

Markscheme

May 2018

**Information technology
in a global society**

Higher level

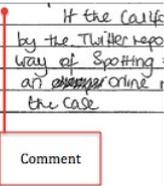
Paper 3

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The following are the annotations available to use when marking responses.

Annotation	Explanation	Comment	Short cut
	Correct point	Use for identify, state, outline, describe	
	Incorrect point	Use for identify, state, outline, describe	
BOD	Benefit of the doubt	Answer is close enough to give some credit, indicates that you see some merit in it.	
NBOD	No benefit of doubt	Not quite enough to earn any credit.	
SEEN	Seen	Indicates that the text has been noted, but no credit has been given, or used on a blank page to ensure that RM Assessor and/or staff in Cardiff know that you have seen the page	
OC	Off course		
TV	Too vague	Point is unclear, or not specific enough to answer the question.	
REP	Repetition	Repeats a point previously made, not necessarily worded in the same way.	
REF	Reference	This is used to indicate a reference to the stimulus material, article or the Case Study (Paper 2 or Paper 3)	
D	Description	Candidate has added descriptive information to an initial idea that has been named or identified.	
A+	Analysis / Explanation	Candidate has explained why something occurs, or why it is important to the point s/he is making, or described the consequences of a policy/action/use of IT.	
B+	Balanced argument involving detailed analysis	Use in the examiner’s comments at the end of extended response questions. Balanced arguments involving detailed analysis can occur within paragraphs as well as at the end of the response. Often, a transition word to link/compare ideas, such as “however” or “on the other hand” is used. Can also be structured analysis of ideas, <i>eg</i> good vs bad, for X and against X.	
EVAL	Evaluation – beyond the ideas presented to reach a conclusion or overall comment.	Use only if evaluation is supported , not just stated. Note that evaluation can occur in the body of an extended response as an evaluative comment about an idea as well as at the end in the conclusion. Fully evaluated requires a well-supported conclusion. Evaluation and detailed analysis can overlap when evaluation is within a paragraph.	
O	Opinion	Use only if opinion is supported, not just stated. Note that opinion can occur in the body of an extended response as well as at the end.	

	Dynamic, Horizontal	Indicates a valid point that the student will need to support in an extended response.	
	Dynamic, Horizontal Wavy	Used for incorrect statements/phrase	
	Dynamic, Vertical Wavy	Indicates that the candidate has veered off course, ie either by not answering the question that is asked or has moved in a direction unrelated to the question. Can also use OC annotation	
	Text box with extended vertical line.	Used to mark and comment on a block of writing that makes a valid point. Note that the text box and the vertical line are connected.	
Text box	Insert comments	Used for comments at the end of questions where the mark needs to be JUSTIFIED. Often with AO2 command terms – EXPLAIN. ALWAYS with AO3 command terms – EVALUATE, JUSTIFY, TO WHAT EXTENT, and DISCUSS.	

You **must** make sure you have looked at all pages. Please put the **SEEN** annotation on any blank page, to indicate that you have seen it.

Critical Thinking – explanation, analysis and evaluation

These trigger words often signal critical thinking. The bold words are the key terms in the various criteria.

Explanation – *Because, as a result of, due to, therefore, consequently, for example*

Analysis – *Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas*

Evaluation – *My opinion, overall, although, despite, on balance, weighing up*

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt, check with your Team Leader.

If candidates answer more than the prescribed number of questions:

- In the case of an “identify” question read all answers and mark positively up to the maximum marks. Disregard incorrect answers.
- In the case of a “describe” question, which asks for a certain number of facts *eg* “describe two kinds”, mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.
- In the case of an “explain” question, which asks for a specified number of explanations *eg* “explain two reasons”, mark the **first two** correct answers. This could include two full explanations, one explanation, one partial explanation *etc.*

1. (a) Alicia will have sensors that use voice recognition.

Identify **two** additional sensors that may be added to provide for a more sophisticated product.

[2]

Answers may include a range of internal and external sensors that could be incorporated into the doll, such as:

- pressure sensors to respond to touch from the child
- proximity sensors to detect child coming into room
- nearness sensors to respond to approach of a child
- heat sensors to detect heat of touch or body
- orientation sensor / gyroscope to detect position of doll in space
- speed detectors to detect movement of the doll
- light sensor - in conjunction with other sensors to power off the doll
- biometric sensor - to determine the identify of who is holding her.

Note to examiners: *When a student provides two similar sensors eg Motion or movement - only accept as one.*

Award [1] mark for identifying each additional sensor that may be added to provide for a more sophisticated product up to a maximum of [2] marks.

- (b) When Alicia is initially activated after purchase, it will ask a number of questions to configure the most appropriate profile for the child.

Identify **two** questions that could be asked.

[2]

Answers may include questions about:

- personal items (gender, age, skin colour, nationality, school grade, language, name, etc)
- family relationships (mother, father, how many brothers, sisters, pets etc)
- surroundings (home environment, address etc)
- likes and hobbies (swimming, walking, games, TV shows, films, books, etc)
- dislikes (behaviors, opposite to likes).

Award [1] mark for identifying each question that could be used to configure the most appropriate profile for that child up to a maximum of [2] marks.

2. (a) Alicia records data about the child's behaviour.

Explain **one** way that this data could be made compatible for use with other systems.

[2]

Answers may include:

[1 mark] A standard data storage format is required. The student may give an example eg xml, csv, some sort of fixed data field, or any other suitable format

- **[1 mark] Any form of data storage format.** An explanation of how the data storage format of the behaviour and interactions will be compatible or can be used between Alicia and the other system. Eg researching industry standard or exporting into another system.

The explanation should be generic as the details of the IT behind the file formats is beyond the current course.

- (b) Explain the sequence of steps that take place when Alicia responds to what the child is saying.

[4]

Input:

Answers will need to include a set of steps from data entry, to processing, to output/feedback:

- the child's voice is recorded by Alicia
- analogue sound waves are converted to digital and sent to be processed by Alicia
- the recording is sent to a natural language processing unit in the doll or in the cloud.

Processing:

- voice recognition software converts the digital sound by dividing it into segments which is then matched to a particular language
- the meaning of the words in the deep learning based AI in the doll is used to determine a response after being combined with other data about the child's behavior
- the doll is trained to understand the words spoken by the child
- tone of speech is analysed and compared to the database to identify the emotional behaviour of the child
- the doll is trained to recognise who is speaking
- the response is determined by consulting the most recent profile stored on the doll.

Output

- an appropriate response to the child may be with supporting example (verbal reply, physical action)
- if the AI software within Alicia cannot determine an appropriate response the doll will send the data for processing to the AI software in the cloud.

Accept appropriate and valid steps that are in sequence but not in the markscheme. If in doubt consult your team leader.

Level		Marks
0	No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.	0
1	Response with some steps and maybe out of sequence.	1–2
2	Clear and correct sequence, covering input, processing, output/feedback and ITGS terminology.	3–4

3. A number of organizations are interested in obtaining the data that is collected and stored by *MAGS* from the interactions between Alicia and each child. *MAGS* is responsible for this data, and the problems that could arise if this data was sold to third parties (lines 153–166).

To what extent could data privacy and protection principles be applied to how this data is stored, accessed and used?

[8]

Answers may include:

- candidates would need to justify how the various data privacy and protection principles can be applied with reference to the case study
- a balanced application would include a discussion of how the principles can and cannot be applied, and the reasons why. A judgment would need to be made where not all three areas in the question are addressed in a balanced way
- only one principle needs to be used for each of the three areas (store, access and use). A balance would be easier if more than one was used
- no overall conclusion is needed but candidates would be expected to justify the application to each of the three areas (store, access and use) in the question in the context of the case study
- a generic set of principles can be found at this link, but most countries have legislated a set of laws that could also be used by the candidate <http://www.unglobalpulse.org/privacy-and-data-protection-principles> but most countries have legislated a set of laws that could also be used by the candidate e.g. UK Data Protection Act, Europe's new GDPR etc http://www.teach-ict.com/gcse_new/legal/dpa/miniweb/pg3.htm UK Data Protection Principles
- students may approach this question by responding on the steps to protect the privacy of data *eg*:
- storage - security methods e.g. encryption, access control, no excessive data stored, length of time stored
- sharing - gaining permission, policies on how the data is reshared
- use - data used for its original purpose, no illegal use of data.

SL and HL paper 1 part (c) and HL paper 3 question 3 markband

Marks	Level descriptor
No marks	<ul style="list-style-type: none"> • <i>No knowledge or understanding of the relevant ITGS issues and concepts.</i> • <i>No ITGS terminology.</i>
Basic 1–2 marks	<ul style="list-style-type: none"> • <i>Shows only a little ITGS knowledge.</i> • <i>Makes at least one argument.</i> • <i>May not have any comparison/conclusion.</i>
Adequate 3–4 marks	<ul style="list-style-type: none"> • <i>Shows a little more ITGS knowledge but still weak.</i> • <i>Has more arguments, (at least two) and possibly from different stakeholders.</i> • <i>Has a conclusion or judgments which are probably not backed by much reasoning.</i>
Competent 5–6 marks	<ul style="list-style-type: none"> • <i>Shows good ITGS knowledge and detail.</i> • <i>Has more arguments and they are balanced (+ and –) and for different stakeholders.</i> • <i>Conclusion/judgments are supported by the arguments and is well thought out.</i>
Proficient 7–8 marks	<ul style="list-style-type: none"> • <i>Shows very good ITGS knowledge.</i> • <i>Arguments are very balanced and detailed.</i> • <i>Conclusion is based completely on the arguments.</i>

4. There have already been concerns raised by parents about the deep-learning AI version of the doll. As a result Margaret is considering whether to develop a version of Alicia that is based on the original generic profile and does not share any data with the cloud-based services.

Discuss whether *MAGS* should continue to develop the cloud-based deep learning AI version of Alicia or introduce a simpler version that only uses the original generic profile.

[12]

For a balanced response, the student needs to address both advantages and disadvantages for the main stakeholders – *MAGS*, the child and the parent.

The reasons for/against the child and the parents overlap and can be addressed from either perspective, *eg* the lower cost of the simpler doll could be an advantage from the child's view as the parents could be convinced to buy it; and from the parent's perspective they would be more willing to purchase the doll as a present. Similarly, for *MAGS* and the other stakeholders. Students do not have to discuss the reasons for/against for both options in order to gain access to the higher mark bands.

A balanced analysis should include connections between the various stakeholders and between the advantages and disadvantages. Basic analysis could be displayed through the structure of the response: sections for the various stakeholders and the positive and negative reasons.

Reasons for/against simple toy:

Child/parent

- privacy of the child's interactions is kept
- functionality of the toy would be diminished if it could not learn properly
- the cost of the simpler toy would be less
- parents will know the full capabilities of the doll and not need to worry about any inappropriate behaviour developing.

MAGS

- the popularity of the doll could be lessened if functionality is reduced
- *MAGS* would lose the opportunity to develop AI software that could be used in other products of their own and other companies
- toy would be cheaper to produce
- toy could have enhanced functionality included later increasing sales
- simple toy introduced so that later on there is scope for product extension or product development (existing market will go and buy next version / brand loyalty)
- *MAGS* may not stay competitive if other toy companies develop more AI enhanced toys
- the child may soon get bored of the doll and not play with it anymore.

Reasons to continue to develop the cloud-based deep learning AI version of Alicia:

Child/parent

- the toy would have increased functionality so the child would enjoy the toy more
- parents would be worried about privacy issues and the issue of dependency on the doll impacting the child's life
- It is possible that the doll can be hacked and programmed to develop undesirable behaviour
- child may learn undesirable behaviour or pick up bad habits
- parents may rely on this developed doll which will replace some of the interactions with their child e.g. reading a story at bed time.

MAGS

- MAGS would be able to develop much better AI software
- MAGS could enter the market with a "successful" product to see if it would be worth the money and effort to develop and sell a fully functional doll
- MAGS would need to be prepared for dealing with the privacy and other issues associated with the collection and use of children's interaction data
- MAGS can use this data to improve on Alicia's performance and send updates to Alicia based on the analysis of the data collected
- MAGS will need to develop ways to maintain limitations of how Alicia behaves.

HL paper 3 question 4 markband

Marks	Level descriptor
No marks	<ul style="list-style-type: none"> • <i>A response with no knowledge or understanding of the relevant ITGS issues and concepts.</i> • <i>A response that includes no appropriate ITGS terminology.</i>
Basic 1–3 marks	<ul style="list-style-type: none"> • <i>A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.</i> • <i>A response that includes minimal use of appropriate ITGS terminology.</i> • <i>A response that has no evidence of judgments, conclusions or future strategies.</i> • <i>No reference is made to the information in the case study or independent research in the response.</i> • <i>The response may be no more than a list.</i>
Adequate 4–6 marks	<ul style="list-style-type: none"> • <i>A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.</i> • <i>A response that includes limited use of appropriate ITGS terminology.</i> • <i>A response that has evidence of conclusions, judgments or future strategies that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.</i> • <i>Implicit references are made to the information in the case study or independent research in the response.</i>
Competent 7–9 marks	<ul style="list-style-type: none"> • <i>A response with knowledge and understanding of the relevant ITGS issues and/or concepts.</i> • <i>A response that uses ITGS terminology appropriately in places.</i> • <i>A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.</i> • <i>Explicit references to the information in the case study or independent research are made at places in the response.</i>
Proficient 10–12 marks	<ul style="list-style-type: none"> • <i>A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.</i> • <i>A response that uses ITGS terminology appropriately throughout.</i> • <i>A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis.</i> • <i>Explicit references are made appropriately to the information in the case study and independent research throughout the response.</i>