



GCSE

Computer Science

J277/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2025

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It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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MARKING INSTRUCTIONS

PREPARATION FOR MARKING RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training: OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the RM Assessor messaging system, or by email.

5. **Crossed Out Responses**

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add a tick to confirm that the work has been seen.

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7. There is a NR (**No Response**) option. Award NR (No Response):

- if there is nothing written at all in the answer space
- OR if there is a comment which does not in any way relate to the question (e.g., 'can't do', 'don't know')
- OR if there is a mark (e.g., a dash, a question mark) which is not an attempt at the question.

Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

If you have any questions or comments for your team leader, use the phone, the RM Assessor messaging system, or e-mail.

9. *Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.*

10. For answers marked by levels of response: Not applicable in F501

- a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
- b. **To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

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11. Annotations

Annotation	Meaning
	Omission mark
	Benefit of doubt (must be accompanied with a tick)
	Cross
	Follow through (must be accompanied with a tick)
	Not answered question
	Benefit of doubt not given
	Repeat
	Tick
	Too vague
	Blank pages, pages with no annotation, no attempt to answer the question, page seen on QER
	QER Level 1 mark awarded
	QER Level 2 mark awarded
	QER Level 3 mark awarded

12. Subject Specific Marking Instructions

Mark scheme conventions:

- Each mark point is worth 1 mark unless stated otherwise
- Each mark point can only be awarded once
- A word/phrase that is underlined needs to be exact in the answer to award the mark point
- A word/phrase that is **bold** needs that concept to be in the answer (but can be given in multiple ways) to award the mark point
- 3 dots at the end of one mark point and at the start of the next mark point mean that the second mark point cannot be awarded without the first being awarded, unless the mark scheme states otherwise (for example a reasonable attempt with some inaccuracies)
- 3 dots at the start of a mark point, without 3 dots at the end of the mark point above, means the sentence carries on and there is no dependency
- Any text in brackets is not required to gain the mark point
- Single / means alternative word
- Double // means an alternative statement that is acceptable for the same mark point
- Enlarged font is used for visibility reasons only

Annotating scripts:

- Blank pages at the start of the script need SEEN annotation
- Any questions answered elsewhere (e.g. on the first blank pages, separately on the page) need to be linked within RM Assessor and annotated with ticks/crosses/SEEN as appropriate
- 1 tick for every mark awarded, if a question is given 3 marks there must be 3 ticks (apart from QER question)
- A BOD or FT annotation needs to be accompanied by a tick
- QER question 3 – One annotation from: L1, L2 or L3, according to the level awarded, the page not annotated with the level needs a SEEN annotation. Do not include any ticks, crosses or other annotations on this question – other than SEEN and one from: L1, L2 or L3
- Any answers with no candidate response need a SEEN annotation and NR entered as the mark.
- Any questions where the candidate has not attempted the question e.g. answered 'don't know' need a SEEN annotation and NR entered as the mark.
- All questions must be annotated throughout the marking process.

Question			Answer	Mark	Guidance
1	(a)		1 mark for each completed term to max 6 An analogue sound wave needs to be converted into a digital sound wave. Sound sampling is when the amplitude of the sound wave is measured at set intervals. The sample rate is the number of times a second the sound wave is measured. This is given in Hertz. Each amplitude is given a unique binary number. The number of bits allocated to each sample is the bit depth. The higher the number of bits, the wider the number of amplitudes can be measured.	6	
1	(b)	(i)	1 mark from - The smallest unit/part of an image - A (single) square/dot/diode which has one/single colour	1	Accept screen in place of image. BOD block/particle etc. in place of square.
1	(b)	(ii)	1 mark for one stage of working: $800 * 500 (= 400\,000)$ $400\,000 * 10 = 4\,000\,000$ $4\,000\,000 * 8 (= 32\,000\,000 \text{ bits})$ $32\,000\,000 / 8 = 4\,000\,000$ $4\,000\,000 / 1000 = 4\,000$ 1 mark for answer 4000 kilobytes	2	For MP1 accept $8 * 5$ BOD. Accept any method of doing calculations e.g. statements, grids, calculations. Accept division by 1024 instead of 1000. Final answer will be 3906.25 kilobytes. If no answer in the final answer space, look for answer clearly identified in working.
1	(b)	(iii)	8	1	Allow calculation that equates to 8

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1	(c)	No mark for choice 1 mark per bullet to max 4 for matching justification Solid-state choice e.g. • Durable/robust // Less likely to be damaged/break • ... no moving parts // because it does not get scratched like a disk • Larger capacity (than optical) // store more data • ... needed because the files could be very large // there could be many files to transfer // store large number of files • Portable • ... small in (physical) size // lightweight • Fast to read/write/access data • More compatible • ... no additional device/drive is needed Optical choice e.g. • Large (enough) capacity // store sufficient data // BOD larger capacity • ... needed because the files could be very large // there could be many files to transfer // store large number of files • Portable • ... small in (physical) size // lightweight • Cost per unit is less // Cost for the same amount of storage is less • The fast access/read/write speed is not required • ... files are being copied not run direct from the storage	4	Accept type by example. No choice – check justification for clearly stated choice and then award justification. No clear choice then 0 marks. Allow justification marks for using one, or not using the other. SS – BOD faster to transfer the data for read/write/access SS – BOD more 'efficient' to read/write/access. SS – accept optical may only be able to be written to once. Do not accept longevity/reliability.
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Question			Answer	Mark	Guidance																														
2	(a)		1 mark for each row to max 5 <table><thead><tr><th>Operating system function</th><th>Memory management</th><th>Peripheral management</th><th>User management</th><th>File management</th></tr></thead><tbody><tr><td>Multitasking</td><td>✓</td><td></td><td></td><td></td></tr><tr><td>Renaming a folder</td><td></td><td></td><td></td><td>✓</td></tr><tr><td>Creation of user accounts</td><td></td><td></td><td>✓</td><td></td></tr><tr><td>Installation of a printer driver</td><td></td><td>✓</td><td></td><td></td></tr><tr><td>Transfer of data to and from RAM</td><td>✓</td><td></td><td></td><td></td></tr></tbody></table>	Operating system function	Memory management	Peripheral management	User management	File management	Multitasking	✓				Renaming a folder				✓	Creation of user accounts			✓		Installation of a printer driver		✓			Transfer of data to and from RAM	✓				5	
Operating system function	Memory management	Peripheral management	User management	File management																															
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Transfer of data to and from RAM	✓																																		
2	(b)	(i)	1 mark from • Perform housekeeping tasks • Perform maintenance // Keep the computer running smoothly // identify/fix errors // improve performance of computer • To monitor / manage / configure a computer system	1	Do not accept a specific example of utility software. Do not accept a task performed by one example of utility software. Read whole answer and award a correct statement.																														
2	(b)	(ii)	1 mark each • Jumble / mix-up / encode / scramble / cypher data • Encrypt / decrypt using an algorithm / key • Make it meaningless (if intercepted / unauthorised access) // it cannot be understood / used (if intercepted / unauthorised access)	3	MP3 do not accept it cannot be 'read' or 'accessed'.																														

3		Mark Band 3–High Level (6-8 marks) The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i> Includes benefits and drawbacks. At least one ethical and at least one environmental issue. References both customer and company clearly for top of band. Points are expanded. Mark Band 2-Mid Level (3-5 marks) The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. <i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i> Covers benefits or drawbacks to achieve band, top of band requires at least one of each. Covers ethical and/or environmental. Some points are expanded. May only reference customer or company. Mark Band 1-Low Level (1-2 marks) The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. <i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i> Has a point for ethical/environmental/benefit/drawback, not all relevant. May not reference customer or company. 0 marks	8	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: Indicative Content: Ethical issues: • Will cost remain the same? – unfair on customers • Will customers be told? Or are they being deceived? • Can improve profit for company – allow staff to be paid more • Ethical to the company but unethical to the customers • Reduced cost may mean reduced reputation- long term loss If people move to other companies • Customers want most up-to-date devices – prepared to spend regularly • Lower cost to purchase may allow more people to afford device Environmental issues • Increase in e-waste from products that are disposed
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			No attempt to answer the question or response is not worthy of credit		- Older devices could be distributed to people without devices to reduce waste - Products could be recycled for components Benefits and drawbacks: - Company - Increase sales - Increase profit - Decrease popularity/reputation - Customer - Increase in cost - May be able to buy when couldn't before if initial cost is less - Less reliable devices - Effort/time to install new devices more regularly
4	(a)		1 mark each to max 2 - Small geographical location // single building - No use of external infrastructure // All hardware will be owned/managed by youth centre - Dedicated hardware // The hardware is not shared/used by anyone else/any other business - It is not connecting networks (like a WAN does)	2	Mark any two correct points as long as not contradicted.
4	(b)	(i)	1 mark each to max 2 (Partial mesh) means all devices are connected to one or more devices // (Full mesh) means all devices are connected to every other device - No need for central management / switch / device / node // All devices are equal // Decentralised - Multiple routes/paths (between devices)	2	MP1 BOD each device is connected to other devices // all devices are connected MP2 do not accept no central server

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4	(b)	(ii)	1 mark each to max 2 for drawback max 2 for benefit e.g. Benefits: • No purchase/cost of central switch / device • ... lower cost to install/maintain network // no need to setup / connect to the central device • More connections/paths between devices // alternate routes • ... no single point of failure // if a connection breaks can still connect • ... more robust structure • More scalable // can have more devices/connections/nodes/computers • ... easier to add devices • ... can add / remove nodes without impacting other nodes/speed • Decrease in latency • ... fewer collisions • Can be setup over a larger area // can provide a more stable connection • ... each device acts as repeater Drawbacks: • Large number of / more connections/wires • ... can involve redundant connections • ... this is impractical • Reduced central management/control/oversight of the network/transmission • ... less control over transfer/security of the network • Less secure BOD example less secure • ... more routes/points/devices for data interception/attack/unauthorised access • Difficult to find an error • ... because of the multiple routes where an error could occur • Mesh network uses more power • ... more nodes are involved in each transmission	4	1 mark for a point 1 for expansion/reason/benefit. Any of the MPs can be the benefit/drawback and can be the expansion as long as they follow on. Do not accept faster/slower transmission speeds – dependent on media and many other factors. MP3 and MP4 can be in a single statement e.g. 'If one connection breaks the nodes can still connect through another route'
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4	(c)	(i)	1 mark each to max 3 e.g. • Easier to add more devices/users • Can have more devices/connections/users // more scalable • ... without cost of purchase/install additional wired connections • Devices are not fixed to one spot // devices can be moved // can connect from anywhere in (wireless) range • ...allowing people to use them where they are needed // can use where there is no physical connection • Reduces risk of (additional) trailing wires • Less potential damage to equipment/wires • Connect wider range / more types of device // by example e.g. mobile phones/tablets • ... that don't have ports / wired connections // that only have wireless connections • It allows a backup network if the wired network fails • (Due to each node acting as a repeater in the mesh) the network will have a greater range	3	MP1 is for easier to add more devices to the network. MP2 is there can be more connections/nodes/devices than on a wired. 'more devices can be added easily' is MP1 on its own.						
4	(c)	(ii)	1 mark per bullet to max 2 for each factor <table><tr><th>Factor</th><th>How it affects the performance</th></tr><tr><td>Bandwidth</td><td> • More bandwidth = faster network/transmission BOD better performance • ...because more data is transferred simultaneously/per second </td></tr><tr><td>Number of users accessing the network at the same time</td><td> • More users = slower network/transmission BOD worse performance • ...because more data is transferred simultaneously // more traffic // the bandwidth is being shared/used // more bandwidth used // BOD more congestion / collisions </td></tr></table>	Factor	How it affects the performance	Bandwidth	• More bandwidth = faster network/transmission BOD better performance • ...because more data is transferred simultaneously/per second	Number of users accessing the network at the same time	• More users = slower network/transmission BOD worse performance • ...because more data is transferred simultaneously // more traffic // the bandwidth is being shared/used // more bandwidth used // BOD more congestion / collisions	4	Allow reverse of each. Do not award references to Internet speed alone. Points need to reference more/less data in correct context.
Factor	How it affects the performance										
Bandwidth	• More bandwidth = faster network/transmission BOD better performance • ...because more data is transferred simultaneously/per second										
Number of users accessing the network at the same time	• More users = slower network/transmission BOD worse performance • ...because more data is transferred simultaneously // more traffic // the bandwidth is being shared/used // more bandwidth used // BOD more congestion / collisions										

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4	(d)		1 mark each to max 5 e.g. • Can be expensive for large amounts of data / long term / hosting // may be ongoing subscription // no control over changing costs • May be limited amount of storage • No control over security // Need to rely on provider for security • May be hacked/stolen/intercepted/affected by a virus • May lose (personal) data // May lose access to data • May go against DPA/legislation // Data may be misused (by provider) • May not be clear where in the world the data is stored • Limited/No control over access • Company/cloud could go down • No control over backup // May not have (automatic) backups ... • ... data is not retrievable • Need internet access // no internet access means no data • ... access speed depends on network/connection speed • Concerns over ownership of the data • Need to remember login details // may forget/lose login details • Users may need training	5	MP1 needs more than high cost, it needs identification of ongoing, cost for hosting etc. MP3 just poor/low security is NE Accept data may be sold as example of misuse.															
4	(e)	(i)	1 mark for router/modem	1																
4	(e)	(ii)	1 mark for each row. <table border="1"><thead><tr><th>IP address</th><th>Valid (✓)</th><th>Invalid (✓)</th></tr></thead><tbody><tr><td>192.154.21.2</td><td>✓</td><td></td></tr><tr><td>258.0.0.3</td><td></td><td>✓</td></tr><tr><td>56.1.2.66.1</td><td></td><td>✓</td></tr><tr><td>251.58.3.7</td><td>✓</td><td></td></tr></tbody></table>	IP address	Valid (✓)	Invalid (✓)	192.154.21.2	✓		258.0.0.3		✓	56.1.2.66.1		✓	251.58.3.7	✓		4	Do not award rows with 2 ticks. Allow Xs in place of ticks in either/both columns.
IP address	Valid (✓)	Invalid (✓)																		
192.154.21.2	✓																			
258.0.0.3		✓																		
56.1.2.66.1		✓																		
251.58.3.7	✓																			

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4	(e)	(iii)	1 mark each to max 4 • Browser checks cache for matching IP address • URL/domain is sent to DNS • DNS looks for URL/domain to find matching IP • ...in table/database/files/lists (of URL/domain and IPs) • If not found the request is transferred to higher-level DNS • DNS returns IP address to computer/browser • An error is returned/sent if the IP address cannot be found	4	MP3 – award for the use of the DNS converting URL to IP MP5 accept another/larger for higher-level MP6 needs to be computer/browser, do not award user on its own.
4	(f)		1 mark for legislation Data Protection Act (2018) // DPA // GDPR // Data protection 1 mark each for steps to max 3 e.g. • Identify data protection officer • Keep data secure/safe (from unauthorised access) • ... by example // installing firewall // usernames and passwords // access rights // physical security // encrypt • Do not share/sell (without consent) • Don't store without consent • Only keep relevant data • ... do not collect data from users that is not required • Do not store the data for longer than needed • Make sure the data remains accurate / up-to-date • Only use for purpose collected // Data must not be misused • ... state purpose for collection • Do not store/share with countries with lower levels of protection • Change/delete data when requested ... • ... permanently/securely • Provide data for users when they request to see it • Notify individuals of data breaches • Must use data lawfully/fairly • Staff need to be trained in principles	4	If no legislation, wrong legislation, unclear legislation still award up to max 3 marks for description of DPA. Accept answers listing what needs to be done e.g. data must be up-to-date (without the specific step that will be followed to do this)? MP2 is stopping unauthorised access. MP4 is the company actively giving the data willingly to someone else.

Question			Answer	Mark	Guidance															
5	(a)		1 mark for 2000000MB (last one)	1																
5	(b)		1 mark for each completed box <table><tr><th>Denary</th><th>8-bit Binary</th><th>2-digit Hexadecimal</th></tr><tr><td>38</td><td>00100110</td><td>26</td></tr><tr><td>78</td><td>01001110</td><td>4E</td></tr><tr><td>156</td><td>10011100</td><td>9C</td></tr><tr><td>215</td><td>11010111</td><td>D7</td></tr></table>	Denary	8-bit Binary	2-digit Hexadecimal	38	00100110	26	78	01001110	4E	156	10011100	9C	215	11010111	D7	4	Correct answers only – binary must be 8 bits.
Denary	8-bit Binary	2-digit Hexadecimal																		
38	00100110	26																		
78	01001110	4E																		
156	10011100	9C																		
215	11010111	D7																		
5	(c)		1 mark for working all 3 carries . 1 mark for binary answer e.g. 0 1 1 1 0 0 1 1 + 0 0 1 1 0 1 0 0 1 0 1 0 0 1 1 1 1 1 1	2	Do not award conversion to denary as the only working.															
5	(d)		1 mark for 00011101 (first one)	1																
5	(e)		1 mark each - Left shift 3 places	2	No marks for contradictions e.g. “shifting to left or right”															

Question			Answer	Mark	Guidance
6	(a)		1 mark for any 1 correct binary code 2 marks for all 3 correct binary codes in the correct order with no additional bits / addition 01010000 01001111 01010000	2	BOD 7-bit ASCII codes if correct Accept answer vertically and horizontally
6	(b)		1 mark for benefit - Can represent more/a wider range of characters - Can represent characters from all/many/different languages // by example - Can store emojis 1 mark for drawback - Larger file size // double the file size of ASCII // more data/binary per character // more storage/bits used // requires more/additional processing - Additional characters are not backward compatible to ASCII // some characters will not be recognised when documents are read/opened in computers that only have ASCII	2	Award any correct point in benefit/drawback
6	(c)		1 mark for register with purpose - Program counter // PC Stores the address of the current/next instruction to be fetched // stores the address of the instruction for the current/next FE cycle - Memory address register // MAR Stores the address of the current/next/required instruction/data // stores the address of data/instruction about to be fetched/executed // stores the address where data/instruction (in MAR) is going to be stored // stores the address of instruction/data being decoded/executed - Memory data register // MDR Stores the data/instruction fetched from memory // stores data/instruction to be stored in memory // stores the data/instruction located in the memory location in the MAR - Accumulator // ACC Stores the result of calculations // stores data currently being processed / by example // stores the result from the ALU	2	Careful that the purpose is not an action such as fetches, takes, retrieves. Accept “points” to/at in place of stores Accept Current instruction register//CIR//Instruction register//IR Stores the instruction currently being executed BOD memory buffer register for MDR. Accept memory address, memory data without ‘register’.

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