel running and not about the computer-aided design (CAD) or cloud computing systems.

Candidates must be encouraged to attempt all questions. Even if the candidate knows little about the topic, writing a few sentences, despite the previous comments about targeting command words, may gain valuable marks towards the overall total.

Candidates should also 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.

Comments on specific questions

Question 1

This question was about the use of `for` loops in JavaScript.

- (a) While some answers showed a good understanding of the syntax, few candidates understood that there is a distinct purpose for each of the statements in a `for` loop construction in JavaScript. Many answers confused the `for` loop given in the question with IF statements in e.g. Excel spreadsheets stating that if the first statement is not true, then the next statement is carried out and so on or gave similar such incorrect answers. There was often confusion between the purpose of

each statement with the initiation, condition and increment statement being given in the wrong order. Good answers gave concise but full descriptions of each statement i.e. descriptions of the initiation of a counter/variable, defining the condition, and determining the iteration/incrementation.

- (b) Where both similarities and differences, or where only similarities or only differences, are specifically required, this will be made clear in the question. This question did not ask specifically for both similarities and differences, so candidates were able to gain the full marks by commenting on either the similarities or the differences, or on both, between the use of two different JavaScript loop constructs. While there was much confusion of the use of these loops, many candidates could point out that both looped repeatedly through a block of code – the mark was for the repeatedly/iteration comment since ‘loop through a block of code’ was given in the question. Good answers should have elaborated with comments about limits or stopping after a number of iterations. Differences were less well described but some candidates could point out that a `for in` loop is used to go through the properties of an object.

Question 2

This question was about the use of tools in image editing software.

- (a) There are many ways to remove ‘red eye’ from photographs, but the question required a description of tools can be used to do so. Answers that described red eye reflection but not how to remove it did not score marks. Good answers should have identified the tool, and the steps followed to remove red eye from the selection of the area and its recolouring.
- (b) There are a number of ways to make the edges of objects clearer in photographic images. Good answers concentrated on the objects rather than the whole image. The use of selection tools, stroke, sharpen, adjusting filter radius or thresholds etc. were seen in good answers. As for **Question 2(a)** the steps that should be carried out using the tools should be included in description of how such actions are carried out.

Question 3

This question asked candidates to describe the evaluation of a new software application. An evaluation of ‘the ease of use’ was specifically mentioned in the question and candidates were asked to describe other evaluations. Where questions ask for ‘other’ references, candidates must not refer to those given in the question. Answers about ‘ease of use’ therefore did not gain any credit. There are two other areas of evaluation given in the syllabus, so answers were expected from these. The question asked for two other evaluations so full marks could not be gained without mentioning two e.g. evaluating the application for efficiency in its use of resources and for how it meets user requirements. Good answers expanded on each of these to give details of what would be evaluated or how the evaluations would be carried out.

Question 4

- (a) This question asked candidates to draw a PERT (Performance Evaluation and Review Technique) chart using the details of a project given in a table. Since there are a number of ways to draw a PERT chart, marks were awarded for including the essential elements of a PERT chart. Good answers used the appropriate symbols, labelling of tasks, durations and arrows and showed the dependencies.
- (b) Descriptions of PERT charts of costings did not answer the question. Good answer referred to the use of PERT charts in showing dependencies, following calculations of timings including float and overall durations.

Question 5

This question asked candidates to discuss the impact of artificial intelligence (AI) in health care. At this level, candidates are expected to be able to discuss this emerging technology accurately and, in some detail, but weaker answers confused AI with expert systems or ‘robots’ and often attributed an autonomy to these that does not exist e.g. diagnosing and prescribing medicines or robots that carry out precise surgery without doctors being involved at all, or replacing humans in jobs such as nurses. Good answers described and expanded upon the use of AI to enhance health practice e.g. its use in enhancing expert systems used by doctors for diagnoses, used in analysing vast quantities of data in data mining to search for patterns to

establish new treatments, enhancing the use of robotic vehicles or assistants in care facilities despite various drawbacks e.g. the costs and the inability to deal with new, unforeseen circumstances.

Question 6

This question asked candidates to consider how the use of tunnelling protocols in networking affects the security of data.

- (a) Good answers included references to the encapsulation of IP packets within other packets so that they are disguised and are more private and to the use of tunnelling protocols to encrypt the payload of other protocols when they are carried over public networks so that the contents are hidden from or cannot be analysed by e.g. routers or firewalls.
- (b) Better answers referred to the consequences of encapsulation and encryption of the packets or the packet contents e.g. bypassing firewall restrictions to make unauthorised connections references to circumventing geo-restrictions did not answer this question unless there was a reference to data security.

Question 7

This question asked candidates to describe phases in the data mining process. Many answers confused the phases or described the use of data mining in a specific scenario e.g. credit card fraud these did not answer the question. In questions such as these, candidates will only gain the higher marks by including accurate details in their answers.

- (a) Answers should have referred then collection of relevant data and its preparation for use in a data mining model e.g. removal of corrupt or inaccurate data, the cleaning of the data or selection of data in terms of quality or quantity. Weaker answers described the use of the data to find trends and patterns which is not part of this phase.
- (b) Many candidates confused the use of the term evaluation as a phase in data mining with that in the system life cycle. Also, there was confusion between evaluation of the model with evaluation of the data itself or with the results of the data modelling. The evaluation phase in data modelling evaluates the model against e.g. the success criteria set out when business understanding phase.

Question 8

This question was about the use of the parallel running method of implementing a new or replacement system. The old system in the scenario was a standalone computer-aided design (CAD) system which was to be replaced by a cloud-based CAD system. Responses that described CAD or cloud computing did not answer the question. A good answer would have included descriptions and explanations of the benefits and drawbacks to the company and the designers of using parallel running to change over from one system to the other. The answer would have included the issue e.g. running both systems at the same time until the new one completely takes over and commenting upon the consequences of this in terms of e.g. costs, time and the affect on the designers work and work loads.

Question 9

This question was about animation.

- (a) (i) Stop motion involves repeatedly photographing an object, moving it slightly and taking another photograph to produce a series of photographs which when shown in succession make the object appear to move. Many candidates could describe this but there was a number that could not describe it at all.
- (ii) A key frame holds and defines all the parameters of the objects in a frame. Adding a new key frame and altering the parameters makes the objects appear to move (or change). Adding frames in between the key frames allows the illusion of movement. The better answers described this concisely and in detail. To gain marks in such questions at this level, responses must be precise and accurate.
- (b) Many candidates gave the answer, correctly, as the speed of movement of change. A common mistake was to refer to timings, a repeat of the question.

Question 10

This question was about prototyping. Candidates were asked to evaluate the use of evolutionary prototyping for developing a data input screen for a database. The command word 'evaluate' requires a judgement of the importance of the points being made about the method of prototyping. Weaker answers confused the methods of prototyping, made statements with no consequences, expansion, or judgments. To gain access to the higher marks in this question, a good answer should include a point about the method of prototyping e.g. the user continuously engages with the system throughout the process and then add a consequence on this e.g. the effectiveness or ease of use of the screen is increased and adding 'so the new screen is more likely to meet the user requirements' is a judgement. A full evaluation should include both arguments for the use of the method and arguments against its use. A concluding, overall judgment would also have been given credit.

INFORMATION TECHNOLOGY

Paper 9626/33
Advanced Theory

Key messages

Candidates are expected to have a depth of knowledge of the subject topics. Questions can be set on any, and all, areas of the A Level syllabus topic areas.

Questions are designed to give candidates the opportunity to demonstrate their wider understanding of the syllabus topics to the Examiners. The different command words are used enable candidates to show that they can not only recall, select, and communicate their knowledge of IT but can also, analyse and evaluate IT issues using that knowledge.

It is important that candidates are able to customise their responses according to the command words in the questions so that they can access the full range of marks available. Centres are reminded to advise their candidates to target their responses to the command word used in the question and to ensure that they actually answer the question as set. For example, where a question asks how a process is carried out e.g. **Question 2** where an explanation of how different types of test data are used in testing, marks would not be available for a description of the actual data. The command word 'explain' requires reasons or supporting evidence whereas a description does not require these. For example, **Question 4** requires reasons why a colour management system is needed so a description of a colour management systems (CMS) without e.g. a reason why would not gain full credit.

General comments

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. Candidates must 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. For example, **Question 6 (b)** was about the impact of the development of UHD televisions on the environment not about the impact on viewing experience.

Candidates must be encouraged to attempt all questions. Even if the candidate knows little about the topic, writing a few sentences, despite the previous comments about targeting command words, may gain valuable marks towards the overall total.

Candidates should also 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.

Comments on specific questions

Question 1

This question was about the manipulation of strings in JavaScript.

- (a) Many candidates could give the precise definition of a string as a 'sequence of characters'.
- (b) Most candidates scored the mark with 'enclose the characters in quotation marks'.
- (c) (i) A common mistake was to repeat the question e.g. 'concatenate the variables without describing how. A good answer would describe the use of e.g. the `concat()` method and how it would be

used, or to describe how the variables could be joined using a + and a space to create the correct sequence of words when displayed. Giving an example without a description did not allow the award of full marks as it was not a description of 'how' the joining would be carried out.

- (ii) There are a number of different ways to extract characters from strings or variables in JavaScript. Marks were awarded for identifying a correct method and describing its use. Many candidates answered this correctly.

Question 2

This question was about the use of the different types of data rather than about the types of data themselves. Answers that did not explain how the data would be used were not able to access the full range of marks. As well as the use of the e.g. extreme, normal etc. types of data to test the functioning of the system, a good answer should have referred to e.g. the use of the test data to see what error messages are produced and the use of null data to test how the system reacts processes blank fields.

Question 3

- (a) This question asked candidates to describe what is meant by brightness in a bitmap image. A precise description such as 'the degree of pixel intensity' was all that was required. Repeats of the question e.g. 'how bright the image is' did not gain credit.
- (b) A precise description of contrast in a bitmap image such as 'the difference between a pixel's maximum and minimum intensity' was all that was required.
- (c) Colour balance refers to how the intensities of the different colours in a bitmap image render the image's appearance under varying light conditions compared to a 'neutral' colour. Valid references to colour temperature and white balance were also accepted.
- (d) In bitmap image terms, highlights can refer to spots of light giving visual clues to e.g. the shape or the location of an object, or to the light source.

Question 4

This question asked candidates to explain why a colour management system is needed in computer graphics. Weaker answers that stated 'to make the colours look better or interesting' did not gain credit. Answers that described a CMS without explaining why it is required could not gain full marks. Good answers included those that referred to a CMS being needed because colour is dependent on the device or medium monitor displaying the colour and explaining that they are used to ensure that colours are displayed looking the same on the different media or devices.

Question 5

This question asked candidates to justify the use of the agile method of software development when creating an app for smartphones. This required candidates to describe the process of the agile method and give reasons why it would be used. To access the full mark range, answers should make a point about the method and then give a reason e.g. the app can have features added or removed more easily because a customer gives feedback during development, and this can improve the app quality. It is the reasons that gain most credit in questions that ask for 'justify'.

Question 6

This question asked candidates about ultra-high definition television (UHD), an emerging technology.

- (a) A concise description of UHD television technology was required.
- (b) The question was about the impact of UHD television technology on the environment not on the user. Weak answers referred to how it affects user experience when viewing TV e.g. health issues which did not answer the question. The better answers were those that focused on describing the environmental impacts of the effect of mining for the metals required in production, the increased resources need to provide the infrastructure for UHD TV streaming or broadcast to the home and the disposal of older TV sets.

Question 7

This question was about system flowcharts. In both **Question 7(a)** and **Question 7(b)** there was confusion between the symbols used in system flow charts and those used in data flow diagrams.

While it is accepted that there are variations on the use of symbols and their naming in system flowcharts, it is expected that for the purposes of this syllabus that the symbols shown in the syllabus be used.

- (a) (i) The symbol is used to represent multiple document output.
- (ii) The symbol is used to represent a magnetic disk file.
- (b) Candidates were expected to draw one other symbol that would be used in a system flowchart. Most candidates could neatly draw a system flowchart symbol and describe its use, but many drew symbols that were either unclear or found in charts other than system flowcharts.

Question 8

Most candidates discussed data mining by businesses in depth in a structured way as required by the command word. Some very good answers were seen. However, some candidates produced answers that described the data mining process rather than its use. To gain access to the full mark range, candidates must answer the question as set. Answers should have included references to a use and expansions on the point e.g. data mining allows businesses to collect reliable information for use in marketing research so they can determine the products that interest customers make those products available for sale and e.g. data mining helps businesses find patterns in their data to evaluate their own policies and procedures to find out how effective these are. Responses that only make a point e.g. 'data mining can be used to discover trends/patterns in customer buying' without any further expansion is not 'in depth' or structured as required by the command word so cannot be awarded more than a few marks in total.

Question 9

Most candidates explained the drawbacks of using social media to advertise commercial products. Some very good answers were seen. However, some candidates included benefits of using social media, some described social media use by individuals, and some gave generic answers about access to social media none of which were required by the question. This question illustrated the need for candidates to read the whole question and focus their answers on the information given in the scenario of the question. The higher marks were only accessible to candidates who concentrated their answers on advertising by businesses.

Question 10

This question was about the different types and methods of animation.

- (a) A description should state the main points of a topic or give characteristics or features. Most candidates could state the name, but few could provide a proper description. A good answer should include e.g. that CGI is Computer Generated Imagery (or Images) that creates special effects or adds backgrounds to movies or TV programmes.
- (b) Cel animation, while mostly superseded by computer software methods, is listed first in the methods noted in the syllabus and should be studied along with the other animation methods.
 - (i) Some good descriptions were seen but many could not correctly describe this method of animation.
 - (ii) Many candidates could answer this question and gain at least one mark. As mentioned above, explanations should include 'reasons' e.g. computer animation software uses key frames so can create animation sequences with greater accuracy and realism of movements compared to manually drawn cel animations.

Question 11

This question was about the consequences of, and prevention of, unauthorised access to data.

- (a) Most candidates could answer this question, but many did not give sufficient detail of the difference. A good answer would have included a description of one and then described how the

other differs e.g. data manipulation changes the format of the data but does not change the factual content, but data modification changes the factual content to a different value.

- (b)** This question was answered well by most candidates. However, some candidates included physical methods which were not required. The question asked for methods, in plural, so at least two methods were required from candidates to gain full marks. Some very good answers were seen with a range of software methods included, each being expanded upon and judgments made about the effectiveness of the method. In questions where an evaluation is, or evaluations are, required, the judgement can be for individual points or for an overall judgement on the whole content of the answer.

INFORMATION TECHNOLOGY

Paper 9626/04 Advanced Practical

Key messages

In terms of basic skills, it seems that most candidates were well prepared for this session but there were a number of common issues that indicate that candidates need a greater depth of experience if they are to aspire to the higher grades.

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

- Candidates need to be sufficiently familiar with the concept of modelling; centres would benefit from providing more practice with similar tasks.
- Candidates need to be aware of the use of chart sheets as opposed to adding the chart to a worksheet.
- The importance of extensive experience and practice with the use of selection and masking tools.
- The need to stress the importance of examining details shown in graphics tasks very closely and that final images must match examples shown very accurately.
- Candidates need experience of the creation and use paths in animations.
- The problem-solving elements of tasks that seemed to cause the most problems for candidates.

General comments

Most elements of the data task proved accessible to all candidates but the last stage of the task, showed that many needed more familiarity with the concept of modelling and more practice with similar tasks.

The graphics and animation tasks showed that while almost all candidates were able to demonstrate the necessary basic skills, many of their attempts at the necessary refinements, lacked accuracy and did not match the details shown in the question paper with sufficient precision.

Complete solutions for **Task 4** were rarely seen and this is an area that candidates can improve on.

Comments on specific questions

Task 1

Full solutions to the initial break-even task were few. The solution required the use of the 'Goal Seek' function. The task instructed candidates not to use the trial and error method. There were no marks for only a close result.

The marketing scenario element required amendment to the referencing in the unhidden formula. This was clearly understood and carried out accurately by most candidates. The extension of the table did not prove difficult to most and when completed, all candidates managed to create a chart. The chart needed to be shown in a 'chart sheet', however, and not just added to a worksheet.

Formatting the chart was another important element. Setting a secondary axis was often completed but the major issue was configuring the axis values and all the titles as shown. Candidates need to be aware that fulfilling simple formatting requirements is essential and this is an area that candidates can improve on.

The final part of the task, modelling, was potentially the simplest and candidates need to realise that this only required manual entry of the advertising amounts given and manual recording of the resulting maximum profit in a table.

Candidates need experience in recognising the problem-solving elements and this is an area that candidates can improve on.

Task 2

The graphics task only required candidates to carry out the specified steps. Marks were therefore gained for the accuracy of their solutions.

To avoid cumulative errors and imprecisions, the task was best tackled using layers since the layers not being worked upon could be hidden in order to concentrate on the correct stage. From their final images it was difficult to tell which candidates used layers efficiently, but successful candidates showed they were aware of the importance of matching the image shown in the question paper very closely.

Removing the figure in the sea was carried out by all, but the sea had to be repaired with precision. The concentric ripples needed to appear uninterrupted, and no other elements of the scene should have been affected.

The next step was to recolour the image as greyscale and cut out the sky. The greyscale required only the use of a simple application menu option, but cutting out the sky required a lot of care. Successful candidates took time to make sure that elements were cleanly cut. It was important that the mast of the boat and the headland and trees were clearly defined. The use of selection and masking tools are skills that candidates can improve on.

The replacement sky with the correct gradient was carried out well, particularly if a background layer was used to fill the extracted area.

Most candidates managed to recolour the sea and the sand with a 40 per cent opaque blue layer. It was important to ensure the layer only covered the sea and the sand.

The next steps were to include the moon with a halo, add some stars and position some lights as shown in the question paper. Recolouring the moon to silver proved no problem for candidates but the proportions of the moon, the halo and the stars needed careful attention.

The final step of adding the reflection of the moon in the sea involved selecting the silver components from the source image. Most candidates extracted the solid silver core, but it was important to accurately select all the detail required. Again, the skilful use of selection tools was the key to success with this part of the task.

Task 3

All candidates made a fair attempt at the animation. There were, however, a few common issues.

The earth and axis images needed to be consistently aligned whilst the earth image rotated to face the focus of the ellipse. Often the axis was seen to be fixed and rotated as well.

The earth plus axis image had to follow a path to match the example. Animating the image in small increments in an attempt to match the correct path was insufficient. This was particularly clear with the rotation of the earth plus axis image which would then just jump between angles.

The appearance to the required text at the correct points and timings proved no problem but it should be noted that matching the font and font size was important as well.

Task 4

There were very few fully working solutions for this task, but many candidates made a fair attempt and earned marks for use of the correct code elements.

Almost all were familiar with editing an external JavaScript file and the techniques for hiding and showing HTML elements. A few candidates created problems for themselves by renaming the external .js file and not referencing it accurately in the HTML. Although this meant that their solution could not work, they could still earn marks for the code.

In general, the main problem for candidates seemed to be the logic of the sequence required to display the correct buttons and text and this is an area that candidates can improve on.