Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2023

Information technology in a global society

Higher and standard level

Paper 2

14 pages

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

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Using assessment criteria for external assessment

For external assessment, a number of assessment criteria have been identified. Each assessment criterion has level descriptors describing specific levels of achievement, together with an appropriate range of marks. The level descriptors concentrate on positive achievement, although for the lower levels failure to achieve may be included in the description.

Examiners must judge the externally assessed work at SL and at HL against the four criteria (A–D) using the level descriptors.

- The same assessment criteria are provided for SL and HL.
- The aim is to find, for each criterion, the descriptor that conveys most accurately the level attained by the candidate, using the best-fit model. A best-fit approach means that compensation should be made when a piece of work matches different aspects of a criterion at different levels. The mark awarded should be one that most fairly reflects the balance of achievement against the criterion. It is not necessary for every single aspect of a level descriptor to be met for that mark to be awarded.
- When assessing a candidate's work, examiners should read the level descriptors for each criterion until they reach a descriptor that most appropriately describes the level of the work being assessed. If a piece of work seems to fall between two descriptors, both descriptors should be read again and the one that more appropriately describes the candidate's work should be chosen.
- Where there are two or more marks available within a level, examiners should award the upper marks if the candidate's work demonstrates the qualities described to a great extent. Examiners should award the lower marks if the candidate's work demonstrates the qualities described to a lesser extent.
- Only whole numbers should be recorded; partial marks, that is fractions and decimals, are not acceptable.
- Examiners should not think in terms of a pass or fail boundary, but should concentrate on identifying the appropriate descriptor for each assessment criterion.
- The highest level descriptors do not imply faultless performance but should be achievable by a candidate. Examiners should not hesitate to use the extremes if they are appropriate descriptions of the work being assessed.
- A candidate who attains a high level of achievement in relation to one criterion will not necessarily attain high levels of achievement in relation to the other criteria. Similarly, a candidate who attains a low level of achievement for one criterion will not necessarily attain low achievement levels for the other criteria. Examiners should not assume that the overall assessment of the candidates will produce any particular distribution of marks.
- The assessment criteria must be made available to candidates prior to sitting the examination.

Theme: Business and employment, environment, home and leisure

Criterion A — The issue and stakeholder(s) **[4]**

1. (a) Describe **one** social/ethical concern related to the IT system in the article.

Note to examiners: The concern may relate to its impact or result or consequences or effect or outcome.

*Award **[1]** for identifying the concern (which does not have to be stated explicitly). Mark the first concern only (if there are two or more).*

*Award **[2]** for a description of the concern that must be stated explicitly.*

Social/ethical concerns may include the following:

- **Reliability**: *CityScoots* devices might fail, problems with the app, user's phone/camera, company server.
- **People and machines**: availability 24 hours/7 days a week).
- **Privacy:** as details may be shared by the app.
- **Security:** hacking banking information.
- **Security: c**redit card is stolen and used, and/or false email address is used as well, the wrong person will be blamed for any accidents and damage and fines.
- **Anonymity:** as scooter riders involved in accidents may be identified.
- **Digital divide:** you need a smartphone, cellular connection, digital literacy.
- **Policies:** government regulation about the appropriate use of *CityScoots*, concerns about how the *CityScoots* has been introduced and issues from lack of regulations. Especially concerning the speed of the scooters and the lack of protection for riders who often do not use a helmet or protective equipment like motorbike riders use, and the use of scooters on paths also used by pedestrians, and the use of scooters in fast flowing traffic, often ignoring road rules.
- **Policies:** Discarded e-scooters may exposing others to a potentially hazardous environment - "Some riders just abandon the e-scooter at the side of the road." - consequence for pedestrians if on pavements/sidewalks.

(b) Describe the relationship of **one** primary stakeholder to the IT system in the article.

Note to examiners
*Award **[1]** for identifying the stakeholder (who). Mark the first stakeholder only* (if there are two or more).
*Award **[2]** for describing how the stakeholder interacts with the IT system or what part of the IT system* relates to the stakeholder.

Primary stakeholders may include:
- User/*CityScoots* rider/Justine: Using the mobile app, entering their information and use of the *CityScoots* device. Personal and private information could be hacked by third parties.
- Operators of the service.
- Governing bodies that permit the service (city/government): Policies and regulations to the proper use of the IT system.
- *CityScoots* company owner: Maintenance and user's data security.
- *CityScoots* manufacturer: Reliability of the device.
- Mobile app software developer: Reliability of the interconnectivity and banking information security.

Examiners should reward suitable responses that are not included in this mark scheme. Before awarding marks, please check with team leader.

Do not accept the following as primary stakeholders as they are not directly involved with the IT system (but can be used in Criterion C).
- Pedestrians and car drivers
- *CityScoots* competitors
- E-scooters can be left and abandoned on streets, parks, in rivers, etc. which then requires clean-up crews, to be paid for by *CityScoots* or the city authorities.

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1	Either an appropriate social/ethical concern **or** the relationship of **one** primary stakeholder to the IT system in the article is identified.
2	Either an appropriate social/ethical concern **or** the relationship of **one** primary stakeholder to the IT system in the article is described **or** both are identified.
3	Either an appropriate social/ethical concern **or** the relationship of **one** primary stakeholder to the IT system in the article is described; the other is identified.
4	Both an appropriate social/ethical concern **and** the relationship of **one** primary stakeholder to the IT system in the article are described.

Criterion B — The IT concepts and processes **[6]**

2. (a) Describe, step-by-step, how the IT system works.
IT system: QR codes, global positioning systems (GPS)

*The major steps are the use of the **components** of the IT system: smartphone, texting, GPS positioning.*

*Award **[1]: T**here is some understanding of the process but NOT in a step-by-step approach using the information **within** the article with some steps missing.*

*Award **[2]: T**here is a logical step-by-step account using the information **within** the article (but it may lack some detail).*

*Award **[3]: A** step-by-step account that **identifies** how the IT system works that goes **beyond** the article.*

*Award **[4]:** A step-by-step account of how the IT system works with **descriptions** that go **beyond** the article.*

The user sees on their screen the ride time cost charged to their account.

Answers provided in the article include:

- Download the app.
- Complete an online registration form / create a user account.
- Provides payment/banking information.
- Locate the e-scooter on the app map, find out how to get to the scooter, and check device's battery life (route-finding, GPS navigation).
- User needs to scan the QR code of the CityScoots at the start of the rental period.
- To end the rental service, user needs to scan again the QR code of the e-scooter.
- Rental cost is deducted from user's account.

Additional information that goes beyond that provided in the article may include:

- Access to a smartphone with storage capacity, and cellular data (e.g. 3G, 4G, GPS).
- Download/install the app from the Apple or Play Store after user authentication/biometric identification.
- Using the touch screen/on screen keyboard as an input device (e.g., user login details).
- Other information such as username/password for profile, email, consent for privacy policy, GPS tracking access/share location, access to camera
- Mobile app verifies user account funds and/or credit limit by connecting with the corresponding bank and or PayPal company.
- User opens the mobile app and uses the navigation map to locate the nearest e-scooter.
- GPS process (CityScoots locations, searching e-scooters nearby). How GPS works technically is not required, only the use; however, accept an explanation of how it works and accept as extra information. For incorrect explanations of how GPS works, e.g. the GPS sends signal to the satellite, do not award as extra information beyond the article.
- A client server is used – mobile app user as client and CityScoots company as server where user information is recorded and updated.
- Database to store information about the hire (such as eScooter and the customer)
- A confirmation of rental period ending is shown in mobile app and record is linked in the database to the records of the e-scooter and the user.
- The mobile app calculates the number of minutes the CityScoots has been used to calculate the rental cost.
- eScooter availability removed from map when hired by users/comes online when QR code scanned after use.
- Rental cost is deducted from the user account (bank information system, PayPal).
- The number of minutes is multiplied by the fee per minute to calculate the total charge.
- The QR code is read by the camera in the phone in order to extract data containing bike details.
- The QR code data, plus pickup/drop off times will be sent to the server.
- Details of the ride (pickup time/drop off time/total cost) are displayed on the user’s phone.

(b) Explain the relationship between the IT system and the social/ethical concern described in **Criterion A**.

Note to examiners

*Explaining the link between the concern and specific parts, or whole, of the IT system means the candidate must include **how** or **why** the concern has arisen from the use of the IT system. The concern identified in Criterion A may be implicit.*

*There **must** be a link to the concern identified/described in Q1(a).*

*Award **[1]** If the relationship between the concern and the IT system is identified. This may be a repeat, or rewording, of the response to Q1(a) or lack of detail for the how or why. If there is more than one concern identified in Q1(a) accept **any** concern (i.e., preventing a follow through error).*

*Award **[2]** if how **or** why the concern that has arisen is explained. Appropriate IT or ITGS terminology is used.*

For example, using a privacy concern, responses need to explain:

- *HOW the data can be accessed (e.g., interception of the WiFi signal is achieved)*

  OR

- *WHY it is possible to access the data (e.g., lack of encryption of the WiFi signal)*

- Reliability (*CityScoots* devices might fail).
- People and machines (ease of use, availability 24/7, concerns about how the *CityScoots* has been introduced and issues from lack of regulations).
- Privacy (as details may be shared by the app).
- Security (hacking banking information).
- Anonymity (as scooter riders involved in accidents may be identified).
- Digital divide (you need a smartphone, cellular connection, digital literacy).
- Policies (government regulation about the appropriate use of *CityScoots*).

The following are examples the students may use. They may present other reasons.

- **How** – **Reliability**, *CityScoots* might fail due to hardware malfunction.
- **Why** – Phone camera malfunction.

- **How** – **Software**, *CityScoots* might have an unreadable bar code.
- **Why** – Users would not be able to hire a scooter.

- **How** – **Hardware**, can't access server / out of WiFi range
- **Why** – unable to verify customer/determine total cost.

- **How** – **People (and machines)** using the *CityScoots* inappropriately.
- **Why** – Users might use the e-scooters in ways that affect their safety and that of pedestrians.

- **How** – **Privacy** of users' data collected by *CityScoots* and shared with third-parties.
- **Why** – Because *CityScoots* collects personal and travel information and *CityScoots* may benefit from sharing this information.

- **How** – a scooter is in an accident/damaged and rider is anonymous.
- **Why** – someone else hires the scooter using Justine's account by illegally accessing her mobile phone.

Candidates are expected to make reference to the relevant stakeholders, information technologies, data and processes. Candidates will be expected to refer to "how the IT system works" using appropriate IT terminology.

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1–2	There is little or no understanding of the step-by-step process of how the IT system works and does not go beyond the information in the article. The major components of the IT system are identified using minimal technical IT terminology.
3–4	There is a description of the step-by-step process of how the IT system works that goes beyond the information in the article. Most of the major components of the IT system are identified using some technical IT terminology. The relationship between the IT system referred to in the article and the concern presented in criterion A is identified, with some use of ITGS terminology.
5–6	There is a detailed description of the step-by-step process that shows a clear understanding of how the IT system works that goes beyond the information in the article. The major components of the IT system are identified using appropriate technical IT terminology. The relationship between the IT system referred to in the article and the concern presented in criterion A is explained using appropriate ITGS terminology.

Criterion C — The impact of the social/ethical issue(s) on stakeholders [8]

3. Evaluate the impact of the social/ethical issues on the relevant stakeholders.

Note to examiners

Mark holistically using a two-step process:

1. *Determine the markband the response falls into.*
2. *Determine the level within the markband using the guidelines below.*

Impact - result/consequence/effect/outcome on stakeholder which can be positive or negative

The evaluation should focus on the overall impact on the stakeholders. Evaluative comments may be within the body of the analysis or as a final summary.

Band 1-2

*Award **[1]** for at least one impact identified.*

*Award **[2]** for at least one impact described **or** more than one impact identified*

Band 3-5

*Award **[3]** for a limited analysis (such as the division into groups (privacy issues, security issues), or the impact on different stakeholders).*

*Award **[4]** for an incomplete analysis (such as mostly positives **or** mostly negatives).*

*Award **[5]** for a balanced analysis that includes **connections** (such as between positive and negatives or between impacts on different stakeholders). There may be limited **evaluative** statements.*

Band 6-8

*At least **two** stakeholders are required*

*Award **[6]** for a balanced analysis of the impacts that includes substantiated **evaluative** comments**.***

*Award **[7–8]** for an overall **evaluation** supported by **explicit references** to the analysis of the impacts (this is not a repetition or summary of the analysis). The evaluation shows evidence of insightful thinking.*

Users
Positive impacts may include:
- Users find it easy to use the *CityScoots*, with high availability around the city to commute short distances.
- Accidents involving *CityScoots* users and pedestrians can be resolved easily as the *CityScoots* user identity and private information can be provided by the *CityScoots* company to the authorities.

Negative impacts may include:
- Safety and security of *CityScoots* users and pedestrians.
- Lack of e-scooter riding policies and government regulation.
- Data been shared, loss of privacy.
- Some people will not have the IT skills/mobile phone to use this service
- A person might be wrongly blamed for an accident if the e-scooter is stolen, or some other way of using it e.g. stolen bank details/credit card, and has an accident.

***CityScoots* company**
Positive impacts may include:
- Use of data to inform (data analytics) policies, IT system improvement and marketing
- Competitive advantage that could lead to financial gains.
- Innovators reputation.

Negative impacts may include:
- Cost of the app development and/or e-scooter device, return on investment
- Additional cost of maintenance, re-charge of e-scooters, repair, loss, theft
- Accountability gap – risk liability (user, company, pedestrian?).
- Lack of data security policies and procedures – third-party companies. If there is a leak of information, who is liable?

Government agencies
Positive impacts may include:
- Reduce traffic.
- Improve air quality.
- Combat climate change.

Negative impacts may include:
- Change current traffic policies and regulations.
- Urban planning change.
- Recycling and disposal of e-waste.

Examiners should reward suitable responses that are not included in this mark scheme. Before awarding marks, please check with team leader.

Please see the criterion level descriptors on page 12

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1–2	The impact of the social/ethical issues on stakeholders is described but not evaluated. Material is either copied directly from the article or implicit references are made to it.
3–5	The impact of the social/ethical issues on stakeholders is partially analysed, with some evaluative comment. Explicit references to the information in the article are partially developed in the response. There is some use of appropriate ITGS terminology.
6–8	The impact of the social/ethical issues on stakeholders is fully analysed and evaluated. Explicit, well developed references to information in the article are made appropriately throughout the response. There is use of appropriate ITGS terminology.

Criterion D — A solution to a problem arising from the article **[8]**

4. Evaluate **one** possible solution that addresses at least **one** problem identified in **Criterion C**.

Note to examiners

The problem should be stated in the box above the response. However, if this is not done, a solution can be evaluated that addresses any problem identified in Criterion C.

*The solution must be **feasible**.*

If there is more than one solution, mark the first solution only.

Mark holistically using a two-step process:

1. *Determine the markband the response falls into.*
2. *Determine the level within the markband using the guidelines attached.*

*The solution may be a series of **related** measures that address the problem identified. For example, if the candidate identifies a problem such as security and then includes a range of security measures that are grouped together, this is acceptable.*

If there are more than one solution, and there is no explicit connection between them, only mark the first solution.

Band 1 - 2

The link to the problem may be implicit.

*Award **[1]** if a solution is identified.*

*Award **[2]** if a solution is described.*

Band 3 - 5

The solution is explicitly linked to the problem.

*Award **[3]** if the solution described and there is at least one evaluative statement (the application of the solution to the problem or a strength/weakness of the solution)*

*Award **[4]** if the solution described has limited evaluative comments about the strengths **and/or** weaknesses of the solution.*

*Award **[5]** if the solution described has evaluative comments that address a range of strengths and weaknesses.*

Band 6 -8

There are explicit references to the article throughout the response.

*Award **[6]** for an overall judgement about the effectiveness of the solution.*

*Award **[7-8]** for an overall judgement about the effectiveness of the solution that is supported by the **evaluation of its strengths and weaknesses**. Future developments may be proposed **and/or** insightful thinking demonstrated.*

Answers may include the following:

Data security

- Data sharing agreement with other citywide authorities.
- Right to anonymity.
- Data encrypted during transfer.
- Links to policies such as GDPR.

Safety and security of *CityScoots* users – expectations

- Use of a helmet by the driver is often required.
- The e-scooter should be equipped with LED lights, in the front, and back, and a horn.
- Insurance by *CityScoots* company is a must-have (for user and third party).

Lack of e-scooter riding policies and government regulation

- Establish a minimum age to use the e-scooters.
- Establish circulation paths (bicycle lanes) and restrict its use on sidewalks, parking spaces for e-scooters and set speed limits.
- Integrated transport system / sustainable innovation.
- Login credentials must be kept safe and secure.

Lack of IT skills

- *CityScoots* website could include a video/pictures to guide users through the process of hiring the scooter.

Examiners should reward suitable responses that are not included in this mark scheme. Before awarding marks, please check with team leader.

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1–2	**One** feasible solution to at least **one** problem is proposed and described. No evaluative comment is offered. Material is either copied directly from the article or implicit references are made to it.
3–5	**One** appropriate solution to at least **one** problem is proposed and partially evaluated. The response contains explicit references to information in the article that are partially developed. There is some use of appropriate ITGS terminology.
6–8	**One** appropriate solution to at least **one** problem is proposed and fully evaluated, addressing both its strengths and potential weaknesses. Areas for future development may also be identified. Explicit, fully developed references to the information in the article are made appropriately throughout the response. There is use of appropriate ITGS terminology.