Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Applied 2013

Marking Scheme

Mathematical Applications

Common 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
LEAVING CERTIFICATE APPLIED, 2013

MATHEMATICAL APPLICATIONS

GENERAL GUIDELINES FOR EXAMINERS

1. Penalties of three types are applied to candidates' work as follows:
   - Blunders - mathematical errors/omissions (-3)
   - Slips - numerical errors (-1)
   - Misreadings (provided task is not oversimplified) (-1).

   Frequently occurring errors to which these penalties must be applied are listed in the scheme. They are labelled as B1, B2, B3,....., S1, S2, S3,...., M1, M2, etc. Note that these lists are not exhaustive.

2. When awarding attempt marks, e.g. Att(3), it is essential to note that
   - any correct relevant step in a part of a question merits *at least* the attempt mark for that part
   - if deductions result in a mark which is lower than the attempt mark, then the attempt mark must be awarded
   - a mark between zero and the attempt mark is never awarded.

3. Worthless work is awarded zero marks. Some examples of such work are listed in the scheme and they are labelled as W1, W2,....etc.

4. The *same* error in the *same* section of a question is penalised *once* only.

5. Special notes relating to the marking of a particular part of a question are indicated by an asterisk. These notes immediately follow the box containing the relevant solution.

6. Particular cases, verifications and answers derived from diagrams (unless requested) qualify for attempt marks only.

7. The phrase “and stops” means that no more work is shown by the candidate.

QUESTION 1

Part (a)	**5 marks**	**Att 2**
Part (b)	**5 marks**	**Att 2**
Part (c)	**5 marks**	**Att 2**
Part (d)	**5 marks**	**Att 2**
Part (e)	**5 marks**	**Att 2**
Part (f)	**5 marks**	**Att 2**
Part (g)	**5 marks**	**Att 2**
Part (h)	**5 marks**	**Att 2**
Part (i)	**5 marks**	**Att 2**
Part (j)	**5 marks**	**Att 2**

Part (a) **5 marks** **Att 2**

Calculate $\sqrt{215}$, correct to two decimal places.

(a) **5marks** **Att 2**

(a) $\sqrt{215} = 14{\cdot}6628783$

$= 14{\cdot}66$

* Accept correct answer with no work.

Blunders(-3)
B1: Answer = $(215)^2 = 46225$
B2: Answer = $215 \div 2 = 107.5$
B3: Misplaced decimal.

Slips (-1)
S1: Each numerical error to a max. of –3.
S2: Failure to round or incorrect rounding.

Attempts(2)
A1: $215 \times 2 = 430$

Part (b) **5 marks** **Att 2**

A house originally priced at €225 000 is reduced by 5%. What is the new selling price of the house?

(b) **5 marks** **Att 2**

(b) €225 000 × 5% = €11 250.
New selling price = €225 000 - €11 250
= €213 750

* Accept correct answer with no work.

Blunders(-3)
B1:Misplaced decimal.
B2: Inverts 225000
B3: Inverts 5%

Slips(-1)
S1: Each numerical error to a max. of –3.
S2: Failure to round or incorrect rounding.
S3: Answer = €11250 (+ S4)
S4: Calculates 105% (236250)

Attempts(2)
A1: Multiplies the €225 000 × 5 = €1 125 000 and stops
A2: Answer = 225000 ±5 (225005/224995)
A3: €225000 decreased by any number not mentioned above.
A4: Answer = 95%
A5: Answer = 225000 ÷ 5 = 45000 or 225000 – 45000 = 180000

Part (c) **5 marks** **Att 2**

An injection uses 15 cm^3 of medicine. How many such injections can be got from 1·8 litres of medicine?

(c) **5marks** **Att 2**

(c) 1·8 litres × 1000 cm^3 = 1800 cm^3
Number of injections = 1800 ÷15
= 120

* Accept correct answer with no work.

Blunders(-3)
B1: 1800 ×15 = 27000 or 1.8×15=27.00
B2: Failure to covert litres to cm^3
B3: Misplaced decimal

Slips(-1)
S1: Each numerical error to a max. of –3.

Attempts(2)
A1: Answer = 1·8 ±15 (16.8/-13.2)
A2: Answer = 15÷1.8 = 8.33333
A3: Answer = 15^3 = 3775÷1.8 = 1875 or 3375× 1.8 = 6075

Part (d) **5 marks** **Att 2**

What measurement is the arrow pointing to?

(d) **5marks** **Att 2**

(d) Answer = 4·3

* Accept correct answer with no work.

Blunders(-3)
B1: Answer = 0·3
B2: Answer = 4·2 or 4.4
B3: Misplaced decimal

Part (e)	**5 marks**	**Att 2**
Given an exchange rate of €1 = £0·79 sterling, convert €150 to sterling		

(e)	**5 marks**	**Att 2**
€150 × £0·79 = £118·50		

* Accept correct answer with no work

Blunders(-3)
B1: Answer = €150 ÷£0·79 = £189·87
B2: Inverts €150. (.005266660)
B3: Misplaced decimal

Slips(-1)
S1: Failure to round or incorrect rounding
S2: Incorrect or omitted units.
S3: Each numerical error to a max of -3

Attempts(2)
A1: Answer = €150± 0·79 (150.79/149.21)

Worthless (0)
W1: Answer = €150 or 0.79

Part(f) **5 marks** **Att 2**

Calculate $1\frac{3}{4} \cdot 2\frac{1}{3}$

(f) **5 marks** **Att 2**

(f) $1\frac{3}{4} \cdot 2\frac{1}{3} = \frac{7}{4} \cdot \frac{7}{3} @ \frac{21}{12} \cdot \frac{28}{12} @ \frac{49}{12} @ 4\frac{1}{12}$ ***or*** $1{\cdot}75 + 2{\cdot}33333333 = 4{\cdot}08333333$

* Accept correct answer with no work

* Accept answer = $\frac{49}{12}$ or any equivalent of $\frac{49}{12}$

Blunders(3)

B1: Misplaced decimal

B2: Incorrect common denominator

Slips(-1)

S1: Each numerical error to a max. of -3.

S2: Truncates decimal answer.

Attempts(2)

A1: Answer = $\frac{7}{4}$ or $\frac{7}{3}$

A2: Answer = (1+2) = 3 4/7

A3: Answer = 13/4+21/3=41/4

Worthless (0)

W1: Answer = $\frac{7}{7}$

Part (g) **5 marks** **Att 2**

A regular hexagon has a side of length 7.25 cm. Find the perimeter of the hexagon

(g) **5 marks** **Att 2**

(g) 7·25 cm × 6 = 43·5 cm

***** Accept correct answer with no work

Blunders(3)
B1: Misplaced decimal
B2: Inverts 7·25 and continues
B3: Calculates 7.25×7.25=52.5625
B4: Omits one side to a max of 4
B5: Divides by 6 (1.200833333)
B6: Answer = 7.25 + 7.25 + 7.25 + 7.25 + 7.25 + 7.25 and stops or 7.25 × 6 and stops
B7: Answer = 7.25 + 6 = 13.25

Attempts(2)
A1: Any use of 6 or 7.25
A2: Indicates lengths on sides on diagram

Slips(-1)
S1: Each numerical error to a max of -3.
S2: Incorrect or omitted units

Worthless(0)

W1:Answer = 7.25 cm
W2: Answer = 7.25 ÷ 2 = 3.625

Part (h) **5 marks** **Att 2**

I lodged three cheques for €34·32, €23·67 and €12·76 in the bank. How much in total did I lodge?

(h) **5marks** **Att 2**

(h) €34·32 + €23·67 + € 12·76 = €70·75

* Accept correct answer with no work.

Blunders(-3)

B1: Subtracts instead of adds (€-2.11).

B2: Misplaced decimal

Slips(-1)

S1: List evident….one amount omitted.

S2: Each numerical error to a max of - 3.

Attempts(2)

A1: Answer = €34·32 + €23·67 + € 12·76 and stops.

A1: Multiplies the cheques (10365.64)

A3: Answer = €70.75÷3 = €23.58

Worthless(0)

W1: Answer = One of the cheques only

Part (i) **5 marks** **Att 2**

What is the difference between the largest and the smallest of the following numbers:
0·034, 0·403, 0·304, 0·430, 0·043

(i) **5marks** **Att 2**

(i)
0·034, 0·043, 0· 304, 0·403, 0·430

=> Difference = 0·430 - 0·034 = 0·396

* Accept correct answer with no work.

Blunders(-3)
B1: Incorrect smallest number unless S3
B2: Incorrect largest number unless S3
B3: Misplaced decimal.
B4: Adds instead of subtracts (0·464)

Slips(-1)
S1: Each numerical error to a max. of -3.
S2: Truncates or rounds decimal answer
S3: Either smallest or largest correct and the opposite incorrect

Attempts(2)
A1: Answer = incorrect smallest number – incorrect largest number
A2: List put into correct order and stops.
A3: Any attempt to convert any one number to fractions
A4: Answer = 0.034 or 0.430

Worthless(0)
W1: Answer = any one number from the given list.

Part (j) **5 marks** **Att 2**

A letter is chosen at random from the word ALGEBRA. What is the probability the letter chosen is an A?

(j) **5marks** **Att 2**

(j) $\frac{2}{7}$

* Accept answer written as 2:7, 2 in 7, 2 out of 7, or 0·2857142857

Blunders(-3)

B1: No fraction or ratio set up.

B2: Answer = 2 + B1.

B3: Answer = 7 + B1.

B4: Answer $= \frac{7}{2}$

B5: Answer $= \frac{1}{7}$.

Slips(-1)

S1: Truncates decimal answer

S2: Answer = 2-7 or 2 to 7

Attempts(2)

A1: Any proper fraction other than $\frac{2}{7}, \frac{1}{7}, \frac{7}{2}$.

QUESTION 2

Part (a)	**10 marks**	**Att 3**
Part (b)	**5 marks**	**Att 2**
Part (c)	**10 marks**	**Att 2,2**
Part (d)	**5 marks**	**Att 2**
Part (e)	**10 marks**	**Att 2,2**
Part (f)	**10 marks**	**Att 3**

Part (a) **10 marks** **Att 3**

Estimate the costs involved, to the nearest euro

(a) **10 marks** **Att 3**

(a)

Quantity	Item	Cost (to the nearest €)
10	Packets of crisps at 72 cent each	7
5	Bags of sweets at €1·85 each	9
20	Cupcakes at 52 cent each	10
12	Sausage Rolls at 37 cent each	4

* Accept correct answers with no work

Blunders(-3)
B1: Incorrect or lack of rounding, apply once only.
B2: Each cost omitted
B3: Misplaced decimal
B4: answer = €30
B5: Fails to multiply by quantity.

Slips(-1)
S1: Each numerical error to a max of -3.

Attempts(3)
A1: One cost estimated, correct or incorrect

Part (b) **5 marks** **Att 2**

John gave an estimate of €30. Mary said it would be nearer €40. Which of them gave the best estimate?

(b) **5 marks** **Att 2**

(b) Estimated costs = €7 + €9 +€10 +€ 4 = €30
John gave best estimate.

* Accept correct answer without work
* Accept candidate's answer from part (a)

Attempts(2)
A1: Answer = Mary, with no work.

Part (c) **10 marks** **Att 2,2**

The attendance at a football match, when given to the nearest thousand, was 37 000.
(i) What is the maximum number that could have been in attendance?
(ii) What is the minimum number that could have been in attendance?

(c) (i) **5 marks** **Att 2**

(i) What is the maximum number that could have been in attendance?

(c) (i) **5 marks** **Att 2**

(c) (i) 37 499

* Accept correct answer with no work.

Blunders(-3)

B1: Maximum given > 37 500 to 40000 unless S1.

B2: Answer = 37000

Slips(-1)

S1: Answer for part (i) given for part (ii) **and** visa versa once only

S2: Answer = number between 37 001 and 37 500

Attempts(3)

A1: Number greater ≥ 37500 and ≤ 40000

Worthless(0)

W1: Answer = 30 000 <number < 37 000

(c) (ii) **5 marks** **Att 2**

(ii) What is the minimum number that could have been in attendance?

(c) (ii) **5 marks** **Att 2**

(c) (ii) 36 500

* Accept correct answer with no work.

Blunders(-3)

B1: Minimum given from 30000 < 36 500 unless S1.

B2: Answer = 37000

Slips(-1)

S1: Answer for part (i) given for part (ii) **and** visa versa once only

S2: Answer = number between 36 501 and 37 000

Attempts(2)

A1: Number ≥ 30000 and ≤ 36500

Worthless(0)

W1: Answer = number > 38 000

Part (d) **5 marks** **Att 2**

Round the following to the nearest whole number:

(i) 143·2 ***(ii)*** 0·58 ***(iii)*** 14·728

(d) **5 marks** **Att 2**

(d) ***(i)*** 143
(ii) 1
(iii) 15

* Accept correct answer without work

All three correct 5 marks
Two correct 4 marks
One correct 3 marks

Attempts(2)
A1: Only one part attempted incorrect

Part (e) **10 marks** **Att 2,2**

(i) Write 96·41 to the nearest 10

(ii) Use your answer to estimate $\sqrt{96.41}$.

(e) *(i)* **5 marks** **Att 2**

(i) Write 96·41 to the nearest 10

(e) *(i)* **5 marks** **Att 2**

(e) *(i)* 100

* Accept correct answers with no work.

Blunders(-3)
B1: Incorrect rounding (answer must be a whole number between 90 and 99 or 96.4/100.4 /100.41)

Worthless(0)
W1: Answer = 96·41

(e) *(ii)* **5 marks** **Att 2**

(ii) Use your answer to estimate $\sqrt{96.41}$.

(e) *(ii)* **5 marks** **Att 2**

(e) *(ii)* Estimated answer = $\sqrt{100} = 10$

* Accept correct answers with no work.
* Accept candidate's answer from part (e) (i)

Blunders(-3)
B1: Answer = $\sqrt{100}$ and stops.
B2: Answer = 9

Slips(-1)
S1: Answer = 9·818859404 and stops
S2: Truncates or rounds decimal answer
.

Part (f) **10 marks** **Att 3**

Round the numbers as indicated in the following:

Lottery Jackpot of €5 116 813 last weekend

The Lottery Jackpot last weekend was over_____ (rounded to nearest million euro).

387 216 people now registered as unemployed

Nearly_____ (rounded to nearest 100 000) people now unemployed.

Inflation in Europe now running at 0·0275

European inflation is now at nearly_____ (rounded to two places of decimals).

(f) **10marks** **Att 3**

Lottery Jackpot of €5 116 813 last weekend

The Lottery Jackpot last weekend was over (i) **€ 5 million** (rounded to nearest million euro).

387 216 people now registered as unemployed

Nearly (ii) **400 000** (rounded to nearest 100 000) people now unemployed.

Inflation in Europe now running at 0·0275

European inflation is now at nearly (iii) **0.03** (rounded to two places of decimals).

* Accept correct answer with no work
*Accept 5 or 4
Marking Scheme
All three correct……10 marks
Two correct……7 marks
One correct…….4 marks

Attempts(3)
A1: Only one part attempted incorrect

QUESTION 3

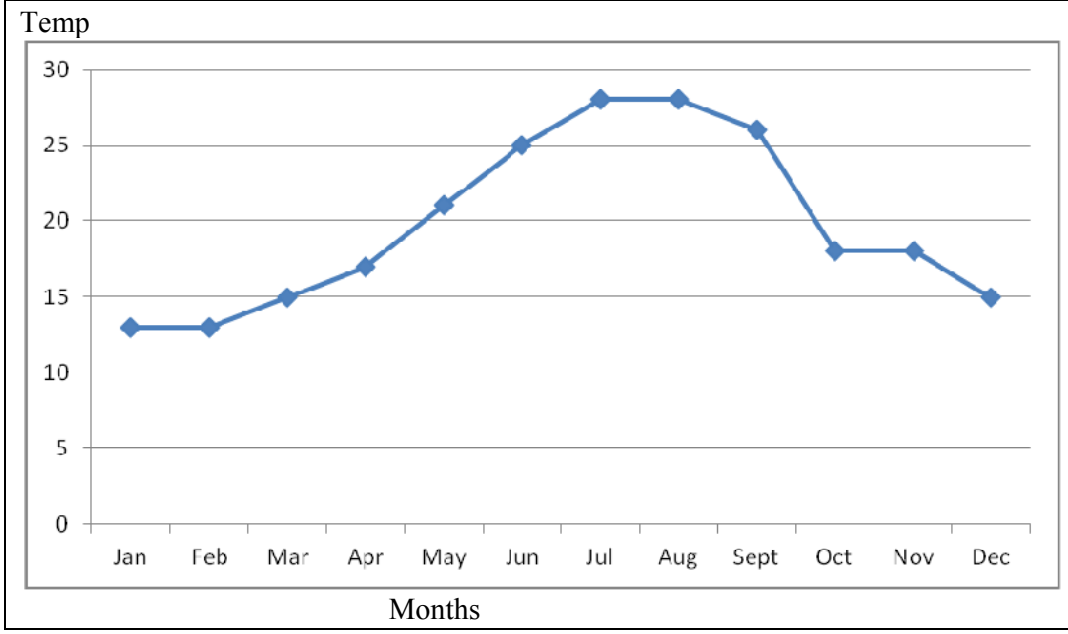
Part (a)	**20 marks**	**Att 7**
Part (b)	**10 marks**	**Att 3**
Part (c)	**5 marks**	**Att 2**
Part (d)	**15 marks**	**Att 2,2,2**

Part (a) **20 marks** **Att 7**

(a) The average monthly temperature for Malta is recorded on the following table:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp(°C)	13	13	15	17	21	25	28	28	26	18	18	15

Draw a trend graph to represent this information



Blunders(-3)
B1: Omits a month to a max of -9.
B2: Divisions on Month axis not all of equal length
B3: Incorrect scaling of the 'freq.' axis/
B4: Omits names of months.
B5: Dots not joined or incorrectly joined.
B6: Serious mishandling of scale, numbers or months not in correct order + B3
B7: Omits labels on axis once only
Attempts(7)
A1: Labels one or two axes only.
A2: Draws trend graph with no axes
Misreading(-1)
M1: Constructs correct bar chart or pie chart.

Part (b)	**10 marks**	**Att 3**
Calculate the average temperature for June, July and August		

(b)	**10 marks**	**Att 3**
(b) $\frac{25 \,.\, 28 \,.\, 28}{3} = \frac{81}{3} = 27°C$		

* Accept correct answer with no work.

Blunders(-3)
B1: Multiplies the total by 3 (Answer = 243)
B2: Total only + B1
B3: Inverts 81
B4: Misplaced decimal
B5: Each incorrect temperature unless M1
B6: Adds all 12 months and finds average (19.75)

Slips(-1)
S1: Each numerical error to a max of -3.
S2: Incorrect or omitted units
S3: List evident, one temperature omitted

Attempts(3)
A1: Any indication of addition
A2: Multiplies one of the temperatures by 3

Misread(-1)
M1: Uses any other 3 consecutive months

Worthless(0)
W1: Multiplies temperatures only
W2: Answer = 3, with no work
W3: Answer = 28

Part (c) **5 marks** **Att 2**

(c) Convert the temperature for July to degrees Fahrenheit using the formula

$$F @ C „ \frac{9}{5} . 32$$

(c) **5 marks** **Att 2**

(c) $F = 28 \times \frac{9}{5} . 32$

$F = \frac{252}{5} . 32$

$F = 50{\cdot}4 + 32$

$F = 82{\cdot}4°F$

* Accept correct answer with no work

*Accept answer = $82\frac{2}{5}$°F or $\frac{412}{5}$°F

Blunders(-3)

B1: Ignores order of operations

B2: Mishandles or ignores $\frac{9}{5}$

B3: Misplaced decimal

B4: Correct substitution and stops + B1 + possible B2

Slips(-1)

S1: Each numerical error to a max of -3

S2: Truncates or rounds decimal

Attempts(2)

A1: Substitution for C correct or incorrect and stops

Part (d) **15(5,5,5) marks** **Att 2,2,2**

ROUTE	41a	41b	41c
Dublin(Busáras) dep.	1305	1400	1450
Dublin Airport dep.	1320**P**	1415**P**	1505**P**
Newry(Buscentre) arr.	1430**D**	1525**D**	1615**D**
Banbridge(War Memorial) arr.	1450**D**	1545**D**	1635**D**
Sprucefield(Shopping Centre) arr.	1510**D**	1605**D**	1655**D**
Belfast(Glangall Street) arr.	1525	1620	1710

(i) At what time does the **41c** bus arrive in Belfast?
(ii) How long does it take the **41a** bus to reach Belfast from Dublin?
(iii) The distance from Dublin to Belfast is 170 km.

Calculate the average speed of the **41a** bus, using $S = \frac{D}{T}$

(d) (i) **5 marks** **Att 2**

(d) (i) 41c bus arrives at 1710

* Accept use of the 12 hour clock but must indicate am or pm

Blunders(-3)
B1: Incorrect column
B2: Incorrect row

Slips(-1)
S1: Calculates the duration of the journey correctly
S2: Uses 12 hour clock but does not indicate am or pm

(d) (ii) **5 marks** **Att 2**

(d) (ii) Duration = 15:25 – 13:05
= 2 hours and 20 minutes / 140 minutes

* Accept correct with no work.
*Accept answer using any column

Blunders(-3)
B1: 1 hour = 100mins
B2: Adds instead of subtracts

Slips(-1)
S1: Each numerical error to a max of -3
S2: Answer = 220 with no units

Misreadings(-1)
M1: Uses incorrect row

Attempts (2)
A1: Answer = arrival time in Belfast only (1525)
A2: Answer = any time greater than 2 hours

(d) (iii) **5 marks** **Att 2**

(d) (iii) $S = \frac{D}{T}$

$S = \frac{170}{2.33333}$

S = 72·85715 km per hour

* Accept correct answer with no work.
*Accept candidate's answer from part (d)(ii)

Blunders(-3)
B1: Multiplies by 2·33333333333333 (39.666666)
B2: Correct substitution and stops
B3: Each incorrect substitution
B4: Inverts $\frac{170}{2.33333}$ (0.3333352871)
B5: Misplaced decimal
B6: 1 hour = 100 minutes (170÷2.20 =77.27)

Slips(-1)
S1: Each numerical error to a max of -3
S2: Incorrect or omitted units
S3: Truncates answer

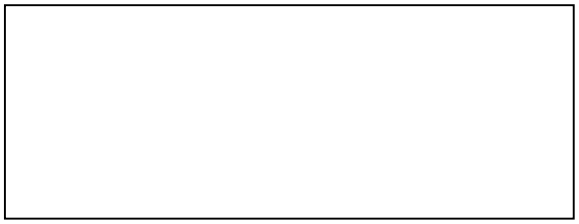
Attempts (2)
A1: One substitution only correct or incorrect
A2: 170± 2·3333333333333 and stops

QUESTION 4

Part (a)	**10 marks**	**Att 3**
Part (b)	**10 marks**	**Att 3**
Part (c)	**10 marks**	**Att 3**
Part (d)	**10 marks**	**Att 3**
Part (e)	**5 marks**	**Att 2**
Part (f)	**5 marks**	**Att 2**

Part (a) **10 marks** **Att 3**

In the box below, construct a rectangle 8 cm long and 3 cm wide



***** tolerance ± 0·1 cm
* tolerance ± 3°
* Accept width = 8 cm and length = 3 cm

Blunders(-3)
B1: Each side of rectangle omitted to a max of -6
B2: Side outside tolerance of 0·5 cm applied once to either side.
B3: Angle not between 80° and 100° once only.
Slips(-1)
S1:Incorrect units.
S2: Each side outside tolerance of 0·1 cm unless B2 applied once to either side.
S3: Angle not between 87° and 93°, once only unless B3

Attempts(3)
A1: One side drawn only, within tolerance
A2: Rectangle not drawn with straight edge.
A3: Draws a triangle with no sides correct

Part (b) **10 marks** **Att 3**

The rectangle you have drawn in part (a) is a scaled diagram of a parking space. The scale is 1:200. Calculate the actual measurements of the car parking space.

(b) **10 marks** **Att 3**

(b) Length: 8 cm × 200 = 1600 cm or 16 metres
Width : 3 cm × 200 = 600 cm or 6 metres

* Accept correct answer with no work
* Accept answer in cm or m.

Blunders(-3)
B1: Correct answer for the length or width only
B2: Divides by 200
B3: Answer = 8×1.2 = 9.6 / 3×1.2= 3.6

Slips(-1)
S1:Each numerical error to a max. of -3.
S2: Incorrect or omitted units once only

Attempts(3)
A1: Answer = length = 1 cm and width = 200 cm and stops
A2: Answer = length = 9 cm (8+1) and width = 203 cm (3+200)

Worthless(0)
W1:Length = 8 cm and width = 3 cm and stops

Part (c) **10 marks** **Att 3**

What is the area of the car parking space? Give your answer in m^2

(c) **10 marks** **Att 3**

(c) Area:- 16 m ×6 m = 96 m^2

* Accept correct answer with no work
* Accept candidate's answer from part (b)

Blunders(-3)
B1: Misplaced decimal.
B2: Divides to get area
B3: Incorrect length unless B8
B4: Incorrect width unless B8
B5: Incorrect conversion.
B6: 16 × 6 and stops
B7: Calculates perimeter + B5 (Answer = 22 cm)
B8: Area = 8 cm × 3 cm 0·0024 m^2

Slips(-1)
S1: Each numerical error to a max. of -3.
S2: Incorrect or omitted units

Attempts(3)
A1: Answer =16 - 6 and stops

Worthless(0)
W1: Answer = 8 or 3 or 200 not relevant to candidates answer from part (b)

Part (d) **10 marks** **Att 3**

Tarmacadam costs €16·50 per square metre. Find the cost of tarmacadam for the parking space.

(d) **10 marks** **Att 3**

(d) 96 m^2 × €16·50 = €1584.

* Accept correct answer with no work
* Accept candidates answer from part (c)

Blunders(-3)
B1: Divides by €16·50.
B2: Inverts 96
B3: Misplaced decimal

Slips(-1)
S1:Each numerical error to a max. of -3.
S2: Failure to round or incorrect rounding.

Attempts(3)
A1: Answer = 96 ± 16·50 and stops

Part (e) **5 marks** **Att 2**

(e) €364·32 VAT is added to the cost of the tarmacadam. Find the percentage rate of VAT that is being used.

(e) **5 marks** **Att 2**

(e) VAT rate = $\frac{364{\cdot}32}{1584} \times 100 = 0{\cdot}23 \times 100 = 23\%$

* Accept candidate's answer for part (d)
* Accept correct answer with no work

Blunders(-3)

B1: Inverts $\frac{364{\cdot}32}{1584}$.(4.347826087)

B2: Subtracts €364·32 from €1584 and continues

B3: Misplaced decimal

Slips(-1)

S1: Each numerical error to a max. of -3.

Attempts(2)

A1: Answer = €364·32 + €1584 (1948.32)

A2: Answer = €364·32 ×€1584 (577082.88)

A3: Some work with 100

Part (f) **5 marks** **Att 2**

(f) A sphere has diameter of length 5 cm. Calculate the volume of the sphere taking $\pi = 3{\cdot}14$.

(f) **5 marks** **Att 2**

$$\text{Volume} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times 3{\cdot}14 \times 2.5^3$$

$$= \frac{4}{3} \times 3{\cdot}14 \times 15{\cdot}625$$

$$= \frac{4}{3} \times 49{\cdot}0625$$

$$= 65{\cdot}416666 \text{ cm}^3 \quad \text{or} \quad 65\frac{5}{12}\text{cm}^3$$

* Accept volume using $\pi = \frac{22}{7}$

* Accept answer = 65·44984695 (using π button on the calculator)

* Accept correct answer with no work

Blunders(-3)

B1: r = diameter

B2: Mishandling of r^3 (e.g $3r$ for r^3)

B3: Fails to substitute for π and continues (Answer = 20·83333333 cm^3)

B4: Misplaced decimal.

B5: Correct substitution and stops + possible B2

B6: Mishandles or ignores fraction

Slips(-1)

S1: Each numerical error to a max. of -3.

S2: Truncates answer

S3: Incorrect or omitted units

Attempts(2)

A1: Only one substitution correct or incorrect and stops

A2: Adds the dimensions only.

QUESTION 5

Part (a)	**10 marks**	**Att 3**
Part (b)	**10marks**	**Att 3**
Part (c)	**5 marks**	**Att 2**
Part (d)	**10marks**	**Att 3**
Part (e)	**5 marks**	**Att 2**
Part (f)	**10 marks**	**Att 2,2**

Part (a) **10 marks** **Att 3**

Write out the list of all possible two-digit numbers that can be made using the digits 2, 3, 4.

(a) **10 marks** **Att 3**

(a) 22, 23, 24,
32, 33, 34,
42, 43, 44,

* Accept correct answer in any order

One or two (including 42) selections correct = 3 marks
Three selections correct = 4 marks
Four selections correct = 5 marks
Five selections correct = 6 marks
Six selections correct = 7 marks
Seven selections correct = 8 marks
Eight selections correct = 9 marks
Nine selections correct = 10 marks

Note no penalty for extra numbers

Attempt(3)
A1: Answer = 6 and stops.
A2: Answer = 9 and stops

Misreadings(-1)
M1: Lists all 3 digit numbers.

Part (b) **10 marks** **Att 3**

One ticket is chosen at random. What is the probability that the number on the ticket chosen is an odd number?

(b) **10 marks** **Att 3**

(b) $\frac{3}{9}$ or $\frac{1}{3}$

* Accept answer written as 3:9, 3 in 9, 3 out of 9, or 0·333333333333
* Accept answer written as 1:3, 1 in 3, 1 out of 3, or 0·333333333333
* Accept correct without work.
* Accept candidate's answer for part (a)

Blunders(-3)

B1: No fraction or ratio set up.
B2: Answer = 3+ B1. or 1 +B1
B3: Answer = 9+ B1. or 3 +B1
B4: Answer = $\frac{9}{3}$ or $\frac{3}{1}$
B5: Answer = $\frac{1}{9}$

Slips(-1)

S1: Truncates decimal answer.
S2: Answer = 3 to 9 or 1 to 3
S3:Answer = 3 to 9 or 1 to 3

Attempts(3)

A1: Any proper fraction other than $\frac{3}{9}, \frac{1}{9}, \frac{3}{1}$.

Part (c) **5 marks** **Att 2**

This ticket is replaced, and a ticket is again drawn at random. What is the probability that the number on the ticket chosen is less than 40?

(c) **5 marks** **Att 2**

(c)

$\frac{6}{9}$ or $\frac{2}{3}$

* Accept answer written as 2:3, 6:9, 6 in 9, 2 in 3, 2 out of 3, 6 out of 9 or 0·6666666666
* Accept candidate's answer for part (a)

Blunders(-3)
B1: No fraction or ratio set up.
B2: Answer = 2 + B1or 6 + B1
B3: Answer = 3 + B1 or 9 + B1
B4: Answer = $\frac{9}{6}$ or $\frac{3}{2}$
B5: Answer = $\frac{1}{9}$ or $\frac{1}{3}$

Slips(-1)
S1: Truncates decimal answer
S2: Answer = 6 to 9 or 2 to 3
S3: Answer = 6 to 9 or 2 to 3

Attempt(2)
A1: Any proper fraction other than $\frac{6}{9}, \frac{2}{3}, \frac{9}{6}, \frac{1}{9}, \frac{1}{3}$.

Part (d) **10 marks** **Att 3**

Michelle has a gross salary of €28 500 per year.
(d) Tax is paid at 21%. Calculate Michelle's tax

(d) **10 marks** **Att 3**

(d) €28 500 × 21% = €5985

* Accept correct answer with no work

Blunders(-3)
B1: Inverts 21%
B2: Inverts €28 500
B3: Misplaced decimal.

Slips(-1)
S1: Each numerical error to a max. of -3.
S2: Calculates 121%
S3: Answer = €22515

Attempts(3)
A1: Answer = €28 500 ± 21

Part (e) **5 marks** **Att 2**

Michelle has a tax credit of €3340 per year. How much tax does she pay?

(e) **5 marks** **Att 2**

(e) Tax = €5985 - €3340
= €2645

* Accept correct answer with no work
*Accept candidate's answer from part (d)

Blunders(-3)
B1: Adds rather than subtracts tax credits (€9325)
B2: Calculates 21% of answer in part (d) and continues
B3: Misplaced decimal

Slips(-1)
S1: Each numerical error to a max. of -3.
S2: Truncates answer

Attempts(2)
A1: €28 500 ± €3340 and stops (31840/25160)

Part (f) **10 marks** **Att 2,2**

The Universal Social Charge (USC) is calculated using the following chart

Fill in the missing details to calculate Michelle's USC

Income	% USC	USC
€0 - €10036	2%	€200·72
€10036 - €16016	4%	€239·20
Earnings over €16016	7%	
Total USC payable		

(f)(i) **5 marks** **Att 2**

f(i)
Earnings over €16016 7%

(f)(i) **5 marks** **Att 2**

(f)
€28 500 - €16016 = €12484× 7% = €873.88

* Accept correct answer with no work
Blunders(-3)
B1: Inverts 7% and continues
B2: Inverts €16016 and continues
B3: Uses 2% or 4%
B4: Fails to subtract 16016 from 28500 and continues (gets 7% of 16016 = 1121.12)
B5: Misplaced decimal

Slips(-1)
S1: Each numerical error to a max. of -3.
S2: Truncates answer

Attempts(2)
A1: €16016 ±7.
A2: Finds 7% of a relevant number

(f)(ii) **5 marks** **Att 2**

f(ii)

Total USC Payable

(f)(ii) **5 marks** **Att 2**

(f)(ii)

€200·72 + €239·20 + €873.88= €1313.80

* Accept answer from part f(i)
*Accept correct with no work

Blunders(-3)
B1: Each amount omitted to a max of -3
B2: Subtracts rather than adds
B3: Misplaced decimal

Slips(-1)
S1: Each numerical error to a max. of -3.
S2: Truncates answer

Attempts(2)
A1: Answer = €200·72 or €239·20 or answer from part f (i)