
INFORMATION TECHNOLOGY

9626/31

Paper 3 Advanced Theory

May/June 2019

MARK SCHEME

Maximum Mark: 90

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **10** printed pages.

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1	<p>Six from e.g.:</p> <p>Some graphics software may not support all file types so different export options allows images to be shared e.g. use of JPEG / GIF is almost universal</p> <p>Images can be saved as compressed images / files to save storage space / allow use in various scenarios / situations e.g. use of JPEG allows compression by various amounts but the more compression the lower the quality</p> <p>GIF allows areas to be made transparent whereas JPEG does not support this</p> <p>Different file types support different colour depths for use in various situations e.g. JPEG supports more colours than GIF</p> <p>Quality of the image is affected by choice of filetype e.g. TIFF retains better quality than JPEG / GIF when compressed</p> <p>Bitmap (BMP) files restrict the use of the images to e.g. Windows OS so availability of other types allows cross-platform use.</p>	6

Question	Answer	Marks						
2(a)	<p>Four from:</p> <p>Function sort () treats values as strings not numbers</p> <p>Strings are sorted alphabetically</p> <p>Strings are not sorted numerically</p> <p>a is before / 'lower' than b so list 1 is sorted alphabetically by the first letter and then by the second etc.</p> <p>in list 2, the list is also sorted alphabetically so e.g. 1111 is before 12 because 2 is 'bigger' than 1</p> <p><i>Max. 1 for additional examples e.g.:</i></p> <p>The third character in 1111 has no match so is 'bigger' than 12</p> <p>3666 is before 37 because while the 3s match, and 6 is before 7, there is no match for the second 6 so it is 'bigger' than no number.</p>	4						
2(b)	<p>A suitable line with the function is: <code>insects.reverse();</code></p> <p>The variable name can be anything suitable, <code>reverse()</code> is the function.</p> <p><i>Mark allocation:</i></p> <table> <tr> <td>Use of suitable variable name e.g.</td> <td><code>insects</code></td> <td>1 mark</td> </tr> <tr> <td>All correct function and syntax</td> <td><code>.reverse();</code></td> <td>1 mark</td> </tr> </table>	Use of suitable variable name e.g.	<code>insects</code>	1 mark	All correct function and syntax	<code>.reverse();</code>	1 mark	2
Use of suitable variable name e.g.	<code>insects</code>	1 mark						
All correct function and syntax	<code>.reverse();</code>	1 mark						

Question	Answer	Marks								
3(a)	<p>Six from:</p> <p><form action="mailto: aftersales@mycompany.com" Tells the page that this is a form to be actioned by sending / submitting the form to a specified URL / default URL is this page To send an email via mailto to the specified address</p> <p>method="post" Specifies the HTTP method to be used when submitting the form In this case post means not to display the submitted data / used for sensitive or private / personal data / make the submitted data invisible in the field / will not allow bookmarking / is not saved in browser history Post can send unlimited amounts of data so no need to specify the size</p> <p>enctype="text/plain"> Specifies the encoding of the data As plain text.</p>	6								
3(b)	<p>Four from:</p> <table border="1"> <thead> <tr> <th>Line number</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>9</td> <td> <div style="display: flex; justify-content: space-between;"> <input type="text" name="name"> 1 mark 1 mark 1 mark </div> <div>
</div> </td> </tr> <tr> <td>11</td> <td> <div style="display: flex; justify-content: space-between;"> <input type="text name"="email">
 1 mark </div> </td> </tr> </tbody> </table>	Line number	Code	9	<div style="display: flex; justify-content: space-between;"> <input type="text" name="name"> 1 mark 1 mark 1 mark </div> <div>
</div>	11	<div style="display: flex; justify-content: space-between;"> <input type="text name"="email">
 1 mark </div>	4		
Line number	Code									
9	<div style="display: flex; justify-content: space-between;"> <input type="text" name="name"> 1 mark 1 mark 1 mark </div> <div>
</div>									
11	<div style="display: flex; justify-content: space-between;"> <input type="text name"="email">
 1 mark </div>									
3(c)	<table border="1"> <thead> <tr> <th>Line number</th> <th>Code</th> </tr> </thead> <tbody> <tr> <td>13</td> <td><input type="text" name="comment" size="100"></td> </tr> <tr> <td>14</td> <td><input type="submit" value="Submit your details"></td> </tr> <tr> <td>15</td> <td><input type="reset" value="Reset the form"></td> </tr> </tbody> </table> <p>Six from:</p> <p>Code on correct lines Correct syntax Size="100" or suitable value value="Submit your details" following submit value="Reset the form" following reset Correct input types</p> <p style="text-align: right;">1 mark each</p>	Line number	Code	13	<input type="text" name="comment" size="100">	14	<input type="submit" value="Submit your details">	15	<input type="reset" value="Reset the form">	6
Line number	Code									
13	<input type="text" name="comment" size="100">									
14	<input type="submit" value="Submit your details">									
15	<input type="reset" value="Reset the form">									

Question	Answer	Marks
4(a)	<p>Eight from:</p> <p>Risk to data from unauthorised access through remote access via network / internet</p> <p>Data can be (more easily) lost / stolen while being replicated / distributed across remote servers</p> <p>Large number of people can access the data which leads to theft of data as there are more people who can be compromised / make errors</p> <p>Data travels over more networks' so is more easily compromised / lost / stolen / corrupted</p> <p>Supplier of the storage may not be reliable / security aware to same degree as owner of the data</p> <p>Supplier of storage may go out of business / change their serve conditions / be purchased by rival companies</p> <p>Performance of cloud storage may not be as good as that of local storage leading to increased access times</p> <p>Owner of data may have no idea where the data is stored so may not be aware that is being stored in another country</p> <p>Owner of data is not responsible for e.g. backups so is reliant on third party systems to maintain their data integrity</p> <p>Data is extremely difficult to delete from the cloud</p> <p>Legal regulations referring to the data / storage systems may be different in different countries.</p>	8
4(b)	<p>Two from e.g.:</p> <p>Can allow access to data at any time / from anywhere with internet connection provided one has valid User ID / password</p> <p>Data can be accessed using different hardware so no need to carry hardware with you</p> <p>Company need only purchase / pay for the actual amount of storage needed</p> <p>Energy use by company can be reduced by not having (large) server farms for data storage</p> <p>Number of IT staff can be reduced saving the company the cost of their employment</p> <p>Supplier of storage is responsible for e.g. backups / disaster recovery / virus protection / security of the data.</p>	2

Question	Answer	Marks
5	<p>Six from:</p> <p>Electrical signals converted to light for transmission / converted back to electrical signals after transmission</p> <p>LED / laser (at node) sends / transmits a light beam / electromagnetic wave along the fibre</p> <p>Data is modulated onto a carrier wave</p> <p>Optical fibre connects the nodes / devices</p> <p>ADC / DAC are used to modulate / demodulate the data onto / off carrier wave</p> <p>Laser is used where longer distances are to be covered</p> <p>LED is used where shorter distances are to be covered as it is cheaper than laser</p> <p>Lasers produce coherent light which can allow greater bandwidth</p> <p>Receiver is photo detector to convert light into electricity</p> <p>Uses indium gallium arsenide in photo detector.</p>	6

Question	Answer	Marks
6	<p>Six from e.g.:</p> <p>Altered images can dissuade from / reinforce a belief of the viewer</p> <p>Adding people to images can persuade the viewer that the person was present when in fact they were not</p> <p>Removing people from photographs can create the belief that the person did not participate in an event</p> <p>Removing disgraced / out of favour people from photographs can create the belief that the person did not exist</p> <p>Retouching images of politicians can make them appear more attractive than in real life so more likely to appeal to a voter</p> <p>Viewers can be unaware that an image has been manipulated so may make decisions based on false information.</p>	6

Question	Answer	Marks
7	<p>Four from:</p> <p>Detail is needed so Telephone or Personal administration are options</p> <p>Rapport is needed so Telephone or Personal administration are options</p> <p>High response rate is needed so Telephone or Personal administration are options</p> <p>High speed of return of results is required so Telephone or Email are options</p> <p>Only Telephone meets all the requirements.</p>	4

Question	Answer	Marks
8(a)	<p>Eight from:</p> <p>Human types a request / is flagged as requiring help / guidance by interface / dialog system</p> <p>Dialog system provides interface between human input and the assistant's database</p> <p>It translates human input into digital format</p> <p>It generates human intelligible replies from the assistant for the human</p> <p>It uses natural language processing</p> <p>Avatar appears with indication that help / advice is available</p> <p>Avatar represents a 'real' assistant to provide a more realistic experience for the user / enhance the human-computer interaction process</p> <p>Increases the trust that humans put in the system</p> <p>Help / advice is generated by the system ...</p> <p>... for display by avatar</p> <p>System provides the specific advice / help that the human requested.</p>	8
8(b)	<p>Two from:</p> <p>Help / advice is available 24/7</p> <p>Decrease in number of humans required at call centre / online to provide help / advice</p> <p>Provides customised expertise for the particular website</p> <p>Increase in trust of website by online shoppers.</p>	2

Question	Answer	Marks
9	<p>Command word: Evaluate: discuss the importance of, weigh up, the advantages and disadvantages, judge the overall effectiveness, weigh up your opinions.</p> <p><i>This question to be marked as a Level of Response.</i></p> <p>Level 3 (7–8 marks) Candidates will evaluate, giving advantages and disadvantages, of at least three ways in which physical security can be used in combatting IT crime. The information will be relevant, clear, organised and presented in a structured and coherent format. There will be a reasoned conclusion / opinion. Subject specific terminology will be used accurately and appropriately.</p> <p>Level 2 (4–6 marks) Candidates will explain giving advantages and disadvantages of at least two ways in which physical security can be used in combatting IT crime. For the most part, the information will be relevant and presented in a structured and coherent format. There may be a reasoned conclusion / opinion. Subject specific terminology will be used appropriately and for the most part correctly.</p> <p>Level 1 (1–3 marks) Candidates will give advantages / disadvantages of using physical security in combatting IT crime. Answers may be in the form of a list. There will be little or no use of specialist terms.</p> <p>Level 0 (0 marks): Response with no valid content.</p> <p><i>Answers may make reference to e.g.:</i></p> <p>Physical barriers such as wall / doors / bars / use of floors other than ground floor which are cheap and easy to make use of / make use of existing resources which lowers costs Use of CCTV which can be placed overtly to deter unauthorised persons just by their presence or by a warning / notice that watching is occurring / can be cost effective as a deterrent Video surveillance can be used to watch large areas with few staff Physical presence of guards / security staff shows persons that a security system is in operation ... can deal with issues quickly / immediately Security lighting / automatic lights / sensor-controlled lights can illuminate when persons present to act as deterrent / highlight intruders / warn intruders that they have been seen and these have low cost if e.g. solar powered Computer devices can be easily / cheaply / quickly fixed / attached to large objects / shelving to deter theft Physical locks require keys that may be lost / key fobs etc may be lost or stolen / given to unauthorised persons Combinations to locks can be forgotten</p>	8

Question	Answer	Marks
9	Locks can be left unlocked in error Physical keys can be copied / given to unauthorised person Physical combinations to locks can be compromised by watching as lock is accessed Security staff / guards may not be alert / honest / in place when required.	

Question	Answer	Marks
10(a)	Four from: Animator only needs to draw 12 frames instead of the full 24 so saves time / effort ...fewer animators / less computer time needed for the whole project (Drawing on 'twos') makes slow animations look / appear smoother to the eye Less precision / accuracy is needed than for drawing on 'ones' ('ones' animation does not look jerky) so drawing can be done faster / with less skill from animator (Drawing on 'twos') makes animations appear more lively / active than when drawn on 'ones'.	4
10(b)	One from: Action needs to appear very fast / active Animation can include a flurry of activity around the main object Can portray a very smooth animation of many objects in the animation.	1
10(c)	One from: The animation may appear jerky / flashing of objects on / off Objects move very fast.	1

Question	Answer	Marks
11	<p>Command word: Discuss: give important arguments for and against. Often requires a conclusion, this command word requires ‘Analysis’ and ‘Evaluation’</p> <p>Six from:</p> <p><i>Advantages:</i> First person / heads up display via headsets can enhance monitoring of processes in real time from wearers point of view Can allow enhanced monitoring of employee activity via wearable devices on shop floor Can track every step of activity in manufacturing by employee activity Can allow enhanced / better manufacturing processes via wearable devices that view / transmit live data from activity Faults can be directly entered into fault database / expert system of company Can improve employee safety due to ability to remotely control machinery while on shop floor / using wearable devices Sensors can provide information about environment for working</p> <p><i>Disadvantages:</i> Positioning of devices on body can lead to inaccuracies in the data / actions performed Wearable devices need power so have to carry heavy batteries Wearable devices need charging so have downtime. Staff may not wish to be monitored.</p> <p><i>Max. 5 if all advantages or all disadvantages.</i></p>	6

Question	Answer	Marks
12	<p>Command word: Analyse: explain the main points or effectiveness in detail, identify their characteristics, examine closely.</p> <p>Six from e.g.:</p> <p>Use for VR therapy for psychological / occupational therapy Patients can interact with harmless representations of trauma-causing stimuli to reduce fear Can be used to treat depression instead of use of drugs Patient can role play in a fantasy world to help manage the depression Can be used improve the skills of autistic patients by providing controllable, different environments Can be used to train healthcare professionals using simulations Simulations provides a safe and repeatable set of activities Can perform operations remotely reducing surgeon travel time / allowing patients access to surgeons around the world Can allow patients to experience the operation before they actually have the procedure so are reassured / less worried.</p>	6