Pearson Edexcel International GCSE in Mathematics (Specification B) (9-1)

Exemplar student answers with examiner comments

Contents

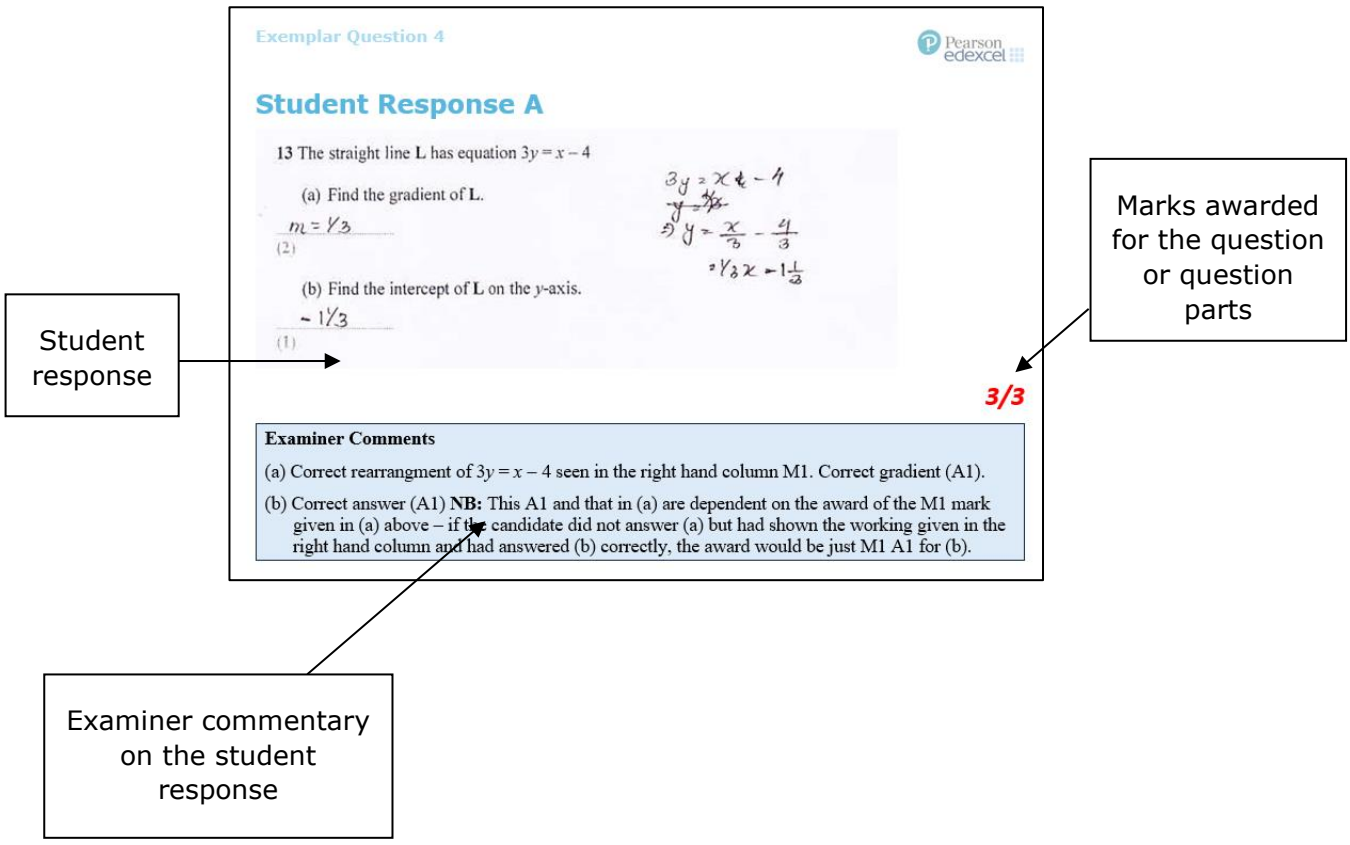
About this booklet

This booklet has been produced to support mathematics teachers delivering the new International GCSE in Mathematics Specification B.

The booklet looks at questions from the Sample Assessment Materials. It shows real student responses to these questions, and how the examining team follow the mark scheme to demonstrate how the students would be awarded marks on these questions.

How to use this booklet

Our examining team have selected student responses to 18 questions. Following each question you will find the mark scheme for that question and then a range of student responses with accompanying examiner comments on how the mark scheme has been applied and the marks awarded, and on common errors for this sort of question.



Guide on the use of abbreviations

M	method mark awarded for a correct method or partial method
B	unconditional accuracy mark (no method needed)
A	accuracy mark (awarded after a correct method or process; if no method or process is seen then full marks for the question are implied but see individual mark schemes for more details)
oe	or equivalent
cao	correct answer only
ft	follow through (when appropriate as per mark scheme)
sc	special case
dep	dependent (on a previous mark)
indep	independent
awrt	answer which rounds to
isw	ignore subsequent working
ee	each error
oo	or omission
cc	correct conclusion
ncc	not corrected correctly
dp	decimal place

Paper 1

Exemplar Question 1

7. The point A has co-ordinates $(3, -4)$, with respect to the origin O.

The point C is such that $\overrightarrow{AC} = \begin{pmatrix} -5 \\ 7 \end{pmatrix}$

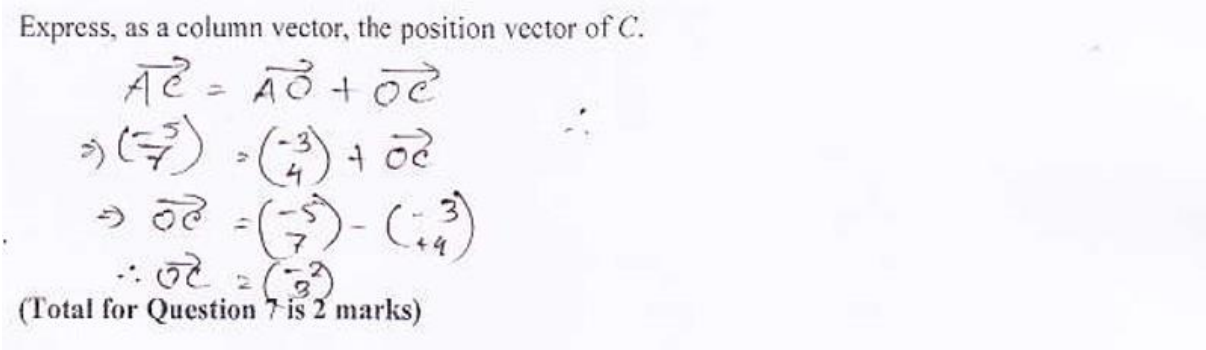
Express, as a column vector, the position vector of C.

(Total for Question 7 is 2 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
7.	$\overrightarrow{OC} = \begin{pmatrix} 3 \\ -4 \end{pmatrix} + \begin{pmatrix} -5 \\ 7 \end{pmatrix}$	$\begin{pmatrix} -2 \\ 3 \end{pmatrix}$	M1 A1	2.8	2

Student Response A


Express, as a column vector, the position vector of C.

$\overrightarrow{AC} = \overrightarrow{AO} + \overrightarrow{OC}$

$\Rightarrow \begin{pmatrix} -5 \\ 7 \end{pmatrix} = \begin{pmatrix} -3 \\ 4 \end{pmatrix} + \overrightarrow{OC}$

$\Rightarrow \overrightarrow{OC} = \begin{pmatrix} -5 \\ 7 \end{pmatrix} - \begin{pmatrix} -3 \\ +4 \end{pmatrix}$

$\therefore \overrightarrow{OC} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

(Total for Question 7 is 2 marks)

2/2

Examiner Comments

Correct statement of method (on line 3 of answer) for $\overrightarrow{OC}$ (M1).
A1 for correct column vector $\overrightarrow{OC}$.

Student Response B

The point C is such that $\overrightarrow{AC} = \begin{pmatrix} -5 \\ 7 \end{pmatrix}$ (-2, 3)

Express, as a column vector, the position vector of C.

$C = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

2/2

Examiner Comments

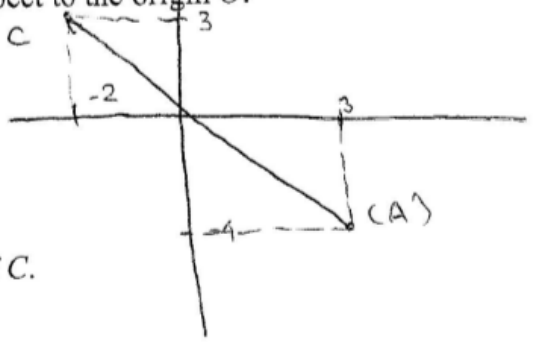
Correct answer for $\overrightarrow{OC}$ given with no working seen therefore M1 A1.
NB: However, as a rule, *incorrect* working followed by a *correct* answer will score zero marks.

Student Response C

7 The point A has co-ordinates $(3, -4)$, with respect to the origin O.

The point C is such that $\overrightarrow{AC} = \begin{pmatrix} -5 \\ 7 \end{pmatrix}$

Express, as a column vector, the position vector of C.



$C = (-2, 3)$

$C = -2i + 3j$

1/2

Examiner Comments

Correct diagram (M1) but the answer is not given as a column vector (A0).

Student Response D

7 The point A has co-ordinates $\overset{x_1}{(3}, \overset{y_1}{-4})$, with respect to the origin O.

The point C is such that $\overrightarrow{AC} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$

$\begin{pmatrix} -5 \\ 7 \end{pmatrix}$

Express, as a column vector, the position vector of C.

$\begin{pmatrix} -5 \\ 7 \end{pmatrix} \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ $\begin{pmatrix} -5 \\ 7 \end{pmatrix} + \begin{pmatrix} 3 \\ -4 \end{pmatrix}$

$= \begin{pmatrix} -5+3 \\ 7-4 \end{pmatrix} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

(Total for Question 7 is 2 marks)

2/2

Examiner Comments

Correct statement of method (on line 1 of answer) for $\overrightarrow{OC}$ (M1).
A1 for correct column vector.

Exemplar Question 2

8. The lengths of the sides of a rectangle, measured to the nearest 10 mm, are 90 mm and 40 mm.

Find the smallest possible perimeter, in mm, of the rectangle.

.....mm

(Total for Question 8 is 2 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
8.	85 mm or 35 mm		M1	1.1	
		240	A1	2.7	2

Student Response A

8 The lengths of the sides of a rectangle, measured to the nearest 10 mm, are 90 mm and 40 mm.
Find the smallest possible perimeter, in mm, of the rectangle.

85 + 35 = 120 mm

120 mm

1/2

Examiner Comments

M1 for using 85 and 35 as per scheme.
A0 for incorrect answer.

Student Response B

8 The lengths of the sides of a rectangle, measured to the nearest 10 mm, are 90 mm and 40 mm.
Find the smallest possible perimeter, in mm, of the rectangle.

smallest perimtre = 80 + 30
= 110 mm

110 mm

0/2

Examiner Comments

Neither 85mm nor 35 mm used therefore M0 and therefore A0.
(**NB:** An "A"(accuracy) mark can only be obtained if the corresponding "M" (method) marks have been obtained.)

Student Response C

8 The lengths of the sides of a rectangle, measured to the nearest 10 mm, are 90 mm and 40 mm.

Find the smallest possible perimeter, in mm, of the rectangle.

258 mm

90mm ≥ 89.5 mm

40mm ≥ 39.5 mm

(89.5+39.5) x 2 = 258

0/2

Examiner Comments

Incorrect values for the lengths of the smallest boundaries therefore M0 A0.

Student Response D

8 The lengths of the sides of a rectangle, measured to the nearest 10 mm, are 90 mm and 40 mm.

Find the smallest possible perimeter, in mm, of the rectangle.

~~140~~ 14 mm

~~90+40+~~

Area = 90x40

= 3600 mm²

~~140 90 40 10~~

#

Nearest 10 = 14

90+40+10

= ~~140mm~~ = 140 mm

0/2

Examiner Comments

No use of 85 nor 35 therefore M0 A0.

Exemplar Question 3

9. A fair 6-sided red dice and a fair 6-sided blue dice are rolled. The score on the red dice and the score on the blue dice are added together to get the total.

Given that the score on the red dice is 1, find the probability that the total is less than 4

Total for Question 9 is 2 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
9.	P(1, 1) + P(1, 2) = $\frac{1}{6}+\frac{1}{6}$ (oe)	$\frac{2}{6}$, $\frac{1}{3}$, 0.333, 33.3%	M1 A1	3.10	2

Student Attempt A

9. A fair 6-sided red dice and a fair 6-sided blue dice are rolled. The score on the red dice and the score on the blue dice are added together to get the total.
Given that the score on the red dice is 1 find the probability that the total is **less than 4** = $\frac{1}{3}$

$\frac{1}{6}$ $\frac{1}{3}$

2/2

Examiner Comments

Correct answer seen and preceeded by no (incorrect) working therefore M1 A1 awarded.

Student Attempt B

9. A fair 6-sided red dice and a fair 6-sided blue dice are rolled. The score on the red dice and the score on the blue dice are added together to get the total.
Given that the score on the red dice is 1, find the probability that the total is **less than 4**

Red dice = $\frac{1}{6}$ (P) = $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$

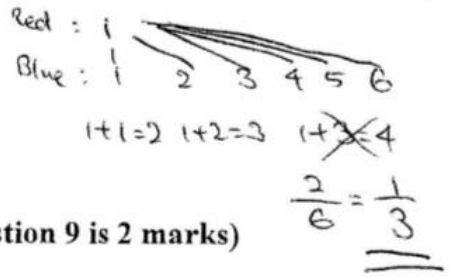
0/2

Examiner Comments

No correct method seen (M0 A0).

Student Attempt C

9. A fair 6-sided red dice and a fair 6-sided blue dice are rolled. The score on the red dice and the score on the blue dice are added together to get the total.
Given that the score on the red dice is 1, find the probability that the total is **less than 4**



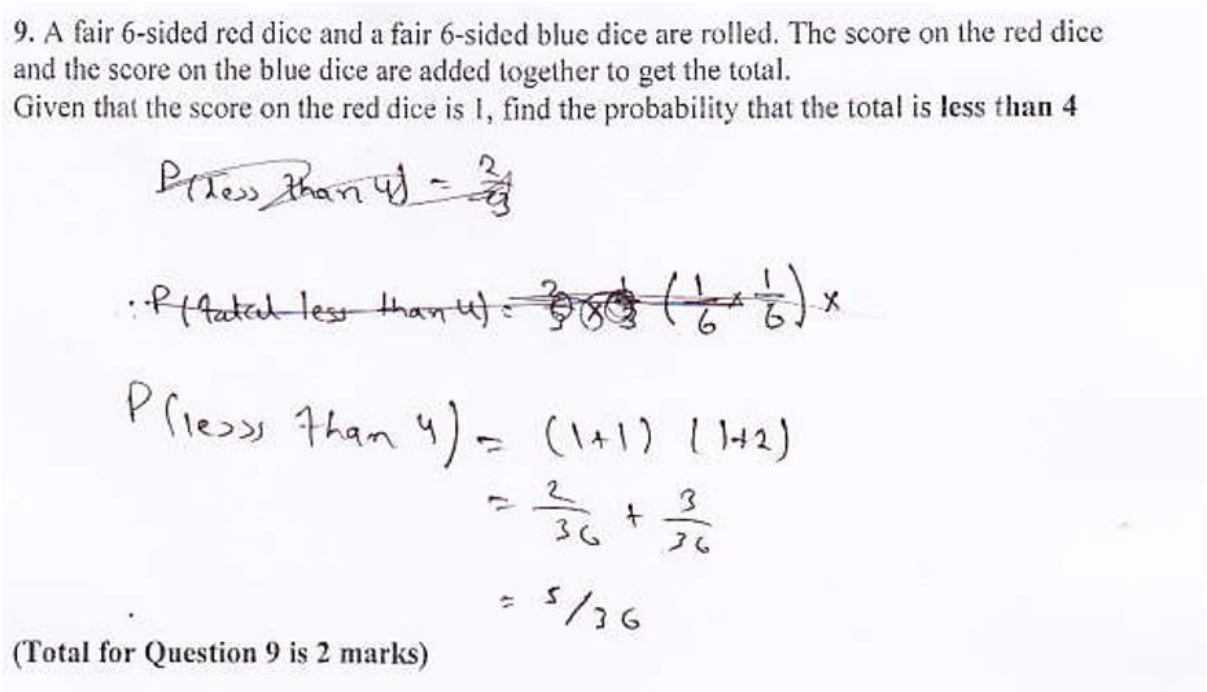
(Total for Question 9 is 2 marks)

2/2

Examiner Comments
Correct answer and preceeded by no (incorrect) working seen (M1 A1).

Student Attempt D

9. A fair 6-sided red dice and a fair 6-sided blue dice are rolled. The score on the red dice and the score on the blue dice are added together to get the total.
Given that the score on the red dice is 1, find the probability that the total is **less than 4**



(Total for Question 9 is 2 marks)

0/2

Examiner Comments
Adding incorrect probabilities (M0 thus A0).

Exemplar Question 4

13 The straight line L has equation $3y = x - 4$

(a) Find the gradient of L.

(2)

(b) Find the intercept of L on the y-axis.

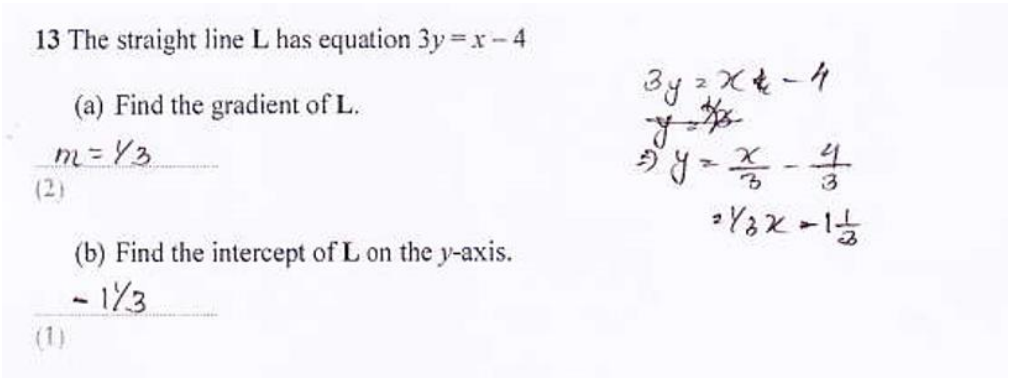
(1)

(Total for Question 13 is 3 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
13. (a)	$y = \frac{x-4}{3}$		M1	1.4	
		$(m =)\frac{1}{3}$	A1		2
(b)	**N.B.** The M mark is awarded once only	$-\frac{4}{3}$	A1		1

Student Response A



13 The straight line **L** has equation $3y = x - 4$

(a) Find the gradient of **L**.

$m = 1/3$

(2)

(b) Find the intercept of **L** on the y-axis.

$-1\frac{1}{3}$

(1)

$3y = x - 4$

$y = \frac{x}{3} - \frac{4}{3}$

$= 1/3\,x - 1\frac{1}{3}$

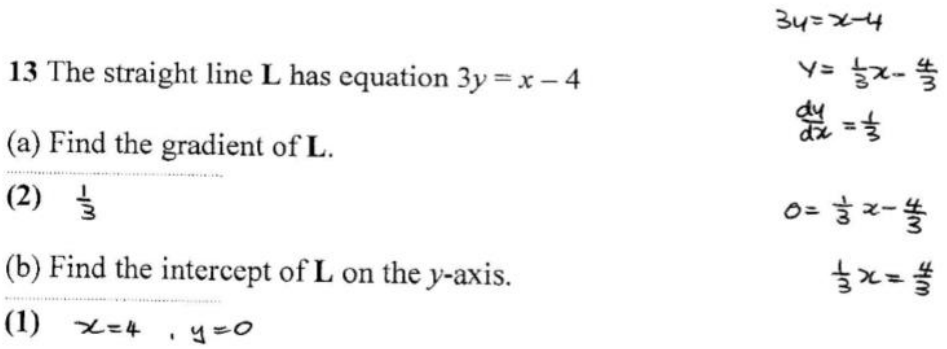
3/3

Examiner Comments

(a) Correct rearrangment of $3y = x - 4$ seen in the right hand column M1. Correct gradient (A1).

(b) Correct answer (A1) **NB:** This A1 and that in (a) are dependent on the award of the M1 mark given in (a) above – if the candidate did not answer (a) but had shown the working given in the right hand column and had answered (b) correctly, the award would be just M1 A1 for (b).

Student Response B



13 The straight line **L** has equation $3y = x - 4$

(a) Find the gradient of **L**.

(2) $\frac{1}{3}$

(b) Find the intercept of **L** on the y-axis.

(1) $x = 4$, $y = 0$

$3y = x - 4$

$y = \frac{1}{3}x - \frac{4}{3}$

$\frac{dy}{dx} = \frac{1}{3}$

$0 = \frac{1}{3}x - \frac{4}{3}$

$\frac{1}{3}x = \frac{4}{3}$

2/3

Examiner Comments

(a) Correct rearrangement of and the correct derivative of the given equation seen (M1). Correct gradient calcuated (A1).

(b) The value of the intercept on the x-axis has been found (A0)

Student Response C

13 The straight line **L** has equation $3y = x - 4$

(a) Find the gradient of **L**.

(2) $m = \frac{1}{3}$ $y = \frac{1}{3}x - \frac{4}{3}$ $m = \frac{1}{3}$

(b) Find the intercept of **L** on the y-axis.

(1) $-\frac{4}{3}$ when $x = 0$ $y = 0 - \frac{4}{3} = -\frac{4}{3}$

(Total for Question 13 is 3 marks)

3/3

Examiner Comments

(a) and (b) are fully correct.

Student Response D

13 The straight line **L** has equation $3y = x - 4$

(a) Find the gradient of **L**. $y = mx - c$ $3y = x - 4$ $3 = 4x - 4$ $x = 3 + 4$ $= 7$

(2) 7

(b) Find the intercept of **L** on the y-axis.

(1) 1 $3y = 7 - 4$ $3y = 3$ $y = 1$

(Total for Question 13 is 3 marks)

0/3

Examiner Comments

(a) No attempt at rearranging (nor differentiating) so M0 and therefore A0.

(b) No correct method for finding the intercept (A0).

Exemplar Question 5

14. The probability that a train arrives on time at a station is 0.76

Mary has a list of all the trains that are due to arrive at the station on Monday.

She picks, at random, a train from this list.

(a) Write down the probability that this train will not arrive on time at the station on Monday.

(1)

600 trains arrive at this station on Monday.

(b) Work out an estimate for the number of trains that do arrive on time at this station on Monday.

(2)

(Total for Question 14 is 3 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
14. (a)		$0.24, \frac{6}{25}, 24\%$	B1	3.10	1
(b)	0.76×600		M1		
		456	A1		2

Student Response A

14 The probability that a train arrives on time at a station is 0.76
Mary has a list of all the trains that are due to arrive at the station on Monday. She picks, at random, a train from this list.

(a) Write down the probability that this train **will not** arrive on time at the station on Monday.

0.24

(1)

600 trains arrive at this station on Monday.

(b) Work out an estimate for the number of trains that **do** arrive on time at this station on Monday.

144

1/3

Examiner Comments

(a) B1 for correct answer seen.
(b) M0 as no method seen followed by an incorrect answer (A0).

Student Response B

14 The probability that a train arrives on time at a station is 0.76
Mary has a list of all the trains that are due to arrive at the station on Monday. She picks, at random, a train from this list.

(a) Write down the probability that this train **will not** arrive on time at the station on Monday.

0.76 − 1 = 0.24

1 − 0.76 = 0.24

(1)

600 trains arrive at this station on Monday.

(b) Work out an estimate for the number of trains that **do** arrive on time at this station on Monday.

0.76 × 600

456

456

3/3

Examiner Comments

(a) Correct derivation of correct seen answer (B1).
(b) Correct method (0.76 × 600) M1. A1 for correct answer.

Student Response C

$\frac{76}{100}$

14 The probability that a train arrives on time at a station is 0.76
Mary has a list of all the trains that are due to arrive at the station on Monday. She picks, at random, a train from this list.

(a) Write down the probability that this train **will not** arrive on time at the station on Monday.

(1) $\frac{6}{25}$

$100-76=24$

$\frac{24}{100} = \frac{6}{25}$

600 trains arrive at this station on Monday.

(b) Work out an estimate for the number of trains that **do** arrive on time at this station on Monday.

456 trains

$\frac{76}{100} \times 600^{6}$

(2)

(Total for Question 14 is 3 marks)

3/3

Examiner Comments

(a) Correct answer (B1).
(b) Correct method seen on right hand side (M1) followed by correct answer. (A1) seen on the left hand side.

Student Response D

14 The probability that a train arrives on time at a station is 0.76
Mary has a list of all the trains that are due to arrive at the station on Monday. She picks, at random, a train from this list.

(a) Write down the probability that this train **will not** arrive on time at the station on Monday.

~~0.77~~ 0.76 0.77

(1)

arrive = $\frac{76}{100}$ Not arrive = $\frac{76}{100}$ $\frac{77}{100}$ = 0.77

600 trains arrive at this station on Monday.
(b) Work out an estimate for the number of trains that **do** arrive on time at this station on Monday.

0.75

Arrive = 0.76, 0.75, 0.74

(2)
(Total for Question 14 is 3 marks)

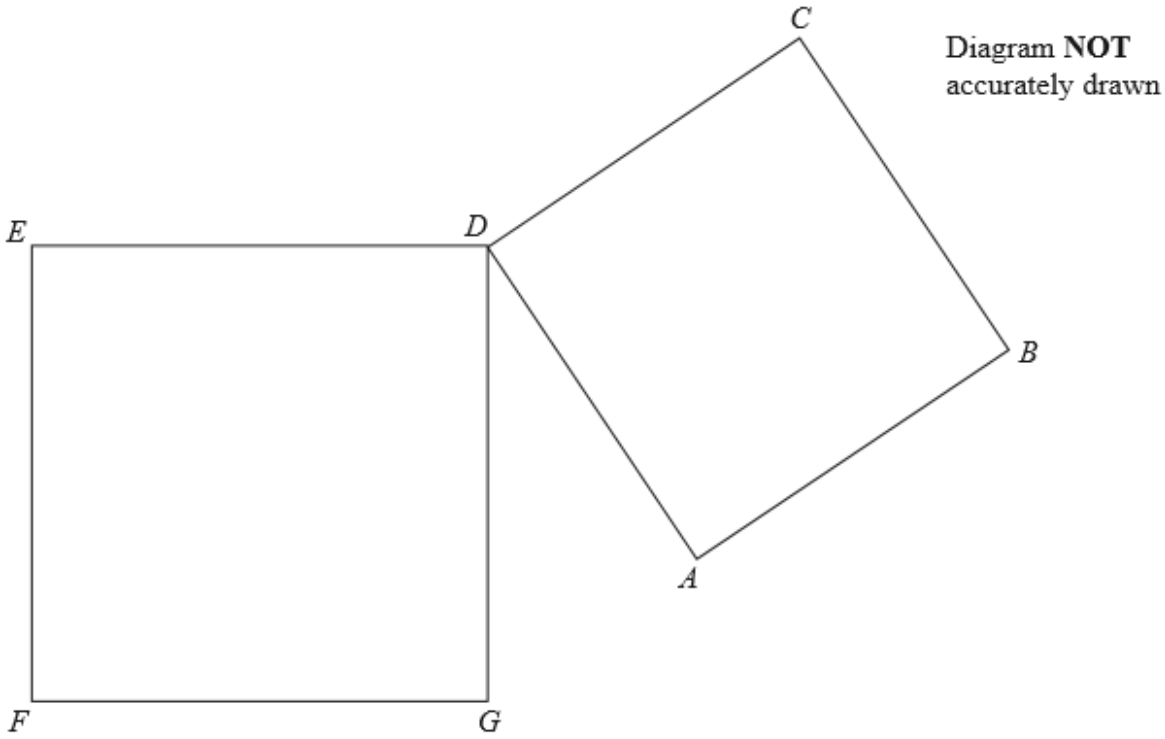
0/3

Examiner Comments

(a) "0.77" is incorrect (B0).
(b) No method seen (M0), incorrect answer (A0).

Exemplar Question 6

17.



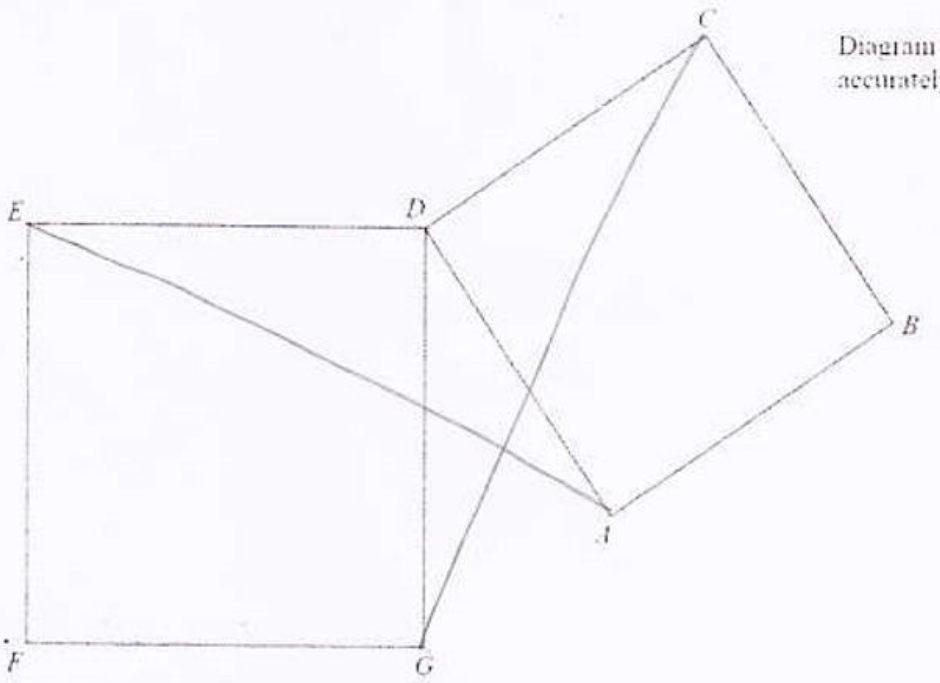
ABCD and *DEFG* are squares that are not identical.

Prove that $AE = CG$

Mark Scheme

Question	Working	Answer	Mark	AO	Total
17.	$(\because \angle EDG = \angle ADC = 90°$ and $\because \angle ADG$ is common$)$			2.6	
	$\angle EDA = \angle CDG$		B1		
	$\therefore \Delta s \begin{matrix} EDA \\ GDC \end{matrix}$ are congruent (SAS)	(cc)	B1		
	Hence $AE = CG$		B1		
	Two reasons (those in brackets above)		B1		4

Student Response A



ABCD and *DEFG* are squares that are not identical

Prove that $AE = CG$

let the sides of ABCD be x and that of DEFG be y.

In $\triangle ADE$

$DE = x$, $AD = y$.

In $\triangle CGD$

$CD = y$, $DG = x$

Since, $DE = DG = x$

$AD = CD = y$

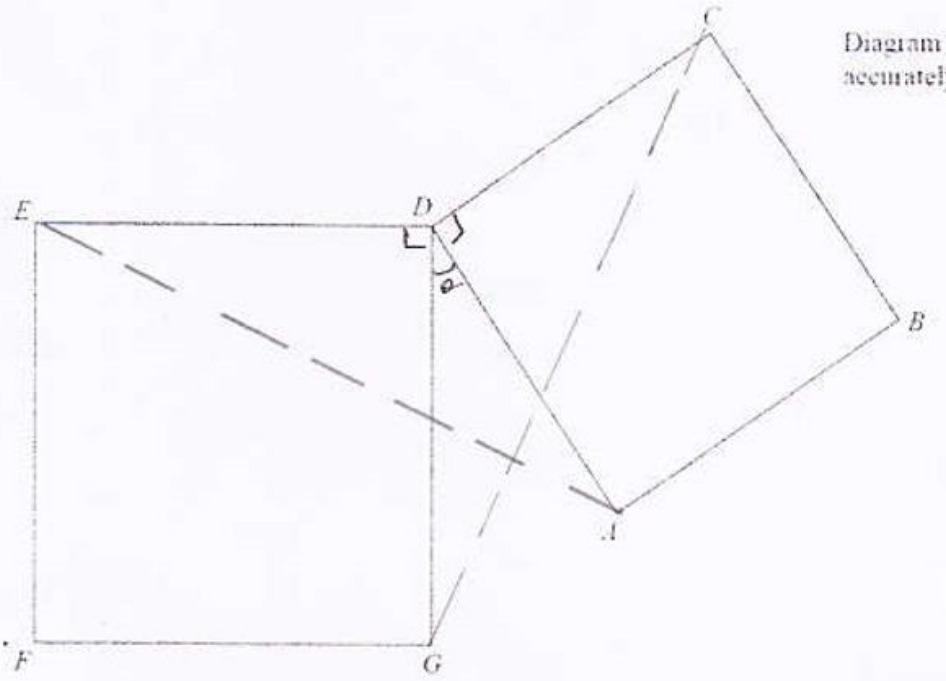
$\therefore AE = CG$. [Proved]

0/4

Examiner Comments

B0 as no consideration of angles.
B0 as no attempt at proving congruence of triangles *EDC* and *GDC*.
B0 for invalid conclusion.
B0 as no valid reasons given.

Student Response B



ABCD and *DEFG* are squares that are not identical.

Prove that $AE = CG$

From $\triangle EDA$ and $\triangle GDC$

$\therefore AD = CD$,

$DE = DG$,

$\angle EDA = \angle GDC = 90° + \theta$

$\therefore AE = GG$

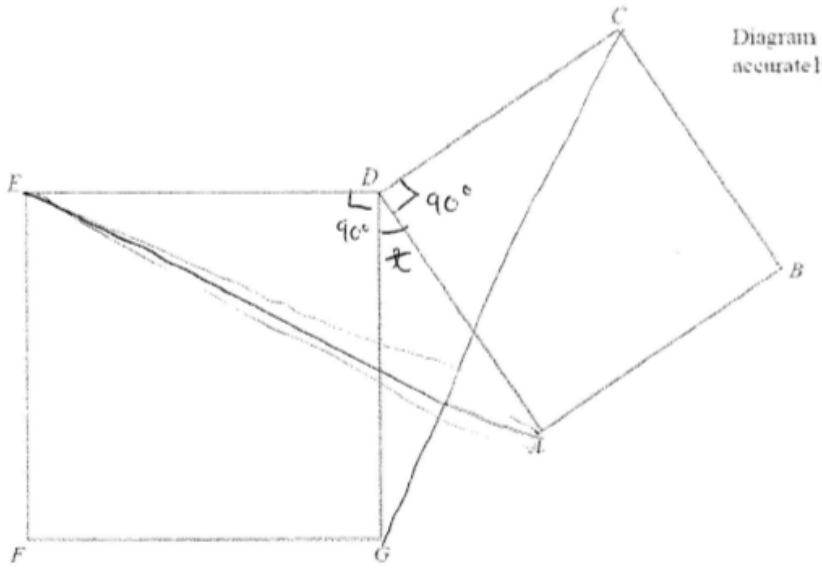
(shown)

1/4

Examiner Comments

B1 for stating that $\angle ADE = \angle CDG$
B0 for not stating congruence.
Thus B0 for not showing the correct conclusion.
B0 for insufficient reasons.

Student Response C



ABCD and *DEFG* are squares that are not identical.

Prove that $AE = CG$

Since they are similar,

$\frac{ED}{DA} = \frac{DG}{DC}$

As SAS, (same 2 sides and one angle is same, $90° + t$)

$\triangle EDA$ and $\triangle CDG$ are identical

So $\frac{EA}{\sin(90+t)} = \frac{CG}{\sin(90+t)}$

$AE = CG$

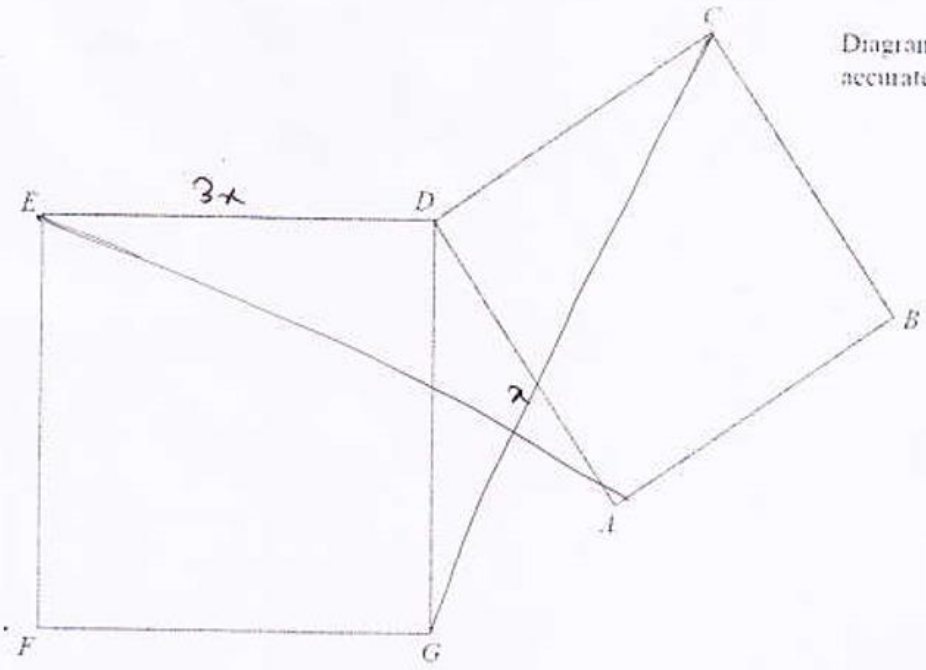
(Total for Question 17 is 4 marks)

1/4

Examiner Comments

No definition of "they" in line of the answer, so what is similar?
The candidate's diagram seems to suggest that $\angle FDA = \angle GDC$ but the candidate does not explicitly say so. In line 4, triangles *EDA* and *CDG* are said to be "identical". At best, this candidate earms B1 for stating "SAS" but nothing else.

Student Response D



ABCD and *DEFG* are squares that are not identical.

Prove that $AE = CG$

Using a ruler measure AE & CG,

AE = 3.3

CG = 3.3

∴ AE = CG {shown}

0/4

Examiner Comments

The candidate attempts to show that $AE = CG$ by measurement even though the diagram clearly states that it is **not** accurately drawn. The candidate is therefore not answering the question as required, namely, by geometrical arguments.

Exemplar Question 7

26. (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

(2)

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

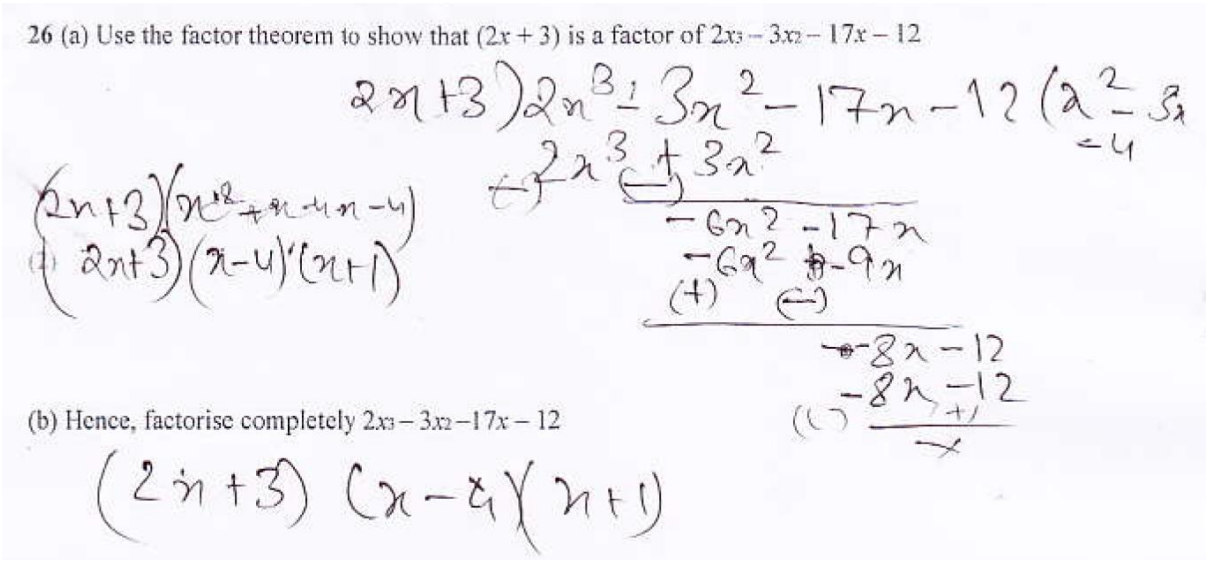
(4)

(Total for Question 26 is 6 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
26. (a)	$2\times(-1.5)^3-3\times(-1.5)^2-17\times(-1.5)-12$ (substitute)		M1	1.3	
		= 0	A1		2
(b)	x^2-3x		M1		
		x^2-3x-4	A1		
	$(x-4)(x+1)$ (solving trinomial quadratic)		M1 INDEP		
	$(2x+3)(x-4)(x+1)$		A1		4

Student Response A



4/6

Examiner Comments

(a) The candidate divides $(2x + 3)$ into $2x^3 – 3x^2 – 17x – 12$ and makes no comment about whether the result of the division shows anything about $(2x + 3)$ being a factor of $2x^3 – 3x^2 – 17x – 12$ thus M0 (also, no substitution of $x = –1.5$ is seen) and so A0.

(b) The candidate has a correct division in the working space for part (a) which we take into account for part (b) thus M1 A1 (for the division) then M1 A1 for a correct factorisation.

Student Response B

26 (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

$f(x) = 2x^3 - 3x^2 - 17x - 12$

$f(-\frac{3}{2}) = 2(-\frac{3}{2})^3 - 3(-\frac{3}{2})^2 - 17(-\frac{3}{2}) - 12$

$= 0$

(2) $\therefore (2x+3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$ (Shown)

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

$2x+3 \mid 2x^3 - 3x^2 - 17x - 12 \mid 2x^2 - 3x - 4$

$2x^3 + 3x^2$

$-6x^2 - 17x - 12$

$-6x^2 - 9x$

$-8x - 12$

$-8x - 12$

0

$x^2 - 3x - 4$

$= x^2 - 4x + x - 4$

$= (x-4)(x+1)$

$(x-4)(x+1)(2x+3)$ (4)

(Total for Question 26 is 6 marks)

6/6

Examiner Comments

(a) Substitution of $x = -\frac{3}{2}$ into the cubic (M1). A1 for correct conclusion.

(b) Correct algebraic division (M1 A1) followed by a correct factorisation (M1 A1).

Student Response C

26 (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

$(2x+3) = 2x^3 - 3x^2 - 17x - 12$

(2)

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

$2x^3 - 3x^2 - 17x - 12$

~~$x(2x^2 - 3x - 17) - 12$~~ $x(2x^2 - 3x - 17) - 12$

$x(2x^2 - 3x - 17) - 12$

(4)

0/6

Examiner Comments

(a) Incorrect statement (M0 A0)
(b) No method (M0 A0 M0 A0)

Student Response D

26 (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

factor

~~root~~ $= (2x+3)$

$2x = -3$

$x = -\frac{3}{2}$ is a root

$f(-\frac{3}{2}) = 2(-\frac{3}{2})^3 - 3(-\frac{3}{2})^2 - 17(-\frac{3}{2}) - 12$

$= 2(-\frac{27}{8}) - 3(\frac{9}{4}) - 17(-\frac{3}{2}) - 12$

$= -\frac{27}{4} - \frac{27}{4} + \frac{51}{2} - 12$

$= 0$

(2)

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

$x^2 - 3x - 4$

$2x+3 \overline{)2x^3 - 3x^2 - 17x - 12}$

$2x^3 + 3x^2$

$-6x^2 - 17x$

$-6x^2 - 9x$

$-8x - 12$

$-8x - 12$

0

$(2x+3)(x^2 - 3x - 4)$

$= (2x+3)(x-4)(x+1)$

$(2x+3)(x-4)(x+1)$

(4)

(Total for Question 26 is 6 marks)

6/6

Examiner Comments

Fully correctly obtained answers for both parts as required by the mark scheme.

Exemplar Question 8

27. (a) Solve the inequality $x^2 - x - 6 < 0$

(4)

(b) On the number line below represent your answer to part (a).

–5 –4 –3 –2 –1 0 1 2 3 4 5

(2)

(Total for Question 27 is 6 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
27. (a)	Rewriting (or solving) $x^2 - x - 6 < 0$ as $(x-3)(x+2)$ (solving trinomial quadratic marking rules)		M1	1.3	
		$x = 3$ and $x = -2$			
		$x < 3$	A1 ft		
		$x > -2$	A1 ft		
		(or $-2 < x < 3$)	(A2 ft)		4
(b)	Open circles at '$x = -2$ and $x = 3$'		B1 ft		
	Line joining '$x = -2$ and $x = 3$'		B1 ft		2

Student Response A

7 (a) Solve the inequality $x2 - x - 6 < 0$

$x^2 - x - 6 < 0$

$(x-3)(x+2) < 0$

C.V. $x - 3 = 0$, $x + 2 = 0$

$x = 3$ or -2

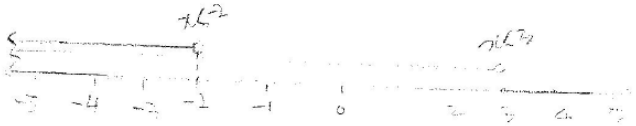
x	-3	$-3x$
x	2	$2x$
x^2	-6	$-x$

$x = -2$ or 3

(4)

(b) On the number line below represent your answer to part (a).

–5 –4 –3 –2 –1 0 1 2 3 4 5



(2)

3/6

Examiner Comments

(a) $x = 3$ and $x = -2$ correctly found (M1 A1) but no use of inequalities thus A0, A0.
(b) B1 for seeing open circles at the correct places but B0 for missing line.

Student Response B

7 (a) Solve the inequality $x^2 - x - 6 < 0$

$x^2 - x \geq 0 + 6$

$x^2 - x < 6$

$0 < 6$

$0 < 6$

(4)

(b) On the number line below represent your answer to part (a).

–5 –4 –3 –2 –1 0 1 2 3 4 5

0, 1, 2, 3, 4, 5

(2)

0/6

Examiner Comments

(a) No correct attempt seen M0 A0, A0 A0.
(b) B0 – no circles above number line seen. B0 no line connecting circles seen.

Student Response C

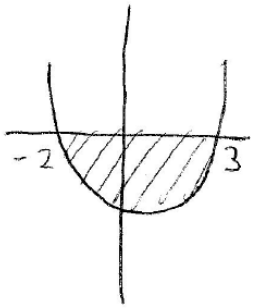
7 (a) Solve the inequality $x^2 - x - 6 < 0$

x	-3	$-3x$
x	2	$2x$
x^2	-6	$-x$

$(x-3)(x+2) < 0$

$x = 3 \quad x = -2$

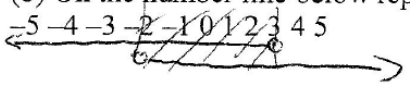
$-2 < x < 3$

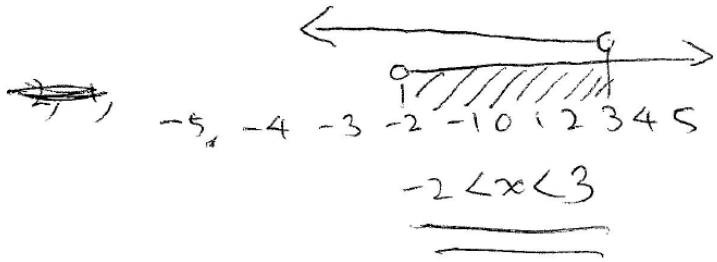


$-2 < x < 3$

(4)

(b) On the number line below represent your answer to part (a).





$-2 < x < 3$

(2)

6/6

Examiner Comments

(a) Full marks
(b) Full marks (acceptable shading used to indicate the region of the inequality rather than a line connecting the two open circles).

Student Response D

7 (a) Solve the inequality $x^2 - x - 6 < 0$

$x^2 - x - 6 < 0$

$\Rightarrow x^2 + 2x - 3x - 6 < 0$

$\Rightarrow x(x+2) - 3(x+2) < 0$

$\Rightarrow (x+2)(x-3) < 0$

$\therefore x = -2, \; x = 3$

$x = -2, \; x = 3$

(4)

(b) On the number line below represent your answer to part (a).

–5 –4 –3 –2 –1 0 1 2 3 4 5

3/6

Examiner Comments

(a) The candidate solves the quadratic (M1 A1) but then fails to deal with the inequalities (M0 A0).
(b) B1 for two open circles but B0 since there is no line *connecting* the open circles as required.

Exemplar Question 9

10. $\left(\sqrt{x}+\sqrt{3}\right)^2 = y + 6\sqrt{2}$ where x and y are positive integers.

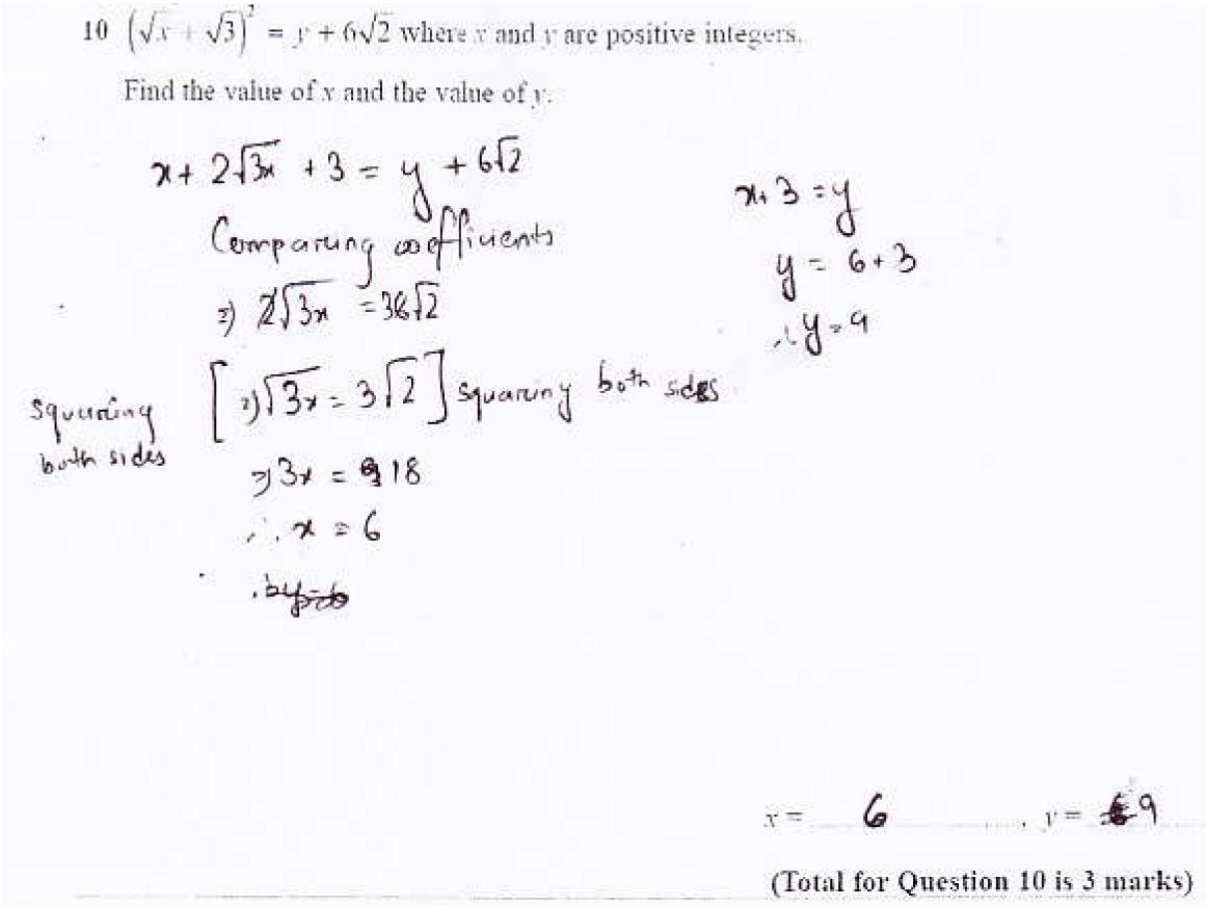
Find the value of x and the value of y.

(Total for Question 10 is 3 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
10.	$x+3+2\sqrt{3x} = y+6\sqrt{2}$ $\sqrt{3x} = 3\sqrt{2}$	$x = 6, y = 9$	M1 M1 (dep) A1	1.3	3

Student Response A



10 $\left(\sqrt{x}+\sqrt{3}\right)^2 = y + 6\sqrt{2}$ where x and y are positive integers.

Find the value of x and the value of y.

$x + 2\sqrt{3x} + 3 = y + 6\sqrt{2}$

Comparing coefficients

$2\sqrt{3x} = 6\sqrt{2}$

Squaring both sides $\left[2\sqrt{3x} = 3\sqrt{2}\right]$ squaring both sides

$3x = 18$

$\therefore x = 6$

$x + 3 = y$

$y = 6 + 3$

$\therefore y = 9$

$x =$ 6 , $y =$ 9

(Total for Question 10 is 3 marks)

3/3

Examiner Comments

M1 for a correct expansion of $\left(\sqrt{x}+\sqrt{3}\right)^2$
M1 for correct comparison of like terms: $\sqrt{3x} = 3\sqrt{2}$
A1 for correct answers for x and y

Student Response B

10 $\left(\sqrt{x}+\sqrt{3}\right)^2 = y + 6\sqrt{2}$ where x and y are positive integers.

Find the value of x and the value of y.

$x + 2\sqrt{3x} + 3 = y + 6\sqrt{2}$

1/3

Examiner Comments

M1 (only) for a correct expansion of $\left(\sqrt{x}+\sqrt{3}\right)^2$ thus 1 out of 3 marks.

Student Response C

10 $\left(\sqrt{x}+\sqrt{3}\right)^2 = y + 6\sqrt{2}$ where x and y are positive integers.

Find the value of x and the value of y.

~~$(\sqrt{x}+\sqrt{3})^2 = y + 8.5$~~

~~$(\sqrt{x}+\sqrt{3})^2 = y + 8.5$~~

$\sqrt{x}+\sqrt{3} = \sqrt{y}+6\sqrt{2}$

$\sqrt{x}+\sqrt{3} = \sqrt{y}+8.5$

$\sqrt{x}+1.73 = \sqrt{y}+8.5$

$\sqrt{x} = \sqrt{y}+8.5-1.73$

$x = \sqrt{y}+8.5^2-1.73$

$\sqrt{x}+8.5 = \sqrt{x}+1.73$

$\sqrt{y} = \sqrt{x}+1.73-8.5$

$y = \sqrt{x}+1.73^2-8.5$

$x = \sqrt{y}+8.5^2-1.73$ $y = \sqrt{x}+1.73^2-8.5$

(Total for Question 10 is 3 marks)

0/3

Examiner Comments

Original question simplified and incorrectly (M0 M0 A0).

Student Response D

10 $\left(\sqrt{x}+\sqrt{3}\right)^2 = y + 6\sqrt{2}$ where x and y are positive integers.

Find the value of x and the value of y.

$x + 2\sqrt{3x} + 3 = y + 6\sqrt{2}$

M1 Because x and y is integers

① $x+3=y$ $\quad 2\sqrt{3x} = 6\sqrt{2}$ – ②

M1A1 $6+3=y$

$y = 9$

B1ft

$\sqrt{12x} = \sqrt{72}$

$12x = 72$

$x = 6$

→ ①

$x =$ 6 , $y =$ 9

(Total for Question 10 is 3 marks)

3/3

Examiner Comments

M1 for candidate's line 1 (expansion).
M1 for candidate's equation 2 (comparing).
A1 for answer.

Exemplar Question 10

19. y varies directly as the square root of x.

$y = 52$ when $x = 169$

Find the value of x when $y = 68$

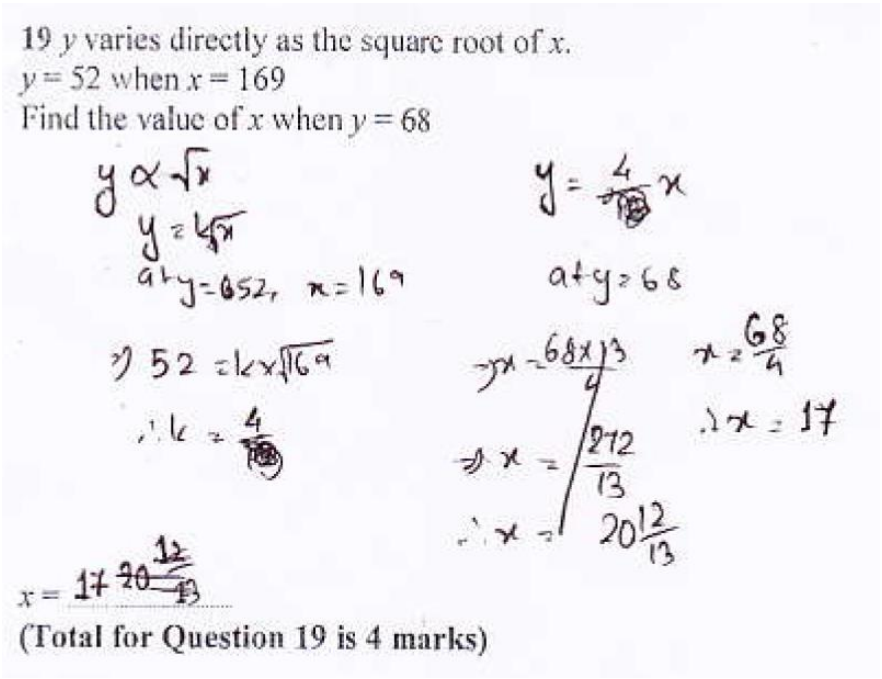
$x =$ .....

(Total for Question 19 is 4 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
19.	$52 = k\sqrt{169}$ (oe)	$k = 4$ (oe, can be implied)	M1 A1	1.4	
	$x = \left(\frac{68}{"4"}\right)^2$		M1 DEP		
	(or $52 = k\sqrt{169}$ and $68 = k\sqrt{x}$ $\frac{\sqrt{x}}{\sqrt{169}} = \frac{\sqrt{x}}{13} = \frac{68}{52}$ (oe)) **N.B.** Just seeing above line without sight of the first line earns both M marks		(M1) (M1 DEP)		
		$\left(\sqrt{x} = \frac{68}{4}\right.$ (oe)$\left.\right)$	(A1)		
		$x = 289$ (cao)	A1		4

Student Response A



2/4

Examiner Comments

$k = 4$ correctly obtained so M1 A1 but then we see in the right hand column that "$x=\frac{68}{4}$" which is incorrect thus M0 and therefore A0, making a total of 2 marks.

Student Response B

19 y varies directly as the square root of x.
$y = 52$ when $x = 169$
Find the value of x when $y = 68$

$y \propto \sqrt{x}$

$y = k\sqrt{x}$

$\Rightarrow 52 = k \cdot \sqrt{169}$

$\Rightarrow 52 = k \cdot 13$

$\therefore k = 4$

$y = k\sqrt{x}$

$\Rightarrow 68 = 4\sqrt{x}$

$\Rightarrow 17 = \sqrt{x}$

$\Rightarrow x = 17^2$

$\therefore x = 289$

$x =$ 289

(Total for Question 19 is 4 marks)

4/4

Examiner Comments

Correct calculcation of the constant of proportionality ($k = 4$) (M1 A1).
Correct calculation of the required value of x (M1 A1).

Student Response C

19 y varies directly as the square root of x.
$y = 52$ when $x = 169$
Find the value of x when $y = 68$

$x = \frac{28561}{289}$ or 98.8

(Total for Question 19 is 4 marks)

$y = \frac{k}{\sqrt{x}}$

$52 = \frac{k}{\sqrt{169}}$

$k = 676$

$y = \frac{676}{\sqrt{x}}$

$68 = \frac{676}{\sqrt{x}}$

$\sqrt{x} = \frac{169}{17}$

$x = \frac{13\sqrt{17}}{17}$ or 3.15 (3 s.f.)

$\therefore x = \frac{28561}{289}$ or 98.8

0/4

Examiner Comments

Here the candidate considers that y varies *indirectly* rather than *directly* as required therefore **zero** marks – the question has not been answered..

Student Response D

19 y varies directly as the square root of x.
$y = 52$ when $x = 169$
Find the value of x when $y = 68$

$Y = KX$
$52^2 = K169$

$\frac{2704}{169} = K$

$K = 16$

$x =$ 16

(Total for Question 19 is 4 marks)

2/4

Examiner Comments

An alternative method rarely seen. The candidate is effectively using $y^2 = k^2x$ and correctly evaluates the value of k (M1 A1) but then does **not** attempt to find the value of x when $y = 68$ as required (M0 A0).

Exemplar Question 11

21. x, y and n are three consecutive even numbers.

(a) Write down expressions for x and y in terms of n.

(1)

(b) Hence, show that the sum of three consecutive even numbers is a multiple of 6

(2)

(c) Find three consecutive positive even numbers whose sum is a square number.

(1)

(Total for Question 21 is 4 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
21. (a)		$x = n - 4$, $y = n - 2$	B1	1.3	1
(b)	$3n - 6$		M1	1.1	
	n even $\therefore$ $3n - 6$ is divisible by 6	(cc)	A1		2
(c)		10, 12, 14 (oe)	B1		1

Student Response A

21 x, y and n are three consecutive even numbers.

(a) Write down expressions for x and y in terms of n.

x = $n-2$, y = $n-1$

(1)

(b) Hence, show that the sum of three consecutive even numbers is a multiple of 6

(2)

$(n-2)(n-1)(n)$

$= (n^2 - n - 2n + 2)(n)$

$= (n^2 - 3n + 2)(n)$

$= n^3 - 3n^2 + 2n$

$n - 2 + n - 1 + n$

$= 3n - 3$

$= 3(n-1)$

$= 6\left(\frac{n-1}{2}\right)$

∴ The sum of three consecutive numbers is a multiple of 6. [Shown]

(c) Find three consecutive positive even numbers whose sum is a square number.

~~$(n+1)$~~ ~~$3(n-1) = n^2$~~

$11 + 12 + 13 = 36$

11, 12, 13

(1)

0/4

Examiner Comments

(a) B0 – the answer for *y* is not even.
(b) No attempt at adding three even numbers so M0 and therefore A0 as the candidate's conclusion is incorrectly obtained.
(c) The B mark is awarded for seeing a correct answer and this is not seen thus B0.

Student Response B

21 x, y and n are three consecutive even numbers.

(a) Write down expressions for x and y in terms of n.

x = $n - 4$, y = $n - 2$

(1)

(b) Hence, show that the sum of three consecutive even numbers is a multiple of 6

(2)

$(n-4) + (n-2) + n$

$3n - 6$

$n - 2$

(c) Find three consecutive positive even numbers whose sum is a square number.

10, 12, 14

(1)

3/4

Examiner Comments

(a) B1 for a correct statement for *x* and *y*.
(b) M1 for summing the three numbers (3*n* – 6) but A0 since no correct conclusion is seen.
(c) B1 for a correct statement.

Student Response C

21 x, y and n are three consecutive even numbers.

(a) Write down expressions for x and y in terms of n.

x = $n+1$, y = $(n-1)$

(1)

(b) Hence, show that the sum of three consecutive even numbers is a multiple of 6

(2)

$x + y + n = 6$

$\Rightarrow n - 2 + n - 1 + n = 6$

$\Rightarrow 3n - 3 = 6$

$\Rightarrow 3n = 3$

$\therefore n = 1.$

$n = 6,$

$n + 1 + n - 1 + n$

$\Rightarrow (6+1) + (6-1) + 6$

$= 18$ (shown)

(c) Find three consecutive positive even numbers whose sum is a square number.

.....

(1)

0/4

Examiner Comments

(a) Incorrect values for *x* and *y* given (B0).
(b) Adding two odd numbers to produce an even one (M0 therefore A0).
(c) No attempt (B0).

Student Response D

21 x, y and n are three consecutive even numbers.

(a) Write down expressions for x and y in terms of n.

x = n−4, y = n−2

(1)

(b) Hence, show that the sum of three consecutive even numbers is a multiple of 6

(2)

$n(n-4)(n-2) = n(n^2-6n+8)$

$6x = n^3-6n^2+8n$

If $n=6 \rightarrow (6)^3-6(6)^2+8\times6 = 48$ $\quad 48 = 6\times8$

∴ Sum of 3 consecutive even numbers is a multiple of 6. ←

$n+(n-2)+(n-4) = 6x$

$3n-6 = 6x$

$3(3)-6$

∴ $3(4)-6 = 6(?)$

$3(6)-6 = 6(2)$

$3(8)-6 = 6(3)$

∴ Shown

(c) Find three consecutive positive even numbers whose sum is a square number.

$n(n-4)(n-2) = A^2$

$n+n-4+n-2 = A^2$

$3n-6 = A^2$

$3(14)-6 = 36 = 6^2$

$\therefore n = 14$

$x = 10,\ y = 12$

10, 12, 14

(1)

3/4

Examiner Comments

(a) Correct B1
(b) M1 for the sum of the three numbers but incomplete conclusion (A0).
(c) Correct B1

Exemplar Question 12

22.

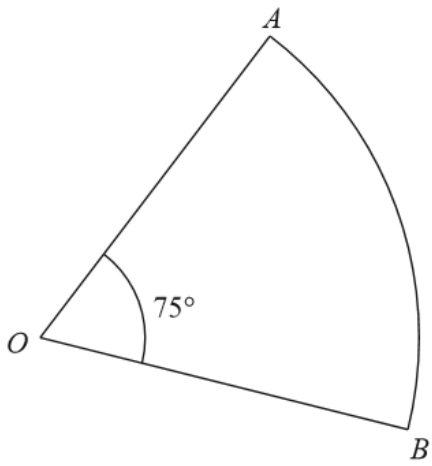


Diagram **NOT** accurately drawn

AOB is a sector of a circle, centre *O*, with $\angle AOB = 75°$

The area of the sector is 200 cm^2

Find to 3 significant figures,

(a) the radius, in cm, of the circle,

(2)

(b) the length, in cm, of the perimeter of the sector.

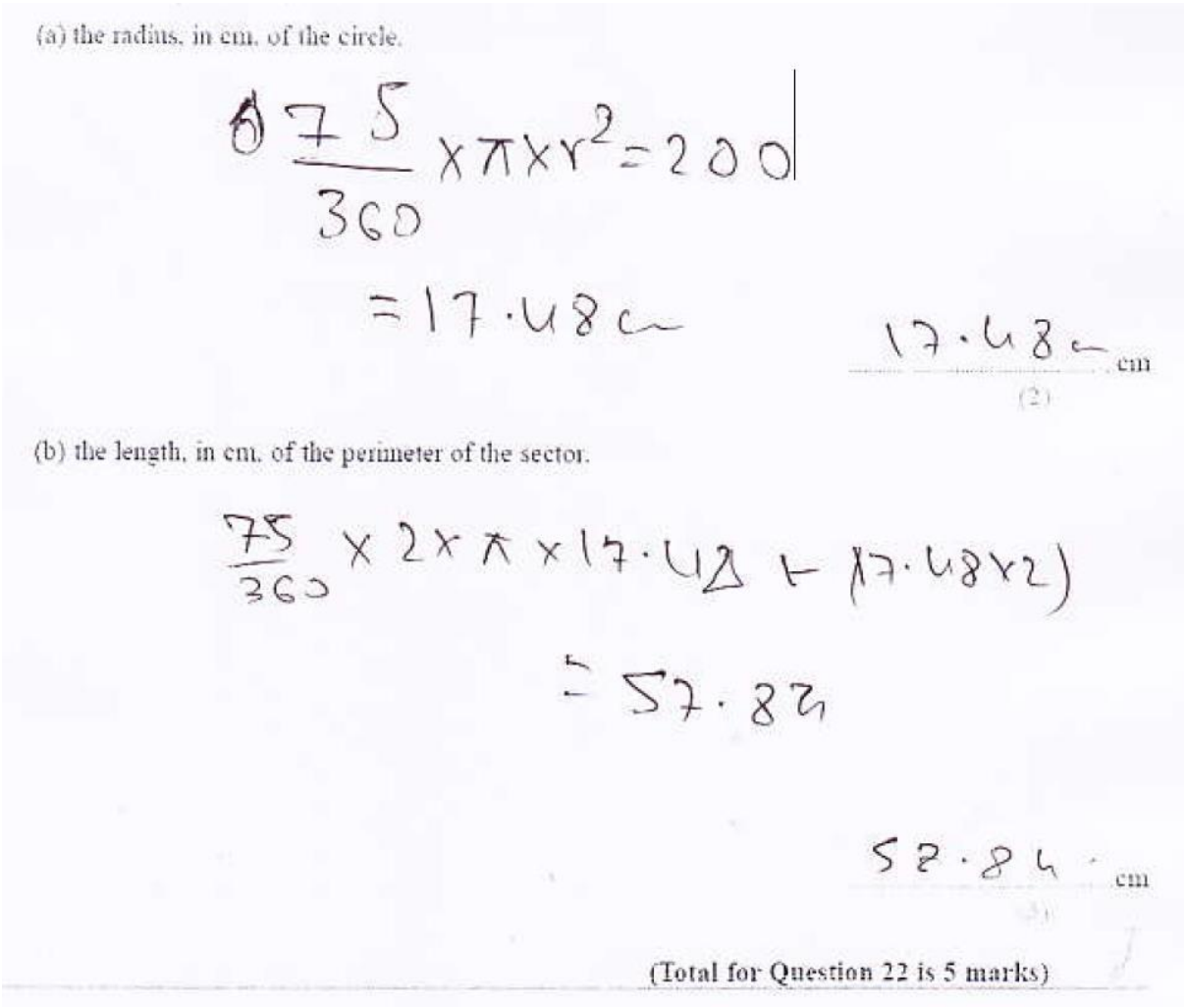
(3)

(Total for Question 22 in 5 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
22. (a)	$\frac{75}{360} \times r^2 \times \pi = 200$		M1	2.7	
		17.5 (17.48077…)	A1	1.3	2
(b)	$\frac{75}{360} \times 2 \times \pi \times '17.5'$		M1	2.7	
	$+2 \times '17.5'$		M1 DEP		
		57.9 (57.84678…)	A1		3

Student Response A



(a) the radius, in cm, of the circle.

$\frac{75}{360} \times \pi \times r^2 = 200$

$= 17.48\text{cm}$

17.48cm

cm

(2)

(b) the length, in cm, of the perimeter of the sector.

$\frac{75}{360} \times 2 \times \pi \times 17.48 + (17.48 \times 2)$

$= 52.82$

52.84 cm

(3)

(Total for Question 22 is 5 marks)

3/5

Examiner Comments

(a) Correct method (M1) but answer is not given to 3 significant figures as required (A0).
(b) Correct statement of the three relevant lengths and their addition (M1 for the arc length then M1 (Dependent) for adding two correct radii). However, A0 as the answer is not given to 3 significant figures as required.

Student Response B

(a) the radius, in cm, of the circle.

Area $= \frac{\theta}{360} \times \pi r^2$

$\Rightarrow 200 = \frac{75}{360} \times \pi r^2$

$\Rightarrow r^2 = \frac{960}{\pi}$

$\Rightarrow r = \sqrt{\frac{960}{\pi}}$

$\therefore r = 17.48$

17.48 cm

(2)

(b) the length, in cm, of the perimeter of the sector.

perimeter $= \left(17.48 + 17.48 + \frac{75}{360} 2\pi(17.48)\right)$ cm

$= 57.84$ cm

57.84 cm

(3)

(Total for Question 22 is 5 marks)

3/5

Examiner Comments

(a) Correct method (M1) but answer not given to 3 significant figures so A0.
(b) Again, correct method (M1, M1 (Dep)) but answer not given to 3 significant figures so A0.

Student Response C

(a) the radius, in cm, of the circle.

$\frac{75}{360} \times \pi r^2 = 200$

$\pi r^2 = 200 \times \frac{360}{75} = 960$

$r^2 = \frac{960}{\pi} = 306.0$

$\sqrt{r^2} = r = \sqrt{306}$

$\therefore r = 17.5$

17.5 cm

(b) the length, in cm, of the perimeter of the sector.

$\frac{75}{360} \times 2\pi(17.5) = \frac{175}{24}\pi = 22.9$

22.9 cm

(Total for Question 22 is 5 marks)

3/5

Examiner Comments

(a) Correct M1, A1.
(b) Correct arc length (*AB*) (M1) but does **not** add to the two radii so M0 A0.

Student Response D

(a) the radius, in cm, of the circle.

$\frac{1}{2}r^2\theta$ = area

$\frac{1}{2}r\theta$ = area

$\theta = \frac{75}{360} \times 2\pi = \frac{75 \times \pi}{180} = \frac{5}{12}\pi$

$\frac{1}{2}r\left(\frac{5}{12}\pi\right) = 100$

$r = 100 \times \frac{12}{5\pi} = 76.4$ cm

76 cm

(2)

(b) the length, in cm, of the perimeter of the sector.

$2r + l$ = perimeter

$r\theta = l$

$l = (76)\left(\frac{5}{12}\pi\right) = 99$ cm

$2(76) + 99 = 251$ cm

251 cm

(2)

(Total for Question 22 is 5 marks)

2/5

Examiner Comments

(a) Incorrect attempt using radians (M0 A0).
(b) M1 for arc length *AB*. M1 (Dep) for adding twice the candidate's radius. A0 for incorrect answer (since the candidate's radius value is incorrect).

Exemplar Question 13

24.

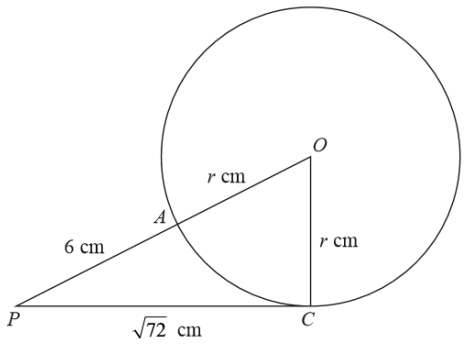


Diagram **NOT** accurately drawn

A and *C* are two points on the circumference of a circle centre *O* and radius *r* cm.

The point *P* is such that *PC* is a tangent to the circle and *PAO* is a straight line.

Give that *PC* = $\sqrt{72}$ cm and *PA* = 6 cm,

(a) write down an equation in *r*,

(1)

(b) find the value of *r*,

(2)

(c) find the size, in degrees to 3 significant figures, of $\angle OPC$.

(2)

(Total for Question 24 is 5 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
24. (a)	$(r+6)^2 = r^2 + 72$ or $r = \sqrt{(r+6)^2 - (\sqrt{72})^2}$ or $6\times(6+2r) = 72$ (oe)		B1	2.6	1
(b)	$r^2 + 12r + 36 = r^2 + 72$ (oe) or $36 + 12r = 72$	$r = 3$ (cao)	M1 A1	1.3 1.3	2
(c)	$\sin\angle OPC = \frac{'3'}{'3'+6}$ (oe)		M1	2.9	
		$\angle OPC = 19.5°$	A1	2.9	2

Student Response A

(a) write down an equation in r.

$(6+r)^2 = (\sqrt{72})^2 + r^2$

$(6+r)^2 = (\sqrt{72})^2 + r^2$

(1)

(b) find the value of r.

$(6+r)^2 = (\sqrt{72})^2 + r^2$

$\Rightarrow 36 + 12r + r^2 = 72 + r^2$

$\Rightarrow 36 + 12r = 72$

$\Rightarrow 12r = 36$

$\therefore r = 3\text{cm}$

$r =$ 3cm

(2)

(c) find the size, in degrees to 3 significant figures, of $\angle OPC$.

$\sin \angle OPC = \frac{3}{\sqrt{13}}$

$\Rightarrow \sin \angle OPC = 3/\sqrt{13}$

$\Rightarrow \angle OPC = \sin^{-1}(3/\sqrt{13})$

$\therefore \angle OPC = 19.47°$

$= 19.5°$

19.5

(2)

(Total for Question 24 is 5 marks)

5/5

Examiner Comments

(a) Correct equation (B1).
(b) Correct expansion and solution for r (M1 A1).
(c) Correct expression for sin $\angle OPC$ (M1) and correct answer to 3 significant figures (A1).

Student Response B

(a) write down an equation in r.

$r^2+72 = (6+r)^2$

(2)

(b) find the value of r.

$r^2+72=36r^2$

$35r^2=72$

$r^2=$

$r=1.43$

$r^2+72=(6+r)^2$

$r^2+72=36+12r+r^2$

$12r=36$

$r=3$

$r =$ 3

(2)

(c) find the size, in degrees to 3 significant figures, of $\angle OPC$.

$\tan \angle OPC = \frac{3}{\sqrt{72}}$

$\angle OPC = 19.5°$

19.5 °

(2)

(Total for Question 24 is 5 marks)

5/5

Examiner Comments

(a) Correct equation (B1).
(b) Correct expansion and solution for r (M1 A1).
(c) Correct expression for tan $\angle OPC$ (M1) and correct answer to 3 significant figures (A1).

Student Response C

(a) write down an equation in r.

$(\sqrt{72})^2 + r^2 = (6+r)^2$

$72 + r^2 = r^2 + 12r + 36$

(1)

(b) find the value of r.

$72 + r^2 = r^2 + 12r + 36$

$12r = 36$

$r = 3$ cm

$r =$ 3 cm

(2)

(c) find the size, in degrees to 3 significant figures, of $\angle OPC$.

$\frac{6+r}{\sin C} = \frac{r}{\sin P}$

$\frac{9}{\sin 90} = \frac{3}{\sin(OPC)}$

$3\sin$

$\angle OPC = \sin^{-1}\left(\frac{3\sin 90}{9}\right)$

$= 19.5°$

19.5 °

(2)

(Total for Question 24 is 5 marks)

5/5

Examiner Comments

(a) Acceptable answer (B1).
(b) and (c) are fully correct with the candidate using the Sine Rule correctly in part (c).

Student Response D

(a) write down an equation in r.

r^2 $\quad r^2 + 72 = (6+r)^2$ (1)

(b) find the value of r.

$r^2 + 72 = 36 + 2 \cdot 6 \cdot r + r^2$

$\Rightarrow 72 = 36 + 12r$

$\Rightarrow 12r = 36$

$\therefore r = 3$

$r =$ 3 (2)

(c) find the size, in degrees to 3 significant figures, of $\angle OPC$.

$\tan \angle OPC = \frac{3}{\sqrt{72}}$

$\therefore \angle OPC = 19.5°$

19.5 ° (3)

(Total for Question 24 is 5 marks)

5/5

Examiner Comments
Fully correct answer.

Exemplar Question 14

28.

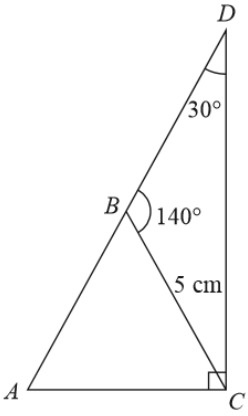


Diagram **NOT** accurately drawn

The diagram shows ΔBDC in which $BC = 5$ cm, $\angle BDC = 30°$ and $\angle CBD = 140°$

(a) Calculate the length, in cm to 3 significant figures, of DC.

(3)

The line DB is extended to the point A so that the line AC is perpendicular to DC as shown in the diagram.

(b) Calculate the area, in cm^2 to 3 significant figures, of ΔABC.

(4)

(Total for Question 28 is 7 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
28. (a)	**Penalise ncc ONCE only in question**				
	$\frac{5}{\sin 30} = \frac{CD}{\sin 140}$		M1	2.9	
	$CD = \frac{5 \times \sin 140}{\sin 30}$		M1 DEP		
		6.43	A1		3
(b)	$\frac{AC}{'6.428'} = \tan 30 \quad (AC = 3.711)$		M1	2.9	
	$\angle BCA = 80^\circ$		M1	2.6	
	$\Delta ABC = \frac{1}{2} \times 'AC' \times 5 \times \sin '80'$		M1 DEP		
		9.14	A1	2.7	4

Student Response A

(a) Calculate the length, in cm to 3 significant figures, of DC.

Using Sine rule

$\frac{\sin(140^\circ)}{DC} = \frac{\sin(30^\circ)}{5}$

$\Rightarrow DC = \frac{5 \times \sin(140^\circ)}{\sin(30^\circ)}$

$\therefore DC = 6.43\text{cm}$

6.43 cm

(3)

The line DB is extended to the point A so that the line AC is perpendicular to DC as shown in the diagram.

(b) Calculate the area, in cm^2 to 3 significant figures, of ΔABC.

~~$\angle BCD = 180^\circ - 140^\circ = 30^\circ$~~ $\angle DAC = 180^\circ - 90^\circ - 30^\circ$

~~$= 10^\circ$~~ $= 60^\circ$

~~$\angle BCA = 80^\circ$~~,

$\angle ABC = 180^\circ - 140^\circ = 40^\circ$

$\angle ACB = 180^\circ - 100^\circ$

$= 80^\circ$

$\frac{\sin(30^\circ)}{AC} = \frac{\sin(60^\circ)}{\frac{5 \times \sin(140^\circ)}{\sin(30^\circ)}}$

$\therefore AC = 3.711\text{cm}$

Area $= \frac{1}{2} \times AC \times DC$

$\Rightarrow = \frac{1}{2} \times 3.711 \times 6.43 \Rightarrow = 11.9\text{cm}^2$

11.9 cm^2

(4)

(Total for Question 28 is 7 marks)

5/7

Examiner Comments

(a) M1 for a correct statement of the Sine Rule. M1 (Dependent) for correctly isolating *DC*.
A1 for the correct answer to 3 significant figures.

(b) M1 for a correct method for *AC*. M1 for a correct method for angle *ACB*. M0 for a method for the area of triangle *ABC* as the candidate only has a method for triangle *ACD* and therefore A0.

Student Response B

(a) Calculate the length, in cm to 3 significant figures, of DC.

$\frac{\sin A}{a} = \frac{\sin B}{b}$

$\Rightarrow \frac{\sin 140^\circ}{DC} = \frac{\sin 30}{5}$

$\Rightarrow DC = \frac{5\sin 140^\circ}{\sin 30^\circ}$

$\therefore DC = 6.43\text{cm}$

6.43 cm

(3)

The line DB is extended to the point A so that the line AC is perpendicular to DC as shown in the diagram.

(b) Calculate the area, in cm^2 to 3 significant figures, of ΔABC.

$\frac{AC}{\sin 30^\circ} = \frac{6.43}{\sin 60^\circ}$

$\Rightarrow AC = \frac{6.43 \sin 30^\circ}{\sin 60^\circ}$

$\therefore AC = 3.71$

Area of $\Delta ABC = \frac{1}{2} \times 3.71 \times 6.43$

$= 11.93\text{cm}^2$

$= 11.9$

11.9 cm

(4)

(Total for Question 28 is 7 marks)

4/7

Examiner Comments

(a) M1 for a correct statement of the Sine Rule. M1 (Dependent) for correctly isolating DC.
A1 for the correct answer to 3 significant figures.

(b) M1 for a correct method for AC. Area of ΔACD found instead of the area of ΔABC as required. Therefore M0 ($\angle BCA$) and M0 A0 for the required area.

Student Response C

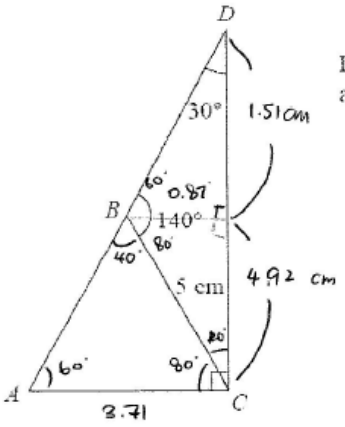


Diagram **NOT** accurately drawn

The diagram shows ΔBDC in which $BC = 5$ cm, $\angle BDC = 30°$ and $\angle CBD = 140°$

(a) Calculate the length, in cm to 3 significant figures, of DC.

$\cos 10° = \frac{x}{5}$ $\quad$ ~~$\sin 10° = \frac{y}{5}$~~ $\quad \sin 10° = \frac{y}{5}$

$\therefore x = 4.92$ $\quad \therefore y = 0.87$

$\tan 60° = \frac{z}{0.87}$ $\quad \therefore DC = 4.92\text{cm} + 1.51\text{cm}$

$z = 1.51$ $\quad = 6.43$

6.43 cm

(3)

The line DB is extended to the point A so that the line AC is perpendicular to DC as shown in the diagram.

(b) Calculate the area, in cm^2 to 3 significant figures, of ΔABC.

~~Sin~~ $\tan 60° = \frac{6.43}{AC}$

$\Delta C = 3.71$ cm

$\frac{1}{2}(3.71)(6.43) = 11.92$

$= 11.9$

11.9 cm^2

(4)

(Total for Question 28 is 7 marks)

5/7

Examiner Comments

(a) Alternative method: M1 for either of "$x = 4.92$" or $z = 1.51$" (**not** for $y = 0.87$) then M1 (Dep) for DC = "4.92" + "1.51" and finally A1.

(b) M1 for finding AC but the candidate calculates the area of triangle ADC and **not** triangle ABC as required (but M1 for $\angle BCA$ seen on the diagram). M0 (Dep) A0).

Student Response D

(a) Calculate the length, in cm to 3 significant figures, of DC.

$\frac{a}{\sin A} = \frac{b}{\sin B}$

$\frac{DC}{\sin 140} = \frac{5}{\sin 30}$ $DC = \frac{5 \sin 140}{\sin 30} = 6.43\text{cm}$ 6.43 cm (3)

The line DB is extended to the point A so that the line AC is perpendicular to DC as shown in the diagram.

(b) Calculate the area, in cm^2 to 3 significant figures, of ΔABC.

$\angle A = 180 - 90 - 30 = 60°$

$\angle B = 180 - 140 = 40°$

$\angle C = 180 - 60 - 40 = 80°$

$\frac{5}{\sin 60} = \frac{AB}{\sin 80}$

$AB = (\sin 80)\left(\frac{5}{\sin 60}\right) = 5.69\text{cm}$

Area $= \frac{1}{2} ab \sin C = \frac{1}{2}(5.69)(5)\sin 40°$

$= 9.14\text{cm}^2$

9.14 cm^2 (4)

(Total for Question 28 is 7 marks)

7/7

Examiner Comments

(a) Full marks as per mark scheme.

(b) An alternative method: M1 for AB, M1 for $\angle BCA$, M1 (Dep) for a correct method for the area of triangle ABC, and A1 for the correct answer.

Paper 2

Exemplar Question 1

5. The nth term of a sequence is given by $3n - 5$

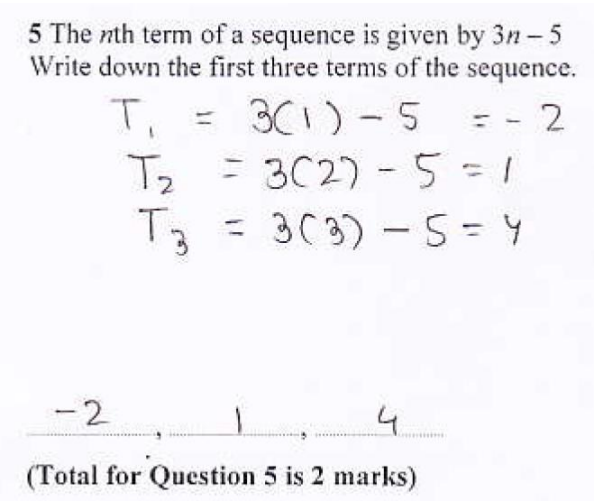
Write down the first three terms of the sequence.

(Total for Question 5 is 2 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
5.		−2, 1, 4	B2 (−1 eeoo)	1.3	2

Student Response A



5 The nth term of a sequence is given by $3n - 5$
Write down the first three terms of the sequence.

$T_1 = 3(1) - 5 = -2$
$T_2 = 3(2) - 5 = 1$
$T_3 = 3(3) - 5 = 4$

−2 , 1 , 4

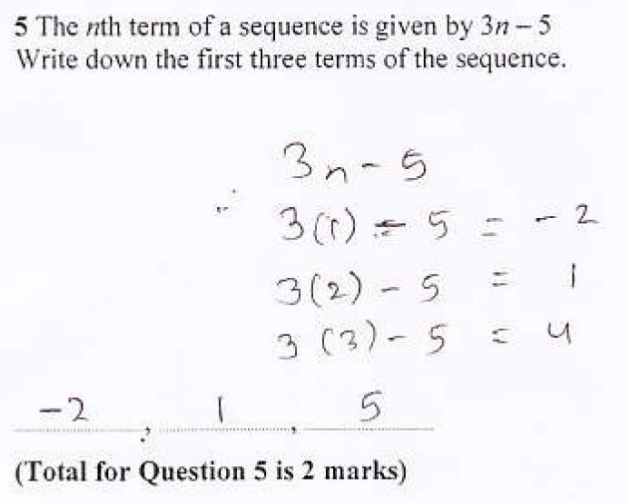
(Total for Question 5 is 2 marks)

2/2

Examiner Comments

Fully correct.

Student Response B



5 The nth term of a sequence is given by $3n - 5$
Write down the first three terms of the sequence.

$3n - 5$
$3(1) - 5 = -2$
$3(2) - 5 = 1$
$3(3) - 5 = 4$

−2 , 1 , 5

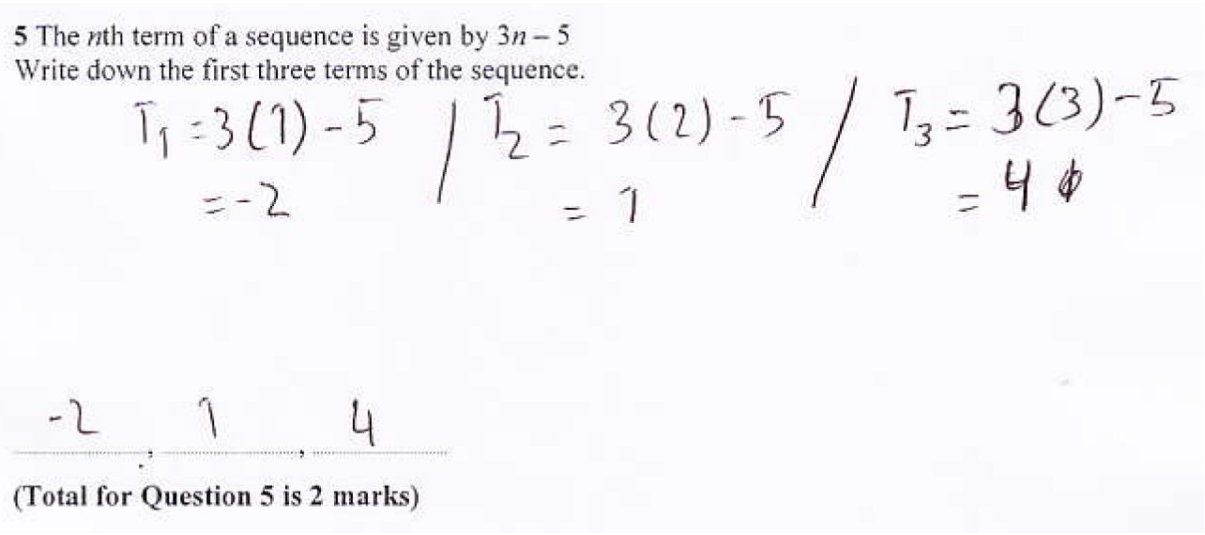
(Total for Question 5 is 2 marks)

1/2

Examiner Comments

B1 as one mark deducted for "5" (incorrect).

Student Response C



5 The nth term of a sequence is given by $3n - 5$
Write down the first three terms of the sequence.

$T_1 = 3(1) - 5 = -2$ / $T_2 = 3(2) - 5 = 1$ / $T_3 = 3(3) - 5 = 4$

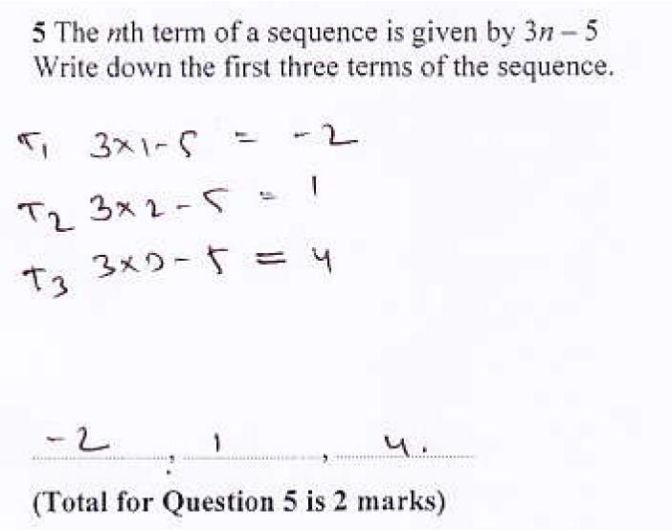
-2 , 1 , 4

(Total for Question 5 is 2 marks)

2/2

Examiner Comments
Fully correct.

Student Response D



5 The nth term of a sequence is given by $3n - 5$
Write down the first three terms of the sequence.

T_1 $3 \times 1 - 5 = -2$

T_2 $3 \times 2 - 5 = 1$

T_3 $3 \times 3 - 5 = 4$

-2 , 1 , 4.

(Total for Question 5 is 2 marks)

2/2

Examiner Comments
Fully correct.

Exemplar Question 2

11.

$\mathscr{E} = \{a, b, c, d, e, f, g, h, i, j\}$

$A = \{a, b, e, f\}$

$B = \{b, c, d, e, g, h\}$

$C = \{e, f, g, h, i, j\}$

Write down the elements of

(a) $A \cap B \cap C$

(1)

(b) $(A \cup B)'$

(1)

(c) $A' \cap C$

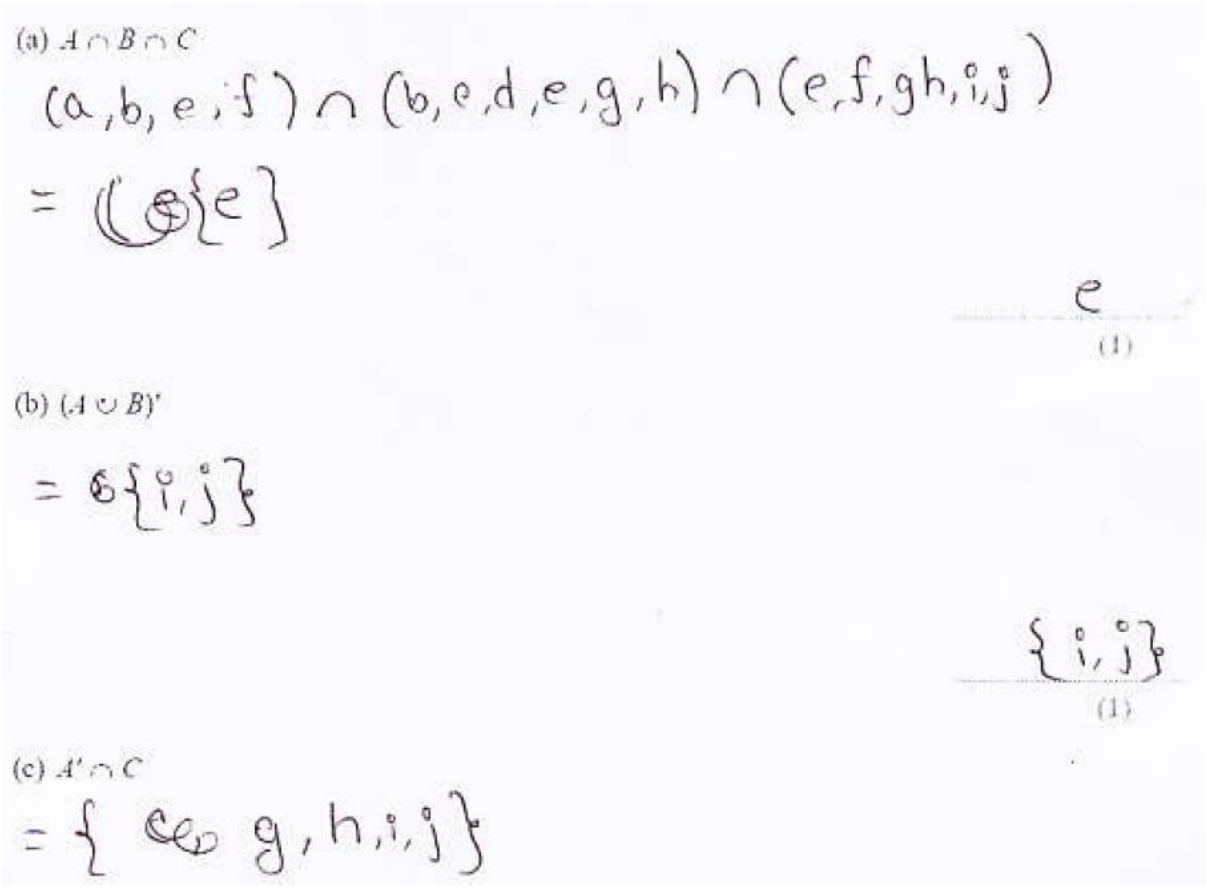
(1)

(Total for Question 11 is 3 marks)

Mark Scheme

Question		Working	Answer	Mark	AO	Total
11.	**(a)**		e	B1	1.2	1
	(b)		i, j	B1		1
	(c)		g, h, i, j	B1		1

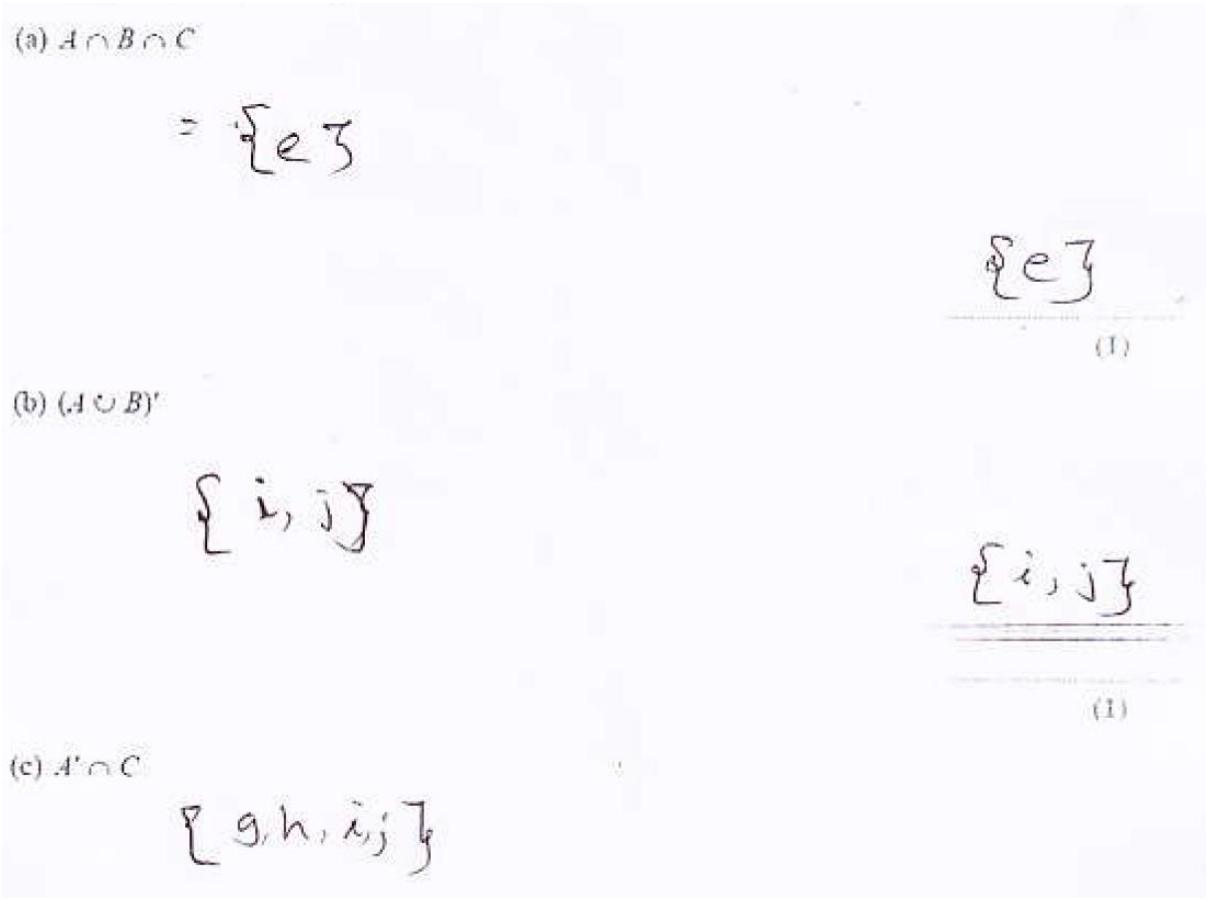
Student Response A



3/3

Examiner Comments
Fully correct.

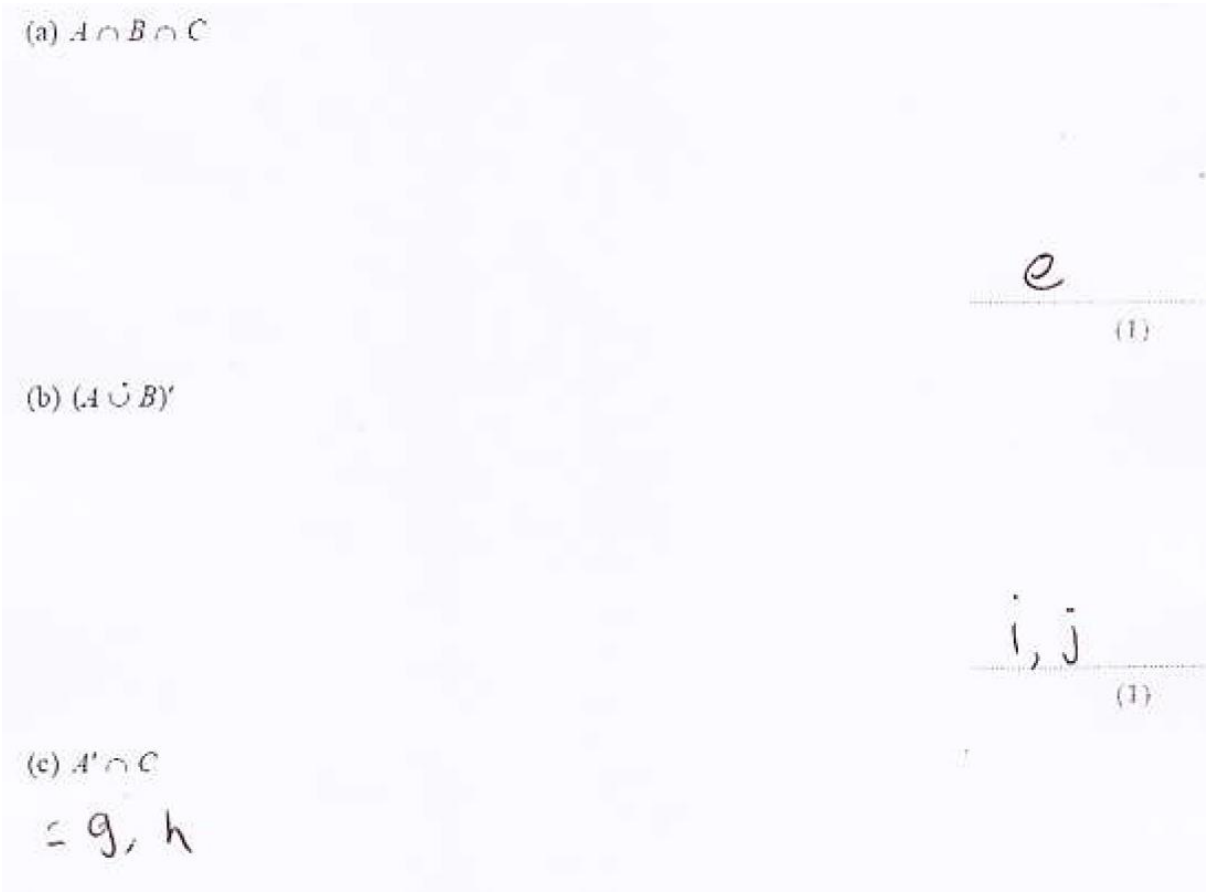
Student Response B



3/3

Examiner Comments
Fully correct.

Student Response C



2/3

Examiner Comments

(a) & (b) correct.
(c) Missimg elements *i* and *j* so B0

Student Response D

11 $\xi = \{a, b, c, d, e, f, g, h, i, j\}$

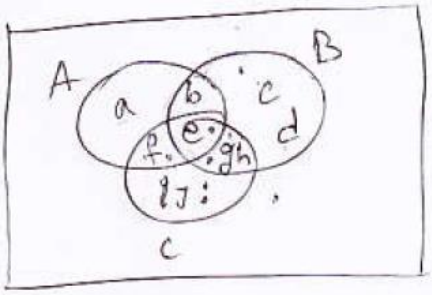
$A = \{a, b, e, f\}$

$B = \{b, c, d, e, g, h\}$

$C = \{e, f, g, h, i, j\}$

Write down the elements of

(a) $A \cap B \cap C$



e

(1)

(b) $(A \cup B)'$

a, f, c, d, g, h, i, j

(1)

(c) $A' \cap C$

i, j, g, h

2/3

Examiner Comments

(a) & (c) correct.
(b) Elements *a*, *f*, *c*, *d*, *g* and *h* should not be present so B0.

Exemplar Question 3

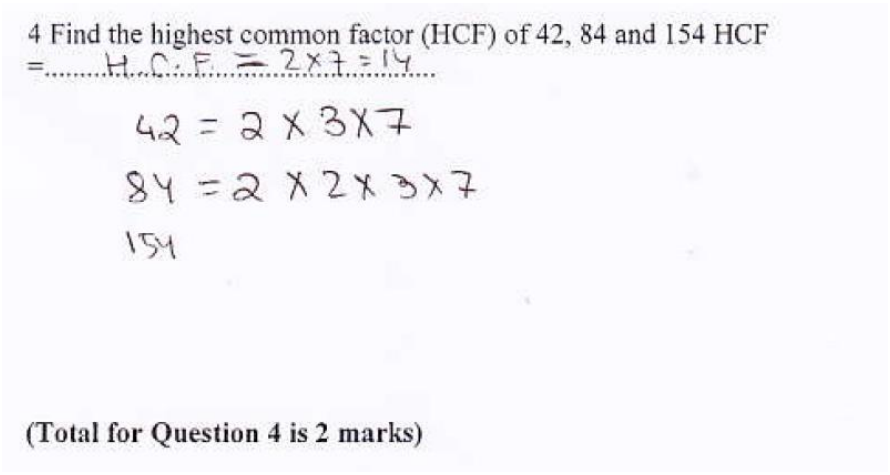
4 Find the highest common factor (HCF) of 42, 84 and 154

(Total for Question 4 is 2 marks)

Mark Scheme

Question	Working	Answer	Mark	AO	Total
4.	42 = 2 × 3 × 7 84 = 2 × 2 × 3 × 7 154 = 2 × 7 × 11 Prime factors of two of 42, 84 and 154 or 42 = 3 × 14 84 = 6 ×14 154 = 11 × 14 Two of above or Attempt at factor tree for two of the numbers	HCF = 14	M1 A1	1.1	2

Student Response A


4 Find the highest common factor (HCF) of 42, 84 and 154 HCF
= H.C.F = 2x7 = 14

42 = 2 x 3 x 7

84 = 2 x 2 x 3 x 7

154

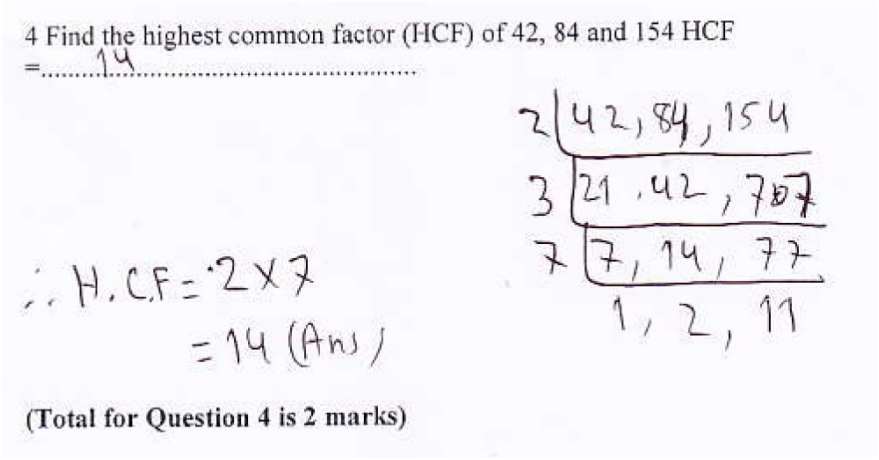
(Total for Question 4 is 2 marks)

2/2

Examiner Comments

M1 for prime factors of two of the numbers
A1 for correct HCF.

Student Response B


4 Find the highest common factor (HCF) of 42, 84 and 154 HCF
= 14

2 | 42, 84, 154

3 | 21, 42, 77

7 | 7, 14, 77

1, 2, 11

∴ H.C.F = 2 x 7

= 14 (Ans)

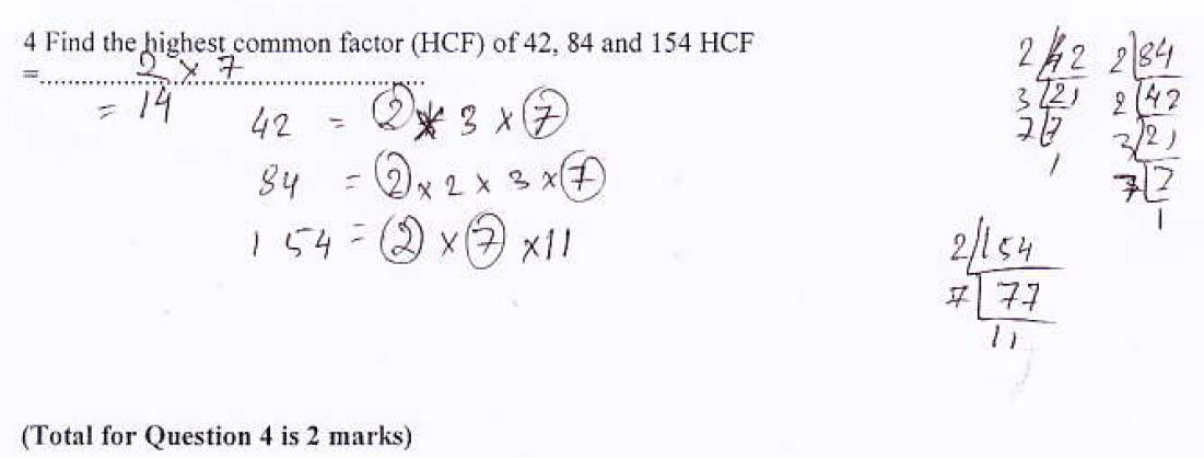
(Total for Question 4 is 2 marks)

2/2

Examiner Comments

M1 for prime factors
A1 for correct HCF.

Student Response C

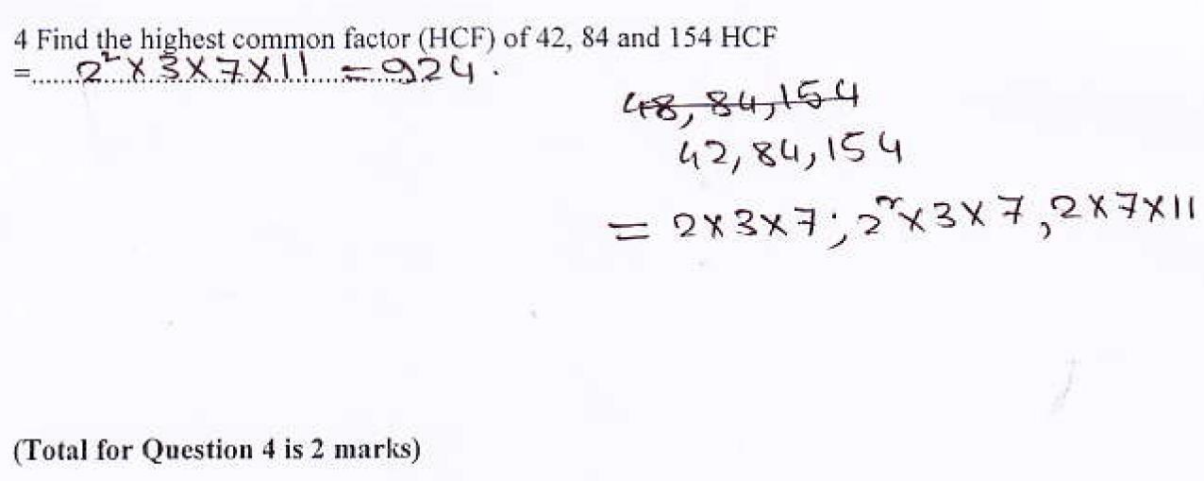


2/2

Examiner Comments

M1 for prime factors
A1 for correct HCF.

Student Response D



1/2

Examiner Comments

M1 for prime factors
A0 for HCF.