INFORMATION TECHNOLOGY

Paper 9626/12
Theory

Key messages

Candidates showed a fairly high level of general understanding but there were areas of the syllabus where more detailed knowledge was required.

On much of the paper some expansion and detail are required. It is not sufficient to give brief answers.

Questions that ask candidates to discuss the benefits and drawbacks of something require responses to give both sides of the argument and should be in continuous prose rather than bullet points. Where a question asks candidates to evaluate different methods, candidates need to judge the importance of each of the different methods by also giving the negative aspects of each method. These answers should also be written in continuous prose rather than just listing points. Questions that required candidates to discuss or evaluate proved challenging and candidates are advised to develop these higher order thinking skills so that answers go beyond just recalling information.

Questions that required a recall response were generally answered well, particularly those which required short answers. Questions that required candidates to apply their knowledge and understanding proved more challenging, with many responses needing greater accuracy and detail.

Candidates should ensure that handwriting is clear in order that all responses can be read and given appropriate credit.

General comments

After reading a question, candidates could improve their answers by listing their thoughts in rough before choosing, and elaborating on, items appropriate to the question.

Candidates are reminded that brand names must not be used in responses and that technical terms should be used accurately when answering questions.

Comments on specific questions

Question 1

This question was fairly well answered, particularly **part (b)**.

(a) Many responses made at least two good points and some responses gained full credit. Candidates clearly understood the difference between data and information.

(b) Most responses gained full credit, with candidates able to give three sensible explanations of how the data examples could become information. Some responses were incomplete for, usually, one item but even then were able to explain the other two very well.

Question 2

This question was fairly well answered, with the majority of responses gaining at least partial credit and some gaining full credit. Many responses included at least two good points. Most of these correctly identified that interpreters translate a high level language program and do so one line at a time. A small minority of responses confused interpreters with compilers.

Question 3

This question proved challenging, particularly **part (a)**.

(a) This part of the question proved very challenging, with few responses gaining credit. Many responses concentrated on online banking without referring to transaction processing.

(b) Most responses gained credit for making valid points, but few went on to discuss the points they made by expanding on them. The most common correct answers related to the implications of mainframe computers' size, their tendency to generate a lot of heat and their relative speed of processing. Many responses mentioned costs without going into sufficient detail to merit credit. The strongest answers were written in full prose style and included points which were expanded upon such as 'It has greater fault tolerance than other systems allowing hardware and software upgrades to occur while the system is still in operation'.

Question 4

This question proved challenging. Some responses named sensors, but few correctly identified the atmospheric variables they were measuring. Many responses, however, were able to describe the need for analogue to digital conversion. A small minority of responses erroneously referred to the need for digital to analogue conversion

Question 5

This question proved very challenging. Some responses identified the fact that forward changing is data-driven but were often too vague in the rest of the response and lacked the use of technical terms. A significant number of responses described the use of expert systems in general without addressing forward chaining explicitly.

Question 6

Overall, this question was fairly well answered, although **part (b)** proved to be more challenging than **part (a)**.

(a) This part of the question was quite well answered, with many responses linking field names to an appropriate validation check. This question listed various types of validation but stipulated that they would not be suitable. Some responses included a description of these types instead of concentrating on the alternative validation checks. A minority of responses contained non-existent checks, such as name check or digit check. Some responses confused a format check with a type check while some responses mentioned fields other than those requested by the question.

(b) This part of the question proved to be challenging, with few responses containing more than one valid point. The most common correct answer related to identifying an error in data entry that validation would not pick up. Many responses indicated confusion about what verification meant, often erroneously suggesting that it would ensure data was correct. Some responses contained descriptions of methods of verification which were not required by the question. There were, however, some good responses which included a distinction between what would be found by verification and what by validation and a justification as to why both might be necessary.

Question 7

This question proved very challenging. This was the first time a question on this topic had been set. Many responses did not use appropriate pseudocode. Despite this, many responses gained at least partial credit. Where responses did use appropriate pseudocode included a REPEAT…UNTIL loop and incorporated the need for the algorithm to work for different sets of numbers they often achieved full credit.

Question 8

This proved to be a challenging question. Many responses consisted of a list of points rather than an evaluation as required by the question. Most responses gained credit for making valid points and indicating some understanding of phishing. The strongest answers were written in full prose style and included points which were expanded upon such as 'Users should never trust emails that come from people whose names

they do not recognise but sometimes emails may come from people whose names they do not recognise but they may still be genuine.'

Question 9

This question was quite well answered. **Part (a)** of this question was well answered but **part (b)** proved more challenging.

(a) Most responses gained some credit, with many containing at least two valid points. Responses generally showed a good understanding of what is meant by 'spyware'.

(b) This part of the question proved to be a little more challenging. Some responses identified the use of identity theft but were too vague in the rest of the response. A significant number of responses just elaborated on the answer to **part (a)** without saying how the information gained would be used.

Question 10

Overall, this question proved to be very challenging. Few responses gained credit with many responses showing an incorrect use of the terms field, record, tables or database. Responses indicated that the topics of relationships and key fields was unfamiliar to most candidates.

(a) (i) and (ii) Many responses referred to relating two tables or relating two sets of data without defining the relationship. Where responses were given credit for **part (i)** they usually achieved credit for **part (ii)** and showed a full understanding of the terms.

(iii) More responses gained credit for this part than for **parts (i)** and **(ii)**. However, some responses erroneously referred to combining two primary keys within the same table.

(b) This part of the question proved to be the most challenging on the paper. Many responses erroneously described the use of database tools to directly link the two tables with a many-to-many relationship. Responses that gained credit often referred to breaking the relationship down into two one-to-many relationships and also using a third table, a 'join table'.

INFORMATION TECHNOLOGY

Paper 9626/02
Practical

Key messages

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

- Candidates need to understand the function and syntax of an Entity Relationship Diagram (ERD).
- Candidates need to understand the differences between conceptual, logical and physical ERDs.
- Candidates need to understand the requirements of databases designed to First Normal Form (1NF) and Third Normal Form (3NF).
- Candidates need to understand the components and requirements of a data dictionary.
- Candidates need to take care when examining data files that will be used to create a normalised database and ensure that appropriate duplicate data is removed to achieve 1NF and 3NF.
- Candidates need to be able to apply appropriate validation rules to appropriate fields in a data dictionary and then the database.
- Candidates need to take care to ensure the consistency of formatting within a database report.
- Candidates need to ensure that database report labels are meaningful to a user with little prior knowledge of the report's contents.

General comments

Some candidates performed well on the practical database questions, but the questions that required knowledge of ERDs, data dictionaries and normalisation were generally less well answered.

Comments on specific questions

Question 1

Most candidates produced an Evidence Document, although there were a number of centres where no candidates produced this in document format, instead providing either Access databases or Excel spreadsheets. Where an Evidence Document was produced, many candidates attempted to create an ERD. This task appeared to be challenging for the candidates, with few producing a conceptual ERD drawn using rectangles with rounded corners and containing no data types, no key fields and no field lengths. Many candidates successfully placed the entity names at the top within each rectangle with the attributes for that entity placed below the entity name. Most candidates identified links between the entities, but few used the correct symbols on the diagram to signify one-to-many relationships. Few candidates demonstrated these relationships between the entities in general terms, with many pointing their links at individual fields which is not a requirement of an ERD, where the decision making on the fields to be used in the relationships is made when transferring the database structures from the ERD into database software. Many candidates identified most of the entities required, with a significant number identifying all five. These candidates were usually successful in identifying many of the appropriate attributes within each entity.

Question 2

Most candidates who produced an Evidence Document created a data dictionary. Few candidates created this to First Normal Form (1NF) as the name field was often not split into atomic data with field names such as Forename and Surname or First_Name and Family_Name. Not all candidates produced the data dictionary as a single table. Few candidates identified the table name for this single table, although many candidates identified the correct fields. Field sizes appropriate to the data were not always set. Candidates were often successful in identifying appropriate field names, although spaces in field names were seen in a small number of scripts. Data types and key fields were frequently assigned correctly to these fields. Few

candidates included appropriate validation to apply to these fields. Most candidates excluded the *To Pay* data from their data dictionary.

Question 3

Having created a data dictionary in **Question 2**, candidates were expected to create the database to 1NF to **match** their data dictionary. Whilst some were successful in this, many candidates defined elements like field lengths in their data dictionaries but did not apply these to the fields in their database. A small number of candidates identified the need for the *name* data to be atomic in their data dictionary but had a single name field in their database for this question.

Question 4

Many candidates successfully identified the three tables required to create the database to 3NF. Fewer candidates placed the fields in the most appropriate table. The student table was usually created with the 243 unique records imported but many candidates did not split the name data into two atomic fields (as required by 1NF) for this table. Data types and field lengths were often appropriately set for this table but field lengths for the Student_ID and Trip_ID fields in the link table were frequently left at the default 255 characters. Currency values were usually formatted to display a currency symbol but were not always formatted to two decimal places. The trip table was often created correctly with only six records, but some candidates omitted the Cost field from this table. Those candidates who created the three tables usually set appropriate links between them. Most candidates saved the database with the correct file name.

Question 5

This question gave a wide range of results, with most candidates creating a report grouped by the destination. Few candidates provided sufficient detail in the report title, with candidate responses such as ‘Outstanding’, ‘Balance’ or ‘Outstanding Balance’ as their title. This did not convey sufficient information to someone reading the report without prior knowledge of the contents. Where candidates had grouped the data, the data was frequently sorted as specified. Where group totals and the overall total were present, these were usually correctly calculated but were poorly labelled with insufficient detail in many cases. Some candidates set the outstanding balance, the grouped total and overall total in different formats, often having some data in one currency and other data in another or with no currency symbol. At AS level, candidates should be able to create reports with consistent formatting. Candidate identification details were not always positioned in the page footer but in the report footer so they printed at the end of the report rather than on every page.

INFORMATION TECHNOLOGY

Paper 9626/32
Advanced Theory

Key messages

Paper 3 is, as stated in the syllabus, an opportunity for candidates to demonstrate that they have a 'greater depth as well as breadth of subject knowledge, confidence in applying knowledge and skills in new situations and the vocabulary to discuss their subject conceptually and show how different aspects link together'. With this in mind, it is expected that A level candidates have a depth of knowledge of the subject topics and are able to customise their responses to the command words in the questions. They should not merely be giving lists of facts but should show their understanding by applying their knowledge. The command words given in the syllabus are used in questions to give candidates the opportunity to do this. Candidates are reminded to target their responses to the command word in the question.

Candidates should study all of the topics in the syllabus in some depth as questions can be set on any, and all, areas of the A Level syllabus. Candidates should therefore be prepared to answer questions on any topics covered by the syllabus. For example, **Question 2** was about social networking. The question focussed on the effects of social networking on individuals and the stem of the question gave a definition of the two effects that were being examined. However, many candidates described other effects, such as health issues and cyber-bullying.

General comments

This was the first Paper 3 to feature a total mark of 70. It was noted that few candidates omitted whole questions. Given that the number of candidates is significantly lower than in other series, this is merely an observation but it is hoped that this trend continues. Candidates should attempt to answer all questions.

Candidates should not write answers based solely on words that they have 'spotted' in the question. They should read the whole of each question carefully and apply their knowledge to the scenario in the question. The full range of marks is only available to candidates for answers referring to the scenario in the questions.

Comments on specific questions

Question 1

This question asked candidates to 'contrast' the characteristics of LANs and WANs. Strong answers gave only the differences in the characteristics and did not mention any similarities. Similarities were not required as the command word 'contrast' (p.45 of the syllabus) refers to differences only. Weaker answers just stated facts, sometimes as unconnected bullets, or described uses of LANs/WANs. Others gave similarities. These did not gain credit because the responses did not answer the question. To obtain the marks it was necessary to point out the difference and not to merely state a fact about LANs or WANs. For example, 'a LAN covers a small geographical area' on its own is a true fact but does not answer the question. However, 'a LAN covers a smaller geographical area than a WAN' answers the question and would gain credit.

Question 2

This question proved challenging, with many answers being too vague and not focussing on the specific effects mentioned in the question.

(a) Strong answers could have referred to social media sites and social networking allowing the creation of 'echo chambers' for like-thinking groups of individuals to repeat ideas but limiting the expression of alternative viewpoints so that viewpoints are selective. These viewpoints are

reinforced by repetition. Weaker answers were either very vague or referred to other aspects of social-networking.

(b) Strong answers could have referred to social networking subjecting individuals to intense scrutiny/surveillance, with comments being seen by extremely large numbers of readers and that individuals may conform to the stereotypes demanded by social media comments in order to 'fit in' with peers. Weaker responses made vague references to 'being picked on', hate speech or cyber-bullying but these did not answer the question.

(c) The command word 'justify' requires that responses provide evidence to support a case. In this question, candidates were required to support the case for businesses using social networking in marketing their products. Weaker answers merely stated how social networking is used and not why it may be beneficial to the business, gave advantages with little explanation as to why they were advantages or gave reasons for not using social networking. Strong answers could have pointed out, for example, that social networking allows businesses to reach customers very quickly so can be used to keep customers up to date about products.

Question 3

In this question, many candidates confused the resolutions of digital images with the stated resolution of TV displays. Weaker answers gave inappropriate resolutions for the scenarios. Precise figures for the resolutions were not required to gain credit, nor was it necessary to describe the details of UHD/4K TV systems. Strong responses, however, gave accurate details of the resolutions, or references to very low or high, and related these to the specific scenarios given in the question. For example, image resolution needs to be high (around 600 ppi for professional printing) to produce high quality images on paper for publications but an acceptable quality is achieved with lower resolutions (e.g. 300 ppi) for photographic images in magazines.

Question 4

Most responses correctly explained how VPNs can be used for both for legitimate and for illegal purposes and stated these in some detail. However, the question required that the use of VPNs be evaluated. An evaluation should take possible uses and make a judgment about the importance or value of these when using the internet. Strong answers could have included evaluations such as the encryption of all data during transmission enhancing the security of data and so protecting the privacy of user.

Question 5

Many strong answer to this question were seen, with references to, for example, having validation routines to check data entries for unreasonable data, using input controls (e.g. drop boxes and radio buttons) to force user entries to comply with what is required, highlighting important fields to try to ensure that important data is not missed out and the appropriate use of white space so that the screen is not cluttered.

Question 6

Many of the responses to this question gave general information about wireless communications rather than concentrating on microwave transmissions.

(a) This question required specific details of microwave transmissions such as data being modulated onto a carrier wave, the use of line-of-sight between the sending and receiving antennae with the use of multiple antennae to send and receive signals simultaneously. To gain credit, answers should have included specifics and not just give generalised comments on wireless systems.

(b) Most responses gave appropriate uses for microwave transmissions, such as mobile phone systems and satellite data links.

Question 7

This question was about the prompt() method which is used in JavaScript to provide a popup dialog box on web pages. Most candidates showed that they knew about this method but many could not accurately describe its use.

(a) This question was quite well answered by many candidates. Strong answers included the declaration of variables and the requirement for users to input values that are stored in the variable. More details about the prompt() method that should have appeared in strong answers were that a user is required to click either OK or CANCEL, the user value is returned to the variable or NULL is returned.

(b) Many responses contained some details for this question but most were lacking in precision. Weaker answers gave vague references to '*can't check the entry*' or '*have limited number of characters*' without any explanations. Limitations of the prompt() method include that the position and the appearance of the dialog box cannot be specified by programmer but is determined by the browser so it may not be in the 'best' position or size for a user of the dialog box. Candidates must provide precise and accurate details in their answers.

Question 8

This question was well answered by many candidates, with good explanations of how online tutorials can be used to train learners. Explanations require details with reasons. Strong answers should include a statement and then an appropriate reason. Answers could have included the route through being able to be decided by answers to questions or by following links to different topics so that users can choose or be directed to different topics.

Question 9

Many responses to this question accurately stated that RGB is Red, Green, Blue and CMYK is Cyan, Magenta, Yellow, Key or Black and described some similarities and differences. However, a significant number of candidates omitted the key/black reference in CMYK. Candidates are advised that accuracy is important and that they should check their answers carefully.

Question 10

This question asked candidates to describe how a new computer application will be evaluated. Some candidates described methods of testing rather than describing evaluation. The evaluation of a new application happens almost at the end of the development process and is quite separate from testing. Strong answers could have referred to, for example, determining the efficiency and ease of use of the application and whether it meets the user requirements. Methods of carrying out the evaluation could include gathering feedback from users of the application.

INFORMATION TECHNOLOGY

Paper 9626/04
Advanced Practical

Key messages

This was quite a small cohort so it is difficult to generalise guidance for candidates. However, candidates are advised of the importance of matching any images shown in the question paper and bullet pointing all the important steps or conditions described in any task. This would help candidates gain some of the marks that are easy to overlook when working under pressure.

General comments

Most candidates attempted all the tasks, and many were successful with the main elements, but complete solutions were rare. Candidates would benefit from centres prioritising the development of problem-solving skills when devising programmes of study for this paper.

Comments on specific tasks

Task 1 – Graphics

The extraction of the Heron image from the bitmap source file was managed by most candidates but accuracy in the use of cut-out tools varied. The difficulty of preserving the neck feathers was apparent and many candidates needed to clear the space between the heron's leg and body. Candidates are reminded of the need for accuracy and the importance of developing these techniques. These techniques should include selection by colour range.

Many candidates were successful in completing the vector graphics element of the task, and some candidates appreciated the care needed to gain all the marks available. Ensuring the image was saved at the size specified is one of the elements to which more candidates needed to pay attention.

Task 2 – Animation

The animation task was quite well done by most candidates and while it was clear that candidates had practised for the basic elements of the task, there were parts of the task which candidates may not have experienced. These elements included:

- the towel roll needed to narrow to give the impression of unrolling
- the 'unrolling' area needed to be in constant contact with the roll as it moved and narrowed
- each letter in the text on the towel had to be uncovered rather than just displayed.

Each letter on the towel area needed to be uncovered incrementally as the roll appeared to pass over it. This could be achieved using layers and careful positioning of elements on the timeline. Candidates would benefit from practice with similar tasks and the use of masking. Careful planning of stages in a project is important before beginning.

Task 3 – Spreadsheets

Fully satisfying the criteria for this task proved difficult for many candidates. It was the problem-solving element that prevented candidates from providing efficient solutions.

Most candidates set up the spreadsheet accurately and with the correct formatting, but it is important that candidates create worksheets that look identical to those shown in the question papers.

There were very few mistakes with the generation of the table of simulations but an efficient tally of totals for the increasing number of simulations was rarely seen. While some managed to populate the tally table manually, only the stronger candidates realised that for an efficient solution the formulae needed to be replicable in order to ensure the project could be extended or revised.

In general, however, it was clear that many candidates had successfully mastered important spreadsheet skills.

Task 4 – Programming for the web

This task required candidates to extend JavaScript code to respond to 'guesses' of numbers between 1 and 10 as entered by a user. The source file included the code to generate a random number and the first part of the task required candidates to finish the script to display alerts displaying either 'Well done' or 'Sorry that's wrong'.

The html source file provided details of the name of the function required, the name of the variable to be used for the number entered and the name of the bookmark where the text should be displayed in the last part of the task.

The second part of the task was to amend the script to count the number of guesses made until the correct number was entered and display the results or 'Try again' in alerts.

The final part of the task was to display the correct text and the number of guesses on the webpage.

There was only one common error in that many results for the count were incorrect because the variable for the count of guesses was often initialised as zero. This resulted in the count being displayed as one less than the correct total. A simple count of the guesses during a trial would have alerted candidates to this mistake.

The important elements of the solution scripts were:

- the creation of the correct function to compare the submitted guess to the random number generated by the code. (The function had to be named as detailed in the html)
- the conversion of the guess (which would be entered as text) to a number
- the use of a conditional statement such as `if…else`
- the use of alerts to display the required text
- the declaration of a counter variable to hold the number of times a guess was made
- incrementing the counter variable (the ++ operator is the efficient method)
- the use of `getElementById()` method to display an element
- the use of the bookmark to display the element in the correct place on the web page.

Most candidates were successful with displaying the correct alerts and many managed to add a counter to total the number of guesses made.

Those candidates who were not able to display the results on the page resorted to using alerts or displaying the result on a new page. Displaying results in a fixed position and on the current page is an important feature of tasks such as these.

In conclusion

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

- the need for practice in accurately extracting or selecting objects in bitmap graphics
- that accurately reproducing details and proportions shown in the question paper is essential to achieving all the marks in all tasks
- planning the stages and layers of an animation is essential before commencing the task
- efficient solutions in spreadsheet tasks usually require replicable formulae
- in JavaScript tasks, candidates will often need to be able to display results in a fixed position and on the current page
- the need to prioritise the development of problem-solving skills.