

Cambridge International AS & A Level

INFORMATION TECHNOLOGY**9626/31**

Paper 3 Advanced Theory

May/June 2025**MARK SCHEME**

Maximum Mark: 70

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 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **15** printed pages.

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 descriptions 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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
BOD	Benefit of the doubt
Λ	To indicate where a key word/phrase is missing
✗	Incorrect
~~~	Indicate a point in an answer
ISW	Ignore subsequent work
LNK	Statement/points are linked
MAX	Maximum number of marks that can be awarded
NAQ	Not answered question
Off-page comment	Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to.

Annotation	Meaning
REP	To indicate a point that has already been made or was given in the question
SEEN	Indicates that work/page has been seen including blank answer spaces and blank pages.
	Correct
TV	Too vague
	Indicate a point in an answer

Mark scheme abbreviations:

/	separates alternative words / phrases within a marking point
//	separates alternative answers within a marking point
<u>Underline</u>	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be awarded
()	the word / phrase in brackets is not required, but sets the context

Note: No marks are awarded for using brand names of software packages or hardware.

Question	Answer	Marks
1(a)	<p>TWO from:</p> <ul style="list-style-type: none"> • to know what is to be tested • act as a guide/set of instructions for testing • to ensure that the new system has been developed to the specifications • works exactly how the client / analysts / designers / stakeholders / warehouse expected • tests that it deals with normal / abnormal / extreme data 	2
1(b)	<p>FOUR from:</p> <ul style="list-style-type: none"> • Manually generated data by testers to check specific files / rules / messages • Computer-generated data sets that represent 'live' data / expected amount / type of real data • Normal / valid data that is accepted / processed by the database without error • Extreme data to ensure it is processed normally • Abnormal / invalid data that should be / is rejected by the database / causes error • Blank / no data to ensure appropriate error messages are generated 	4

Question	Answer	Marks
2	<p><i>Command word: Analyse - examine in detail to show meaning, identify elements and the relationship between them.</i></p> <p>ONE from:</p> <ul style="list-style-type: none"> • (A method of software development that) consists of a series of successive stages/stages that follow on from one another • SIX from: <p>e.g.:</p> <ul style="list-style-type: none"> • consists of a series of stages that follow on from each other • stages include analysis, design, writing specifications, coding/development, testing, reviews, deployment, maintenance (1 mark for minimum of 3, 2 marks if 5 or more named) • most problems / issues detected / noted / discovered in the early stages / in analysis / design / specification stages • Problems highlighted noted before development begins • Development is ordered / controlled / structured to minimise / stop changes / alterations after design stage ... • Feature creep is minimised / does not occur • Milestones can be clearly defined (1st) allows precise monitoring of progress (1) • Clients may not fully understand / now what they require at the beginning of the development • Difficult / costly to change / alter / amend / add to app specification during development 	6

Question	Answer	Marks
3(a)	<p>FOUR from:</p> <ul style="list-style-type: none"> • (Uniquely) identifies the NIC (in a network) • Used in Ethernet frames (when sending packets) • Used as address when sending / receiving packets • Used by DHCP servers when assigning IP addresses • Used by switches to direct packets around networks • Stored in table in switches for traffic management • Identifies the manufacturer of the NIC 	4

Question	Answer	Marks
3(b)	<p>TWO from:</p> <ul style="list-style-type: none"> • There are two logical networks 192.168.1.x and 192.168.2.x/network 1 and network 2/valid reference to the two network addresses • Laptop C is on a different logical network (than the others) • The laptops are on different subnets • Packets from laptop C are undetectable / unreceivable by laptops A/B/D/E/other 4 // laptop C packets cannot be detected/received by the other laptops 	2

Question	Answer	Marks
4(a)(i)	<p>ONE from:</p> <ul style="list-style-type: none"> • Increments / adds 1 to a number 	1
4(a)(ii)	<p>ONE from:</p> <ul style="list-style-type: none"> • raises to the power/exponential / exponentiation • first number (in variable) / operand (raised) to that of second number / operand 	2
4(b)	<p>FOUR from:</p> <p>TWO arithmetic operators from:</p> <ul style="list-style-type: none"> • * / star symbol (1) • multiplication/multiplies numbers together (1) • / / forward slash symbol (1) • division/divides one number into another (1) • % / percentage symbol (1) • modulus (remainder) (1) • - - / double minus symbols (1) • decrement/removes 1 from a number (1) 	4

Question	Answer	Marks
5(a)	<p>THREE from:</p> <ul style="list-style-type: none"> • ball appears to move slower (compared to on 1s/2s) • less time taken / to draw / create a second of animation • needs to draw 8 frames instead of 24 / fewer frames • can lower the frame rate for the sequence without affecting rest of animation • animation appears jerky / choppy/lively • suitable for action / anime 	3
5(b)	<p>TWO from:</p> <ul style="list-style-type: none"> • creates smooth movement of objects • less frames need to be drawn • takes less time than on 1s 	2

Question	Answer	Marks
6(a)	<p>FOUR from:</p> <ul style="list-style-type: none"> • provides for / set out rules (only) for the addressing of data packets / sending packets from device to another (1st) does not specify type of connection/delivery/error checking / notifications of delivery (1) • adds source/destination <u>address</u> to packets (from transport layer) • protocols at this layer change addresses / add additional addresses when packet is routed from one network to another / across networks • checks address of arriving packet to see if it's at correct IP address (1st) if not discards packet (1) 	4
6(b)	<p>ONE from:</p> <ul style="list-style-type: none"> • IP / IPv4 / IPv6 / internet protocol // (protocol) for setting/providing addresses of devices/network • IPsec // (protocol) for encrypting/authenticating packets/VPN • ICMP (internet control message protocol) // (protocol) used by routers to send information to other routers • ECN (explicit congestion notification) // (protocol) used by routers to handle/deal with network congestion • IGMP (Internet Group Management Protocol) // (protocol) used to send directly to devices that have requested data packets 	1

Question	Answer	Marks
6(c)	<p>ONE from:</p> <ul style="list-style-type: none">• Transmission control protocol (TCP) // (protocol to) establish / create connection / connection-oriented data links between client / server / Provide for reliable / error-checked / retransmission of missing packets• User datagram protocol (UDP) // (protocol to provide) connectionless links / no error checking necessary / used for DNS / DHCP / routing protocols	1

Question	Answer	Marks
7	<p><i>Command word: Discuss – write about issues(s) or topic(s) in a structured way.</i></p> <p>EIGHT from:</p> <p>Max TWO marks:</p> <ul style="list-style-type: none"> • data mining (is a set of techniques and tools) used to from work on / analyse large data sets • to Max extract relevant information • to discover trends / patterns / to find relationships <p><i>Content areas could include:</i></p> <p>Max SIX from:</p> <p><i>Benefits:</i></p> <p>e.g.:</p> <ul style="list-style-type: none"> • used to predict marketing trends • used to improve sales / profits (1st) by targeting customers / demographics (1) • used to adjust business operations • used to alter / amend business process to ensure greater productivity / efficiency • (usually) extracts reliable information • provides a sound basis for decision-making <p>Max SIX from:</p> <p><i>Drawbacks:</i></p> <p>e.g.:</p> <ul style="list-style-type: none"> • extracted information may not be accurate (1st) depends on source of data set (1) • complex tools required • need skilled operators • large databases needed • requires large storage spaces (1st) • expensive to purchase (1) • must ensure privacy of individuals / conform to data protection regulations • time-consuming / expensive to anonymise data sets 	8

Question	Answer	Marks
8	<p>SIX from:</p> <ul style="list-style-type: none"> Content is stored on server as resources / files / scripts / text / images / video / audio files / animations / database / links to other websites Each resource has / is found by a unique identifier / unique resource identifier / URI Web browser makes request (for connection / content) to web server Connection created (between web browser and server) / client-server connection is set up using HTTPS Uses TLS to add encryption Web server sends back a response Response contains information about the resource Response contains any error messages Response contains the requested resource Repeated exchanges with request / response method of communication (1st) until all (requested / required) content has been sent to web browser (1) Connection closed (by server or browser) when all content transferred 	6

Question	Answer	Marks
9(a)	<p>TWO from:</p> <ul style="list-style-type: none"> Connection (of devices) with / to each other over internet / network Devices are uniquely / individually addressable / identified on the network Devices with processors and software (May) contain / have sensors Have input / output 	2

Question	Answer	Marks
9(b)	<p>FOUR from:</p> <p>e.g.:</p> <ul style="list-style-type: none"> • Remote monitoring of patients (RPM) / senior citizens / chronic illness (e.g. hypertension / diabetes) for capturing patient data • Sending patient data automatically to systems for analysis • Connecting wearable computing devices (e.g. smart watch, heart monitor, BP monitor) for monitoring of health / activities • Emergency notifications systems / alerting people / groups of people to an emergency situation • Connecting point-of-care / bedside / near patient testing health devices for diagnosis • Telecare systems to avoid / replace in-person consultations • Ensure patient complies with healthcare regime / takes correct medicines on time 	4

Question	Answer	Marks
10(a)	<p>TWO from:</p> <ul style="list-style-type: none"> • The time taken to carry out / approve transactions can be very long (1st) because all nodes / peers have to be updated / approve the transactions (1) • Large numbers of nodes / peers can add to network congestion (1st) which can slow the process (1) • Different versions of blockchains are not interchangeable / cannot be exchanged for each other (1st) so must use the same blockchain technology (1) 	2
10(b)	<p>FOUR from:</p> <ul style="list-style-type: none"> • Parties (to the contract) agree on conditions of contract to be met / code to be used / deal to be struck / valid example of deal (e.g. sell painting for an amount of money) • Code / program / application representing the contract stored in a blockchain • (Code) runs / is executed only when predetermined conditions are met / only when all parties agree / have authorised its completion • Uses if / when ...- type statements to test conditions // checks conditions have been met • Uses then ...- type statements to execute code // if conditions met code is executed • Blockchain is updated when transaction is complete / conditions are met and authorised by all parties 	4

Question	Answer	Marks
11	<p><i>Command word: Evaluate: judge or calculate the quality, importance, amount, or value of something.</i></p> <p>EIGHT from:</p> <ul style="list-style-type: none"> • Valid definition / description of video-conferencing in education <p><i>Pros:</i></p> <p>e.g.:</p> <ul style="list-style-type: none"> • Gives students remote access to experiences / demonstrations / learning materials / experts / teachers / discussions • (with the remote access) students have access that they might not have otherwise had • Educators / students do not have to physically be present in same location / travel to classes • Saves time of travel / saves costs of travel • Allows those unable to physically attend / travel to take part (1st) ▪ valid reason for not attending (1) • Classes from different schools / colleges / areas / regions / countries can be combined (1st) ▪ reduces employment / resources costs to individual schools / colleges (1) ▪ allows resources to be used more effectively (1) • Can record session for later use <p><i>Cons:</i></p> <p>e.g.:</p> <ul style="list-style-type: none"> • Costs of the (additional) hardware / software can be high / prohibitive (1st) ▪ not all students / schools / colleges can afford them (1) ▪ so cannot take part in the sessions (1) • Technical problems / latency of the audio / lack of synchronisation with the video • Interruptions due to power outages / equipment malfunctions • Dropped internet connections (1st) ▪ can make a video-conferencing session unworkable (1) • Lack of a physical presence by the teacher • Cameras lack complete coverage of the classrooms / do not cover all students • Some students can be distracted / avoid taking part in the lesson • Monitoring of individual student's progress during the lesson is more difficult • Encouragement of all students is more difficult • Student progress may not be as good as in real / face to face classes <p><i>Conclusion:</i></p> <ul style="list-style-type: none"> • One mark for a reasoned conclusion 	8