

Markscheme

May 2015

**Information technology
in a global society**

Higher level

Paper 1

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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. BodyGuardian

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) (i) Identify **two** health indicators that could be measured by the BodyGuardian device. [2]

Answers may include:

- body temperature
- respiratory rate
- blood pressure
- sugar levels (blood glucose)
- heart rate/pulse rate
- electrocardiogram (ECG).

Award [1] for each of the above up to a maximum of [2].

- (ii) Identify **four** steps taken by the software to decide if a health indicator measurement needs to be sent to a doctor for a decision. [4]

Answers may include:

- device takes the measurement
- measurement converted to digital data/ analogue to digital conversion (ADC)
- data sent from BodyGuardian device to smartphone
- patient data is uploaded to mHealth system for analysis
- value is compared with the “normal” value stored in device for patient
- if value is outside accepted range, then signal is sent to doctor for action to be taken
- if value is inside accepted range, then no signal is sent
- device waits for next time interval to take new measurement.

Consider any four steps in the response.

Award [1] for each step up to a maximum of [4].

- (b) The managers of mHealth are investigating the nature of passwords used by doctors to access patient information. The two options being investigated are:
- the doctor creates a password that does not need to be changed
 - the mHealth system requires doctors to create a strong password that must be changed every 40 days.

Analyse these **two** options.

[6]

Answers may include:

- Option: password created by doctor that does not need to be changed
 - familiar for doctor and probably easy for him to remember
 - no need to write it down therefore it will not be found by others
 - others with access to the computer may “guess” it if they know the doctor well
 - if the password is discovered/cracked it can be used for an indefinite time period. the doctor may not be aware that the password has been compromised
 - may allow doctor to access account faster as no need to look-up the password
 - a password that is never changed creates a security problem as people close to doctor may find out the password (ie see it, guess it)
 - may not be a strong password
- Option: strong password created by doctors that must be changed every 40 days
 - secure as it may not be related to the doctor – therefore difficult to guess
 - the need of constantly updating the password in mHealth will improve the security as it may be harder to guess
 - may be difficult for doctors to remember which variant of the password they have used
 - doctor may need to keep it written down – therefore it has the risk of being found by others
 - may have difficult characters that may not be in a keyboard of mobile devices.

[1–2]: *A limited response that demonstrates minimal knowledge and understanding of the topic and uses little or no appropriate ITGS terminology. Only one of the options is addressed in the response.*

[3–4]: *A partial analysis, either lacking detail or balance, that demonstrates some knowledge and understanding of the topic. Some relevant examples from the scenario are used within the response. There is some use of appropriate ITGS terminology in the response. Both options are either explicitly or implicitly implied in the response.*

[5–6]: *A balanced and detailed analysis of the issue which demonstrates thorough knowledge and understanding of the topic. Relevant examples from the scenario are used throughout the response. There is appropriate ITGS terminology throughout the response. Both options are explicitly addressed in the response.*

- (c) As part of the development of the BodyGuardian device, it is being tested in clinical trials by doctors and patients.

Discuss the implications for doctors and patients of trialling the BodyGuardian device before it is sold publicly.

[8]

Answers may include:

- may have to do double checks: with and without the device – this will take more time and put the patient under unnecessary stress / may take time from busy doctors
- if doctors/patients discover that incorrect information is being sent from the device they may not trust it / feel uncomfortable about having to use it
- if device works well doctors/patients may advertise it positively, making others more willing to use it
- doctors/patients may need training to use the device
- patients in the trial may feel their health is being more effectively monitored
- patients and/or doctors may provide feedback to improve final device
- patients may need to be assured that security measures have been taken to protect the privacy of their data
- doctors may have an opportunity to learn how to use the device before it is sold publicly.

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 information sheet on page 25.

2. 3D printing

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) (i) Identify **two** ways that a 2D image file can be input into the 3D printer software.

[2]

Answers may include:

- 2D images *imported* imported into the 3D printer software
- 2D images are *opened* by the 3D printer software
- 2D file is converted into a format required by the 3D printer software by another file conversion program.

Award [1] for each way up to a maximum of [2].

- (ii) Identify **four** of the steps required to produce Charlie's replacement foot.

[4]

Answers may include:

- images of the other duck's foot are imported into the 3D printer/modelling software
- the software creates a 3D image/model of the foot from the images
- the 3D image/model is edited to make it the same size as Charlie's foot
- printer is loaded with the type of raw material needed for creating the foot
- the 3D image/model of the foot is sent to the 3D printer
- the 3D printer creates the replacement foot

Award [1] for each step up to a maximum of [4].

- (b) Analyse Alejandro Toys’s decision to either use open source software or to purchase proprietary software to produce the company’s 3D toys.

[6]

Answers may include:

- open-source software is often free or low-cost, allowing the company to acquire more software within a limited budget / proprietary software may demand a higher level of investment by the company
- open-source software can be changed or customised to suit the company’s requirements – the source code is available for programmers to modify / proprietary software can only be modified by the manufacturer
- open-source software may have “bugs” that have not yet been reported which affect the company’s production (ie may take time to be fixed) / proprietary software manufacturers may release patches/bug-fixes on a regular basis
- open-source software may not have all the options/features needed by the company / proprietary software often has a greater range of options/features
- manufacturers of proprietary software can provide support and assistance to the company / open-source software often has limited support
- using open source software for producing the 3D toys may require hiring more programming staff to upgrade the software

[1–2]: *A limited response that demonstrates minimal knowledge and understanding of the topic and uses little or no appropriate ITGS terminology. Only open-source software or proprietary software is explicitly referred to in the response.*

[3–4]: *A partial analysis, either lacking detail or balance, that demonstrates some knowledge and understanding of the topic. Some relevant examples are used within the response. There is some use of appropriate ITGS terminology in the response. Both open-source software and proprietary software are explicitly or implicitly referred to in the response.*

[5–6]: *A balanced and detailed analysis of the issue which demonstrates thorough knowledge and understanding of the topic. Relevant examples are used throughout the response. There is appropriate ITGS terminology throughout the response. Both open-source software and proprietary software are explicitly referred to in the response.*

- (c) It is now possible to use a 3D printer to print a large range of products in addition to toys. These include guns, bicycles and human prosthetic limbs. However some governments are concerned about the software for 3D printers being freely available on the internet.

To what extent should governments regulate the access to software for 3D printers?

[8]

Answers may include:

Regulation of the access to software for 3D printers

- could aim to ensure good quality of the 3D objects being made. 3D software may allow for sub-standard / faulty 3D objects to be manufactured, creating risks for users
- could aim to prevent the manufacture of artifacts that are only sold with a licence (eg guns). However if similar shapes are needed for other articles, their manufacture may be prevented by mistake Eg: if a certain shape is recognized the software may not allow it to be printed
- could protect manufacturers of copyrighted products. Owners of 3D printers would be prevented from making them
- could prevent owners of 3D printers making their own objects freely, stifling innovation
- could mean an invasion of privacy. It is possible to know what blueprint is being downloaded to which IP address
- to what extent is regulation possible.

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 information sheet on page 25.

3. Small town book shop moves to computer-based records

Note to examiners.

- *Part a and part b questions are marked using ticks and annotations where appropriate*
- *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) (i) Daniela needs to see the books in alphabetical order, with the “Subject area” sorted from A to Z and then the “Number of books” sorted from largest to smallest.

State the author that would appear in the first row of the sorted spreadsheet using only the books shown in **Figure 5**.

[1]

- Badke

Award [1] for the correct answer shown above.

- (ii) State the formula that would be required to add up the cost of all the books in the book store.

[1]

Answer may include:

- =SUM(G2:G401)
- =SUMA(G2:G401)
- =ADD(G2:G401)
- = Σ (G2:G401). (where xxxx is another valid formula which adds the numbers in cells G2 through G401)
- =G2+G3+...+G401

Award [1] for any one of the above.

- (iii) Daniela now thinks that she should have installed a database for the information about the books. Outline **two** advantages that a database would have over a spreadsheet for the El Hoyo book shop.

[4]

Answers may include:

- queries can be done to select specific records, *ie* English books
- reports can be made (ie summary of all the books that have been purchased, labels can be printed to label the books/bookshelves etc.)
- databases may reduce data redundancy and allow for more efficient storage & updating of data than spreadsheets
- a user interface can be included for the book shop staff without much IT knowledge, using spreadsheets may require a greater level of IT capability
- databases allow for data for a large number of books to be stored and accessed without increasing complexity for the user.
- databases allow the field choices to be set so that only certain types of data may be entered (e.g. Type of book, language etc.). Spreadsheets do not have this possibility.
- a database can limit the view of the data for particular users (e.g. Daniela as the shop manager, may be able to view more data than the rest of the staff), a spreadsheet does not have this capability

Note: If an advantage is generic with no reference to the book shop, a maximum of 1 mark is awarded for identifying the advantage.

*Award **[1]** for identifying an advantage and an additional **[1]** for an outline for that advantage.*

*Award up to a maximum of **[4]** for the question.*

- (b) Explain **three** impacts that the new computer system may have for the staff at the book shop.

[6]

Answers may include:

- the salesperson may have to learn/receive training on how to use the computer and software. This may involve additional time commitment.
- the salesperson may request new software applications (ie image editing software to create posters about the books) or hardware (ie barcode scanners) and this may involve costs
- shop owner may now expect the salesperson to perform analysis of sales/inventory
- having a computer may allow the salesperson to perform additional tasks (ie printing of advertisements about new books, mail merged letters, ordering books from their supplier)
- employees work will be easier and faster as they can check directly in the computer if they have a copy of the book
- staff will no longer have to calculate the costs of books manually leading to less errors in charging customers/fewer customer complaints.

*Award **[1]** for each impact identified, and an additional **[1]** for an appropriate explanation of that impact.*

*Award a maximum of **[6]** for the response.*

- (c) El Hoyo receives a large number of tourists during the summer when the fruit festival takes place, but suffers from periods of poor internet connectivity. Daniela has now created a separate area in the book shop that has several computers with free broadband internet access so that tourists can use them to check their emails and find information about the local area.

Evaluate the impacts of this initiative for Daniela as shop manager.

[8]

Answers may include:

- additional staff with IT expertise may be needed to work in that area if the demand is high installation, maintenance and repairs may be needed if the equipment is used frequently
- antivirus and firewalls may be needed to be installed
- the shop may become a popular place and sales of books may increase
- Daniela's investment may not be cost effective if demand for the bookshop's internet access decreases
- Daniela may need to develop an acceptable use policy
- Daniella may have access to the browser histories on the computers and could use that information to help decide what books to stock
- staff are able to query the book database for specific information (e.g. all of the books written by a certain author, all books which cost less than \$200).

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 information sheet on page 25.

Section B

4. Penrose Airport (UK) automated baggage system

Note to examiners.

- *Part a and part b questions are marked using ticks and annotations where appropriate*
- *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) (i) Identify **two** key stakeholders in this automated baggage system project. [2]

Answers may include:

- passengers
- airlines
- airport's chief engineer
- airport's managers
- firm that built the system (or its senior management team)
- system development personnel
- project management team.

Note: reward a specific member of any team i.e. someone who would be on the project management team, but do NOT reward two members of the same team.

Award [1] for each of the points identified above up to a maximum of [2].

- (ii) Identify **two** characteristics of a "prototype". [2]

Answers may include:

- early working model of a system or subsystem
- used to test the system (eg interface, functioning)
- used to demonstrate how the system will work
- used to check whether the systems will meet the target user's requirements.

Award [1] for each of the points identified above up to a maximum of [2].

- (iii) Identify **two** types of information that should have been gathered at the beginning of the automated baggage system project. [2]

Answers may include:

- amount of baggage the system will need to handle
- maximum size and weight of baggage
- needs of individual airlines
- time parameters ie when is the automated baggage system scheduled to open
- number of concourses or gates to be served by the system
- cost estimate.

Award [1] for each kind of information identified up to a maximum of [2].

- (b) Explain **three** reasons why the use of the AGILE system of project development might have prevented the failure of the automated baggage system project.

[6]

Answers may include:

- project could be adapted to changing needs of the stakeholders
- the concerns of lower level managers would have been heeded (eg resolving issues early on before they became significant)
- small parts of the system can be tested as they are developed (eg the parts of the baggage system that failed would have been caught early)
- requires stakeholders and developers to work together throughout the process (eg airlines would have communicated requirements throughout the process)
- developers work in teams increasing communication
- deadlines can be adjusted based on concrete information about the current performance of the system.

Award [1] for each reason why the use of the AGILE system of project development might have avoided the failure of the automated baggage system project.

Award [1] linked to each reason identified for why the use of the AGILE system of project development might have avoided the failure of the automated baggage system project. [1] giving a maximum of [2] for each reason.

Mark as [2 + 2 + 2].

- (c) To what extent is the success of projects such as the Penrose Airport automated baggage system dependent on the involvement of key stakeholders throughout the development process?

[8]

Advantages may include:

- needs of all stakeholders will be taken into account from the beginning/avoids sudden dramatic changes in the project
- key stakeholders will have a clear idea of how the project is progressing
- regular communication with stakeholders ensures that the solution will meet their needs
- affords developers the possibility of working with experts who have detailed knowledge of the system requirement
- enables early recognition of small problems before they become huge problems
- regular communication ensures that necessary resources can be identified and provided.

Disadvantages may include:

- if views of some stakeholders are divergent from the rest, the project could fail
- coordination problems, ie between stakeholders, could cause delays in the project
- if there is no centralized control and knowledge, the project could fail
- meetings with stakeholders can be time consuming and/or non-productive.

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 information sheet on page 25.

5. Zunica Chocolates

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) (i) Identify **three** requirements for an e-commerce website in order to be user-friendly.

[3]

Answers may include:

- shopping cart
- search box
- login box
- social media links
- payment options
- contact information
- clear presentation of products/services
- use smaller files and images and files to reduce load times
- includes functions to aid the disabled
- included FAQs about transactions, delivery etc.
- allows users to compare products
- easy for users to provide information to the seller ,i.e. financial and shipping information
- offers a wishlist .

*Award **[1]** for each of the points identified above up to a maximum of **[3]**.*

- (ii) Identify **three** components of a “feasibility study”.

[3]

Answers may include:

- analysis of the likely success of a project
- considers cost
- technical issues
- resources needed
- value to or needs of the stakeholder(s)
- determine estimated date of completion.

*Award **[1]** for each of the points identified above up to a maximum of **[3]**.*

- (b) Explain why Zunica Chocolates uses both alpha testing and beta testing to ensure the functionality of their website.

[6]

Alpha	Beta
First stage of testing, prepares for beta testing.	Occurs when software passes alpha testing.
Tests if software meets design specifications.	Last stage of testing/pre-release.
Normally done by software testers within the company that created the software.	Test by group of “real world” users.
Reveals bugs, crashes, missing features <i>etc.</i>	Some bugs or crashes but features should be complete.
Critical issues are fixed, some features might be changed.	Only important/critical changes are made, new features are not added.
White box testing <i>ie</i> checks internal workings of the software (code).	Black box testing <i>ie</i> tests how it actually performs.

[1–2]: A limited response that indicates very little understanding of the topic.

[3–4]: A reasonable explanation of how both alpha and beta testing can be used to ensure the success of the project. The answer may be unbalanced and lack appropriate reasoning at the lower end of the band.

[5–6]: A clear, detailed explanation of how both alpha and beta testing can be used to ensure the success of the project.

- (c) To what extent could the use of a Gantt chart such as the one above lead to the successful development of Zunica Chocolates's website?

[8]

Benefits may include:

- use of a Gantt chart visualizes the process *eg* helps to maintain organization
- it illustrates which tasks must be completed before the next one can begin
- task can be viewed against a calendar showing start and end dates
- resources required for tasks can be linked to the tasks on the chart.

Drawbacks may include:

- it is a linear *ie* step-by-step process so it is very inflexible. Changes are difficult to make
- errors are difficult to correct
- changes could result in significant costs
- chart can be too simplistic *ie* does not provide enough detail for a complex project *ie* this chart leaves out the construction of the database
- it is difficult to show where there is slack time in the project.

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 information sheet on page 25.

Section C

6. Telepresence robots

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) (i) Identify **two** of the sensors that the robot must have in order to move around the classroom.

[2]

Answers may include:

- cliff/edge detection
- sensor to detect edge of the wireless network
- sensor to detect battery level
- motion sensor
- proximity sensor (obstacle detection)
- visual sensor.

Note: do not accept distance sensor or cameras.

Award [1] for each sensor identified up to a maximum of [2].

- (ii) Outline **two** characteristics that make the VGo different from a fixed video system such as Skype.

[4]

Answers may include:

- the VGo robot is portable while the video system must be available in every classroom
- the student controls the VGo robot, can move from class to class along with everyone else while a portable video system must be wheeled around by a staff member
- the student controls the VGo while someone in each classroom needs to position the camera
- the student can move around the classroom as if she were physically present but the video system is relatively fixed
- the camera in the VGO system can look all around instead of having a fixed perspective
- student can control the robot from a remote place
- student can zoom in and out to see details or get a better perspective on the room.

Award [1] for each characteristic that makes the VGo different from a fixed video system such as Skype identified up to a maximum of [2].

Award [1] for each expansion of each characteristic identified up to a maximum of [1] giving a maximum of [2].

Mark as [2 + 2].

- (b) Analyse the impact that using a VGo robot would have on a student who cannot attend school in person.

[6]

Advantages may include:

- students will be able to participate fully in interactive class discussions/group work/working in pairs so they will have the full educational experience
- students will be able to move from class to class with peers/go to the lunchroom/chat while walking through the halls so they will be able to develop friendships
- student can participate in some extracurricular activities.

Disadvantages may include:

- sitting in front of a computer monitor can be tiring for the user
- parents might have privacy concerns about using cameras in class
- if the robot loses power, drops the internet connection or there's a hardware or software failure, the student will not be able to follow the lesson
- The student might play with the robot and get distracted
- Other students in school might make the student using the robot feel uncomfortable
- if the student is not confident or competent at using the VGo, the student's ability to follow the lesson will be reduced

[1–2]: *A limited response that indicates very little understanding of the topic.*

[3–4]: *A reasonable description of the positive and negative impacts of using the VGo robot in this scenario. The answer may be unbalanced and lack appropriate reasoning at the lower end of the band.*

[5–6]: *A balanced and thorough analysis of the positive and negative impacts of using the VGo robot in this scenario.*

- (c) Larsson Laboratories, which makes drugs for rare diseases, is considering the use of VGo robots for company communications. The head office is in central Stockholm, with a research laboratory in a nearby town and a production facility in Germany. The VGo robots would be used for meetings and visits to the laboratory and production facility by managers, as well as by workers who are in the office for some of the time, and work from home (telecommute) for the rest.

Discuss the potential effects of the use of VGo robots for Larsson Laboratories.

[8]

Advantages may include:

- the system would allow employees who telecommute to interact with colleagues in the office
- would save the business the costs of travel *ie* transportation, accommodations, meals; especially important for global companies
- employees can gain visual access to remote facilities such as manufacturing facilities, laboratories, *etc*
- employees can be more productive as time will not need to be spent on travel *eg* managers can visit multiple locations in a short period of time
- allows for “walk and talk” or “watercooler” discussions *ie* informal collaboration
- allows direct monitoring and interaction with employees if the supervisor is not physically present
- fewer people physically present means less risk of contamination in the laboratory.

Disadvantages may include:

- trust is harder to build when working with telecommunication technologies *eg* personal relationships are often critical in business environments
- bandwidth can be a problem *ie* video requires significant bandwidth. Companies may be limited in the use of robots by cost of bandwidth or may find their networks cannot handle the telepresence robots
- security is a problem because remote control cameras are moving around a financial institution or research laboratory
- the use of the internet to transmit the video opens up the company to breaches of security
- can make employees uncomfortable because they feel as if they’re being spied on
- cannot be sure the robot will be controlled by the person who is supposed to be controlling it
- the field of vision of VGo’s camera is not as wide as a human’s, so it is impossible to have a view of the whole room
- a moving robot may risk expensive equipment or spill chemicals if not controlled correctly by the remote control user.

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 information sheet on page 25.

7. Art and expert systems

Note to examiners.

- *Part a and part b questions are marked using ticks and annotations where appropriate*
- *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) AARON, like all expert systems, has a knowledge base and inference engine.

- (i) Identify **two** possible items that could be included in AARON's knowledge base. [2]

Answers may include:

- part of a human body
- physical types
- a set of colours to choose from
- basic shapes.

Award [1] for each item that could be in AARON's knowledge base identified up to a maximum of [2].

- (ii) Programs like AARON often contain fuzzy logic. Identify **two** characteristics of fuzzy logic. [2]

Answers may include:

- based on degrees of truth not “true or false”, eg percentages
- can quantify natural language expressions that state imprecise values, eg hot, warm, cool
- can be used in situations where precise values are not known, eg the temperature in a clothes dryer
- uses the logical values between 0 and 1 ie things can be partly true and partly false at the same time.

Award [1] for each characteristic identified.

- (iii) Identify **two** characteristics of machine learning. [2]

Answers may include:

- software learns from data/input
- software can perform new tasks after processing the data
- software can react to new inputs it has not encountered before
- software searches through data for patterns and adjusts accordingly
- an example might be the newsfeed in Facebook/adjusts to the users behaviour.

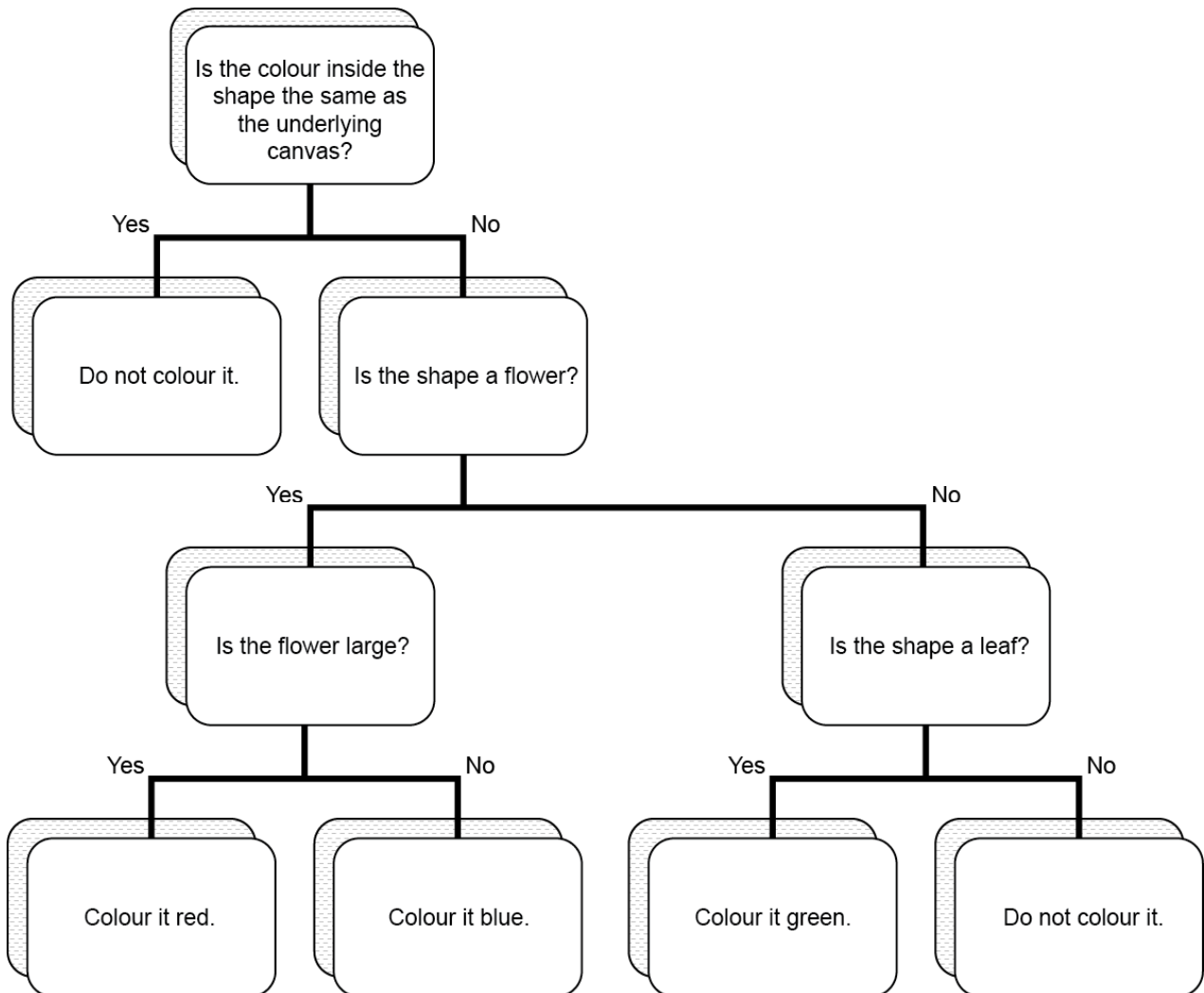
Award [1] for each of the characteristics stated above up to a maximum of [2].

(b) (i) AARON needs to select colours for leaves and flowers in each drawing. Once a shape is selected, it must follow these rules:

- AARON can colour large flowers red
- AARON can colour small flowers blue
- if the shape is a leaf, AARON can colour it green
- if the shape is neither a leaf nor a flower, AARON should not colour it.

Copy and complete the information below to construct a decision tree that AARON could use to colour its drawings.

[4]



Answers may include:

- Y/N at each decision node
- leads to correct conclusions, bottom line
- exactly four levels
- exactly four terminators
- no false leads.

Any four points, award [1] each up to a maximum of [4].

- (ii) Explain **one** weakness of using a decision tree like this one for AARON. **[2]**

Answers may include:

- the decision tree is based on preset parameters which may not address all of the eventualities encountered when AARON is trying to complete a painting
- “flower size: large or small” is ambiguous and relative
- the decision tree is made up of binary choices which are very limited, *ie* only two choices for colour/only flowers vs. leaves. This could be very limiting **OR** could lead to a huge decision tree thus a very slow program
- the decision tree may be influenced by new information as a result of machine learning during the creation of a painting by AARON. This may lead to paintings being created using different inference rules (and not being consistent in the style intended).

*Award **[1]** for identifying one reason why the use of a decision tree like the one in b(i) for AARON may be considered a weakness.*

*Award **[1]** for why the use of a decision tree like the one in b(i) for AARON may be considered a weakness. **[1]** giving a maximum of **[2]**.*

- (c) Discuss the museums' decision to list AARON as the artist when exhibiting AARON's paintings and drawings.

[8]

Reasons supporting the decision may include:

- each of AARON's works is unique, *ie* AARON remembers its drawings so it does not repeat itself
- AARON makes all the decisions so it is the artist
- works to be exhibited in museums are judged to be art by the curators, *ie* they are appreciated as fine art
- it is impossible to know what an artist was feeling when she/he created the work of art
- human brains work creatively while we are unconscious, *ie* asleep.

Reasons against the decision may include:

- Harold Cohen wrote the program so he is the artist
- AARON cannot experience the world the way a human can so he cannot create art
- AARON is not conscious so it cannot make decisions about the quality of its art
- there can be multiple copies of the program, so there is no individual artist
- AARON can only create images out of the knowledge that Cohen has programmed into it
- real art communicates the emotion/passion of the artist.

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 information sheet on page 25.

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 and/or conclusions. • No reference is made to the scenario in the stimulus material in the response. • 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 and/or judgments that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced. • Implicit references are made to the scenario in the stimulus material in the response.
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. • Explicit references to the scenario in the stimulus material are made at places in the response.
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 and/or judgments that are well supported and underpinned by a balanced analysis. • Explicit references are made appropriately to the scenario in the stimulus material throughout the response.