

Markscheme

May 2021

**Information technology
in a global society**

Higher level

Paper 1

22 pages

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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.

In the case of an “identify” question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In all other cases where a question 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.

- It should be recognized that, given time constraints, answers for part (c) questions are likely to include a much narrower range of issues and concepts than identified in the markband. There is no “correct” answer. Examiners must be prepared to award full marks to answers which synthesize and evaluate even if they do not examine all the stimulus material.

Section A

1. A cashless society

Note to examiners:

- All part (a) questions are marked using ticks and annotations where appropriate.
- Part (b) and part (c) are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. **Do not use ticks.**

(a) When a user wants to make a payment with the *Swish* app, the app will need to collect data about the transaction.

(i) Identify **two** items of data that the app could collect from the user making the payment. [2]

Answers may include:

- the name of the person making the payment / username / ID Number (accept other personal identifiers)
- password
- phone number of the person making the payment
- bank account to be used for the transaction (in the case that there is more than one account linked to the *Swish* app)
- amount of the transaction/cost of the item
- message (to indicate what the transaction was for) / personal greeting card.
- name of person receiving the payment
- *Swish* account details / phone number of the person receiving the payment.

Note: Do not accept data that are system generated, e.g., date/time of transaction, transaction id, etc.

Award [1] for identifying each item of data that the app would collect from the user making the payment up to maximum of [2] marks.

(ii) Identify the steps taken by the app to make the payment into the bank account of the person receiving the money. [4]

Answers may include:

- user is verified
- buyer's / payer's bank account is accessed (by the app)
- authorization from the bank for the amount required – amount of the transaction is compared to the amount of money/credit available in the buyer's bank account
- authorization from the bank for the amount required – amount of the transaction is compared to the limit the bank permits for *Swish* transactions
- determine the seller's / payee's bank in order to initiate a transfer
- if authorized, then transfer of money from buyer's bank to seller's bank
- if not authorized, then error message (to buyer and seller)
- message sent (to buyer and seller) to confirm transaction.

Award [1] for identifying each step taken by the app to complete the transaction up to maximum of [4] marks.

- (b) Explain why it is important that any data sharing agreement between the *Swish* app and the Swedish banks has policies that address both the storing **and** sharing of app users' data.

[6]

Answers may include:

Storing:

- to ensure that data is protected by a strong security network (firewalls, anti-malware protection, encryption etc)
- to provide strong security for any machines that have access to the data
- to ensure that access to data is restricted to people who have a need to know
- to provide protections against loss of data are in place
- to provide protections against any attacks aimed at stealing or changing the data
- to provide a plan for backup and recovery.
- to make sure that only relevant data is stored
- to prevent data being stored after people have left the Swish platform.
- to make sure that data being stored adheres to data protection laws as governed in specific locations, e.g., data stored in Sweden follows GDPR

Sharing:

- to ensure that data is only shared with the consent of the app users
- to ensure that any data shared should be anonymized as far as possible to prevent the identity of the app user being determined
- to ensure that app users should be informed if there are any additional organizations that their data may be shared with and for what purpose
- to ensure that data will be shared using secure means.

Award [1] for a reason why it is important that any data sharing agreement between the Swish app and the Swedish banks has policies that address the processing/sharing of app users' data and [2] for developments of that reason up to maximum of [3] marks.

Mark as [3] + [3]

- (c) Many people in Sweden have seen the advantages of using the *Swish* app. It allows friends to share a restaurant bill, to pay where credit or debit cards are not accepted, to easily pay for babysitting or parking tickets, or make a donation at church. However, some people in Sweden have expressed concerns about not using cash and making the *Swish* app the only means of payment.

To what extent do the advantages of the *Swish* app as the only means of payment outweigh the disadvantages.

[8]

Answers may include:

Advantages of using *Swish*:

- no need to carry cash / credit cards – no risk of being stolen/no risk of not having enough cash
- no risk of credit card being used fraudulently
- transactions are recorded – there is proof of payment
- payments can be done immediately – no need to wait until person has time to go to bank to get cash
- can solve other problems regarding money – bills can be shared, one person pays and money is transferred
- in an emergency money can be transferred to dependents without them being close (eg children at university)
- allows money transactions between individuals
- transfers of money are in real time (instantly) and free of charge
- amount of money to be transferred is limited thus minimising the loss of money.
- many people are already used to the app so it would be a good choice if the country were going cashless.
- easier for users to track budgets / spending as all transactions are on one app.

Disadvantages of using *Swish*:

- Swedish banks will be able to obtain more data on their users' transaction habits (privacy concern)
- is not available to people who do not have a bank account so a potential digital divide concern
- it only works within Sweden, or people who have a Swedish bank account so may be problematic for tourists
- removes the anonymity of the payee in transactions – *Swish* stores a user's transaction history. This would include date, item, recipient of the money and cost of the item
- the bank controls the maximum amount of money that can be transferred – this may limit a person's spending
- the transition from a society that uses cash for transactions to one that does not may not be possible and in trying to make this transition it may cause considerable harm to many citizens.
- use of the *Swish* app (specifically) would give the company an unfair monopoly over the technology
- Digital Divide – smartphones ownership and use by mature adults
- if a person loses his/her phone or breaks it or its battery runs out, he/she has no way to pay for anything.
- failure in / lack of phone network coverage could affect when and where people could use the app.
- Failure of the system / technical issues / down time which would prevent people from making transactions.

*Accept implicit and explicit references to the *Swish* app.*

Please see generic markband information sheet on page 22.

2. Automatic crop watering system

- (a) (i) Identify **three** characteristics of proprietary software. **[3]**

Answers may include:

- software is copyrighted
- commercial software
- relicensing, distribution or copying is prohibited
- the user/organization must accept the agreement prior to installing or using the software
- requires a subscription or monthly fee
- has customer support and maintenance of the software provided by its developers as part of the purchase of the software.

Award [1] for identifying each characteristic of proprietary software up to maximum of [3] marks.

- (ii) A computer program uses the data provided by the rain sensor to decide whether to water the trees. Identify the steps in this program. **[3]**

Answers may include:

- the sensor gathers analog data
- the analog data is converted into digital data
- the computer compares the data to a preset level within the program to determine if it is raining.

Either:

- if it is raining the computer program will not start/will stop watering
- if it is not raining the watering continues as programmed.

Or:

- if the ground reaches a certain dampness then the watering is stopped
- if the ground has not reached a certain dampness then the watering continues as programmed.

Award [1] for identifying each step the computer program will use when deciding whether to water the trees up to maximum of [3] marks.

- (b) Water is becoming increasingly scarce in Chacra Province and the provincial government is concerned there will be a point when there is not enough water for all of the farms to water their crops or fruit trees.

To manage water for the watering of crops and fruit trees, the provincial government of Chacra Province intends to create a computer model to calculate how much water each farm in the province will receive.

Explain **three** factors that will contribute to the accuracy of the model.

[6]

Answers may include:

- quality of data input
- high quality data will allow for a more accurate model to be developed as this data will be more reliable / current water levels within each area must be accurate.
- frequency of readings taken
- more frequent readings may be able to pick up more subtle changes in the patterns of rainfall to increase the accuracy of the model / if we take daily readings and use these to create the model, that will be more accurate than monthly readings.
- number of variables taken into account when developing the model
- more variables will enable other, potentially less important, factors to be considered when developing the model / what crops are farmed in different areas in the province / the weather conditions in different areas of the province.
- number of assumptions that have been built into the model
- if any of the assumptions are weak or false the model will be inaccurate.
- quantity of data input
- if the sample of data is larger, then the resulting model would be more accurate / spans several years.

Award [1] for identifying a factor that will contribute to the accuracy of the model and [1] for explanation why that will contribute to the accuracy of the model up to maximum of [2] marks.

OR

Award [1] for each example given and an additional [1] if the explanation contributes to the accuracy of the model up to a maximum of [2] marks.

Mark as [2] + [2] + [2]

Check with your team leader before accepting additional answers.

- (c) The farmers of Chacra Province are concerned about the provincial government using a computer model to determine the amount of water they will be allowed to use to water their fruit trees.

To what extent should the farmers of Chacra Province rely on their knowledge and experience, rather than the computer-based solution provided by the provincial government, to manage the watering of the fruit trees?

[8]

Answers may include:

Knowledge and experience will:

- allow the farmers to see more than water needs for a plant (sick leaves, buds falling, etc) without needing to develop a model
- be able to include other factors that may arise from time to time such as quality of the water (eg coming with mud) and adjust their watering accordingly
- be able to resolve potential issues that cannot be programmed into the computer, or would be outside of the scope of a computational solution
- provide expertise that cannot be quantified/ensure that in a worst-case scenario some of the farmers will be able to grow crops/trees.

Use of the provincial model will:

- allow water to be distributed evenly between the farmers on a “needs” basis rather than based on the opinions of one or two stronger characters
- a scientific approach has limits (e.g. there may be variables which the model does not take into account), the decisions around the water requirements of the trees may be based as much on intuition as algorithms and models.
- model may be biased or influenced by politics e.g. farmers may not have fully disclosed their data / government may favour certain groups or industries.

Use of the proprietary computer system will:

- reduce the amount of time farmers need to spend visibly checking their fields
- allow exact water usage to be measured and lead to potential efficiencies in its usage
- will provide quantitative data that could be used as a model for other farmers growing the same trees in similar locations.

Please see generic markband information sheet on page 22.

3. Technology disruption in Orams Academy

- (a) (i) Identify **two** characteristics of cloud-based storage. [2]

Answers may include:

- data is stored on remote servers accessed from the internet, or "cloud"
- data can be accessed from anywhere as long as the person has an Internet connection
- online space allows users to store data, photos, music, and videos
- documents stored in the cloud can be shared with others (most of the time) instead of sending them via emails
- cloud storage providers may provide other services like backups
- requires a username and password for access.

Award [1] for each characteristic of cloud-based storage identified up to [2] marks.

- (ii) Identify **two** reasons why there might be a lack of bandwidth at times on the school's network. [2]

Answers may include:

- many students are using the internet (e.g. for social media) at certain times of the day (e.g. lunchtimes)
- a large number of classes are working simultaneously on collaborative projects (ie Google docs)
- due to geographic location, local ISPs may not be able to offer enough bandwidth so that at certain times there isn't enough for all the users / shared bandwidth causes internet speeds to fluctuate
- technical issues at the ISP's end may cause slow internet bandwidth supply to its clients for periods of time
- large videos are being streamed or downloaded to show in classrooms
- network design or infrastructure is not optimal / outdated equipment causes frequent outages.

Award [1] for each reason identified up to [2] marks.

- (iii) Identify **two** potential disadvantages of using online collaborative tools. [2]

Answers may include:

- information in the file could be modified and/or deleted by some of the collaborators by mistake
- internet is needed to view the most updated version of the documents and work / to share and collaborate
- different bandwidths/internet connection of the different users may make collaboration inefficient. / More difficult to communicate if a user has poor internet connection, decreasing productivity
- collaborative tools may not work optimally if the number of users gets too big.

Award [1] for identifying each disadvantage of using online collaborative tools up to [2] marks.

- (b) An acceptable-use policy will be required for the appropriate use of virtual learning environments and collaborative online tools in Orams Academy.

Explain **three** elements that would be included in an acceptable-use policy for Orams Academy.

[6]

Answers may include:

- a philosophy of Orams Academy relating to the use of online environments
- which acts as a guiding statement and provides the overarching principles for online behavior.

- a code of conduct
- that provides clear and unambiguous directions about how staff and students should act while online / using appropriate language in text chats / avoiding bullying behaviour / avoiding copying or plagiarism.

please check with team leader for other answers

- an outline of the sanctions
- that would be imposed if staff or students did not adhere to the code of conduct.

- a disclaimer
- so that Orams Academy is not responsible for the actions of the staff or students if an illegal activity is carried out / managers at Orams Academy are able to supervise everything that is posted onto the VLE / managers at Orams Academy would be able to read students' messages.

please check with team leader for other answers

- data privacy and protection
- so it will be transparent who owns the data created in VLE, for how long and what type of data is collected by the VLE servers.

Award [1] for an element that would be included in an acceptable-use policy for Orams Academy and [1] for a development of that reason up to maximum of [2] marks.

OR

Award [1] for each example given and an additional [1] for a development of this example up to a maximum of [2] marks.

Mark as [2] + [2] + [2].

Check with your team leader before accepting additional examples.

- (c) Discuss whether Daniela should make every teacher at Orams Academy use the same learning platform **or** she should allow each teacher to choose their own preferred learning management approach.

[8]

Answers may include:

A single learning platform:

- means that all of the information is centralized and can be easily accessed by staff, students and parents
- the training requirements for staff are reduced as they only have to use one system
- prevents the use of a range of formats that may be incompatible meaning that resources cannot be shared, or may need adapting to work on a different platform
- having a common learning platform would make it convenient for the IT dept. to take backup/restore and roll-over data to new academic year.
- makes it easier for senior managers to monitor the actions of staff, to view lessons etc for consistency
- can be integrated into any acceptable-user policy or training requirements
- may be costly and based on proprietary software meaning that fixes could be expensive and take a long time to happen
- if the single platform is inaccessible for any reason, then all learning content would be inaccessible.

Teachers choosing their own preferred learning management approach:

- allows teachers to use their expertise of particular tools
- allows teachers to feel they are being allowed to use their creativity and innovative approach to the teaching and learning
- may integrate with social media tools that may be blocked by the school and provide a better user experience
- may provide better functionality than a “one size fits all” approach
- may lead to staff or students working outside of an acceptable-user policy/using the sites inappropriately
- the training requirements for staff will be increased if the staff are unfamiliar with the platforms / training will only occur on an ad hoc basis / training might be decreased since staff are already familiar with the tools they choose to use
- expertise of a platform may depend on particular teachers – if they leave then no one may be able to support students with this tool.

Please see generic markband information sheet on page 22.

Section B

4. Fake news

- (a) (i) Identify **three** characteristics of a neural network. **[3]**

Answers may include:

- mimics the way the brain works
- gives weight to each input
- the weights shift with each iteration
- uses an iterative process
- consists of interconnected nodes
- built on examination of large amounts of data
- uses significant computer power
- has the ability to learn, recall and generalize from given data.

Award [1] for identifying each characteristics of a neural network up to maximum of [3] marks.

- (ii) Alpha testing will be used in the development of the voice synthesis software.

Identify **three** characteristics of alpha testing. **[3]**

Answers may include:

- first test of new hardware or software
- main goal is to refine the product by fixing bugs before releasing to the public
- generally done “in house” ie, not by users outside the company
- could be done by the developers themselves.

Award [1] for identifying each characteristics of alpha testing up to maximum of [3] marks.

- (b) *DidYouSayThat* has created a number of prototypes of their voice synthesis software.

Explain **three** reasons why *DidYouSayThat* would have used prototypes during the development of their voice synthesis software.

[6]

Answers may include:

- allows failure to take place early in the process *ie*, identify problems that might have been missed
- so significant costs are not incurred in the creation of a product that is flawed.

- resolve conflicts between different development teams
- the teams may be forced to appreciate that compromises are required, or see the impact of one aspect of the design on the other therefore moving the development forward.

- allows the possibility of estimating production costs, time to create, necessary skills and resources.
- makes the process more efficient and more likely to succeed.

- allows for early feedback from users
- reveals how usable and valuable the product will be to the user.

- reduces the redoing of the work
- saves time and money.

- potential investors/customers can see the end product
- they may be more likely to invest in it.

- patents can be discussed early
- this can take place before other companies begin using the ideas for competitive products.

Award [1] for a reason why DidYouSayThat would have used prototypes in the development of their voice synthesis software and [1] for a development of that reason up to maximum of [2] marks.

Mark as [2] + [2] + [2]

- (c) Law professor John Silverman commented, as humans we tend to believe what we see and the increased number of tools to make fake media that is unrecognizable from real media is going to prove a challenge in the future.

DidYouSayThat is aware of the ethical implications of this voice synthesis technology. Their ethics policy states that with great innovation comes great responsibility.

To what extent should *DidYouSayThat* be accountable for the fake videos posted by users of their software on social media platforms?

[8]

Answers may include:

- *DidYouSayThat* has positioned itself as a responsible developer, therefore they should be “practicing what they preach” and act responsibly by being accountable for the content that is posted using their software
- it is unrealistic, however well intentioned, for *DidYouSayThat* to be accountable for the content of the videos
- if the end-user agreement stated explicitly that the user would be accountable, would that clause be enforceable by *DidYouSayThat*?
- it is hard to determine at what point that *DidYouSayThat* would be accountable, because the software itself does not have the capability to cause harm, it is the user
- at what point is a video considered fake, is a spoof video a fake video?
- although there may be no legal requirement for *DidYouSayThat* to monitor the videos of users of their software, there may be ethical reasons why they should.

Please see generic markband on page 22.

5. Mearlet Finances

- (a) (i) Identify **two** features of an expert system. **[2]**

Answers may include:

- inference engine
- knowledge base
- user interface
- backward / forward chaining.

Award [1] for identifying each feature of an expert system up to [2].

- (ii) Identify **two** responsibilities of a project manager in the development of an expert system such as MF v1.0. **[2]**

Answers may include:

- communicates with stakeholders in order to gather requirements/check on progress
- manages the teams working on the project and analyses, reviews and documents the requirements of a project throughout its lifecycle
- creates, manages and disburses reports related to the project
- maintains project assets, communications and related database(s)
- reviews and reports the project's budget and finances
- notifies the project team about abnormalities in the results
- evaluates and monitors the overall project
- provides recommendations to ensure that the end products will solve the problems at hand/solutions
- enables the organization to meet its goals.

Award [1] for identifying each responsibility of the project manager up to [2].

- (iii) Expert systems use inference rules.

Identify **two** characteristics of inference rules. **[2]**

Answers may include:

- inference rules are based on two possible outcomes
- it uses chaining to develop an understanding of complex behaviour or information requests from simple requests such as "does A apply?" with possible answers being "Yes" or "No"
- inference rules are based on exact matches rather than a range of possible responses
- logical form of statements that draw a conclusion.

Award [1] for each characteristic of inference rules up to [2].

- (b) (i) Explain how the quality of the data collected can affect the effectiveness of a knowledge base. [3]

Answers may include:

- data needs to be collected from a number of reliable sources
- the data must be able to reflect the most likely scenarios that would be found when assessing the financial products of Mearlet Finances
- if this does not occur, the expert system will not function as intended
- however, if Mearlet Finances does not fit the “standard” model used by finance companies the expert system will be less effective.

Award [1] for identifying one reason how the quality of the data collected can affect the effectiveness of a knowledge base and [1] for each subsequent development of that reason up to [3].

- (ii) Explain why the failure to update data within its knowledge base may cause problems for *Mearlet Finances*. [3]

Answers may include:

- if new financial policies are introduced this will mean that the expert system will become increasingly less expert
- it may have knock-on effects to other areas of the business as more customers will find that the information they have been given is imperfect
- this will have negative effects on the customer satisfaction of Mearlet Finances which could have significantly negative effects in the business
- applies logical rules to a knowledge base to derive new information.

Award [1] for each statement that explains why the failure to update the data within the knowledge base may cause problems at Mearlet Finances up to [3].

- (c) Since the introduction of the expert system, *Mearlet Finances* has been able to offer a wider range of financial plans. This has attracted more customers. However, Alia believes that the current expert system may not be able to cope with the increased size and complexity of the business.

Alia is considering two options:

- **Option 1:** Purchase a new version of the MF expert system, MF v2.0.
- **Option 2:** Purchase a new artificial intelligence (AI) system that uses machine learning.

Evaluate these two options.

[8]

Answers may include:

Advantages of Option 1:

- an upgraded expert system is less risky than an AI system
- an upgrade will not require as extensive staff training
- an upgrade should be able to be integrated seamlessly with existing IT systems
- an upgrade can be implemented more quickly
- since the system is being applied to a specific domain, it could be the cheapest alternative.

Disadvantages of Option 1:

- expert systems are inherently rigid so this one may well be outdated quickly
- the system will require continual upgrades
- a chain of if/then rules is too limited and does not allow for complexity.

Advantages of Option 2:

- the AI system may be more futureproof than the upgraded expert system
- machine learning can adapt to new situations
- AI learns by trial and error rather than applying inference rules, so it is more flexible.

Disadvantages of Option 2:

- may be much costlier than an expert system
- often even the experts do not fully understand the decision that the software makes
- training an AI system requires significant amounts of data.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband on page 22.

6. Pepper

- (a) (i) Outline **one** reason why Pepper could not answer a customer’s question in a supermarket. **[2]**

Answers may include:

- the developers of pepper did not train Pepper beyond the most commonly used dialects/accents
- therefore, there may be groups of people whose accent is outside of Peppers range of words *etc.*

- Pepper was not programmed with basic information at the store
- such as the location of various items.

- Pepper was not tested with stakeholders *ie*, customers in the store
- so designers were unable to ensure that Pepper could answer the customer’s questions.

Award [1] for a reason why Pepper could not answer a customer’s question in a supermarket and [1] for a development of that reason up to maximum of [2] marks.

- (ii) Pepper was developed using an agile development methodology.

Outline **two** reasons why an agile development methodology would have been used for the development of Pepper. **[4]**

Answers may include:

- problems are caught early and taken care of before beta testing
- clients can provide feedback throughout the process
- allows for changes to be made after the initial planning
- easier to add a feature that will keep the project up to date with the later developments in the area
- faster implementation and delivery time.

Award [1] for a reason why an agile project management methodology would have been used for the development of Pepper and [1] for a development of that reason up to maximum of [2] marks.

Mark as [2] + [2]

- (b) Pepper could use either machine learning or rule-based learning for its natural language processing.

Analyse these **two** options.

[6]

Answers may include:

- rule based learning has a finite set of words, phrases *etc*
- rule based learning is dependent on the initial dataset created in Pepper and cannot be extended to address differences in accent/dialect, changes to the nature of language
- rule-based learning is a “safe” option and may be appropriate in certain circumstances
- rule based learning systems are not scalable
- can operate with basic information and data.

- machine learning is able to adapt to different situations , constantly evolves
- machine learning can be customized for different groups in different locations so Pepper can be optimized for use
- machine learning can add new terms to Pepper's lexicon
- machine learning may be unsupervised - Pepper may be usable by only a small number of people who share linguistic similarities.
- machine learning systems are scalable
- requires more data than rule-based learning.

Marks	Level descriptor
0	No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.
1–2	A limited response that identifies whether machine learning or rule-based learning would be used for its natural language processing. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material. The response is theoretical and descriptive.
3–4	A description of whether machine learning or rule-based learning would be used for its natural language processing. There is some use of appropriate ITGS terminology in the response.
5–6	A balanced analysis of whether machine learning or rule-based learning would be used for its natural language processing. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.

- (c) *King Robotics* is planning to use robots in schools. The robots will use a unique approach called “care-receiving”. In this approach to teaching the robot does not directly instruct the student, instead the robot makes mistakes and asks the student for help to correct them. Early studies have found that children respond very positively to this approach. The robots will also be able to carry out direct teaching activities.

Evaluate the advantages and disadvantages of using robots such as Pepper to support the care-receiving teaching approach as well as carrying out direct teaching activities.

[8]

Answers may include:

Advantages:

- students often respond better to robots as they are very motivating. For example, students who are very shy often respond to robots
- robots that make mistakes may help with special needs children such as those with autism
- by teaching a robot that is less intelligent, children can reinforce their own learning. We learn by teaching others
- the robot’s need will inspire care-taking behavior in the children
- student’s will want to play with the robot and will feel less pressured to perform correctly
- robots can provide individual attention, so students can learn at their own pace
- robots can coexist with teachers in the classroom serving as assistants
- if there is a shortage of teachers, then robots can fill in the gap especially for teaching repetitive material
- robots do not have emotions, so they are not affected by health or emotional issues.

Disadvantages:

- robots can’t inspire students the way human teachers can. They can’t teach with passion and emotion
- robots can’t respond to children being nervous, upset, excited or loud
- robots can’t create opportunities for students to collaborate and work together in the classroom
- robots can have privacy concerns as they can record the student’s actions and voice
- teachers have responsibilities and a duty of care which robots cannot take over
- teachers may not trust the robots and therefore won’t allow them in the classroom.
- students may not trust the robot and therefore will not participate
- cost - robots are likely to have a high cost to buyout and also to maintain the robot.
- cost - a team will be needed to control the robot if it stops working and fixing certain parts will also be costly to the school.
- robots could lead to the reduction in staffing.
- robots may not understand what a student is saying (accents, volume level, etc) and students may become frustrated.
- robots may malfunction, run out of power, etc.

Please see generic markband on page 22.

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"> • A response with no knowledge or understanding of the relevant ITGS issues and concepts. • A response that includes no appropriate ITGS terminology.
Basic 1–2 marks	<ul style="list-style-type: none"> • A response with minimal knowledge and understanding of the relevant ITGS issues and concepts. • A response that includes minimal use of appropriate ITGS terminology. • A response that has no evidence of judgments, conclusions or future strategies. • The response may be no more than a list.
Adequate 3–4 marks	<ul style="list-style-type: none"> • A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts. • A response that includes limited use of appropriate ITGS terminology. • 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.
Competent 5–6 marks	<ul style="list-style-type: none"> • A response with knowledge and understanding of the relevant ITGS issues and/or concepts. • A response that uses ITGS terminology appropriately in places. • A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.
Proficient 7–8 marks	<ul style="list-style-type: none"> • A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts. • A response that uses ITGS terminology appropriately throughout. • A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis.