

Markscheme

November 2016

**Information technology
in a global society**

Higher level

Paper 3

This markscheme is **confidential** and for the exclusive use of examiners in this examination session.

It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorization of the IB Assessment Centre.

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) Identify **two** ways that the devices in the smart home can be used to make the smart home more environmentally friendly. [2]

Answers may include:

- devices can be programmed or designed to be used only when needed eg settings to be economical with power eg sleep mode
- devices or home appliances used could be designed to be more energy efficient
- appliances can be controlled through scheduling
- home network could monitor use which can bring awareness to the home user
- home network could monitor use which can allow house to “adapt” to needs
- custom or designed lighting can ensure only used when appropriate
- air conditioning can be controlled to be more energy efficient
- devices used in conjunction with home design so that minimal heating or cooling would be needed
- data logging of use would lead to a better profile of the home user. This information could lead to owner understanding more
- sensors and connected devices could alert home owner of issues or misuses of electricity or heating based on specific criteria
- automatic systems, such as curtain closing, heating or cooling on/off, lights on entry to home could ensure environmental conditions in rooms or home is not used redundantly
- sensors could know if person has left a room to switch off lights/air conditioning.

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

*Do not accept simply listing two devices. Students must link to environmental issues **even if mentioning multiple devices**. The focus is not on the items but on the two different methods for making smart home environmental friendly.*

Award only [1] mark for repetition of environmental method.

- (b) Identify **two** requirements for cell/mobile phone or tablet devices to be successfully integrated with a smart home. [2]

Answers may include:

- home network system integrating all devices
- Wi-Fi or 3G connection or Bluetooth to allow mobile phone or tablet to connect
- Cloud-based service storing the data from devices
- smart home devices either connect through home Wi-Fi network or hard cabling to network router/hub
- user account or password access to the smart home
- a smart home app loaded onto the cell/mobile phone
- any features that the phone must have itself (eg ability to run a proprietary app, specific protocol, ??).

Note: Cannot simply say needs internet. Response must identify how/why internet is needed.

Do not accept general phone features but must be specific to use with smart home.

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

2. (a) Explain **one** reason why a protocol is needed by the IFTTT server to send and receive information. [2]

Answers may include:

- protects the security of the data against a third party interception so that data is not manipulated during transmission
- protocol will check that the data is sent in an agreed format so that it can be “understood” at the receiving end
- content of data is specific for the device or instruction so the server will need to know how to use the data in the IFTTT function
- to allow future developers to create products which will be compatible with the system.

Award [1] for the identification of why a protocol is needed by the IFITT server to send and receive information and [1] additional mark for a development of the reason why the protocol is needed up to a maximum of [2].

- (b) Explain **two** reasons why a service such as IFTTT is not suitable for emergency responses, such as notifying the fire department of a fire in a smart home. [4]

Answers may include:

- false readings (reliability) – could alert the emergency services unnecessarily if there is a sensor glitch that keeps triggering the action, it could “cry wolf” a number of times wasting resources
- reliability of the IFTTT server, this could be down at any time for upgrades, maintenance or repairs
- reliability of the home network. If the home network is down then the IFTTT would not work efficiently or effectively
- infrastructure changes need to be connected to emergency services which may require an additional cost to the homeowner
- maintenance of the system for the emergency services would need to be monitored and may lead to additional costs for the homeowner
- changes to the system or upgrades at the home end would need to be matched at the emergency services end to ensure compatibility between the systems
- how much information could the IFTTT send and will be sufficient to be of use by the emergency services? If it is not human voice, what format is the message? Emergency services would need address or be able to answer questions. Would the address be enough?
- IFTTT may not be adequately programmed for every scenario that could result in appropriate calling an emergency services.

Award [1] each for the identification of an unreliable device, or example of network failure, AND/OR identification of problem caused up to a maximum of [2].

Award [1] additional mark for an explanation of each feature identified can cause a problem in a smart home up to a maximum of [2] per feature.

Mark as [2 + 2 = 4] marks maximum.

3. Increasingly, customers are requesting specific devices which are not supplied by Brix Homes's preferred manufacture (lines 65–67).

Discuss whether Brix Homes should offer its customers devices from a range of manufacturers.

[8]

Answers may include:

Responses for allowing devices from other manufacturers

- can capture more market share if a customer has a preferred vendor or manufacturer
- have more options or a wider range of actions for customers to install specific sensors or devices that their current manufacturer offers
- possibly connect to more household devices or appliances than the current manufacturer does
- aesthetics of control pads, sensors etc from different manufacturers may match décor or room designs better
- Brix's preferred manufacturer may not be able to supply the specific device that the owner would like
- clients may have history with a particular manufacturer from previous homes or projects and it would be poor business for Brix to not try to work with this manufacturer and potentially lose a whole project
- more competitive pricing of devices as company is not locked into one manufacturer
- different manufacturers may specialize in different areas eg elderly aids, environment, disabilities etc
- any other market advantages such as alliances with suppliers of a new different range of sensors, mergers, current suppliers going out of business
- technology changes which make a new and more effective type of sensor or home device available which would be better for Brix customers.

Responses against using devices from other manufacturers

- workers would need to train up on the specifications of the other brands to ensure they know how to install, maintain and repair
- compatibility issues may arise by mixing manufacturers. Compatibility with software as well as connections or ports or cabling
- other manufacturers may vary in their quality. If Brix has chosen a high quality product or manufacturer to work with, then using manufacturers who are untested or who have substandard quality could affect Brix's reputation
- other manufacturers may not have after-market service or support meaning Brix will be responsible
- Brix may have to do more testing to sanction certain products – requiring staffing, purchase of devices for testing etc
- working with manufacturers will take more time to negotiate deals, install in homes
- after-service troubleshooting with devices – with more than one manufacturer may be difficult to pinpoint problems where one manufacturer blames the other when devices don't work together
- each time devices are updated/patched – they may cause conflict or create issues with other aspects on the network – more troubleshooting may be required
- much more effort would be required by Brix in terms of: sourcing the new devices, testing them for compatibility, upgrading, maintaining etc – which would translate into higher cost for the company and perhaps raise prices for customers.

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.

4. Brix Homes is planning to go into partnership with a third-party cloud-based data service so that all of the information from the devices in the smart home can be stored centrally and be used to check the quality of service of these devices. There are concerns about this data being used for other purposes that are not in the interests of the smart home owner (lines 74–81).

Discuss whether Brix Homes should go into partnership with a third-party cloud-based data service.

[12]

Answers may include:

Advantages to Brix Homes

- an incentive for people to buy Brix homes that provides a service others may not provide
- data collected by the provider can be used to analyse and improve the smart home setup in the homes Brix builds
- the cost of setting up the smart homes will be cheaper as many homes will be provided with the same products, gaining economies of scale
- it prevents Brix homes from trying to spread their expertise too thinly and outsources this work and responsibility to another organization. Will mean Brix does not need to hire specialist staff
- saves costs as don't need to set up data servers for the Brix Homes
- there may be commercial possibilities for Brix to make money from this data, still within the user agreement (eg providing anonymized data to other organizations).

Disadvantages to Brix Homes

- complaints from homeowners that the data is with a third party that they did not choose or are locked into choosing, they may even choose to sell and move house
- dealing with concerns from clients regarding data protection when they do not have the expertise in this area
- privacy concerns from homeowners about the data collected and how it is used by Brix and the service provider
- concerns of the homeowners about the security of their homes if the security of the service provider is compromised
- will need to develop clear policies that ensure clients are aware of the use of the collection and use of the data
- Brix may need to provide training to the home client on the use of the data or reports that come from the service provider
- the quality of the data service may be low and it may lead to poor information and cause excessive maintenance or alarm when no problem exists.

Advantages to home owners

- do not need to contact a provider and set up a service themselves. Brix will take care of it on behalf of the client
- will be available immediately they enter their home
- system is compatible with the new home design and built with it in mind. It is not done as an afterthought
- the smart home devices will be compatible with the service as it has them in mind throughout the design
- the interface to control and access all the devices will be specially designed for the homes they buy
- data collected from all Brix homes can be analysed and used to improve the service to them and future customers
- a central provider that can be called upon if there is a problem with a device or part of the service
- includes an all-in-one package to the home.

Disadvantages to home owners

- the smart home devices will be limited to those supported by the provider and Brix
- the smart home devices supported may not have the specific capabilities and features the home owners want
- the data collected by the provider about the use of smart devices in their homes and their daily living habits could be used inappropriately
- policies on the privacy of data collected by the service company needs to be provided to home owners and this could be full of lingo or legal language that confuses the customer
- an opt-out of the data collection may not be available.

Advantages to service provider

- a chance to branch out and get involved with a home developer and to set up special services that they can sell to other developers
- a chance to collect data about a large number of homes that use their services in a controlled environment which can be used to improve their services
- build a larger client base that could mean other marketing opportunities such as internet provider or cable TV etc.

Disadvantages to service providers

- possibly need to be involved with the maintenance and set up of the Brix homes smart home networks and devices which is beyond providing a simple web service like IFTTT
- may need to recruit specialist staff to manage the data and service connections
- may require purchasing of new network infrastructure equipment
- service provider may need to provide training to the home client on the use of the data or reports generated.

HL paper 3 question 4 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 1–3 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. • No reference is made to the information in the case study or independent research in the response. • The response may be no more than a list.
Adequate 4–6 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. • Implicit references are made to the information in the case study or independent research in the response.
Competent 7–9 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 information in the case study or independent research are made at places in the response.
Proficient 10–12 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. • Explicit references are made appropriately to the information in the case study and independent research throughout the response.