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INFORMATION TECHNOLOGY

Paper 9626/12
Theory

Key messages

Candidates' performance slightly better than seen in previous sessions. Generally, responses showed that candidates had reasonable understanding of some areas of the syllabus, but this understanding was not evenly spread across the syllabus as a whole. As has previously been the case, candidates tended to fare better with questions based on recall rather than analysis or development and also on those questions where a depth of technical understanding was required.

Candidates are reminded that in order to develop responses, structured answers rather than individual points, should be employed. Furthermore, the scenario within which each question is set is central to any answers that may be accepted. The scenario, by definition, will exclude certain answers that might be accepted in a more general paper. Therefore, candidates must be prepared to apply their knowledge and understanding to the scenario within which the question is set and to reject answers that do not fit that scenario and context.

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

General comments

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

As with previous sessions, work at this level assumes a level of technical understanding. For a number of key questions, answers across the cohort were quite weak and showed a lack of understanding of such technical issues in any real depth. Answers to these questions were either too general to be awarded anything other than single marks, in most cases, or were answers to questions other than that asked – so candidates were writing about something they knew, rather than focussing on the actual question asked.

Candidates are recommended to work to 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 others, candidates are either writing too much or too little for the marks available. Furthermore, some candidates, in an apparent attempt to fill their answers with points, are repeating the points they are making. Clearly, any valid point may only be awarded once and so, this represents something of a waste of time during the exam.

Comments on specific questions

Question 1

(a) This question was well answered, with the vast majority of candidates getting the mark. Generally, correct answers stated that accurate information was either true, or free of error.

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A small number of candidates repeated the question, or stated that accurate information was up-to-date or relevant.

(b) This question focused on an application of the previous concept of accuracy. Where candidates interpreted the question correctly, answers were fairly good and covered a lot of points. Usually, these focussed in the ability to eradicate bias and identify when someone as lying. In a few cases, candidates also focussed on the ability to give wider answers when one is restricted by structured questions within a questionnaire.

Unfortunately, many candidates decided to focus on the make-up of questionnaires and interviews in some detail and so missed the point of the question. Other candidates gave confused answers that possibly included some valid points, but which were so disorganised that it was unclear about which method was being described.

(c) Many correct answers were seen, but a number of candidates confused online processing with real-time processing. Quite a number incorrectly answered that online processing was processing online which was a repetition of the question and so, was too weak to be accepted for a mark.

(d) This question was very well answered, with many candidates achieving high marks for their answers. In questions such as these, candidates are being assessed on their recall of the steps in a process, as well as their ability to recall the order in which they should occur. It was clear from the answers that the majority of candidates had a clear understanding of both aspects of this process and gave answers that were of a high standard.

However, it is worth noting that the question focussed on the process of purchasing goods. In a lot of cases, candidates went beyond this process to include, for example, the delivery process. Whilst this did not negatively affect the marks awarded, this did represent a waste of time in the examination.

Other candidates missed out on relatively straight-forward marks due to a lack of accuracy. For example, candidates talked about the address being entered. This was not sufficiently accurate, as the answer should have been delivery address (with billing address already in the system as Johann had previously registered). Similarly, ‘banking details’ is too vague, as, for example, this could simply be the address of the bank.

Question 2

The candidates were asked to discuss the benefits of using a linker. The answers were very poor with the majority of the candidates believing that linkers translated code. Many filled the answer space discussing compilers and interpreters which scored no marks.

Marks were only awarded occasionally, and, typically, these were for an awareness on working in modules and, even more occasionally, the benefits of doing so.

This area of the syllabus is one with which candidates typically struggle. Whilst marks are usually more than achieved for this particular question, candidates struggle to give answers that are more than simple comments and so do not get marks for developing answers, especially where they are asked to evaluate or compare.

Question 3

Many candidates gave good answers for this question and achieved good marks, with virtually all candidates achieving at least on mark. A wide range of positive aspects were focussed on, with cost and the need for software to be up-to-date being the two most frequent negative aspects identified.

A small number of candidates confused anti-virus software with firewalls.

Question 4

(a) This question seemed to split candidates, with a good number clearly very comfortable with working with flowcharts whilst others gave the impression that they had had little to no training in their use. Typical, and, possibly, the easiest to fix mistake was candidates only using a YES or a

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NO from the decision boxes. If candidates are taught to recognise these symbols, and to add both YES and NO, they will be virtually guaranteed of picking up low level marks for the question.

(b) (i) The vast majority of candidates were awarded the mark for this question. Where a mark was not awarded candidates fell into one of three camps. These were:

- left the question out
- gave a different shape, albeit one recognised as suitable for use in a flowchart
- gave a random shape not usually seen in a flowchart.

(ii) Another mixed group of answers. Whilst many candidates were able to state that the procedure would be called, others seemingly gave an answer just to fill the space, with many and varied, but wrong, answers being suggested.

Question 5

Questions asking why a certain process is needed occur regularly in this paper. In this instance, candidates were asked why encryption is needed. This is actually quite a straightforward question, and, where candidates gave structured and thought-out answers, they achieved well. However, some candidates appear to have seen the word 'encryption' and simply written everything they could about encryption as a process, including comparing different methods of encryption. Whilst such an approach may earn a few marks, a more considered approach, where candidates apply aspects of their understanding to the question being asked is both more effective and efficient.

Question 6

(a) (i) Many were able to describe what a light sensor did, but few were able to give a sensible example of how it should be used. There was a great deal of confusing between the use of a sensor and the processing that would take place after the data had been sensed. The fact that sensors are not able to process anything seemed generally not known.

(ii) Almost no marks were awarded for the description of a temperature sensor. However, some reasonable answers as to how it could be used were seen. Again, incorrectly, temperature sensors were given the attributes of entire systems that might use them, such as air-conditioners, rather than describing the small part the sensor would play in such a system.

(b) Marks were awarded for correctly identifying the three types of calibration. For the majority of candidates, this was the only mark achieved. Candidates seemed to have some understanding of each process, but preferred to describe each of these than actually evaluate their efficacy. As has been mentioned in relation to other questions, candidates need to focus on the question being asked rather than on simply writing what they know about the topic.

Question 7

The processing of phishing was well understood. However, some candidates had difficulty in carefully explaining themselves, with incorrect statements such as websites being sent in an email or people clicking on emails etc. A very small minority thought that emails were not involved. A few carelessly talked of 'mails' which was too vague as it could have been posted mail.

Candidates often wrote about legitimate looking websites or legitimate looking emails which of course all legitimate emails and websites would also look like. In order to get the mark, candidates needed to complete the point by saying that they were legitimate looking but were in fact false.

Question 8

Very few good answers were seen in answer to this question, with the vast majority of candidates giving generic answers about the generic divide, rather than applying their understanding to the context of online shopping. As with other questions, where candidates did focus on online shopping, they then failed to apply the context correctly and so gave answers that focussed on wider issues than just online shopping, and included general shopping, or financial issues.

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Question 9

(a),(b) There were some really strong answers to both parts **(a)** and **(b)** of this question. In both cases, candidates understood the concept well and were able to make a number of salient points about each.

Points to take away from this are as follows:

- candidates repeated that both were malware. As malware was included in the question, this was not awarded.
- Some candidates gave a short story of the Greek use of a Wooden Horse during the Trojan War. Some of these were very well written and interesting, however, such answers did not garner any marks. Whilst it is good that candidates understand the logic behind the use of the term Trojan and link it to the nature of the malware, this is best seen as an aide memoire rather than the basis of an answer to the question.

Question 10

This question required technical understanding and suffered from the same lack of technical understanding shown in other parts of the paper. Whilst most candidates picked up one mark in the question, there were very few who scored beyond this and, frequently, candidates confused open source software and open source formats. Also, there was a lack of concentration on the part of candidates, with terms such as ‘open source can be used by everyone’ frequently being given. As the question was looking for a distinction to be made between proprietary formats and open source formats, such answer were deemed to be too vague.

Many candidates also missed the second part of the question and did not explain why open source formats were needed.

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INFORMATION TECHNOLOGY

Paper 9626/02
Practical

Key Messages

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

- Candidates need to take greater care with data entry and with formatting spreadsheets, particularly in the alignment of cell contents.
- Candidates need to ensure that they understand and apply appropriate validation rules to cells to restrict data entry.
- Candidates need to understand the differences between the ROUND, ROUNDUP and ROUNDDOWN functions and identify when it is appropriate to use each one.
- Candidates need to ensure they can apply conditional formatting to cells to hide items that were displayed in a spreadsheet.
- Candidates need to follow the storyboard of a video carefully, taking into account the positioning of images and text and replicating these in their solution.

General Comments

Many candidates scored well on the formatting questions within the spreadsheet, but more candidates found the use of appropriate validation rules more challenging.

Many candidates performed well on the video question in this paper.

Comments on Specific Questions

Question 1

Although many candidates found duplication of the image provided in the question paper relatively straight forward, a significant number introduced typographical errors or errors in layout to their spreadsheet. Not all candidates right aligned the contents of column A, nor centre aligned column B. The majority of candidates merged cells A1 to C1, although many did not right align the contents of this merged cell. Overall, most candidates formatted cells as required. A small number of candidates did not save this file as specified.

Question 2

Most candidates created a new worksheet and imported the data as specified but many did not use appropriate worksheet names. A significant number of candidates did not display the data in the required format in the Size column, with some candidates performing the calculation of length multiplied by width.

Question 3

Some candidates correctly applied a validation rule to this cell, fewer added appropriate text to this cell, which should have given a message to help the user enter the data and an error message if they had not entered valid data.

Question 4

Some candidates correctly applied a validation rule to cell B7, fewer added appropriate text to this cell, which should have given a message to help the user enter the data and an error message if they had not entered

valid data. Some candidates did not set this rule to select from a drop-down list using the data created in step 2.

Question 5

Some candidates correctly applied a validation rule to cell B8. There were a variety of correct responses, some candidate typed the allowed values into the rule whilst other set them as a list elsewhere in the workbook and referenced them from the rule.

Question 6

This step was found challenging by many candidates. Candidates who had examined the 'sizes' data recognised that the sizes were not all the same number of characters in length and entered formulae using XLOOKUP as shown in the mark scheme or in some cases used formulae identifying the position of the 'x' in B7 and using this with LEFT and RIGHT functions (or sometimes MID functions) with the length of the string to get the two values before using MAX and MIN to determine the right data for cells B13 and B14.

Question 7

Most candidates made a good attempt at this formula. A common error was the lack of the function ROUNDUP to include a tile used where it had to be cut, several instances of ROUNDDOWN and many more ROUND functions were seen in the candidates' work. Some candidates did not add the 5 per cent, many multiplied the result by 1.05 (sometimes inefficiently by using the formula then 0.05 × the formula and adding these together) but few candidates then used ROUNDUP again to get a whole number of tiles.

Question 8

It was surprising to see the number of candidates that applied a different method of solution to calculating the area of the wall (before the window calculation) to the one they used in step 7. Because only full tiles used for the window calculation were required ROUNDDOWN was the appropriate function for candidates to use. Few candidates used this and some did not attempt the rounding part of this question completely. Some candidates did not add the 10 per cent, many multiplied the result by 1.1 (sometimes inefficiently by using the formula then 0.1 x the formula and adding these together) but few candidates then used ROUNDUP again to get a whole number of tiles.

Question 9

The easiest solution to this step was to apply conditional formatting to the specified ranges of cells so that when each condition was met the co-responding cells were displayed with white text on a white background. Few candidates considered this, and many solved a part of this by adding to the formulae in the cells to display the cell as " " should the required condition be met. These candidates were given appropriate credit for the full ranges of cells that were not visible, but this was not a possible solution for all cells.

Question 10

Many candidates attempted all 4 tests, some attempted fewer. Most candidates enter the appropriate data but not all used the tests to try and help them identify any anomalies within the spreadsheet caused by the formulae they had entered (particularly the blanked cells).

Question 11

Many candidates performed this step with 100 per cent accuracy although there were clips with an incorrect length or no fade out applied to the soundtrack.

Question 12

Most candidates placed the two videos as specified. Not all used a smooth transition. A significant number of candidates did not consider the positioning of the logo image and the accuracy and positioning of the text. Some candidates placed the text **Tracy's Tilers** in different positions before and after the 4 second mark so that this text jerked when the video was run which did not give a professional appearance. With these exceptions this step was often completed as specified.

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INFORMATION TECHNOLOGY

Paper 9626/32
Advanced Theory

Key messages

Questions can be set on any, and all, areas of the A Level topic syllabus so it is important that centres ensure that their candidates study the content of all the topic areas. In Paper 3, it is expected that candidates not only have a depth of knowledge and understanding of the subject topics but can customise their responses according to the command words in the questions. As noted in previous reports, the commands words (p.45 of the syllabus) are carefully chosen in questions to give candidates the opportunity to show their wider understanding and to demonstrate their ability to express that understanding. Centres are again reminded to advise their candidates to target their responses to the command word in the question.

General comments

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

Centres are advised to remind their candidates that they carefully read the whole question to ensure that they understand exactly what the question is asking and should not write answers based solely on 'key' words that they have 'spotted'. Further, 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 6** referred to social media use by news organisations so, while references to social media being used for sharing videos and images is valid, sharing personal videos and images of holidays/vacations and family is not answering the question.

Comments on specific questions

Question 1

This question asked candidates about 3G, 4G and 5G mobile communication services. References to 2G and 6G, while possibly interesting, were not relevant and unnecessary.

(a) This question was about how 4G offers a better service than 3G. It gave candidates an opportunity to show that they knew the differences between 3G and 4G technology and how this impacts users. Good answers referred to the use of packet switching in 4G but not in 3G providing full IP services and the use in 4G of e.g. MIMO and higher frequencies to enable higher data transfer rates providing faster download of web content. Answers should have referred to the 'how' rather than just 'what' is provided by 4G.

(b) This question was specifically about how 5G technology provides for higher data transmission speeds and allows many more devices to connect. The 'how' is by e.g. the use of very high bandwidth connections with low latency, seamless handover between base stations and various techniques for improving signal strengths and connections.

Question 2

This question asked candidates to contrast Wi-Fi and cabled connections. When responding to 'contrast' questions, candidates should give only differences. The command word 'contrast' (p.45 of the current syllabus) requires an answer to *'identify/comment on differences'* so similarities are given no credit. Good

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answers referred to e.g. the higher data transfer speeds available using cabled Ethernet compared to Wi-Fi or to Wi-Fi being more susceptible to signal interference from other devices than cabled Ethernet.

Question 3

This question asked candidates to compare the use of static and dynamic routing of data packets through IP networks. Often a question will specify that both similarities and differences as required, as in this question, but even if it does not, candidates are advised to give both to ensure access to the full mark range. This is because the command word 'compare' (p.45 of the current syllabus) requires an answer to comment on *'similarities and/or differences'.* Good answers to this question could have referred to e.g. both being used by routers to determine the path across an IP network and to both providing a default route, static routing tables being created by network administrators and not being changed whereas dynamic routing tables are created by the router and can change according to network conditions. It was noted that a significant number of responses referred to dynamic IP assignment using DHCP. Such references did not answer the question and it can only be assumed that the candidates spotted the words 'dynamic' and 'IP' and misunderstood the question. Centres are referred to the general comments above.

Question 4

(a) Topic 16.7, p. 34 of the current syllabus, clearly refers to 'ease of use' as part of the evaluation of a new system. Ease of use can be evaluated by e.g. checking that the installation and start-up procedures are easy to carry out, that end-users can easily navigate the system and learn how to use it. Good answers made reference to these aspects whereas the weaker answers did not focus on 'ease of use' but referred to other aspects of evaluation e.g. efficiency.

(b) Good answers referred to the meeting of specifications and requirements whereas the weaker answers repeated the responses to **part (a)**.

Question 5

This question required both benefits and drawbacks to be discussed. The full mark range was not available unless both were given. It is usual to expect candidates to produce at least two of each of benefits and drawbacks to be able to achieve full marks. Most candidates produced responses that gave expanded discussion points a few responded with bulleted lists of statements. As noted in previous reports, bulleted lists usually fail to score many marks as they are often brief statements and not expanded into discussion points. Good answers would have included e.g. failure of the new system only affects the department running the pilot but the others are not, implementation is easier to manage as it affects less staff at any one time compared to full direct or other methods of changeover and staff can be trained by department. Drawbacks that could have been included were e.g. old and new systems have to interact as data may be exchanged between departments so data is at risk and full implementation in all departments takes a longer period of time compared to e.g. direct changeover.

Question 6

This question was specifically about the use of social media by news organisations. It can be used as a source of information or for many other purposes by organisations that deal in news. Good answers should have included e.g. social media is used to reach a much wider audience than possible by other means, can include links to further articles and social media news reports can be used to spread news more quickly than other media reports. Generic answers referring to general use of social media, e.g. used to contact friends, did not properly answer the question so did not attract marks. Centres are reminded to ensure that their candidates read questions carefully and focus their responses on the scenario in the question.

Question 7

Answers that restated the question e.g. a WBS is used in PERT, did not score marks. Centres are reminded to advise candidates not to repeat the question.

(a) Good answers to 'explain' questions give reasons and support points with evidence e.g. a WBS is a graphical representation of a project so that it shows stakeholders the scope and describes all the work that is required to complete the project. Generic or vague answers stating what a WBS is did not score marks.

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(b) Characteristics are distinguishing and typical features. Good answers did not simply describe WBS structure but gave reasons for it. Characteristics of a WBS are e.g. that the work is broken down into manageable units and reasons for this are that the units of work can be assigned to individual workers or teams and the work unit is measurable.

Question 8

As well as being able to use JavaScript in a practical situation, candidates are expected to know and understand object-based JavaScript programming techniques.

(a) This question asked about the use of `switch()` to select actions depending on the result of the testing of conditions. Weak answers referred to switching between variables or switching between cases but were either vague or inaccurate. Good answers should have referred to a variable being used to store a specified condition against which a number of cases are tested by `switch()` to determine the action to be taken.

(b) Logical operators are used to test if conditions are TRUE. Weak answers confused logical operators with arithmetic or other operators. Good answers were accurate and precise describing e.g. the use of logical operators for determining the logic between variables or values of any data type and for descriptions of logical operators.

Question 9

The command word 'evaluate' requires candidates to *'judge the quality, importance, amount of something',* p.45 of the current syllabus, so answers to this question should have described how prototyping is used and then making a judgment on the use. Good answers referred e.g. prototyping requiring greater client involvement in all stages of development which enables clients to interact with a working model of their project and this, in turn, means clients are more influential in the development. A good evaluation should include contrary points e.g. it could be that a focus on prototyping can result in an inadequate analysis of project which may overlook potential problems which, in turn, results in poor specifications. Centres should advise their candidates that responses to evaluation questions should make judgments on both sides of the case e.g. for and against, and, where appropriate, come to an overall reasoned conclusion.

Question 10

This question was focussed on vector images. All modern web browsers can display vector images.

(a) This question asked candidates to describe the technical details of how bitmap images are converted into editable vector shapes. weaker answers describing exporting the images as a vector graphic. While this is valid as a way for a user to do the conversion so was given credit, it does not describe the process of conversion. Good answers should have referred to the creation of nodes (control points) and the tracing of clearly defined areas in the bitmap to create the shapes found in vector images.

(b) In a similar way as for question 5, both advantages and disadvantages were specially required in order to access the full range of marks. In this question, given that the mark tariff was six and not eight, at least one of each was required for full marks to be awarded. 'Discuss' requires that topics be written about in depth and in a structured way so bulleted lists of descriptions do not attract many marks. Good discussions could have included e.g. vector images often (but not always) have a smaller file size for a given image size than bitmaps so do not require as much disk space for storage and download faster than bitmap images with the consequence that they can be displayed on low specification devices and e.g. vector images do not produce realistic photographs since any gradations of colour are far too obvious to the viewer.

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INFORMATION TECHNOLOGY

Paper 9626/04
Advanced Practical

Key messages

It was obvious that centres had prepared candidates thoroughly for this session. The need for precision and attention to detail in all the tasks was widely understood. It is hard to identify many common areas that caused candidates to lose marks and centres seem to have addressed most of the issues identified in previous reports.

General comments

Most candidates managed to submit complete solutions to all the tasks, but many struggled with the final stages of the problem-solving elements and in particular with both the last part of the spreadsheet task and the last part of the JavaScript task.

Comments on specific tasks

Task 1 – Vector Graphics

This task was undertaken by all candidates and the majority produced excellent submissions. A few lost marks for some imprecision but in general there were no common mistakes or omissions that indicated any widely seen lack of skill or experience.

Task 2 – Timeline Animation

This is one area where centres might benefit from providing more experience to candidates. Almost all candidates demonstrated an appropriate understanding of the stages and features required for the task but very few fulfilled all the requirements. In particular, the vast majority of candidates left the animation to 'loop', which keeps playing, when this was not required. The other areas where many candidates lost marks were the size of the flame at the start of the descent and the size and duration of the small flame upon landing.

Another very common issue in the submissions was the imprecision of the timings in the given stages. Centres would benefit from highlighting how to control the speed of animations by precisely setting the number of frames for each respective stage in the timeline. It important that the animation is smooth and at an appropriate and consistent speed. Many submissions showed the spaceship changing speeds randomly and abruptly during the descent.

Task 3 – Spreadsheet challenge

Whilst the instructions for each stage were straightforward, the challenge of each became successively higher. Each new stage was subsequently built upon the previous one so that candidates could augment successful formulas at each new step.

All candidates managed to create the necessary drop-down menus for all the sheets, as well as completing the sums in the **SelectPeriod** sheet.

Most candidates managed to complete the **SelectDay** calculations but very few were successful at completing the **SelectAll** selections accurately. The formula required for this sheet was complex but could have been created by using the logic determined for each of the two previous stages.

It was, as previously noted, the problem-solving element that candidates found difficult.

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Task 4 – Programming for the web

The first part of this task was straightforward. It required candidates to create variables to hold the numbers input in the cells on the webpage and write the functions to sum and display the results. The names of the variables and the sums were evident in the html page provided.

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.

A common problem for candidates was that, although numbers were entered in the webpage cells, JavaScript treats them as text, this meant that no entries can be summed without being converted to numbers first. This is achieved in a number of ways, such as multiplying each variable by 1.

The second part of the task was to arrange for the cells to be cleared when another day was selected. This required candidates to add 'onchange' code to the html and add the matching function to the script section.

Not many candidates completed this successfully, although a number of valid attempts were seen.

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

The Window Object properties provide extremely simple methods to open, close and reload windows. There were many ways to clear the entries, but the centre 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:

- The need to provide challenging tasks that develop problem-solving skills.
- Candidates need to be aware of the importance of refining timeline animations to display smooth movements and precise timings.
- Candidates need to practice building formulas by augmenting successive solutions.
- The advantage of setting programming tasks that involve research into the most efficient methods of manipulating webpages with JavaScript.

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