

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2024

Marking Scheme

Computer Science

Ordinary Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Marking Scheme – Section C

Structure of the marking scheme for Section C (Programming)

Candidate responses are marked according to different scales, depending on the types of response anticipated. Scales labelled A divide candidate responses into four categories (correct response, almost correct response, partially correct response, and response of no substantial merit), and so on. The scales and the marks that they generate are summarised in this table:

Scale Label	A	B	C
No. of categories	3	4	5
5 mark scale	0, 3, 5	0, 2, 3, 5	
10 mark scale			0, 3, 5, 7, 10
15 mark scale			0, 3, 7, 10, 15

A general descriptor of each point on each scale is given below. More specific directions in relation to interpreting the scales in the context of each question are given in the scheme, where necessary.

Marking scales – level descriptors

A-scales (3 categories)

- response of no substantial merit
- response about half-right
- correct response

B-scales (4 categories)

- response of no substantial merit
- response with some merit
- almost correct response
- correct response

C-scales (5 categories)

- response of no substantial merit
- response with some merit
- response about half-right
- almost correct response
- correct response

Section A	Short Answer Questions	54 marks
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Answer any **nine** questions.

Question 1 **6 marks**

12
27
3 or 3.0

Each correct item 2 marks
Deduct 2 marks if answers presented on same line (12 27 3)

Question 2 **2 + 4 marks**

(a)

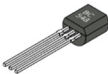
1111
Correct answer 2 marks

(b)

15 (8+4+2+1)
Correct conversion of (a) 4 marks
Half correct conversion of (a) 2 marks
Some valid conversion 1 mark

Question 3 **3 + 3 marks**

(a)

Column A Component Image	Column B Component Name
	Capacitor
	Resistor
	Transistor

Each correct item 1 mark

(b)

- **Resistor – Creates resistance to the flow of current. Creates a voltage difference.**
- **Transistor – Amplifies or switches on or off current. Controls current or voltage flow.**
- **Capacitor – Can build up and store energy. Can release large amounts of built up energy.**

Good description – clear understanding demonstrated 3 marks

Fair description – limited understanding 2 marks

Question 4

6 marks

- **Enables the transfer of data over the internet, allowing users to access websites and other online resources.**
- **HTTP is important for web browsers when reading HTML so that webpages can be displayed correctly.**

Very good explanation - clear understanding demonstrated 6 marks

Good explanation - clear information, lacking full understanding 4 marks

Fair explanation - limited understanding 2 marks

Question 5

6 marks

Column A Flowchart Symbol Description	Column B Flowchart Place
PRINT(price)	D
Is age < 21 AND student = "yes"?	A
price = price – (20% of price)	B
price = price – (10% of price)	C

4 correct – 6 marks

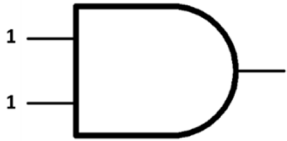
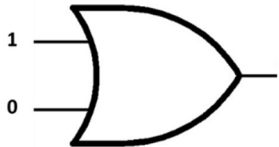
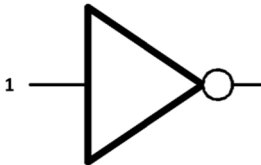
3 correct – 5 marks

2 correct – 3 marks

1 correct – 2 mark

Question 6

6 marks

Column A Logic Gate	Column B Output (0 or 1)
	1
	1
	0

Each correct item 2 marks

Question 7

6 marks

- Coming up with a time line / time plan
- Making decisions on the project
- Leading the team
- Delegating tasks
- Identifying dependencies
- Communicating/reporting to the team & stakeholders
- Managing budgets/resources
- Accept any relevant tasks that could be carried out by a Project Manager

Each valid task (clear) 2 marks

Each valid task (fair attempt) 1 mark

Question 8

3 + 3 marks

(a)

- Casts the input to an integer
- int sets the data type to an integer/ number/ whole number
- Only allows a number to be entered

Good description – clear understanding demonstrated 3 marks

Fair description – limited understanding 2 marks

(b)

- Numbers are equal / the same / match

Valid print statement 3 marks

Question 9

6 marks

Potential Positives:

- Fire & rescue services
- Delivery of parcels/medical supplies to remote areas
- Photography
- Accept any other relevant positive impact

Potential Negatives:

- Disruption of public transport systems
- Privacy of individuals and their property
- Lethal weaponry (military/war)
- Safety (e.g. airports)
- Noise
- Accept any other relevant negative impact

For each (positive/negative):

Good explanation – clear understanding demonstrated 3 marks

Fair explanation – limited understanding 2 marks

Question 10

6 marks

Name	Distance (Km)	Driver's License (Y/N)	Mode of Transport
Mr. Murray	3	Y	Cycle
Mrs. Woods	15	yes	Car
Mr. Murphy	23	Y	
Ms. Jones	340	N	Walk
Bn Uí Fhlanagáin	11	N	Bus
Mr. Murray	3	Y	Cycle
Ms. O'Neill	-18	Y	Car
Mrs. Lavery	4	Y	Walk

- Duplicate data for Mr. Murray
- "yes" entered instead of Y/N
- Blank entry for Mode of Transport for Ms. Jones
- 340 is unrealistic distance for Ms. Jones
- -18 is negative distance value for Ms. O'Neill

Each valid issue 2 marks

Question 11

6 marks

Digital Inputs:

- Button
- On/ Off Switch
- Shake
- Pins
- Accept any relevant digital input

Analogue Inputs:

- Accelerometer
- Magnetometer
- Temperature Sensor
- Light Sensor
- Moisture Sensor
- Sound Sensor
- Pressure Sensor
- Distance Sensor
- Moisture Sensor
- Accept any relevant analogue input

For each (digital/analogue):

Good example 3 marks

Fair example 2 marks

Question 12

6 marks

- Student Name - presence check, character only
- Year Group - presence check, range check, numeric only, select menu, v
- Contact Number - presence check, length check, valid Irish number, numbers only
- Contact Email - presence check, format check (contains @ , .com, etc.)
- Permission Slip - presence check, select menu (yes/no value only)

Each valid method 2 marks

Section B**Long Questions****76 marks**Answer any **two** questions.**Question 13****38 (22, 16) marks****(a)****22 (3, 6, 2, 4, 5, 2) marks****(i)****3 marks**

- A variable is a named location in computer's memory used to store data
- A declaration of a value that can be changed
- A term used as a placeholder for a value that can change

Good description – clear understanding demonstrated

3 marks

Fair description – limited understanding

2 marks

(ii)**6 marks****A – Int / Integer****B – Bool/ Boolean**

A correct 3 marks

B correct 3 marks

(iii)**2 marks**

- An initialised variable is when a variable is given starting value
- The initial value given to a variable the first time it is declared

Good description – clear understanding demonstrated

2 marks

Fair description – limited understanding

1 marks

(iv)**4 marks****Line 5**

Correct answer 4 marks

(v)**5 marks**

On line 4 the programme jumps to line 7. On line 7 the programme adds 1 to 0, then moves on to line 8. On line 8 the programme then jumps back to line 3 and adds 1 to 0, Next, the programme moves on to line 4 which means the code will continue to loop forever through these steps. Variable A will keep increasing but will not impact the loop.

Good description – clear understanding demonstrated

5 marks

Fair description – limited understanding

3 marks

(vi)

2 marks

Syntax errors are mistakes in the code structure causing the program to fail during compilation. Logical errors, on the other hand, are flaws in the program's logic that lead to incorrect output or behaviour, even though the code compiles and runs successfully.

Good description – clear understanding demonstrated 2 marks
Fair description – limited understanding 1 mark

(b)

16 (4,6,6) marks

(i)

4 marks

- The list is not in any sort of order, this means that a binary search will not work.
- The list is short enough to justify the use of a linear search (no need to sort)

Good description – clear understanding demonstrated 4 marks
Fair description – limited understanding 2 marks

(ii)

6 marks

- The code will check the first item in the list (12) and see if it matches the target item (23), these do not match so it will then move on to the next item in the list.
- The code will compare 5 and 23, these do not match so it will move on to the next item in the list.
- The code will compare 59 and 23, these do not match so it will move on to the next item in the list.
- The 4th item in the list matches the target item so the index of 3 will be returned.

Very good - all steps demonstrated with correct index 6 marks
Good - all steps demonstrated without incorrect index 4 marks
Fair – limited knowledge of linear search demonstrated 2 marks

(iii)

6 marks

- The linear search might have to check every item on a list in some cases.
- A large data set will take a lot more time.

Good description – clear understanding demonstrated 6 marks
Fair description – limited understanding 4 marks

Question 14**38 (15, 11, 12) marks****(a)****15 (6, 5, 4) marks****(i)****6 marks**

- Virtual assistants like Siri, Alexa, Google Assistant
- Recommendations: Online platforms such as Netflix, YouTube, Spotify and Amazon
- Adverts on social media: like Facebook, Snapchat, Instagram and TikTok
- Navigation Apps: like Google Maps
- Facial recognition
- Self-driving cars
- Online chat bots
- AI games: like QuickDraw, AlphaGo
- Online services: like ChatGPT & Bing image generator
- Accept other relevant answers

Each correct item 2 marks

(ii)

Artificial intelligence and machine learning are exactly the same thing. **False**

There are some jobs that could potentially be replaced by AI in the future. **True**

AI algorithms can make decisions based on patterns and data without being programmed for each single decision. **True**

AI always makes fair and unbiased decisions. **False**

AI technology is commonly used in self-driving vehicles to help them make decisions on the road. **True**

Each correct item 1 mark

(iii)

Training a machine learning model is the process of teaching the model to recognise patterns and make predictions or decisions based on large data sets.

Good description – clear understanding demonstrated 4 marks

Fair description – limited understanding 2 marks

(b)

11 (4, 4, 3) marks

(i)

4 marks

- **Equitable Use** - The app is usable for people with different needs (language, visibility, text to speech)
- **Flexibility in Use** - The app can be changed for different preferences or needs (dark mode, kid's version)
- **Simple and Intuitive Use** - The app is straight forward to use and has a help option
- **Perceptible Information** - Making sure the information on the app is accessible through a number of different methods
- **Tolerance for Error** - The app is designed to minimize the chance of errors
- **Low Physical Effort** - The app is easy to use and not physically demanding
- **Size and Space for Approach and Use** - The app can be used by any user in any environment

For each principle:

Good description – clear understanding demonstrated 2 marks

Fair description – limited understanding 1 marks

(ii)

4 marks

- **Safety risks** - There might be flaws in the system that can be hacked
- **Privacy risks** - Personal information might be shared
- **Content risks** - Inappropriate content might be available on the app
- **Negative impact on well-being** - The app might encourage bad life choices & decision making
- **Addictiveness** - The app might be highly addictive for children
- **Accept any appropriate answer given**

Good description – clear understanding demonstrated 4 marks

Fair description – limited understanding 2 marks

(iii)

3 marks

User Acceptance Testing (UAT) is the final stage of the development lifecycle where the product is tested and used by those users that it was designed for. It validates that the product works in real-life scenarios.

Good explanation – clear understanding demonstrated 3 marks

Fair explanation– limited understanding 2 marks

(c)

12 marks

Positive impacts:

- Personalised Learning
- Access to resources
- Assistance with homework
- Enhanced accessibility
- Spell check work
- Suggest improvements on student work
- Feedback on pieces of work
- Generate study notes for students
- Create study tips / custom study timetables

Negative impacts:

- Privacy concerns
- Bias Issues
- Overreliance on technology
- Wrong information given
- Using AI to complete work
- AI to assist in tasks may reduce critical thinking skills
- Lack of independent research & effort levels
- Reduction of problem-solving skills and logical thinking skills

For each (positive/negative):

Very good discussion - clear understanding demonstrated

6 marks

Fair discussion - limited understanding

4 marks

Question 15**38 marks (11, 5, 6, 16)****(a)****11 (5, 6) marks****(i)****5 marks**

- **Flight simulation**
- **Natural disaster simulation**
- **Simulating traffic flow**
- **Simulating structural movements**
- **Simulation of building evacuations**
- **Accept any relevant example**

Relevant example

2 mark

Good description – clear understanding demonstrated

3 marks

Fair description – limited understanding

2 marks

(ii)**6 marks****Examples:**

- **Ethernet**
- **World Wide Web**
- **WiFi**
- **GPS**
- **Smart Phones / Apps**
- **Any valid computing development since 1948**

For each development:

Relevant example

1 mark

Good description – clear understanding demonstrated

2 marks

Fair description – limited understanding

1 mark

(b)

5 marks

Column A Name	Column B Description	Column C Data type
Rainfall	Amount of rainfall in mm. Not a decimal number.	Integer
Temperature	Should accept a decimal number	Float
Province	Any one of the following: [Leinster, Munster, Connacht, Ulster]	List
Wind speed	Should not be a decimal number	Integer
Issue weather warning	Yes or No	Boolean
Weather description	Written description of today's weather e.g. It will be warm and sunny today	String

Each correct item 1 mark

(c)

6 marks

- Screen reader compatibility
- Translate language
- Increase font size
- Consistent layout
- Good use of space
- High contrast colours
- Easy navigation
- Search option
- Help option
- Frequently Asked Questions
- Live chat
- Accept other relevant answers

Each correct item 2 marks (max 6 marks)

(d)

16 (11, 5) marks

(i)

11 marks

Example of pseudocode:

```
IF speed > 90 and speed < 110:  
    RETURN Yellow Wind Warning
```

```
ELIF speed > 111 and speed < 130:  
    RETURN Orange Wind Warning
```

```
ELIF speed > 130:  
    RETURN Red Wind Warning
```

For each condition (3 possible):

Correct implementation

3 marks

Reasonable implementation

2 mark

Overall pseudocode/flowchart appearance:

Very good (correct indentation/decision shapes, etc.)

2 marks

Fair

1 mark

(ii)

5 (2, 3) marks

[89, 90, 100, 110, 111, 129, 130, 131]



[20, 70, 80, 90, 95, 135, 145, 165]



[19, 60, 65, 115, 116, 138, 139, 140]



Correct answer

2 marks

This covers and tests all of the conditions / boundaries from the algorithm.

Good description – clear understanding demonstrated

3 marks

Fair description – limited understanding

2 mark

Section C	Programming	80 marks
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Question 16

80 marks

(a)

60 (10, 5, 10, 15, 10, 10) marks

Possible solution:

```

1 # Question 16(a)
2 # Examination Number:
3
4 print("Welcome to the driving licence eligibility checker") #(i)
5
6 #(ii) user asked to input age and it is converted to an integer
7 age = int(input("What age are you? "))
8 print("You entered", age) #(iii)
9
10 name = input("Enter your name: ") #(v)
11
12 #(vi)
13 if (age > 74):
14     print(name, "you are entitled to apply for a three-year driving licence.")
15 elif (age < 17): #(iv)
16     print(name, "you are not entitled to apply for a driving licence.")
17 else:
18     print(name, "you are entitled to apply for a driving licence.")

```

(i)

10 marks (A-10 scale)

10 marks	Correct response Correct implementation using solution above or similar.
7 marks	Response with some merit Any other reasonable attempt.

(ii)

5 marks (B-5 scale)

5 marks	Correct response Correct implementation using solution above or similar.
3 marks	Response about half-right Comment does not properly explain code
2 marks	Response with some merit Any other reasonable attempt.

(iii)

10 marks (C-10 scale)

10 marks	Correct response Correct implementation using solution above or similar.
7 marks	Almost correct response Correct implementation using solution above or similar but with minor syntax or semantic error.
5 marks	Response about half-right Partially correct implementation using solution above or similar but with significant syntax or semantic error
3 marks	Response with some merit Any other reasonable attempt.

(iv)

15 marks (C-15 scale)

15 marks	Correct response Correct implementation using solution above or similar.
10 marks	Almost correct response Correct implementation using solution above or similar but with minor syntax or semantic error.
7 marks	Response about half-right Partially correct implementation using solution above or similar but with significant syntax or semantic error
3 marks	Response with some merit Any other reasonable attempt.

(v)

10 marks (C-10 scale)

10 marks	Correct response Correct implementation using solution above or similar.
7 marks	Almost correct response Correct implementation using solution above or similar but with minor syntax or semantic error.
5 marks	Response about half-right Partially correct implementation using solution above or similar but with significant syntax or semantic error
3 marks	Response with some merit Any other reasonable attempt.

(vi)

10 marks (C-10 scale)

10 marks	Correct response Correct implementation using solution above or similar.
7 marks	Almost correct response Correct implementation using solution above or similar but with minor syntax or semantic error.
5 marks	Response about half-right Partially correct implementation using solution above or similar but with significant syntax or semantic error
3 marks	Response with some merit Any other reasonable attempt.

(b)

20 marks

Possible solution:

```
1 # Question 16(b)
2 # Examination Number:
3
4 print("Split Bill Calculator")
5
6 # Accept the amount of the bill and cast as float to accept decimal
7 myBill = float(input("How much is the bill?: "))
8
9 # Accept the number of people and cast as an integer
10 numberOfPeople = int(input("How many people?: "))
11
12 # Calculate the amount owed by each person by dividing
13 # the bill total by the number of people
14 bill_per_person = myBill / numberOfPeople
15
16 # Display the amount owed by each person
17 print("You each owe", bill_per_person)
```

	High level of achievement All of the following implemented correctly and efficiently	Moderate level of achievement Reasonable attempt to implement each of the following	Low level of achievement Poor attempt to complete any of the following
Programming Standards (5 marks)	• Program executes with no syntax or runtime errors • Program meets requirements • Program design is well explained with comments • Meaningful variable names (5 marks)	• Program executes with no syntax or runtime errors • Program meets requirements • Program design is well explained with comments • Meaningful variable names (3 marks)	• Program executes with no syntax or runtime errors • Program meets requirements • Program design is well explained with comments • Meaningful variable names (2 marks)
Program Inputs (5 marks)	• User correctly prompted to enter a bill amount as a float data type • User correctly prompted to enter number of people as an integer data type • Variable initialisation and use of assignment statements (5 marks)	• User correctly prompted to enter a bill amount as a float data type • User correctly prompted to enter number of people as an integer data type • Variable initialisation and use of assignment statements (3 marks)	• User correctly prompted to enter a bill amount as a float data type • User correctly prompted to enter number of people as an integer data type • Variable initialisation and use of assignment statements (2 marks)
Program Logic (Processing) (5 marks)	• Programme divides total bill by the number of people (5 marks)	• Programme divides total bill by the number of people (3 marks)	• Programme divides total bill by the number of people (2 marks)
Program Outputs (5 marks)	• Program outputs "Split Bill Calculator" at the start • Program outputs "You each owe" + owned amount correctly (5 marks)	• Program outputs "Split Bill Calculator" at the start • Program outputs "You each owe" + owned amount correctly (3 marks)	• Program outputs "Split Bill Calculator" at the start • Program outputs "You each owe" + owned amount correctly (2 marks)

Coursework (90 marks in total)	
1. The report	Marks
- Quality of report website structure and layout. - Evidence of adherence to the principles of good user interface design when creating the website.	4
2. Meeting the brief	
- Meeting the basic requirements of the brief. - Meeting the advanced requirements of the brief.	24
3. Investigation	
- Research into the context of the brief, and existing solutions. - Conduct research with potential end user(s) to understand their needs.	10
4. Plan and design	
- A clear, detailed description of the project. - A flowchart/architecture diagram to show how the project will work. - A description of the technologies you will use and their role within your project.	15
5. Create	
- A progress log covering the key milestones of the development process. - Explanation of unit testing applied during development. - Explain a problem that was encountered in the development of the project and how it was overcome. - An explanation of a piece of code that you have designed and created, which was important in the development of the project.	25
6. Evaluation	
- An evaluation of your project based on the requirements set out in the brief. - An evaluation of how your project has met the needs of the end user(s). - Suggest how you would further improve/iterate this project.	12
References and summary word count	
- You must also include references and/or a bibliography. - Include a summary of the word count of the report, including the total word count.	0

Higher grade	Ordinary grade	Reference Mark	Higher Mark	Ordinary Mark
1		81 – 90	81 – 90	90
2		72 – 80	72 – 80	90
3		63 – 71	63 – 71	90
4		54 – 62	54 – 62	90
5	1	45 – 53	45 – 53	81 – 90
6	2	36 – 44	36 – 44	72 – 80
7	3	27 – 35	27 – 35	63 – 71
8	4	23 – 26	23 – 26	54 – 62
	5	18 – 22	18 – 22	45 – 53
	6	14 – 17	14 – 17	36 – 44
	7	9 – 13	9 – 13	27 – 35
	8	0 – 8	0 – 8	0 – 26

COURSEWORK – conversion from reference mark to Ordinary-level mark

For Ordinary-level candidates, the final mark is found from the reference mark as follows:

- If the reference mark is 54 or more the final mark is 90.
- If the reference mark is at least 27 but less than 54, then add 36 to the reference mark to get the final mark.
- If the reference is at least 1 but less than 27, then double the reference mark and add 9 to get the final mark.
- If the reference mark is 0 the final mark is 0

Reference Mark	Conversion
54 or more	Award 90 marks
27 – 53	Add 36 marks
1 - 26	Multiply the reference mark by 2 and add 9 marks
0	0

