Pearson Edexcel

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)
Mathematics (1MA1)

May/June 2022 Exemplar
1MA1-3H Paper 3 (Calculator)
Higher Tier

Senior Examiner's feedback on student responses

Contents

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

Skip to Main Contents

About this booklet

This document has been produced to support mathematics teachers delivering the new GCSE (9-1) Mathematics specification.

This document looks at a selection of questions from the June 2022 GCSE (9 - 1) Mathematics Higher tier examination. It shows real student responses to selected questions and how the examining team follow the mark schemes to demonstrate how the students would be awarded marks on these questions.

Our examining team have selected student responses to Higher tier questions and common questions that are in both the Higher tier and Foundation tier from the June 2022 examination.

Following each question, you will find the mark scheme for that question, examiner comment, data on how the question performed 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.

Skip to Main Contents

How to use this booklet

Navigate to the Contents page

Navigate to a question

Navigate to a specific part of this question

Skip to Main Contents

Question: 7 8 11 16 18 20 21 22 25 27 28 29

Question 7

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 7 - Question

7 Simon buys some candles.
Each candle costs £2

Simon pays with a £20 note.
He gets £6 change.

Work out the number of candles Simon buys.

(Total for Question 7 is 3 marks)

Question 7 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
7	7	P1	for 20 − 6 (= 14) **or** 20 ÷ 2 (=10) **and** 6 ÷ 2 (=3)	
		P1	for "14" ÷ 2 (= 7) **or** "10" − "3" (= 7)	
		A1	cao	

Skip to Main Contents

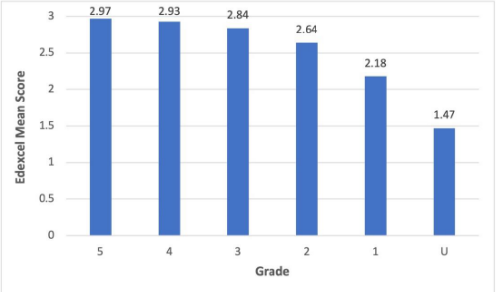
Question: 7 8 11 16 18 20 21 22 25 27 28 29

Question 7 - Examiner Comments

Generally well answered, some with minimal working shown. Careless arithmetic was a major reason for some students not gaining full marks in this question. 20 – 6 = 24 or 20 – 6 = 12 were the most common errors made but by dividing correctly by 2 to get 12 or 6, 2 out of the 3 marks available were possible. A common approach was to list costs of candles in multiples of 2. However, it was not uncommon for some multiples to be omitted, thus affecting the final number of candles bought. Some weaker students got no further than working out the number of candles that could be bought for £20. To gain any credit £6 ÷ 2 also needed to be seen. Giving an answer of 14 on the answer line was also common following correct calculations, with 7 candles often being an embedded answer.

Question 7 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade: ALL	5	4	3	2	1	U
2.70	3	90	2.70	2.97	2.93	2.84	2.64	2.18	1.47



Q7

A B C

6

General Examiner Feedback

The time allowed for the examination appears to have been sufficient for most students to complete this paper. The great majority of students seemed well suited to entry at the higher tier.

Most students entered for this examination presented their working in a clear and logical way. This helped examiners to award any credit due where final answers were not correct. Only a very small proportion of low attaining students presented weak scripts. Questions where working was often not so well organized included question
7 (algebraic expression for an area) and question 13 (manipulation of column vectors).

The paper gave the opportunity for students of all abilities to demonstrate positive achievement. All questions were accessible to some students but, as you would expect, there were relatively few students able to work confidently on all questions. In particular, questions 1 (Pythagoras' rule), 2 (formulae), 3 (ratio), 4 (best buy) and
11 (product rule for counting) were answered well by a large majority of students whereas questions, 10 (reverse percentage), 13 (column vectors), 14(a) (factorisation) and 15 (circle theorems) proved more of a challenge to the students in the attainment range they were aimed at.

Question 3

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 3 - Question

3 Rick, Selma and Tony are playing a game with counters.

Rick has some counters.
Selma has twice as many counters as Rick.
Tony has 6 counters less than Selma.

In total they have 54 counters.

the number of counters Rick has : the number of counters Tony has = 1 : p

Work out the value of p.

p = ...

(Total for Question 24 is 5 marks)

Question 3 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
3	1.5	P1	for process to develop 3 algebraic expressions, eg. (R =) n, (S =) $2n$, (T =) $2n - 6$, oe, at least two must be correct. **or** for selecting 3 values satisfying the given criteria, eg. (R =) 10, (S =) 20, (T =) 14	
		P1	for process to sum 3 algebraic expressions and equating to 54, eg. n + "$2n$" + "$2n - 6$" = 54 **or** for finding the correct sum of their values eg. "10" + "20" + "14" = 44	
		P1	for start of process to solve the correct linear equation, eg. $5n = 54 + 6$ ($n = 12$) **or** for 12, 24, 18	
		P1	for "12" : 2 × "12" – 6 oe eg 12 : 18 oe or 18 : 12 linked to T, R	
		A1	for 1.5 or $\frac{3}{2}$ or $1\frac{1}{2}$	Accept 1 : 1.5 etc as answer

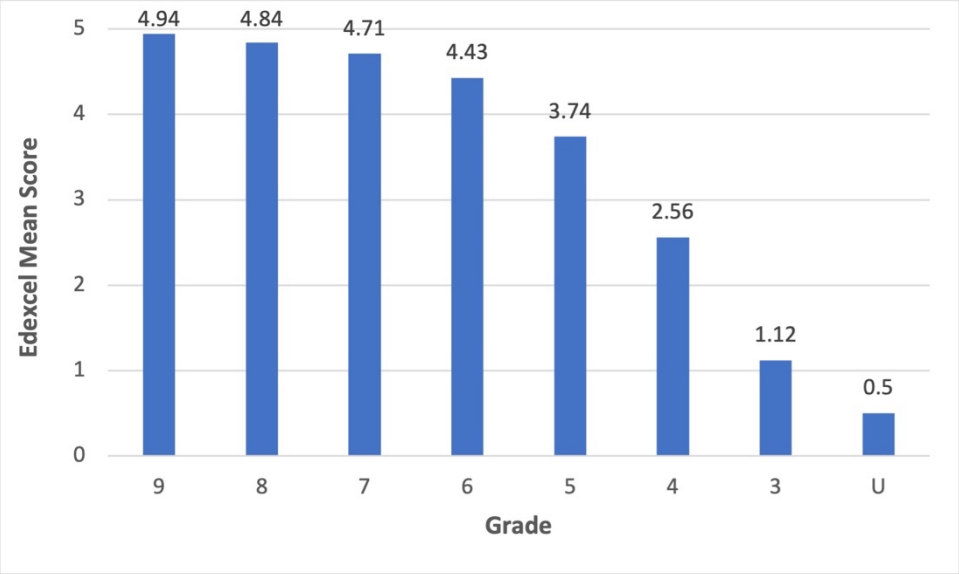
Question 3 - Examiner Comments

A majority of students scored full marks on this question. Many students in this higher tier paper used an algebraic approach, formulating and solving an equation, then using the solution to find a ratio and the value of p. Students usually worked accurately, but there were a number of students who wrote down a correct equation but collected terms in x to get $4x$ instead of the correct $5x$. Other students, having got the correct equation, $5x - 6 = 54$, then made an error in the first step to solve it, writing $5x = 48$.

A significant proportion of students adopted a purely numerical approach, finding, by trial and improvement, three numbers which satisfied the criteria given in the question, then using them to form a ratio. Some students found the number of counters for Rick and for Tony but did not form a ratio. There were also some other students who did form a ratio but did not write it in the ratio 1 : p.

Question 3 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
4.26	5	85	4.26	4.94	4.84	4.71	4.43	3.74	2.56	1.12	0.50



Question 3 - Response A

3 Rick, Selma and Tony are playing a game with counters.

Rick has some counters.
Selma has twice as many counters as Rick.
Tony has 6 counters less than Selma.

In total they have 54 counters.

the number of counters Rick has : the number of counters Tony has = 1 : p

Work out the value of p.

R x
S $2x$
T $2x-6$

~~56~~

$54+6=60$

Rick 12
Selma 24
Tony. 18

$60 \div 5 = 12$

Rick : Tony.
12 : 18
$\div 12$ $\div 12$
1 : 1.5

6 : 9
3
2 : 3

$p =$ 1.5

(Total for Question 3 is 5 marks)

5 /5

P1 for 3 algebraic expressions, at least 2 correct. Here all 3 expressions are correct.

P1 P1 An equation is not explicitly written down but the inverse operations seen leading to 12, 24, 18 confirm the award of the next 2 process marks.

P1 The ratio 12 : 18 is correct for R : T

A1 for 1.5

Question 3 - Response B

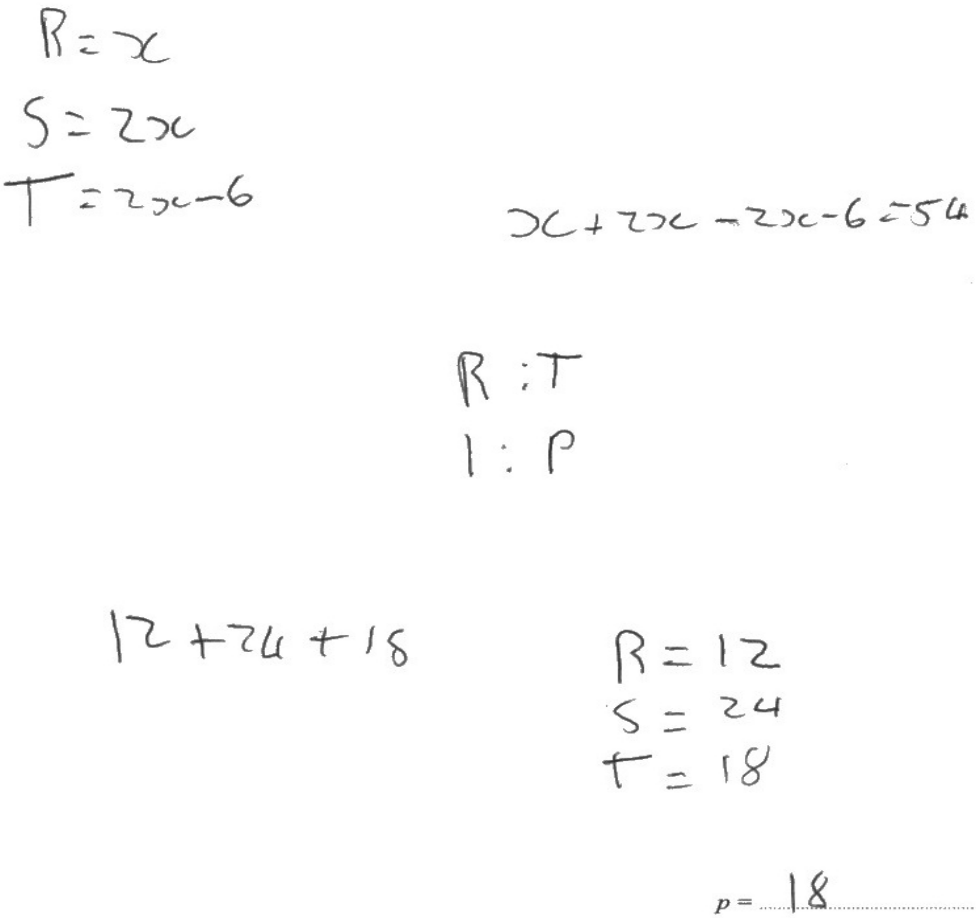
3 Rick, Selma and Tony are playing a game with counters.

Rick has some counters.
Selma has twice as many counters as Rick.
Tony has 6 counters less than Selma.

In total they have 54 counters.

the number of counters Rick has : the number of counters Tony has = 1 : p

Work out the value of p.



Q3

A B C

3 /5

P1 for 3 algebraic expressions, at least 2 correct. Here all 3 expressions are correct.

P1 for a correct equation.

P1 12, 24 and 18

P0 No ratio is given

A0 The answer is not correct and the student has just given the value (18) assigned to Tony instead of forming a ratio.

Question 3 - Response C

3 Rick, Selma and Tony are playing a game with counters.

Rick has some counters.
Selma has twice as many counters as Rick.
Tony has 6 counters less than Selma.

In total they have 54 counters.

the number of counters Rick has : the number of counters Tony has = 1 : p

Work out the value of p.

$R = x$
$S = 2x$
$T = 2x - 6$

$R : T$
$x : 2x - 6$
$1 : p$

Q3

A
B
C

1 /5

P1 for three algebraic expressions, at least 2 of which are correct.

P0 P0 P0 The ratio is a correct algebraic ratio but no attempt has been made to form an equation or find the value of x. The ratio must be correct and in numerical form to gain any credit.

A0 No answer is given.

Question 4

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 4 - Question

4 Jo is going to buy 15 rolls of wallpaper.

Here is some information about the cost of rolls of wallpaper from each of two shops.

Chic Decor	Style Papers
3 rolls for £36	Pack of 5 rolls normal price £70 12% off the normal price

Jo wants to buy the 15 rolls of wallpaper as cheaply as possible.

Should Jo buy the wallpaper from Chic Decor or from Style Papers?
You must show how you get your answer.

(Total for Question 4 is 4 marks)

Question 4 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
4	Chic Decor with correct supporting evidence	P1	for process to find cost of 15 rolls from Chic Decor, eg $\frac{15}{3}\times 36$ (= 180) or for process to find cost of 15 rolls from Style Papers at normal price, eg $\frac{15}{5}\times 70$ (= 210) or for process to find cost of 1 roll from Chic Decor, eg 36 ÷ 3 (= 12) or for process to find cost of 1 roll from Style Papers, eg 70 ÷ 5 (= 14) or for process to find the cost of 5 rolls from Chic Decor, eg $\frac{36}{3}\times 5$ (= 60)	Could compare the costs for any number of rolls
		P1	for any first step in using the discount at Style Papers, eg 0.12 × "210" (= 25.2(0)) or 0.12 × "14" (= 1.68) or 0.12 × 70 (= 8.4(0)) **or** 1 – 0.12 (= 0.88)	
		P1	for full process to find cost from Style Papers, eg. "210" – "25.2" oe (=184.8(0)) or "0.88" × "210" or for "14" – "1.68" oe (= 12.32) or "0.88" × "14" or for 70 – "8.4(0)" oe (= 61.6(0)) or "0.88" × 70	
		C1	for Chic Decor with fully correct figures eg 180 and 184.8(0) or 12 and 12.32 or 60 and 61.6(0)	

Q4

A
B
C

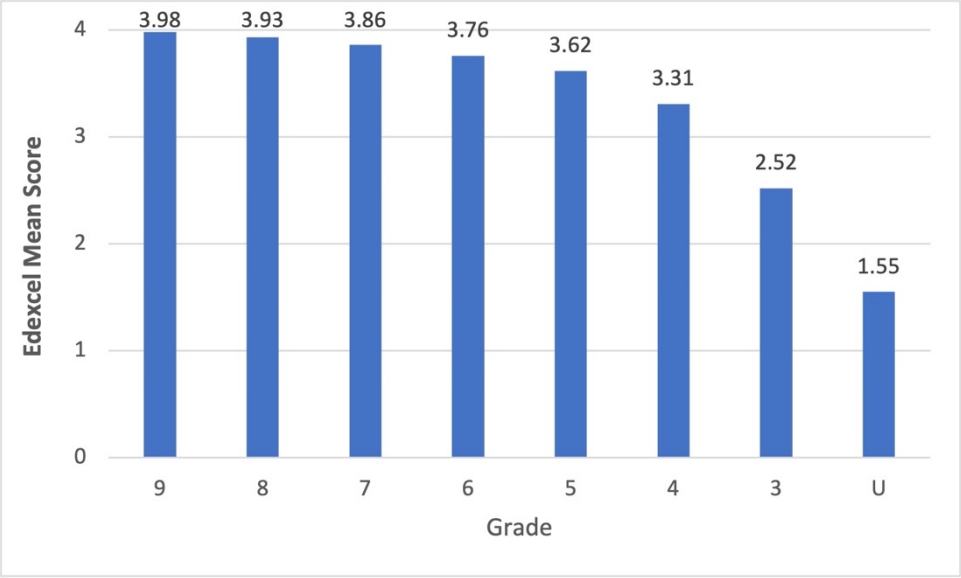
Question 4 - Examiner Comments

A good discriminator between lower attaining students, this question attracted many fully correct solutions. Despite there being a number of possible routes that students could take, there were also many incorrect or incomplete solutions. The most common approach was to find the cost of 15 rolls of wallpaper at each of the shops, though credit was given for comparing any number of rolls, for example 1 roll or 5 rolls. A high proportion of students compared £180 with £184.80 and reached a correct conclusion to score all 4 marks. However, some students worked out the discount and took that to be the cost of the wallpaper at Style Papers.

A common error seen was, for students who did not appear to have access to a calculator, to use a build-up method to find 12%, for example by writing down 10%, 1% and 1%. Students who did this often made an error with the arithmetic and lost marks because they did not show the calculation, for example the addition of the three percentages or how they worked out the 10% or 1%. Students are reminded that when showing their calculation of a percentage, they should show a full method, so for example instead of writing 12% of £70 = £8.40, they should write $\frac{12}{100} \times 70 = 8.40$ or $0.12 \times 70 = 8.40$. This is so that in the event of an incorrect answer, marks for a correct method can be awarded.

Question 4 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
3.74	4	94	3.74	3.98	3.93	3.86	3.76	3.62	3.31	2.52	1.55



Question 4 - Response A

4 Jo is going to buy 15 rolls of wallpaper.

Here is some information about the cost of rolls of wallpaper from each of two shops.

Chic Decor	Style Papers
3 rolls for £36	Pack of 5 rolls normal price £70 12% off the normal price

Jo wants to buy the 15 rolls of wallpaper as cheaply as possible.

Should Jo buy the wallpaper from Chic Decor or from Style Papers?
You must show how you get your answer.

Chic Decor:

3 rolls = 36

15 rolls = 36 × 5

15 rolls = £180

Style papers:

5 rolls = £70 - 12%.

10% = 7

1% = 0.7

2% = 1.4

7 + 1.4 = £8.40

£70 - 8.40 = 61.6

61.6 × 3 = £184.8

Therefore they should buy there wall paper from chic Decor as it's £4.80 cheaper.

(Total for Question 4 is 4 marks)

Q4

A B C

4 /4

P1 for the process to find the cost of 15 rolls at Chic Decor, 36 x 5 or 180

P1 for start of the process to find the cost at Style Papers, £8.40 It should be noted that if any of the figures 7, 1.4 had been incorrect (ie not leading to £8.40), we could not award this mark because the student has not shown how to calculate the value by writing for example, $\frac{2}{100} \times 70$

P1 for a full process to find the cost of 15 rolls (after discount) at Style Papers. (The sight of 184.8(0) is enough evidence to award the second and third process marks.)

C1 A correct decision is made, Chic Decor supported by the 2 correct comparable figures, in this case 180 and 184.80 earns the C mark. (Please note for the final mark you can ignore any additional information given. All they need is a decision of Chic Decor (may just be circled or underlined) together with 2 correct and comparable costs)

Question 4 - Response B

4 Jo is going to buy 15 rolls of wallpaper.

Here is some information about the cost of rolls of wallpaper from each of two shops.

Chic Decor	Style Papers
3 rolls for £36	Pack of 5 rolls normal price £70 12% off the normal price

Jo wants to buy the 15 rolls of wallpaper as cheaply as possible.

Should Jo buy the wallpaper from Chic Decor or from Style Papers?
You must show how you get your answer.

70 × 0.88 = 61.6

15 ÷ 5 = 3

3 × 61.6 = 184.8

15 ÷ 3 = 5

5 × 36 = 180

Chic Decor price 180

Style papers 184.8

Q4

A B C

3 /4

P1 for a correct process to find the cost at Chic Décor, 15 ÷ 3 and 5 × 36

P1 for 0.88, a first step on the way to finding the cost at Style Papers.

P1 for a full process to find the cost at Style Papers, 3 × 61.6

C0 The student has fully correct figures to compare, 180 and 184.8. However, no decision is given. They have not indicated the decision "Chic Decor" either inwords, or by circling or highlighting in some other way

Question 4 - Response C

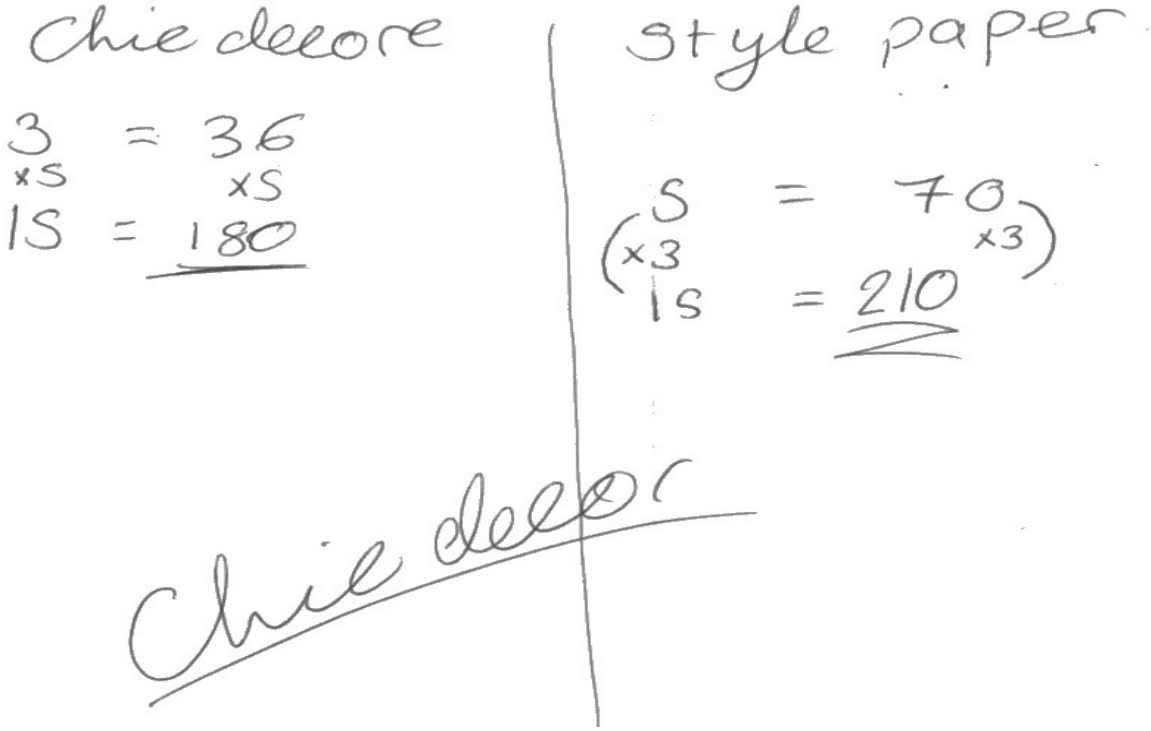
4 Jo is going to buy 15 rolls of wallpaper.

Here is some information about the cost of rolls of wallpaper from each of two shops.

Chic Decor	Style Papers
3 rolls for £36	Pack of 5 rolls normal price £70 12% off the normal price

Jo wants to buy the 15 rolls of wallpaper as cheaply as possible.

Should Jo buy the wallpaper from Chic Decor or from Style Papers?
You must show how you get your answer.



Q4

A
B
C

1 /4

P1 for the process to find the cost of 15 rolls at Chic Decor, 36 x 5 or 180. Note that the process shown by the student to find the normal price of 15 rolls at Style Papers could also have led tothe award of this first mark.

P0 P0 No further progress made. The student has made no attempt to find the cost after discount at Style Papers so they cannot access the second and third marks on the mark scheme.

C0 A decision is taken but they have not taken the discount into consideration so correct comparable figures have not been found and this mark cannot be given.

Question 5

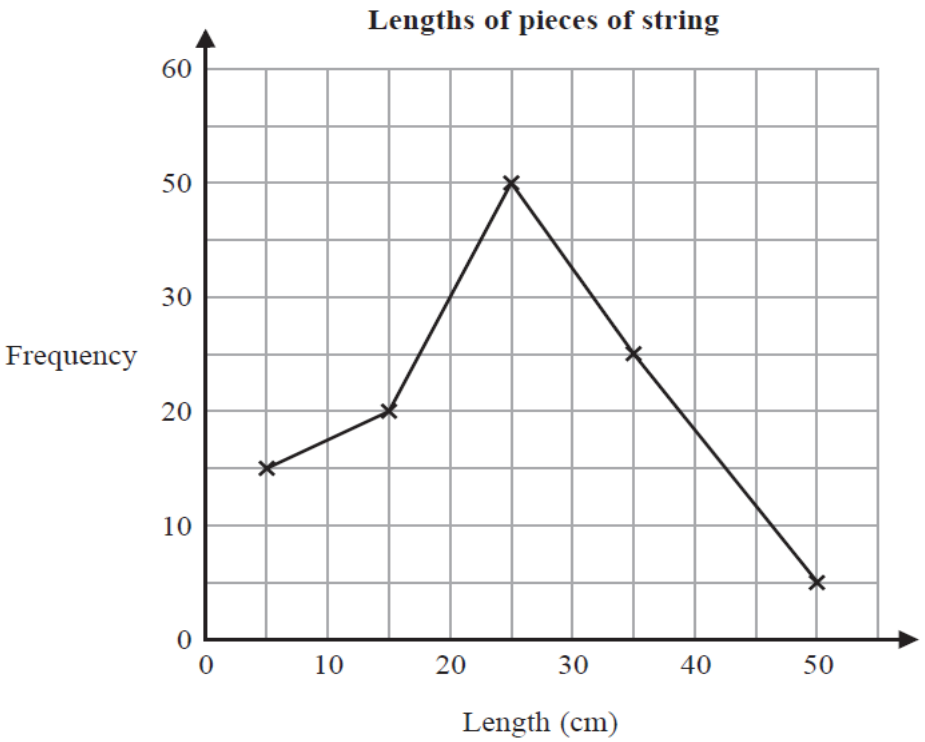
Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 5 - Question

5 The table gives information about the lengths, in cm, of some pieces of string.

Length (t cm)	Frequency
$0 < t \leq 10$	15
$10 < t \leq 20$	20
$20 < t \leq 30$	50
$30 < t \leq 40$	25
$40 < t \leq 50$	5

Amos draws a frequency polygon for the information in the table.



Write down **two** mistakes that Amos has made.

(Total for Question 5 is 2 marks)

Question 5 - Mark Scheme

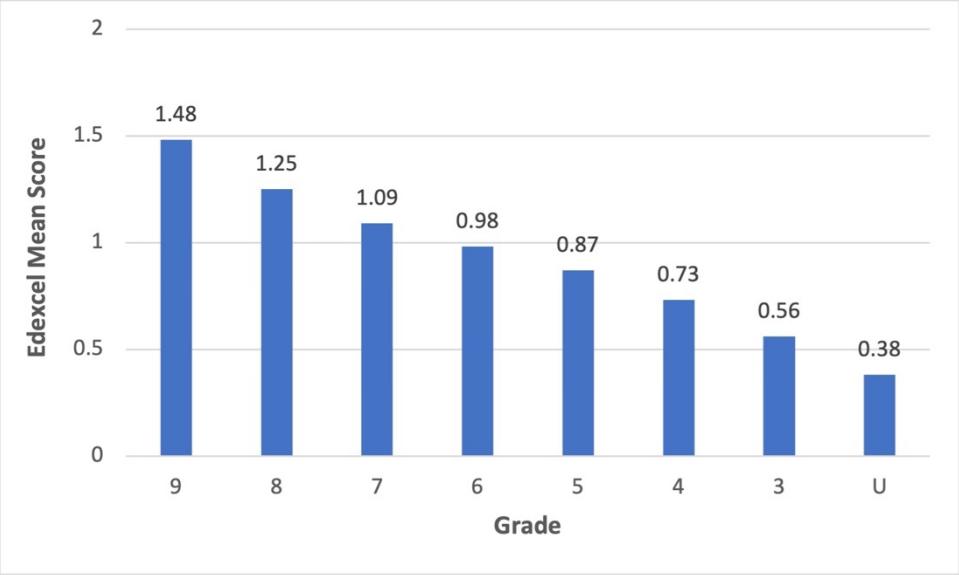
Question	Answer	Mark	Mark scheme	Additional guidance
5	40 missing from frequency scale Incorrect point (50, 5)	C2 (C1	Two different statements **Acceptable** eg (50, 5) / the last point is incorrect the last point should be at (45,5) the last point plotted was placed incorrectly for his last point he has plotted by the end of the data and for the rest he has plotted by the middle he did not use the midpoint, he used 50 instead of 45 40 missing (from vertical axis) vertical scale is not linear the frequency doesn't increase in the same intervals the vertical axis is not right **Not acceptable** eg the last point should be at (40, 5) bottom of the polygon should be connected he didn't start the graph at the origin he did not draw a polygon he has plotted the first 4 points at midpoint One acceptable statement)	Ignore additional statements provided no contradiction

Question 5 - Examiner Comments

This question was quite well answered and descriptions of the mistakes made when the frequency polygon was drawn were generally clearly described. There were two mistakes to identify and students needed to describe them both to score the full 2 marks. Examiners were surprised that more students gained the mark for stating that the point plotted at (50, 5) should have been plotted at (45, 5) than gained the mark for stating that 40 had been omitted from the scale on the frequency axis. Any statement equivalent to one of these, and which was unambiguously stated, earned a mark. The most commonly seen unacceptable statements included not joining the polygon to (0, 0) and not joining the ends of the polygon.

Question 5 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.04	2	52	1.04	1.48	1.25	1.09	0.98	0.87	0.73	0.56	0.38

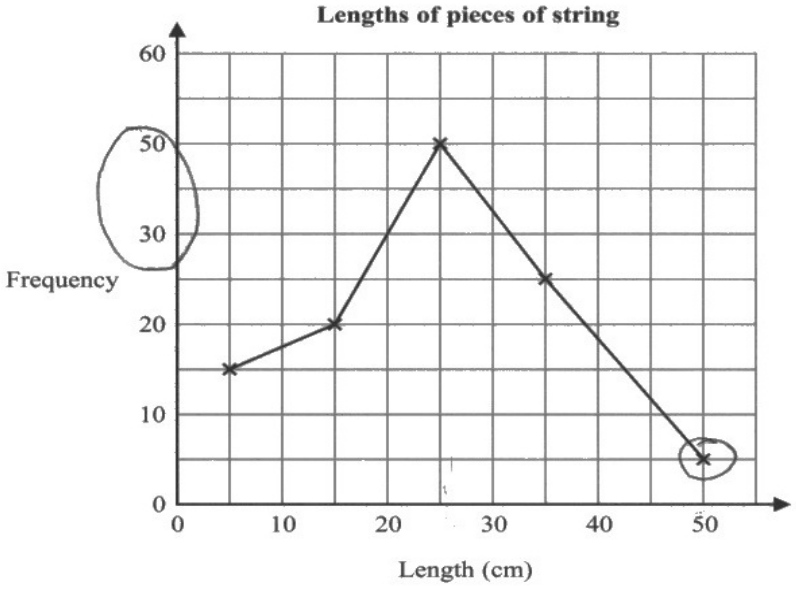


Question 5 - Response A

5 The table gives information about the lengths, in cm, of some pieces of string.

Length (t cm)	Frequency
$0 < t \leqslant 10$	15
$10 < t \leqslant 20$	20
$20 < t \leqslant 30$	50
$30 < t \leqslant 40$	25
$40 < t \leqslant 50$	5

Amos draws a frequency polygon for the information in the table.



Write down **two** mistakes that Amos has made.

1. Amos ~~wrote~~ drew the last point on 50 cm not in the interval between 40 cm and 50 cm, 45 cm would be correct.
2. Amos missed out 40 on the y axis

2 /2

C1 for stating that the last point is plotted incorrectly.

C1 for describing the omission of 40 on the frequency axis.

Q5

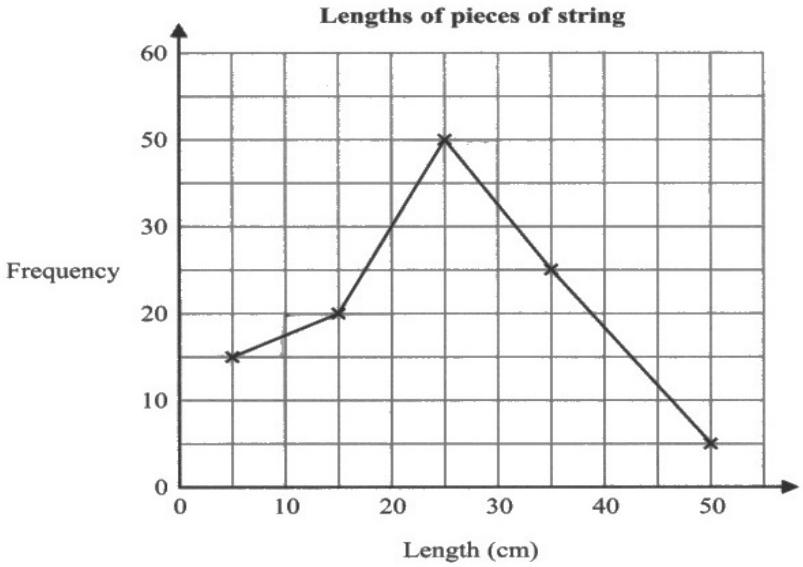
A
B
C

Question 5 - Response B

5 The table gives information about the lengths, in cm, of some pieces of string.

Length (t cm)	Frequency
$0 < t \leqslant 10$	15
$10 < t \leqslant 20$	20
$20 < t \leqslant 30$	50
$30 < t \leqslant 40$	25
$40 < t \leqslant 50$	5

Amos draws a frequency polygon for the information in the table.



Write down **two** mistakes that Amos has made.

1 he left a gap in between 25 and 5 frequencies (40 and 50)

2 he didnt use the midpoint of 40 and 50

1 /2

C0 for a first statement which does not describe the error with enough clarity.

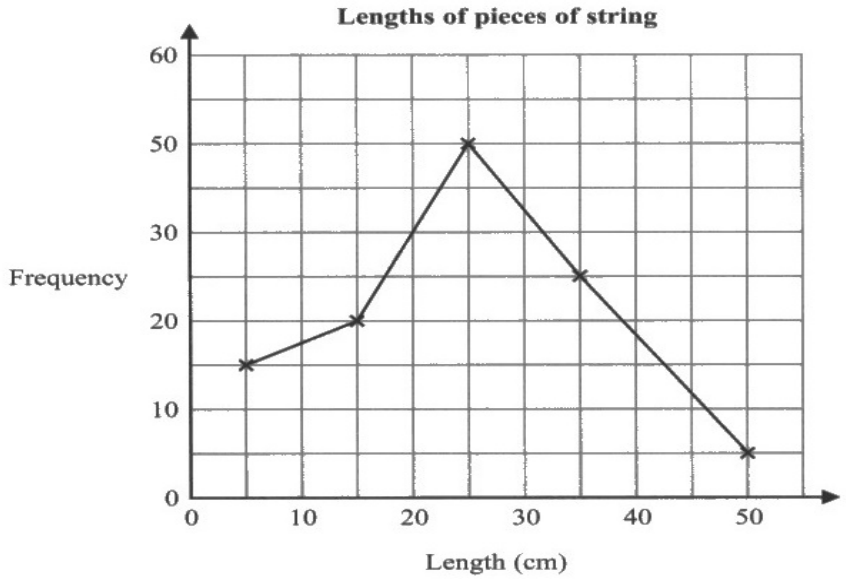
C1 for the second statement, identifying the mistake made in plotting the last point.

Question 5 - Response C

5 The table gives information about the lengths, in cm, of some pieces of string.

Length (t cm)	Frequency
$0 < t \leqslant 10$	15
$10 < t \leqslant 20$	20
$20 < t \leqslant 30$	50
$30 < t \leqslant 40$	25
$40 < t \leqslant 50$	5

Amos draws a frequency polygon for the information in the table.



Write down **two** mistakes that Amos has made.

1 He has plotted the data at the wrong lengths.

2 He has not finished the line connecting the data

0 /2

C0 for a first statement which is too vague and does not focus on the point which is incorrectly plotted.

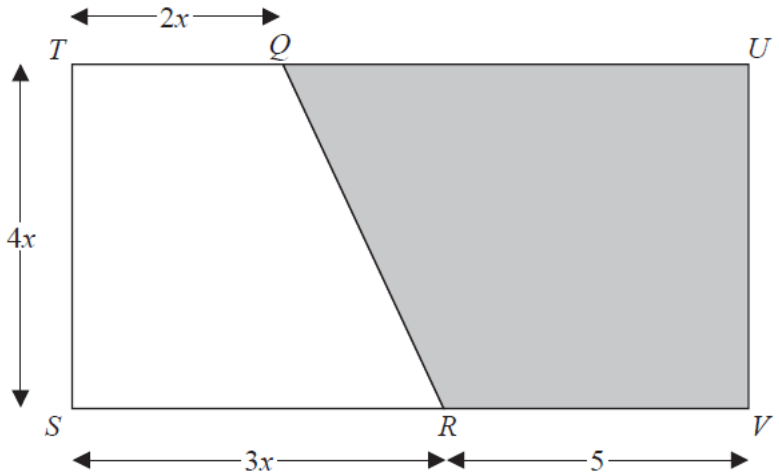
C0 for the second statement which is incorrect. It was common for some lower attaining students to suggest that the ends of the polygon should be joined to each other or to an axis.

Question 7

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 7 - Question

7 The diagram shows rectangle $STUV$.
TQU and SRV are straight lines.
All measurements are in cm.



The area of trapezium $QUVR$ is A cm^2

Show that $A = 2x^2 + 20x$

(Total for Question 7 is 3 marks)

Question 7 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
7	Complete chain of reasoning	M1	for (area of trapezium $TQRS$ =) $0.5 \times 4x \times (2x + 3x)$ or for (area of rectangle $TUVS$ =) $4x \times (3x + 5)$ $(= 12x^2 + 20x)$	Evidence for the award of marks may be seen on the diagram
		M1	for (area of trapezium $QUV\,R$ =) $4x(3x + 5) – 0.5 \times 4x \times (2x + 3x)$	Alternative methods may be seen.
		C1	for correct algebraic processing and simplification to the given form	
		M1	**Alternative 1** for (QU =) $3x + 5 – 2x$ $(= x + 5)$	
		M1	for (area of trapezium $QUVR$ =) $0.5 \times 4x \times$ (("x + 5") + 5) or $0.5 \times 4x \times (x + 10)$	
		C1	for correct algebraic processing and simplification to the given form	

		M1	**Alternative 2**
			for (area of triangle =) $0.5 \times (3x – 2x) \times 4x$ or
			for (area of rectangle =) $4x \times 5$
				Accept x for $(3x – 2x)$

		M1	for (area of trapezium $QUVR$ =) "$0.5 \times (3x – 2x) \times 4x$" + "$4x \times 5$"	
		C1	for correct algebraic processing and simplification to the given form	

Question 7 - Examiner Comments

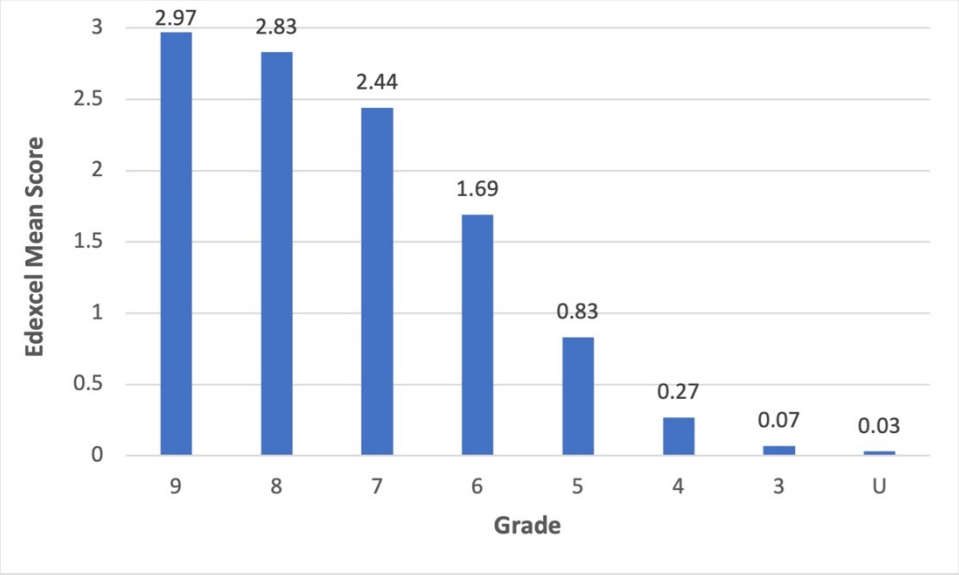
This question was a good discriminator. There were a number of routes which could be followed in order to show the given result. The most popular method was to use the formula for the area of the trapezium $QUVR$. Once a student had found the length of QU ($= x + 5$), they could make substitutions into the formula then simplify it to show
$A = 2x^2 + 20x$. Many students found this to be quite straightforward.

A second commonly seen and generally successful method was to use
Area of trapezium $QUVR$ = Area of rectangle $TUVS$ − Area of trapezium $TQRS$.
Perhaps the most straightforward way was to find the area of the rectangle with length and width $4x$ and 5 then add the area of a triangle of base x and height $4x$. It was surprising how few students took this approach.

The presentation of students answers was often not very clear with examiners having to search the working space for relevant working. However, many students did use algebra in a confident way to show the given result. The absence of brackets to make working clear sometimes led to a student losing marks but examiners were sympathetic where intentions were clear.

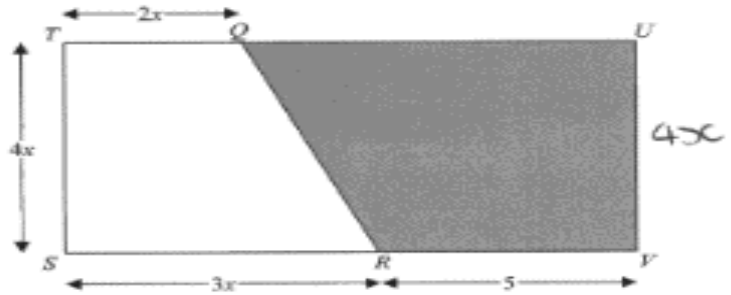
Question 7 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.82	3	61	1.82	2.97	2.83	2.44	1.69	0.83	0.27	0.07	0.03



Question 7 - Response A

7 The diagram shows rectangle $STUV$.
TQU and SRV are straight lines.
All measurements are in cm.



The area of trapezium $QUVR$ is A cm^2

Show that $A = 2x^2 + 20x$

Sum of parallel sides

area of trapezium = $\frac{1}{2}(a+b) \times h$ ← perpendicular separation

$\frac{1}{2}(QU + RV) \times UV$

$UV = 4x$ rectangle = opposites are equal

$RV = 5cm$

$TU = 3x + 5$ $QU = 3x + 5 - 2x = 1x + 5$

$\frac{1}{2}(1x + 5 + 5) \times 4x$ simplify brackets

$\frac{1}{2}x(x + 10) \times 4x$ times ½

$(\frac{1}{2}x + 5) \times 4x$ times 4x

$A = 2x^2 + 20x$

Q7

A
B
C

3 /3

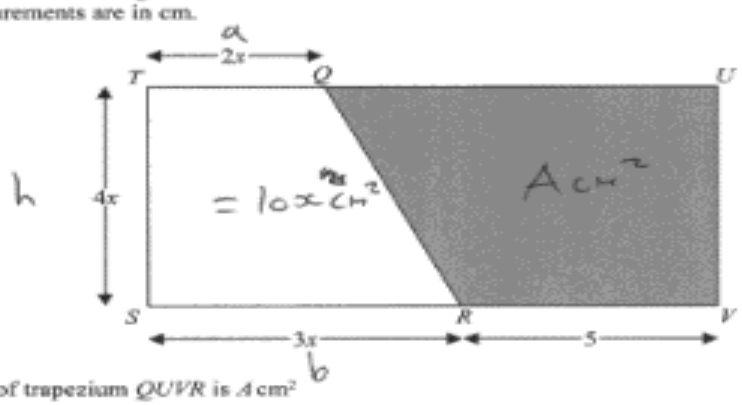
M1 for (QU =) $3x + 5 – 2x$ (= $1x + 5$) from Alternative 1 on the mark scheme. This mark is given for a start which can lead to justifying the given result provided it is an expression in terms of x

M1 for (area of trapezium $QUVR$ =) $\frac{1}{2}(1x + 5 + 5) \times 4x$. This mark is for a complete expression for the area in unsimplified form.

C1 for showing that the expression found is equivalent to $2x^2 + 20x$

Question 7 - Response B

7 The diagram shows rectangle $STUV$.
TQU and SRV are straight lines.
All measurements are in cm.



The area of trapezium $QUVR$ is A cm²

Show that $A = 2x^2 + 20x$

$A = TUSV - TQRS$

$A = 12x^2 + 20x - 10x$

$A = 12x^2 + 10x$

$TUSV = (4x) \times (3x + 5)$

$= 12x^2 + 20x$

$TQRS = \frac{a+b}{2} \times h$

$= \frac{2x + 3x}{2} \times 4x$

$= \frac{5x}{2} \times 4x$

$= 2.5x \times 4x$

$= 10x^2$ cm²

Q7

2 /3

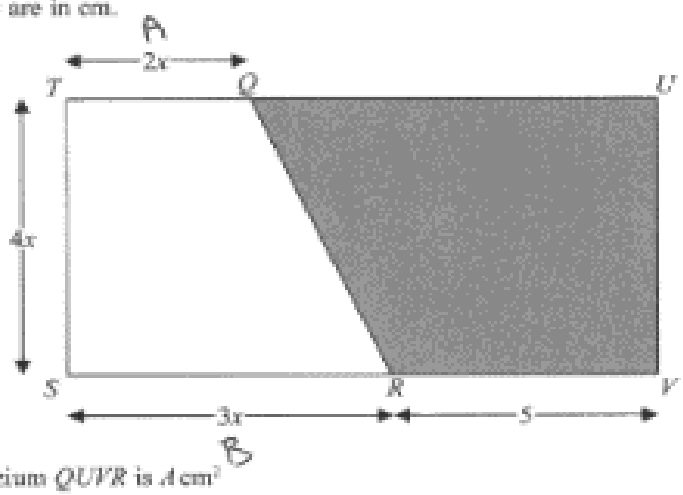
M1 for ($TUSV$ =) $4x(3x + 5)$ from the first method in the mark scheme.

M1 for (A = $TUSV - TQRS$ =) $12x^2 + 20x - 10x$ supported by the working on the left hand side of the working space which shows the student has a correct expression for $TQRS$ which they have incorrectly simplified to $10x$.

C0 because their working does not lead to the required result.

Question 7 - Response C

7 The diagram shows rectangle $STUV$.
TQU and SRV are straight lines.
All measurements are in cm.



The area of trapezium $QUVR$ is A cm^2

Show that $A = 2x^2 + 20x$

A = 1/2 x (2x + 3x) x 4x

A = 1/2 x 5x x 4x

A = 1/2 x 12x

1 /3

M1 for $(A =) \frac{1}{2} \times (2x + 3x) \times 4x$ from Alternative 1 on the mark scheme. This expression gives the area of the unshaded trapezium and is a valid start to the problem.

M0 for no further progress, apart from an incorrect simplification of their expression.

C0 because they do not complete the algebra.

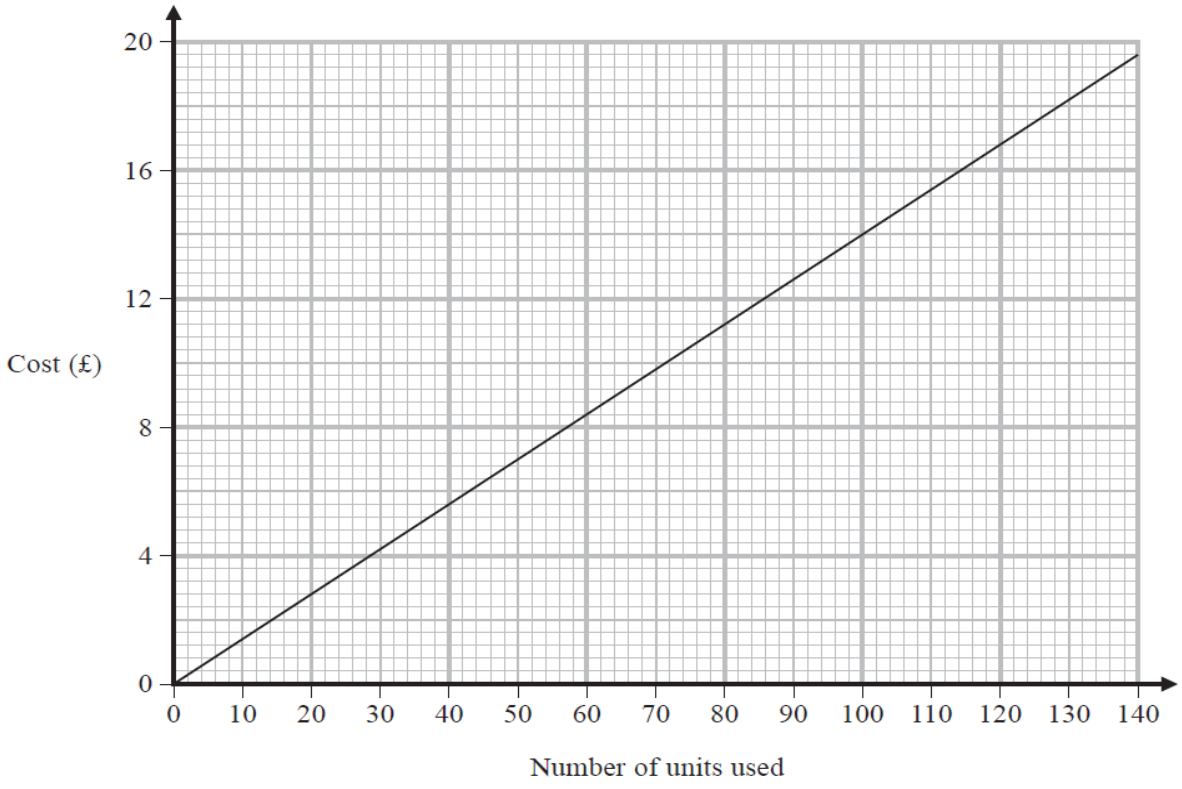
Question 8

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 8 - Question

8 An electricity company charges the same fixed amount for each unit of electricity used.

David uses this graph to work out the total cost of the electricity he has used.



(*a*) Work out the gradient of the straight line.

.....

(2)

(*b*) What does the gradient of this line represent?

.....

(1)

(Total for Question 8 is 3 marks)

Question 8 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
8 (a)	0.14	M1	for a method to find the gradient, eg. 14 ÷ 100 using readings from the graph, at least one correct or for an answer of 0.14x	Must use the scales on the graph
		A1	for answer in the range 0.135 to 0.145 or ft correct readings from the graph	May be expressed as a fraction
(b)	Cost per unit of electricity	C1	for a correct explanation **Acceptable examples** eg cost of each unit (of electricity) rate of change of cost with units of electricity used cost per unit of electricity each unit costs 14p average cost charged for each unit of electricity used **Not acceptable examples** cost of how many units used costs in pounds per number of units used how much the cost of electricity goes up the relationship of cost and number of units used how steep it is	

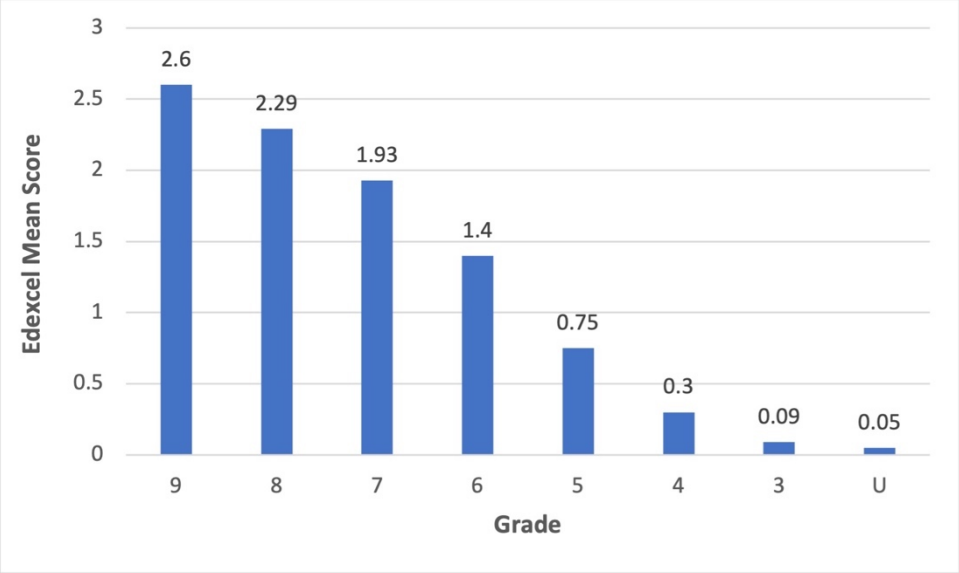
Question 8 - Examiner Comments

Many students found this question to be straightforward. They often used a triangle where readings were easy to take and gave a value for the gradient of the graph within the accepted range, more often than not 0.14. For some other students who drew a small triangle on the line getting an accurate answer was less likely. However, if the value given for the gradient was outside the range 0.135 to 0.145, examiners awarded both marks in part (a) provided a correct method was clearly shown. A small number of students used "increase in x ÷ increase in y" or counted squares rather than using the scales on the axes. These students could not be credited with any marks in part (a).

Part (b) was answered less well and many incorrect or ambiguous statements were seen. An answer equivalent to "cost per unit of electricity" was expected but many students merely described what the graph, not the gradient, showed and statements such as "cost of how many units used" were often seen.

Question 8 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.52	3	51	1.52	2.60	2.29	1.93	1.40	0.75	0.30	0.09	0.05

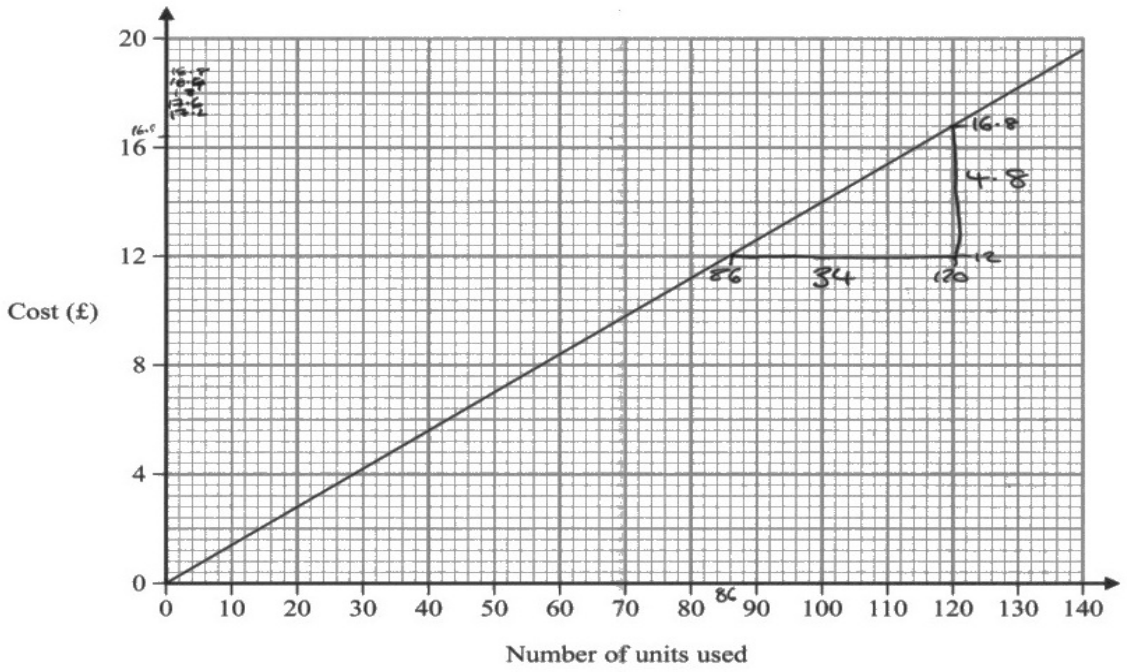


Q8
A
B
C

Question 8 - Response A

8 An electricity company charges the same fixed amount for each unit of electricity used.

David uses this graph to work out the total cost of the electricity he has used.



(a) Work out the gradient of the straight line.

$4.8 \div 34 = 0.14117$

$= 0.1412$

0.1412

(2)

(b) What does the gradient of this line represent?

cost per unit of electricity used

3 /3

Part (a)

M1 for a correct method to find the gradient, shown by the diagram and $\frac{4.8}{34}$

A1 for gradient correctly found in the range 0.135 to 0.145.
If the answer is out of range, we check the graph and follow through their readings, provided at least one of the readings is correct and the scales on the graph are used.

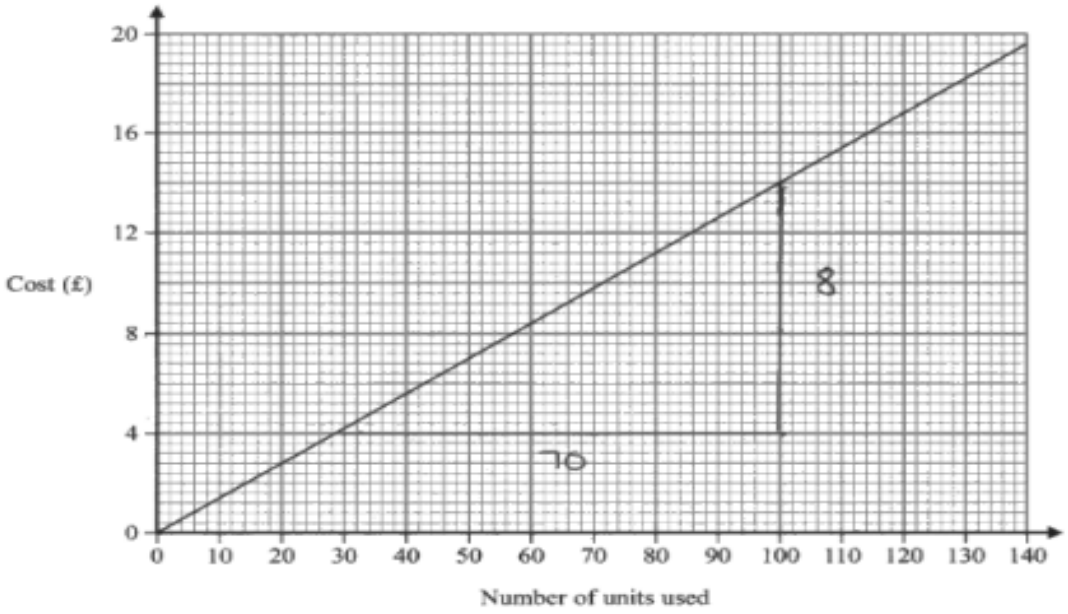
Part (b)

C1 Awarded for a correct explanation.

Question 8 - Response B

8 An electricity company charges the same fixed amount for each unit of electricity used.

David uses this graph to work out the total cost of the electricity he has used.



(a) Work out the gradient of the straight line.

Rise / Run 8/70 = 0.1142857143

0.1142857
(2)

(b) What does the gradient of this line represent?

the rise in cost of electricity

Q8

A B C

1 /3

Part (a)

M1 for a correct method to find the gradient, shown by the diagram and $\frac{8}{70}$. The student has used the scale and although one reading is incorrect, they have used "increase in y" ÷ "increase in x" and can be awarded the method mark.

A0 for an answer outside the range and using one incorrect reading.

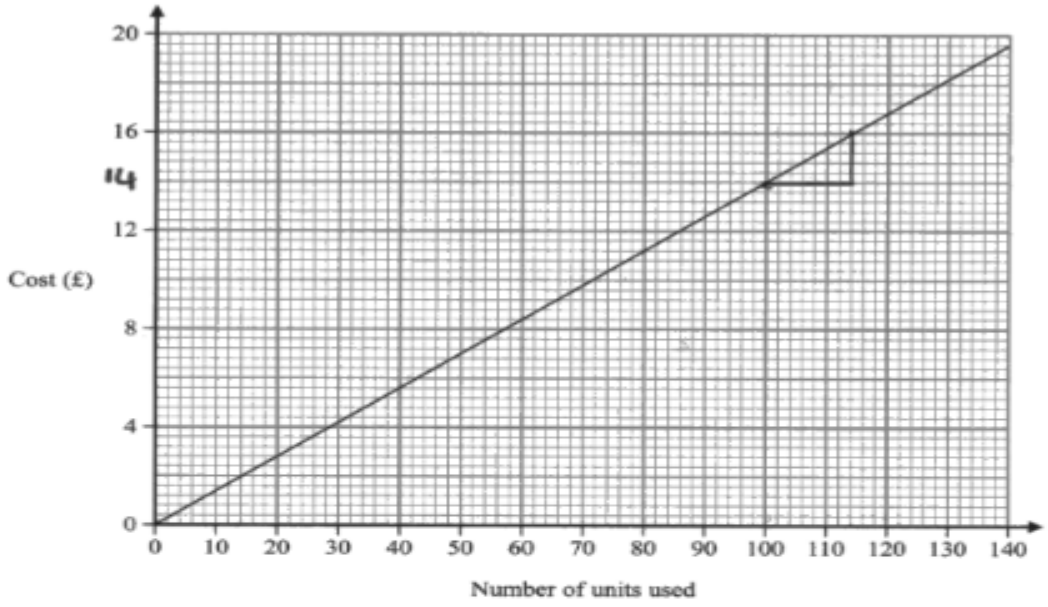
Part (b)

C0 The student has not specified the rise in cost *for one unit of electricity*.

Question 8 - Response C

8 An electricity company charges the same fixed amount for each unit of electricity used.

David uses this graph to work out the total cost of the electricity he has used.



(a) Work out the gradient of the straight line.

A 2 → 14

÷ 1 → 7

7

(2)

(b) What does the gradient of this line represent?

The increased number of units used

0 /3

Part (a)

M0 for a incorrect method to find the gradient; the student appears to have used the increase in number of units used for each £1 increase in cost, ie the reciprocal of what is needed and the number of units per pound, not the cost for one unit.

A0 for an incorrect answer

Part (b)

C0 awarded for an incorrect explanation.

Question 9

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 9 - Question

9 (*a*) Express $\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}}$ as a power of 10

.....

(3)

Liam was asked to express $(12^{50})^2$ as a power of 12

Liam wrote $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(*b*) Explain why.

.....

.....

.....

(1)

(Total for Question 9 is 4 marks)

Question 9 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	10^{60}	M1	for a correct first step using one of the rules of indices, eg. $10^{150} \times 10^{90} = 10^{240}$ or $10^{360} \div 10^{150} = 10^{210}$ or $10^{360} \div 10^{90} = 10^{270}$ or $\sqrt{10^{360}} = 10^{180}$ or $\sqrt{10^{150}} = 10^{75}$ or $\sqrt{10^{90}} = 10^{45}$	
		M1	for correct use of rules of indices leading as far as $\sqrt{10^{120}}$ or $\frac{10^{180}}{10^{120}}$	
		A1	cao	
(b)	reason	C1	for correct reasoning **Acceptable examples** eg should do 50×2 (not 50^2) because $(12^{50})^2 = 12^{100}$ because when you have a power inside and outside the bracket you times them because $(a^b)^c = a^{bc}$ (not a^{b^c}) **Not acceptable examples** because you need to multiply everything in the brackets by 2 because he should have squared 12 as well you add the powers instead of timesing	

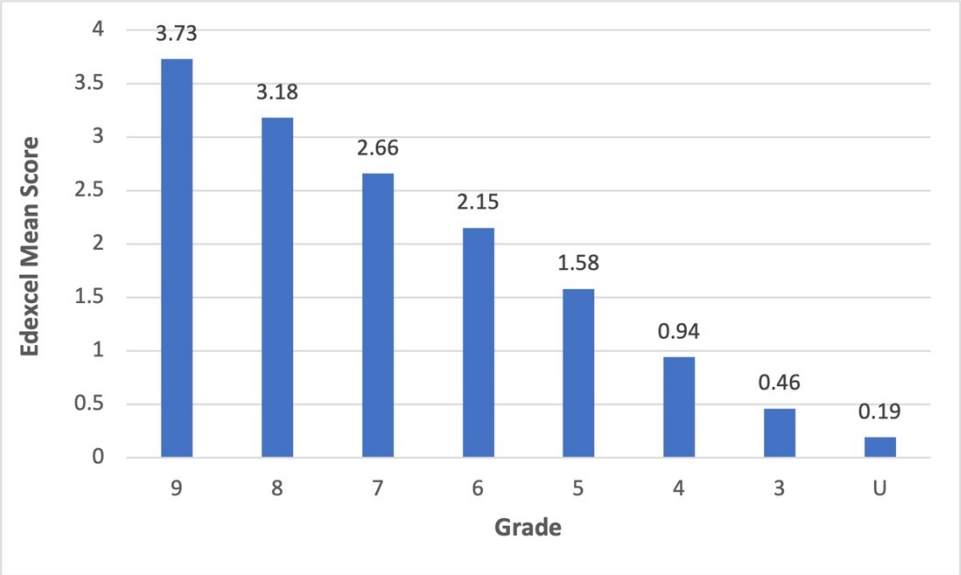
Question 9 - Examiner Comments

Just over a quarter of all students completed part (a) of this question successfully to gain all 3 marks. A commonly seen final answer was 10^{120}. This could only score 1 mark. However, about two thirds of all students got as far as simplifying the expression to $\sqrt{10^{120}}$. Some of these students left this as their answer while other students went on to evaluate it incorrectly.

Answers to part (b) were often marred by a lack of clarity. Answers such as "Liam should have multiplied the numbers inside and outside the brackets" were commonplace but could not usually be rewarded with the mark available. Another common incorrect response was for a student to state that the 12 should be squared. More successful responses usually referred to the answer Liam should get, that is 12^{100} or that Liam should have multiplied 50 and 2, not worked out 50^2.

Question 9 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
2.33	4	58	2.33	3.73	3.18	2.66	2.15	1.58	0.94	0.46	0.19



Q9
A
B
C

Question 9 - Response A

9 (a) Express $\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}}$ as a power of 10

$\sqrt{\frac{10^{360}}{10^{240}}} = \sqrt{10^{120}}$

$= 10^{60}$

10^{60}

(3)

Liam was asked to express $(12^{50})^2$ as a power of 12

Liam wrote $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(b) Explain why.

Instead of squaring 50 he needs to times 50 by 2 giving 100

(1)

4 /4

Part (a)
M1 for the correct first step, $10^{150} \times 10^{90} = 10^{240}$

M1 for simplification to $\sqrt{10^{120}}$

A1 for correct answer, 10^{60}

Part (b)
C1 Here the candidate has clearly explained why Liam's method is wrong.

Question 9 - Response B

9 (a) Express $\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}}$ as a power of 10

$\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}} = \sqrt{\frac{10^{360}}{10^{240}}} = \sqrt{10^{120}}$

$10^{\frac{120}{2}}$

$(10^{\frac{1}{2}})^{120}$

(3)

Liam was asked to express $(12^{50})^2$ as a power of 12

Liam wrote $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(b) Explain why.

law of indices $(12^{50})^2 = 12^{100}$

(1)

3 /4

Q9

A B C

Part (a)
M1 for the correct first step, $10^{150} \times 10^{90} = 10^{240}$

M1 for simplification to $\sqrt{10^{120}}$

A0 because the student has not simplified their expression enough and has not given the answer as a power of 10

Part (b)
C1 Here the candidate has shown that Liam should have used the law of indices (correctly) to get 12^{100}

Question 9 - Response C

9 (a) Express $\sqrt{\frac{10^{360}}{10^{150} \times 10^{90}}}$ as a power of 10

$\frac{10^{180}}{10^{75} \times 10^{45}} = \frac{10^{180}}{10^{240}}$

1^{-60}

Liam was asked to express $(12^{50})^2$ as a power of 12

Liam wrote $(12^{50})^2 = 12^{50^2} = 12^{2500}$

Liam's method is wrong.

(b) Explain why.

He did not square 12. He also squared 50 when he was suppost to times it by 2.

(1)

Q9

A B C

1 /4

Part (a)
M1 for any one of $10^{180}, 10^{75}$ or 10^{45} as a first step.

M0 because no further progress is made to simplify $\frac{10^{180}}{10^{75} \times 10^{45}}$ correctly.

A0 because no answer is given and the last expression written in the working space, 1^{-60} is incorrect

Part (b)
C0 The student has given 2 reasons, one incorrect and one correct so 0 marks are scored

Question 10

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 10 - Question

10 Jane bought a new car three years ago.

At the end of the first year the value of the car had decreased by 12.5%
The value of the car then decreased by 10% each year for the next two years.

At the end of the three years, the value of the car was £17 010

Work out the value of the car when Jane bought it three years ago.

£.....

(Total for Question 10 is 3 marks)

Question 10 - Mark Scheme

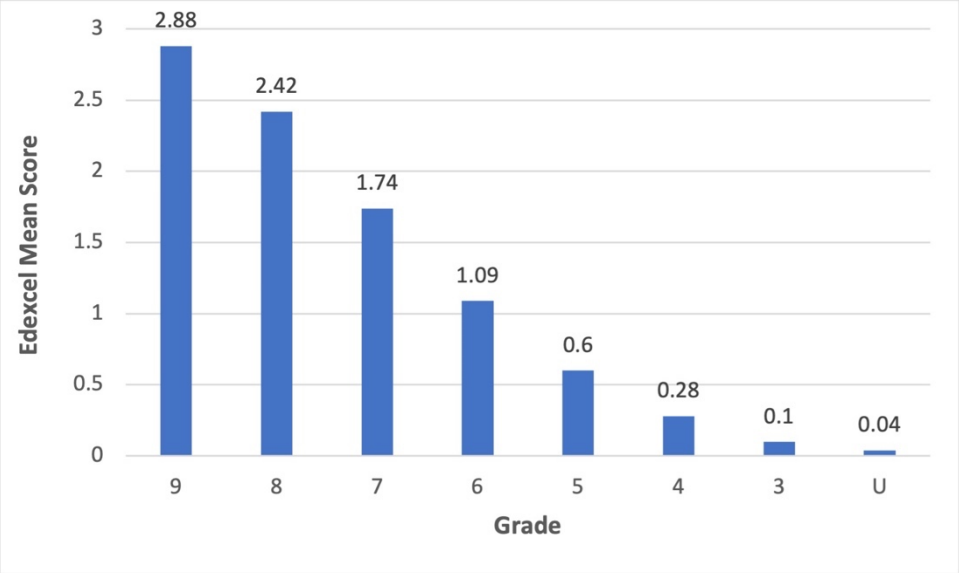
Question	Answer	Mark	Mark scheme	Additional guidance
10	24000	P1	for use of either 0.9 or 0.875 or for 18900 (after 2 years)	
		P1	for using $0.9^2 \times 0.875$ (= 0.70875) oe or for 21000 (after 1 year)	
		A1	cao	

Question 10 - Examiner Comments

This question was not well done. Too many students showed the misunderstanding that, to reverse a 10% decrease, they had to increase the value of the car by 10%, so they multiplied by 1.1 rather than using the correct method of dividing by 0.9. It was relatively unusual to award 1 or 2 marks for responses. Students usually either showed a good understanding or no understanding of the processes required to solve the problem.

Question 10 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.42	3	47	1.42	2.88	2.42	1.74	1.09	0.60	0.28	0.10	0.04



Question 10 - Response A

10 Jane bought a new car three years ago.

At the end of the first year the value of the car had decreased by 12.5%
The value of the car then decreased by 10% each year for the next two years.

At the end of the three years, the value of the car was £17010

Work out the value of the car when Jane bought it three years ago.

£17,010 = 90% of year 2

÷90
×100
= £18,900 in year 2

£18,900 = 90% of year 1

÷90
×100
= £21,000 in year 1

£21,000 = 87.5% of year 0

÷87.5
×100
= £24,000

£ 24000

(Total for Question 10 is 3 marks)

Q10

A
B
C

3 /3

P1 for the price of the car after 2 years (18900), the candidate could also have been awarded the mark for the use of 0.9; dividing by 90 and multiplying by 100 is equivalent to this.

P1 for the price of the car after 1 year (21000) or for using $0.9^2 \times 0.875$ (seen in separate stages here).

A1 correct answer, 24000

Question 10 - Response B

10 Jane bought a new car three years ago.

At the end of the first year the value of the car had decreased by 12.5%
The value of the car then decreased by 10% each year for the next two years.

At the end of the three years, the value of the car was £17010

Work out the value of the car when Jane bought it three years ago.

$x(0.9)^2 = 17010$

$x(0.81) = 17010$

$\div 0.81 \quad \div 0.81$

$x = 21000$

£ 21000

(Total for Question 10 is 3 marks)

Q10

A
B
C

2 /3

P1 for the use of 0.9, this is used in the calculation 17010 / 0.81

P1 for 21000, the price of the car 1 year before the £17010 valuation.

A0 for incorrect answer as the effect of the reduction in the first year, of 12.5%, has not been reversed

Question 10 - Response C

10 Jane bought a new car three years ago.

100 - 12·5 = 87·5

At the end of the first year the value of the car had decreased by 12.5%

0·875

The value of the car then decreased by 10% each year for the next two years.

0·90

At the end of the three years, the value of the car was £17010

Work out the value of the car when Jane bought it three years ago.

£17010 × $(1.1)^2$ = £20582·1

£20582·1 × 1·125 = £23154·86

£23154·86

(Total for Question 10 is 3 marks)

Q10

A
B
C

0 /3

P0 The candidate has the figures of 0.9 and 0.875. However, these have not been used and the student has gone on to use the incorrect multipliers 1.1 and 1.125 instead.

P0 The candidate has increased by 10% and 12.5%, using the multipliers 1.1 and 1.125 in an attempt to reverse the percentage changes. This is a very common incorrect approach.

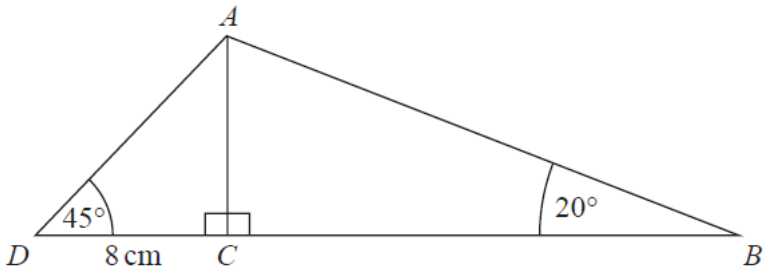
A0 incorrect answer

Question 12

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 12 - Question

12 ABC and ACD are right-angled triangles.



$DC = 8$ cm
Angle $ADC = 45°$
Angle $ABC = 20°$

Work out the length of AB.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 12 is 3 marks)

Question 12 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
12	23.4	M1	for stating that $AC = 8$ or for a relationship that may be used to find AC eg $(AC =)\ 8 \times \tan 45$ or $\tan 45 = \frac{AC}{8}$	May be seen on diagram May use the sine rule
		M1	for relationship that may be used to find AB, eg $\sin(20) =$ "8" $\div AB$ or $(AB =) \frac{"8"}{\sin 20}$	
		A1	for answer in the range 23.3 to 23.4	If an answer is given in the range in working and then rounded incorrectly award full marks.
			Alternative	
		M1	for a relationship that may be used to find AD eg $\cos(45) = 8 \div AD$ oe or $(AD =)$ 11.3(13...)	May be seen on diagram
		M1	for a relationship that may be used to find AB, eg $\frac{AB}{\sin 45} = \frac{"11.3"}{\sin 20}$	
		A1	for answer in the range 23.3 to 23.4	If an answer is given in the range in working and then rounded incorrectly award full marks.

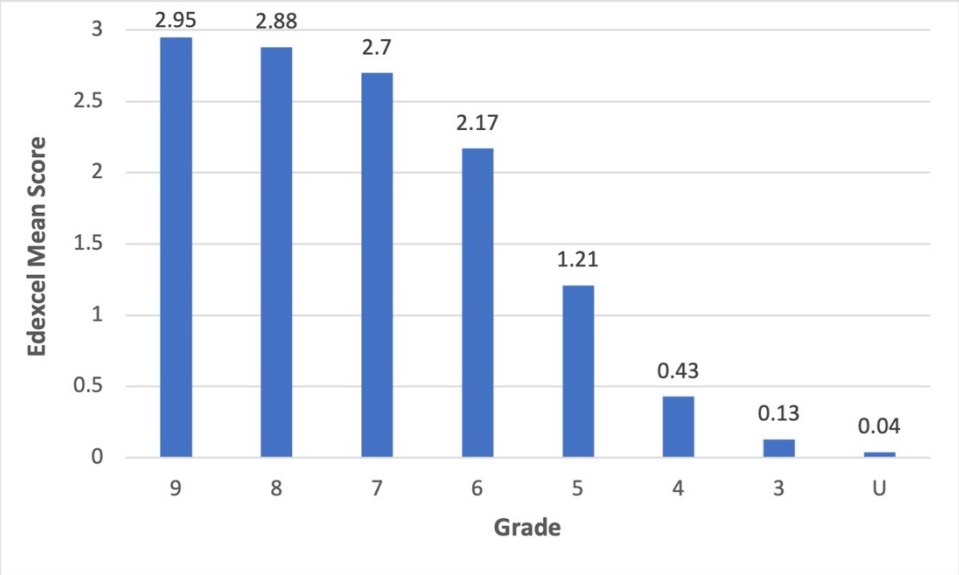
Question 12 - Examiner Comments

In answering this question, most students showed a good understanding of how to apply trigonometrical ratios to this 2 stage problem. However, a significant proportion of them made errors in manipulating the ratio used in the second stage of the problem.

It was envisaged that students would use the trigonometry of right angled triangles to solve this problem and most did. However, a large number of students used the sine rule to get their answer. Examiners were surprised how few students realised that triangle ACD was isosceles and so they were not able to write down the length of AC without further calculation. However, they usually used $\tan 45 = \frac{AC}{8}$ correctly to get 8 cm for the length of AC. Most students were then able to write down a relationship which would enable them to find the length of AB, and this was awarded some credit. However, too many of these students did not rearrange their equation correctly and instead of getting $AB = \frac{8}{\sin 20}$, wrote down $AB = 8 \times \sin 20$, leading to an incorrect answer.

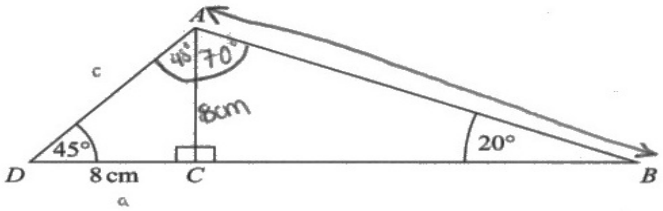
Question 12 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
2.09	3	70	2.09	2.95	2.88	2.70	2.17	1.21	0.43	0.13	0.04



Question 12 - Response A

12 *ABC* and *ACD* are right-angled triangles.



DC = 8 cm
Angle *ADC* = 45°
Angle *ABC* = 20°

Work out the length of *AB*.
Give your answer correct to 3 significant figures.

angle ACD = 90 + 45 = 135
180 - 135 = 45°

angle ABC = 90 + 20 = 110
= 180 - 110 = 70

$\frac{8}{\sin 45} = \frac{d}{\sin 45}$

$\frac{8\sin 45}{\sin 45} = d$

$d = 8\text{cm}$

$\frac{c}{\sin 90} = \frac{8}{\sin 20}$

$c = \frac{8\sin 90}{\sin 20}$

$c = 23.39043$

$c = 23.4$

23.4 cm

3 /3

Q12

A
B
C

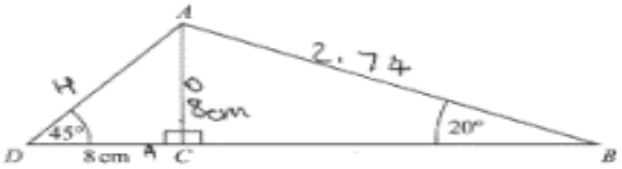
M1 for AC = 8 marked on the diagram; this mark could also be given for the use of the sine rule inthe working space

M1 for a relationship that may be used to find AB, in this case the sine rule. It was expected that trigonometry for right angled triangles would be used but this alternative use of the sine rule is acceptable.

A1 for a correct answer in the range 23.3 to 23.4

Question 12 - Response B

12 ABC and ACD are right-angled triangles.



$DC = 8$ cm
Angle $ADC = 45°$
Angle $ABC = 20°$

SOH CAH TOA

Work out the length of AB.
Give your answer correct to 3 significant figures.

$\tan 45 = \frac{x}{8}$

$8 \tan 45 = x$

$x = 8$

$\sin 20 = \frac{8}{x}$

$8 \sin 20 = 2.74$

2.74 cm

Q12

A
B
C

2 /3

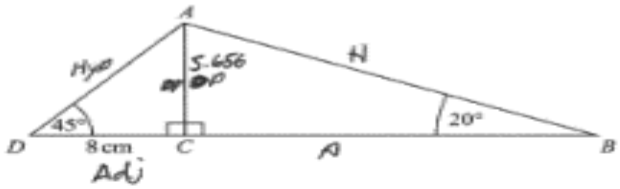
M1 for AC = 8 marked on the diagram or for 8 × tan 45

M1 for the relationship that may be used to find AB, $\sin 20 = \frac{8}{x}$, together with the implication, from the diagram, that x is being used for length AB.

A0 because the student has made a commonly seen error when manipulating the equation and has an incorrect answer.

Question 12 - Response C

12 ABC and ACD are right-angled triangles.



$DC = 8$ cm
Angle $ADC = 45°$
Angle $ABC = 20°$

Work out the length of AB.
Give your answer correct to 3 significant figures.

cos45 × 8 OP = 5.656

8cm
5.656 ÷ sin 20 = 16.537
16.5

16.5 cm

Q12

A
B
C

0 /3

M0 for an incorrect relationship and one which cannot be used to find AC, ie cos 45 × 8

M0 for a relationship that may be used to find AB. The use of quotation marks in the mark scheme, "8", indicates that this value must have been derived from a correct method.

A0 for an incorrect answer

Question 14b

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 14b - Question

14

(*b*) Show that $(m + 4)(2m - 5)(3m + 1)$ can be written in the form $am^3 + bm^2 + cm + d$ where a, b, c and d are integers.

(3)

Question 14b - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
14 (b)	$6m^3 + 11m^2 - 57m - 20$	M1	for a method to find the product of two linear expressions, 3 correct terms out of 4 terms, eg. $6m^2 + 2m - 15m - 5 = 6m^2 - 13m - 5$ or $2m^2 + 8m - 5m - 20 = 2m^2 + 3m - 20$ or $3m^2 + 12m + m + 4 = 3m^2 + 13m + 4$	Note that, for example, $3m - 20$ is regarded as three terms in the expansion of $(m + 4)(2m - 5)$
		M1	for a complete method to obtain all terms, at least half of which are correct (ft their first product), eg. $6m^3 + 2m^2 - 15m^2 + 24m^2 + 8m - 60m - 5m - 20$	First product must be a 3 or 4 term quadratic but need not be simplified or may be incorrect.
		A1	for $6m^3 + 11m^2 - 57m - 20$	Accept $a = 6$, $b = 11$, $c = -57$, $d = -20$

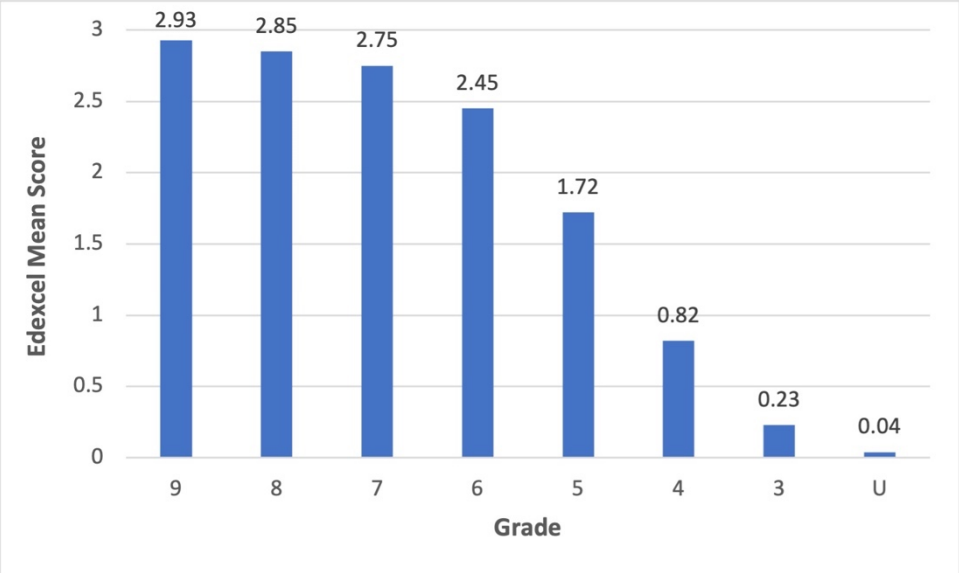
Question 14b - Examiner Comments

A minority of students scored full marks for their responses to this question. However, most students were able to gain some marks and the question was a good discriminator between students who could manipulate algebraic expressions with accuracy and those who made, sometimes unnecessary, errors.

Students usually scored well in part (b) which required the expansion of a product of three linear expressions to give a fully simplified cubic expression. Students generally showed their working in an organized way or used a grid to show terms in their products. Errors were usually restricted to incorrect terms or difficulties in dealing with the signs when collecting terms together, rather than a flawed strategy although some students omitted terms from their expansion. For students who did not give a fully correct answer, it was commonplace for them to earn 2 or 3 of the available marks in part (b).

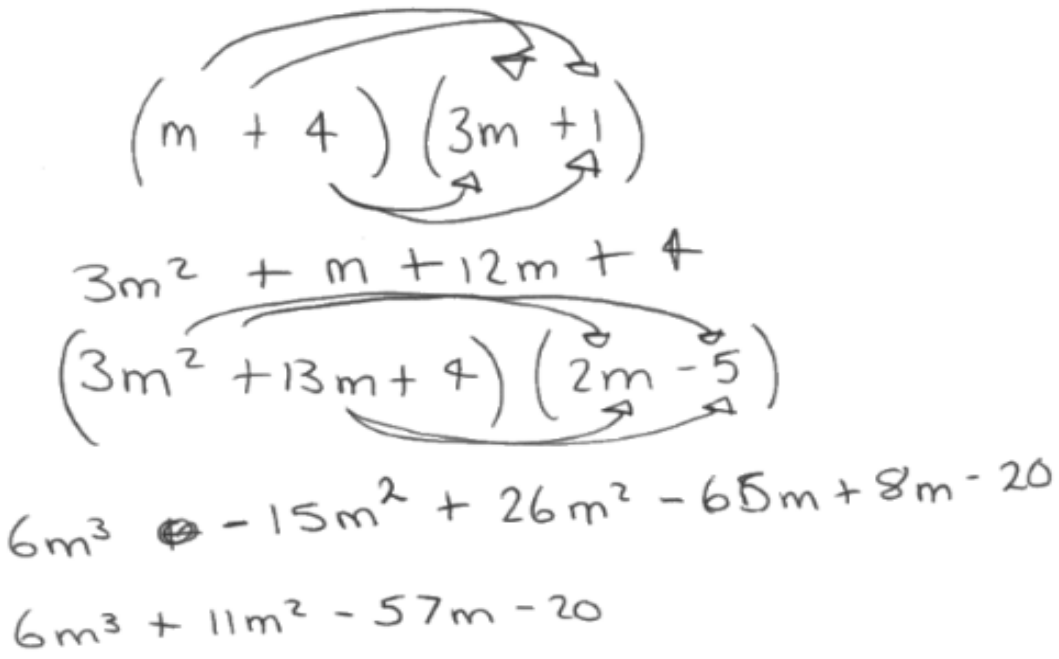
Question 14b - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
2.30	3	77	2.30	2.93	2.85	2.75	2.45	1.72	0.82	0.23	0.04



Question 14b - Response A

(b) Show that $(m + 4)(2m - 5)(3m + 1)$ can be written in the form $am^3 + bm^2 + cm + d$ where a, b, c and d are integers.



(3)

3 /3

Q14b

A B C

M1 for a correct expansion of the product of 2 of the linear factors – this need not be simplified at this stage

M1 for a complete method to find all the terms in the product of the 3 linear factors. At least half of the 6 (or 8) terms need to be correct – here all the 6 terms are correct.

A1 for a fully correct final expression

Question 14b - Response B

(b) Show that $(m + 4)(2m - 5)(3m + 1)$ can be written in the form $am^3 + bm^2 + cm + d$ where a, b, c and d are integers.

$= (m+4)(2m-5)(3m+1)$

$\Rightarrow (m+4)(2m-5) = (m^2 - 5m + 8m - 20)$

$= (m^2 + 3m - 20)$

$= (m^2 + 3m - 20)(3m+1)$

$= 3m^3 + m^2 + 9m^2 + 3m - 60m - 20$

$= 3m^3 + 10m^2 - 57m - 20$.

$a = 3$

$b = 10$

$c = -57$

$d = -20$.

(3)

2 /3

Q14b

A B C

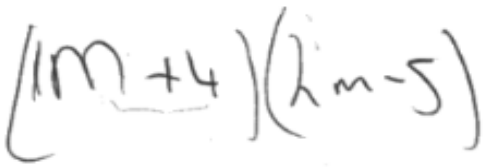
M1 for 3 correct terms out of 4 terms in the product of 2 of the linear expressions

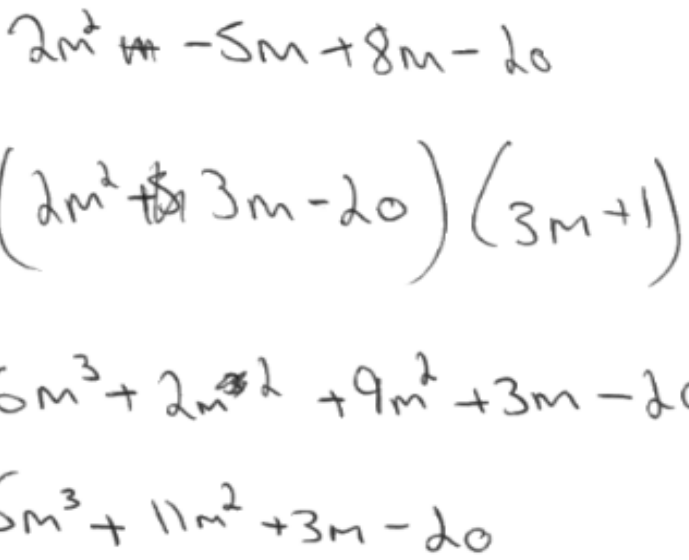
M1 for 6 correct terms out of 6 in a follow through from the incorrect quadratic expansion. At least 3 of their terms from the student's product need to be correct.

A0 because the final answer is not correct

Question 14b - Response C

(b) Show that $(m + 4)(2m - 5)(3m + 1)$ can be written in the form $am^3 + bm^2 + cm + d$ where a, b, c and d are integers.





(3)

1 /3

M1 for 4 correct terms out of 4 terms in the expansion of (m + 4)(2m – 5).

M0 because one of the terms in the expansion of $(2m^2 + 3m – 20)(3m + 1)$ has been omitted.

A0 for an incorrect answer

Q14b

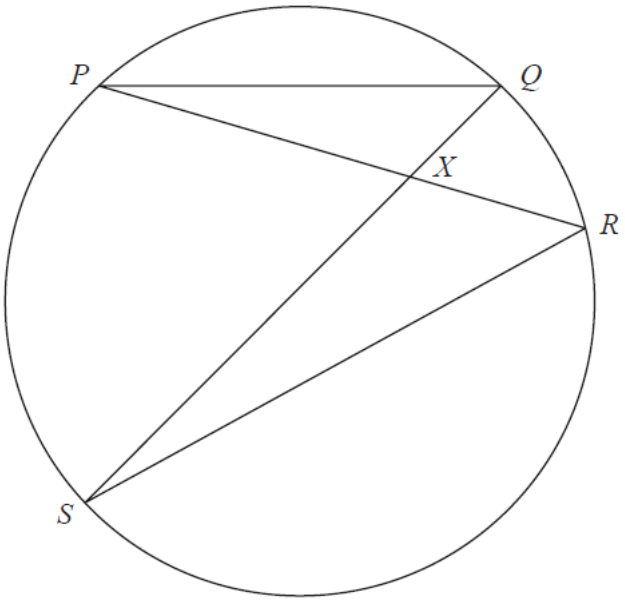
A B C

Question 15

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 15 - Question

15 P, Q, R and S are four points on a circle.



PXR and SXQ are straight lines.

Prove that triangle PQX and triangle SRX are similar.

(Total for Question 15 is 3 marks)

Question 15 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
15	Proof	C1	for angle *PQX* = angle *SRX* as angles in the same segment are equal (or angles at the circumference subtended from the same arc/chord of a circle are equal) or angle *QPX* = angle *RSX* as angles in the same segment are equal (or angles at the circumference subtended from the same arc/chord of a circle are equal) or angle *PXQ* = angle *SXR* as vertically opposite angles/ vertically opposite angles are equal **or** for identifying two pairs of corresponding equal angles with no reason given	Underlined words need to be shown; reasons need to be linked to their method. Could be shown on the diagram
		C1	for identifying two pairs of corresponding equal angles with correct reasons given	
		C1	for stating that the triangles are similar because all three pairs of corresponding angles are equal with complete reasons given.	Note that the students third/final reason may be: Angles in a triangle add up to 180

Question 15 - Examiner Comments

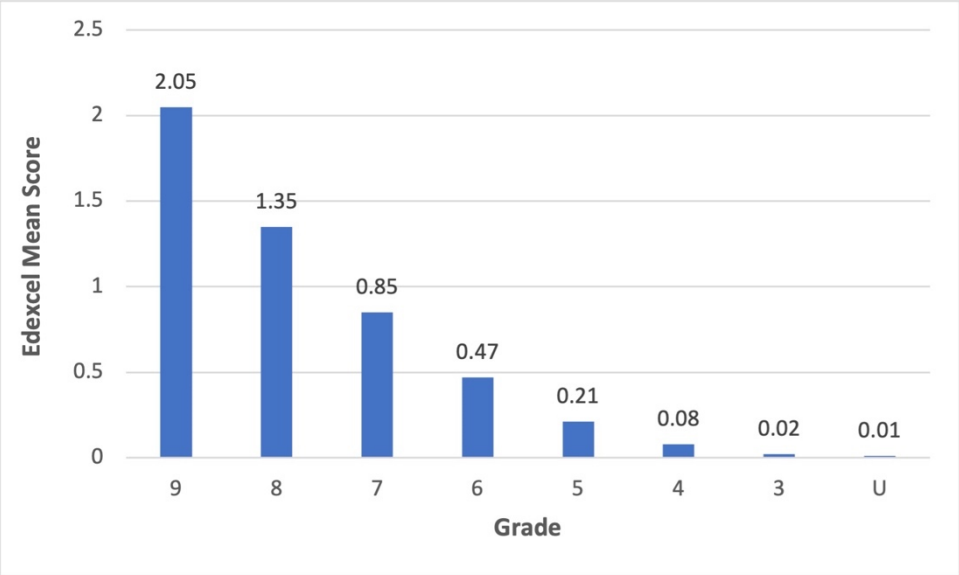
There were some excellent complete, concise and clear proofs to this question involving the application of circle theorems. However, these were only seen in a minority of cases and students need to be aware of the need to state results clearly using the statements indicated on the mark scheme as guidance. There were many students who could not give reasons or who gave them with a lack of clarity. These students often gained some credit for matching up at least two pairs of equal angles. A clear indication of this on the diagram was accepted by examiners.

Of students who completed the proof successfully, most used statements of the same segment theorem together with a pair of vertically opposite angles. Students should note it was not enough to state "same segment theorem" – they needed to say what the theorem states, for example "angles in the same segment are equal". Some students used the result that angles in a triangle sum to 180° as a reason to support the equality of their third pair of angles. This was, of course, acceptable. A small number of students used the result that the angle at the centre of a circle is twice the angle at the circumference to show that angle *PQX* = angle *PRS* and that angle *QPR* = angle *QSR*, another acceptable approach.

About one in ten students obtained full marks for their proof.

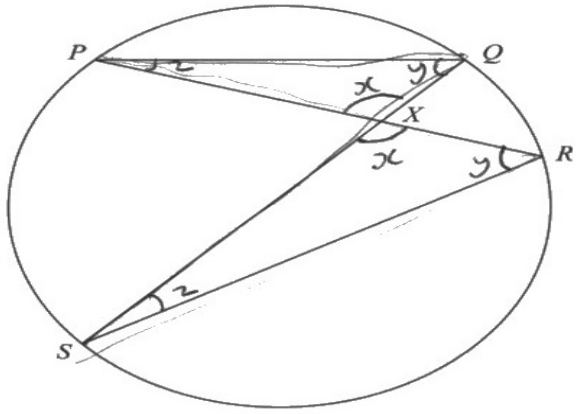
Question 15 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
0.75	3	25	0.75	2.05	1.35	0.85	0.47	0.21	0.08	0.02	0.01



Question 15 - Response A

15 *P*, *Q*, *R* and *S* are four points on a circle.



PXR and *SXQ* are straight lines.

Prove that triangle *PQX* and triangle *SRX* are similar.

PXQ = SXR
vertically opposite angles are equal

XRS = XQP
angles at the circumference subtended from the same arc are equal.

QPX = XSR
angles at the circumference subtended from the same arc are equal.

triangle PQX and ↑triangle SRX are similar, because the contain all the same angles (AAA), so they are congruent.

Q15

A
B
C

3 /3

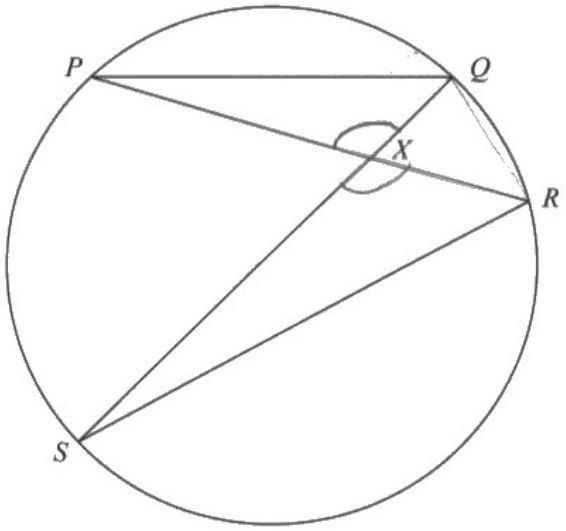
C1 for two pairs of equal angles (seen marked on the diagram) or for angle PXQ = angle SXR with a correct reason

C1 for two correct pairs with sufficient reasons. The reason "angles at the circumference subtended from the same arc are equal" for angle XRS = angle XQP is an acceptable alternative to "angles in the same segment".

C1 the candidate has the 3 correct pairs angles and the correct reasons. They state the triangles are similar as all the angles are the same. At the end of their concluding statement they then state the triangles are congruent. This response was sent to a senior examiner who made the decision to ignore the further statement about congruency and award full marks.

Question 15 - Response B

15 *P*, *Q*, *R* and *S* are four points on a circle.



PXR and *SXQ* are straight lines.

Prove that triangle *PQX* and triangle *SRX* are similar.

Angle PXQ and Angle RXS are equal because they are vertically opposite.
Angle PQX and Angle XRS are equal because corresponding angles are equal.
Angle XPQ and Angle XSR are equal because angles in a triangle add up to 180°.

2 /3

Q15

A
B
C

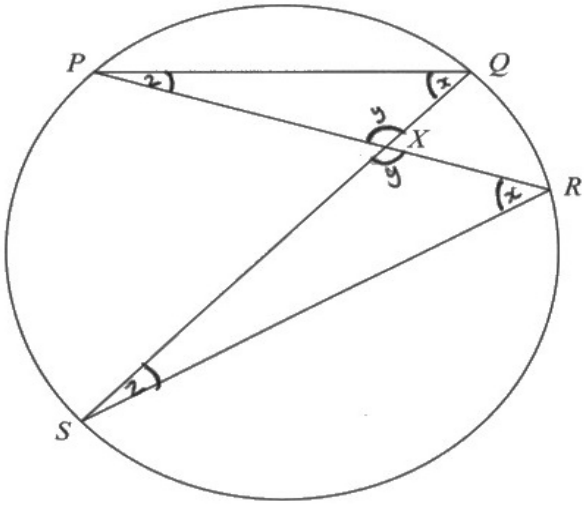
C1 for angle PXQ = angle RXS with a correct reason

C1 for two correct pairs of angles with correct reasons, ie angles PXQ and RXSand angles XPQ and XSR. Note that angles PQX and XRS are not corresponding angles so this cannot be accepted as a correct reason.

C0 because the reasons are not all correct. Note that if all 3 reasons had been correct, the third mark could not be given because no conclusion is seen.

Question 15 - Response C

15 *P*, *Q*, *R* and *S* are four points on a circle.



PXR and *SXQ* are straight lines.

Prove that triangle *PQX* and triangle *SRX* are similar.

∠PQX = ∠SRX
∠QPX = ∠RSX
} due to same segment theorem

∠QXP = ∠SXR because opposite angles are equal to each other.

1 /3

Q15

A
B
C

C1 for either identifying two correct pairs with no reason given, or for angle QXP = angle SXR with the reason"opposite angles"

C0 Although 2 correct pairs have been identified, the reason "same segment theorem"is not sufficient as a statement of the theorem has not been given.

C0 because no conclusion has been made (and the reasons given are not complete.)

Question 16

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 16 - Question

16 $p = \sqrt{\frac{2e}{f}}$

$e = 6.8$ correct to 1 decimal place.

$f = 0.05$ correct to 1 significant figure.

Work out the upper bound for the value of p.
Give your answer correct to 3 significant figures.
You must show all your working.

.....

(Total for Question 16 is 3 marks)

Question 16 - Mark Scheme

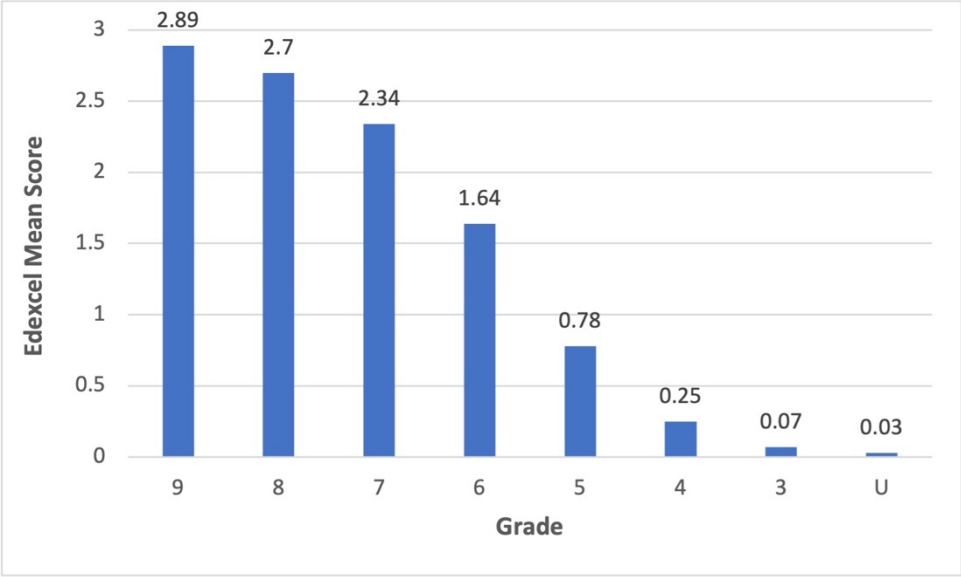
Question	Answer	Mark	Mark scheme	Additional guidance
16	17.4	B1	for stating any correct bound, eg. 6.75 or 6.85 or 0.045 or 0.055	Accept 6.84$\dot{9}$ or 6.8499... for 6.85 and 0.054$\dot{9}$ or 0.05499.. for 0.055
		M1	using both UB of e and LB of f to work out value of $2e \div f$, eg 2[UB of e] ÷ [LB of f] or $\frac{2\times6.85}{0.045}$	$6.8 <$ UB(e) ≤ 6.85 $0.045 \leq$ LB(f) < 0.05
		A1	for answer in the range 17.4 to 17.5 from correct working	If an answer is given in the range in working and then rounded incorrectly award full marks. Award 0 marks for a correct answer with no (or incorrect) supportive working

Question 16 - Examiner Comments

This question discriminated well between more able students sitting this paper with many students being awarded each of the 0, 1, 2 or 3 marks available. Some students did not attempt the question and many lower attaining students restricted their answer to working out the value of p by substituting $e = 6.8$ and $f = 0.05$. This gained no credit. Of those students who did score marks, many of them scored just one mark for writing down at least one of the bounds for e or f. Students who substituted bounds for e and f into the expression for p were split between those who calculated
2[UB of e] ÷ [LB of f], the correct expression and those who calculated
2[UB of e] ÷ [UB of f]. Some students who had the correct fraction, failed to take the square root or made an error in taking the square root and so lost the final accuracy mark.
There was a significant number of students who calculated [UB of $2e$] ÷ [LB of f], that is $\frac{13.65}{0.045}$ instead of $\frac{13.7}{0.045}$. These students could not be awarded full marks even though their final answer worked out to be in the range 17.4 to 17.5

Question 16 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.75	3	58	1.75	2.89	2.70	2.34	1.64	0.78	0.25	0.07	0.03



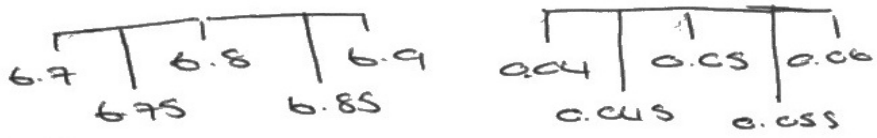
Question 16 - Response A

16 $p = \sqrt{\frac{2e}{f}}$

$e = 6.8$ correct to 1 decimal place.

$f = 0.05$ correct to 1 significant figure.

Work out the upper bound for the value of p.
Give your answer correct to 3 significant figures.
You must show all your working.



Upper = $\frac{\text{upper}}{\text{lower}}$

$P = \sqrt{\frac{2(6.85)}{0.045}} = 17.4$

17.4

(Total for Question 16 is 3 marks)

Q16

A
B
C

3 /3

B1 Awarded for any one of the four correct bounds.

M1 Awarded for a correct calculation to work out the upper bound of p, shown by a substitution of the correct bounds.

A1 Awarded for an answer in the correct range from correct working. If the candidate had the correct answer with no correct supportive working or incorrect working, they would score no marks. (We must check that if an answer is within the acceptable range, it comes from correct working. For example, 17.4.can come from using the upper bound for 2e given correct to 1 dp (ie 13.65 instead of 2 x upper bound of e = 13.7). This would be incorrect working and would not score the M and A marks.)

Question 16 - Response B

16 $p = \sqrt{\frac{2e}{f}}$

$e = 6.8$ correct to 1 decimal place.

$f = 0.05$ correct to 1 significant figure.

Work out the upper bound for the value of p.
Give your answer correct to 3 significant figures.
You must show all your working.

$p = \sqrt{\frac{2e}{f}}$ $p = \sqrt{\frac{6.85}{0.045}}$ $= 12.3$

12.3

(Total for Question 16 is 3 marks)

Q16

A
B
C

1 /3

B1 Awarded for one of the correct bounds, either 6.85 or 0.045

M0 Although the candidate has used the correct bound for e and for f, they have unfortunately omitted to multiply e by 2 and so cannot score the method mark. (Please note that a value of 13.7 for 2e in the formula would imply e = 6.85 and the B1 mark would be awarded).

A0 the answer is incorrect.

Question 16 - Response C

16 $p = \sqrt{\frac{2e}{f}}$

$e = 6.8$ correct to 1 decimal place.

$f = 0.05$ correct to 1 significant figure.

Work out the upper bound for the value of p.
Give your answer correct to 3 significant figures.
You must show all your working.

$\sqrt{\frac{2 \times 6.8}{0.05}} = 4\sqrt{17}$

16.49242

16.492

16.5

16.5

0 /3

B0 The student has not realized that they need to consider bounds and so has not listed any.

M0 The student has substituted the original values into the formula. This is often seen in the work of lower attaining students and no marks can be given for this.

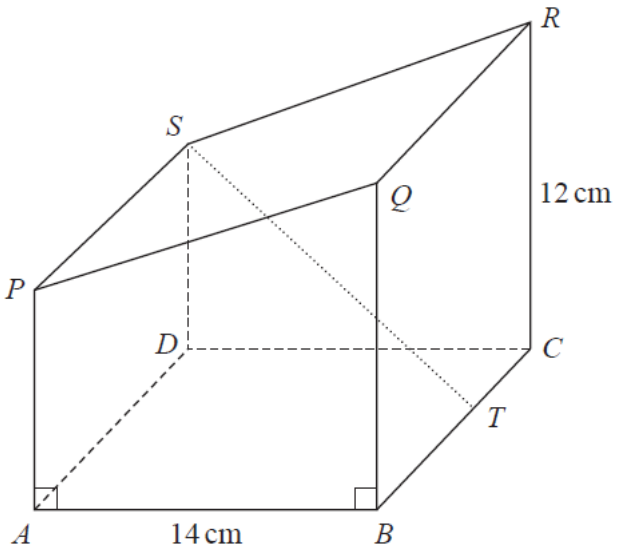
A0 The answer is incorrect

Question 18

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 18 - Question

18 Here is a prism $ABCDSPQR$.



The base $ABCD$ of the prism is a square of side 14 cm
T is the point on BC such that $BT : TC = 4 : 3$

The cross section of the prism is in the shape of a trapezium of area 147 cm^2
$CR = 12$ cm

Find the size of the angle between the line ST and the base $ABCD$.
Give your answer correct to 1 decimal place.

Question 18 - Mark Scheme

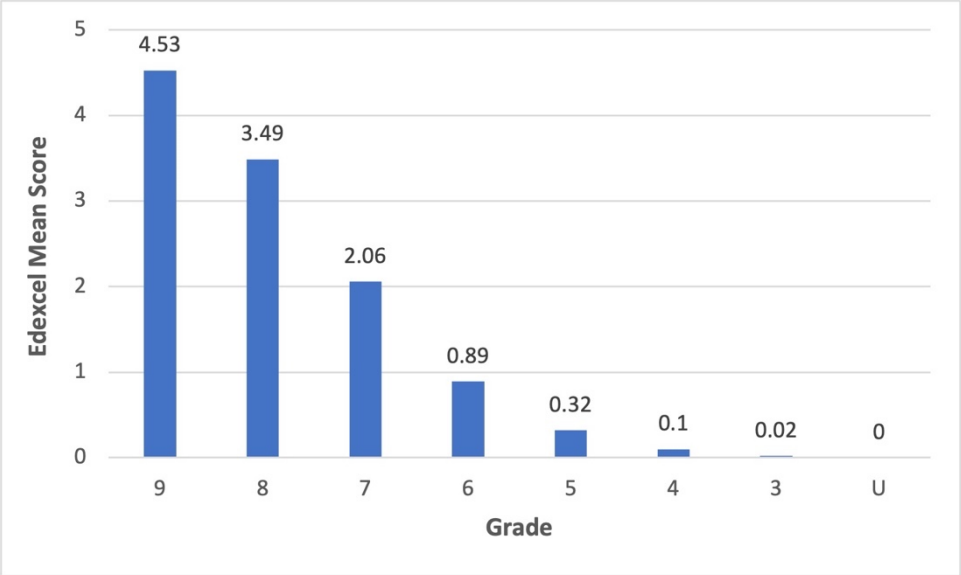
Question	Answer	Mark	Mark scheme	Additional guidance
18	30.6	P1	for process to find *TC*, eg. (*TC* =) $14 \times \frac{3}{3+4}$ (= 6)	Lengths of *TC*, *TD*, *SD* may be seen on the diagram
		P1	for process to find *TD*, eg. (*TD* =) $\sqrt{14^2 + "6"^2}$ or $\sqrt{232}$ or $2\sqrt{58}$ (= 15.2…)	
		P1	for process to find *SD,* using area of a trapezium, 147 = 0.5 × (*SD* + 12) × 14, or *SD*= 9	
		P1	for $\tan^{-1}\left(\frac{"9"}{"15.2..."}\right)$	A complete set of processes to find the angle is needed where an alternative route is involved with more than one stage in the working
		A1	for answer in the range 30.4 to 30.7	If an answer is given in the range in working and then rounded incorrectly award full marks.

Question 18 - Examiner Comments

It is encouraging to report that the majority of students gained some credit for their attempt at this question. The length of *TC* was often found successfully and a good proportion of students were also able to find the length of at least one of *SD* and *TD*. Only the higher attaining students were able to identify the angle which was required and put everything together in order to find the size of this angle, that is the size of angle *DTS*. Errors commonly seen included, substituting 12 and 14 incorrectly into the formula for the area of the cross section and making an error in the use of Pythagoras' rule to find the length of *DT*.

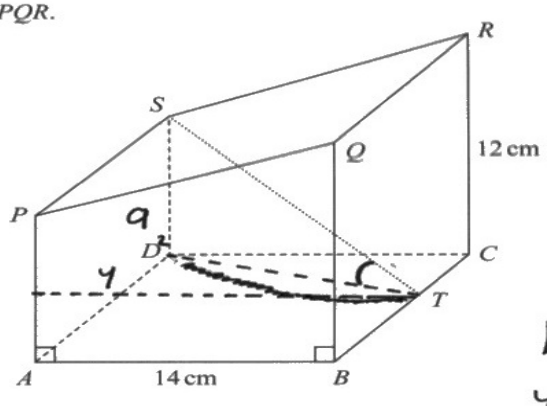
Question 18 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.69	5	34	1.69	4.53	3.49	2.06	0.89	0.32	0.10	0.02	0.00



Question 18 - Response A

18 Here is a prism $ABCDSPQR$.



The base $ABCD$ of the prism is a square of side 14 cm
T is the point on BC such that $BT : TC = 4 : 3$

The cross section of the prism is in the shape of a trapezium of area 147 cm^2
$CR = 12$ cm

Find the size of the angle between the line ST and the base $ABCD$.
Give your answer correct to 1 decimal place.

8:6
1 part = 2

tan = O/A
9
tan | DT

DY = CT
YT = 14 cm
BT + TC = 14 cm

CT = 6
DY = 6

Area of a trapezium = $\frac{1}{2}(a+b)h$

$147 = \frac{1}{2}(12+b) \times 14$

$147 \div 14 = 10.5 \times 2 = 21 - 12 = 9$

Side SD = 9

$6^2 + 14^2 = 232$ $\sqrt{232} = 15.25154621$ = DT

30.6

5 /5

P1 for process to find the length of CT (CT = 6, seen in the working or marked on the diagram is enough evidence for the award of this mark)

P1 for a process to find TD, this can be awarded for $\sqrt{232}$

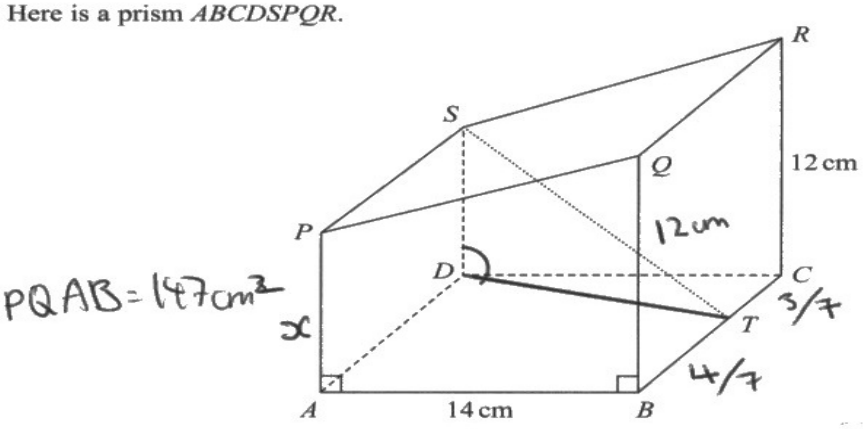
P1 for a process to find SD or for SD = 9

P1 Although the calculation for the angle has not been shown, the answer is correct and this mark is automatically awarded. Please note that if the answer had not been correct, we need to see $\tan^{-1}\left(\frac{"9"}{"15.2..."}\right)$ to award this mark.

A1 for 30.6 which is in the range 30.4 to 30.7

Question 12 - Response B

18 Here is a prism $ABCDSPQR$.



PQAB = 147cm²

x

The base $ABCD$ of the prism is a square of side 14 cm
T is the point on BC such that $BT : TC = 4 : 3$

The cross section of the prism is in the shape of a trapezium of area 147 cm²
$CR = 12$ cm

Find the size of the angle between the line ST and the base $ABCD$.
Give your answer correct to 1 decimal place.

$\frac{12 + PA}{2} \times 14 = 147$

$\frac{12 + PA}{2} = 10.5$

$12 + PA = 21$

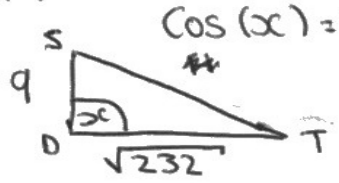
$PA = 9$ cm

↳ SD = 9 cm

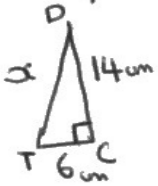
ST

$\cos(A) = \frac{b^2 + c^2}{a^2 + 2bc}$

$\cos(x) = (9)^2 + (\sqrt{232})^2$



$\frac{3}{7}$ of 14 = 6 cm



$x^2 = 14^2 + 6^2 - 232$

$x = \sqrt{232} = 15.23154621$

Q18

A B C

3 /5

P1 for (TC =) 6 shown the working space

P1 for a correct process to find TD.

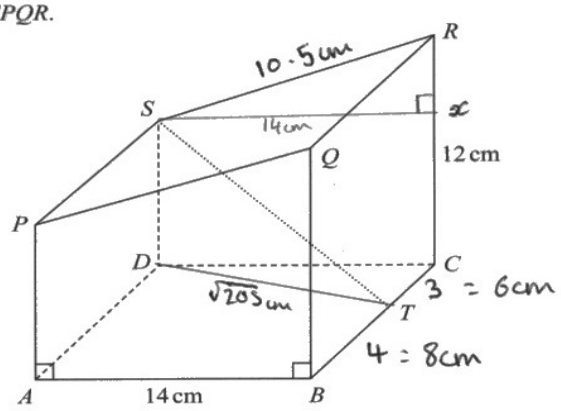
P1 for the process to find SD using the area of a trapezium or for SD = 9. This can be awarded for a correct equation (see the first line of working).

P0 the candidate has a made a flawed attempt at using cosine or the cosine rule to find the angle

A0 no answer given

Question 18 - Response C

18 Here is a prism *ABCDSPQR*.



The base *ABCD* of the prism is a square of side 14 cm
T is the point on *BC* such that *BT* : *TC* = 4 : 3

The cross section of the prism is in the shape of a trapezium of area 147 cm²
CR = 12 cm

Find the size of the angle between the line *ST* and the base *ABCD*.
Give your answer correct to 1 decimal place.

$\frac{1}{2}(a+b)h = 147\text{cm}^2$

$\frac{1}{2}(14+x) \times 12 = 147$

$\frac{147}{\frac{1}{2} \times 12} = 24.5$

$24.5 - 14 = 10.5\text{ cm}$

PQ / SQ = 10.5cm

DT = ~~$\sqrt{14^2+3^2} = \sqrt{205}$~~

$\sqrt{14^2+3^2} = \sqrt{205}$

Rx = $\sqrt{10.5^2 - 14^2}$ =

110.25 -

Q18

A B C

1 /5

P1 for CT = 6 cm, marked on the diagram.

P0 because the process to find TD is incorrect. The student has used 3, not 6, in their Pythagoras calculation.

P0 because the substitution into the formula for the area of a trapezium is incorrect. The 12 and 14 are in the wrong position. This is a common error

P0 because there is no attempt to find the required angle.

A0 because no answer is given.

Question 21

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 21 - Question

21 Ray has nine cards numbered 1 to 9

Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

Work out the probability that the result is an even number.

.....

(Total for Question 21 is 4 marks)

Question 21 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
21	$\frac{11}{21}$	P1	for any product of 3 probabilities of the form $\frac{a}{9}\times\frac{b}{8}\times\frac{c}{7}$ where $a < 9$, $b < 8$, $c < 7$	May see fraction with denominator 504 Students who indicate they are using the approach P(even) = 1 – P(odd) should be given credit as appropriate
		P1	for a product of 3 probabilities giving an even sum, eg. E,E,E = $\frac{4}{9}\times\frac{3}{8}\times\frac{2}{7}$ or E,O,O = $\frac{4}{9}\times\frac{5}{8}\times\frac{4}{7}$	
		P1	for summing the product of at least three correct triples, eg (E,E,E + E,O,O + O,O,E =) $\frac{4}{9}\times\frac{3}{8}\times\frac{2}{7}+\frac{4}{9}\times\frac{5}{8}\times\frac{4}{7}+\frac{5}{9}\times\frac{4}{8}\times\frac{4}{7}$ OR 3($\frac{4}{9}\times\frac{5}{8}\times\frac{4}{7}$)	
		A1	for $\frac{11}{21}$ oe SCB1 for answer of $\frac{364}{729}$ (replacement)	Accept any equivalent fraction, decimal form 0.52(38...) or percentage form 52(.38…)%

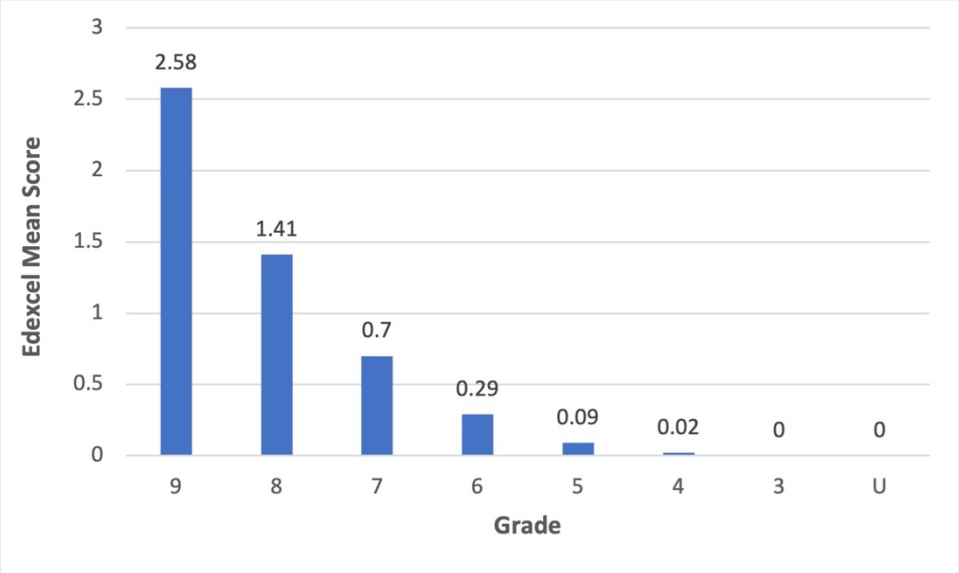
Question 21 - Examiner Comments

Higher attaining students usually made a good start on this question on probability and identified the non-replacement nature of this problem. They usually presented at least one correct product of three fractions with denominators 9, 8 and 7 respectively. Only a small proportion of students gave all four possible ways of getting an even sum with the resultant correct answer, $\frac{11}{21}$. Students who drew a tree diagram were generally more successful at finding all 4 correct combinations.

Very few students approached the problem by finding the probability that the result was an odd number then subtracted from 1. Those students who did do this were rewarded appropriately.

Question 21 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
0.70	4	18	0.70	2.58	1.41	0.70	0.29	0.09	0.02	0.00	0.00



Question 21 - Response A

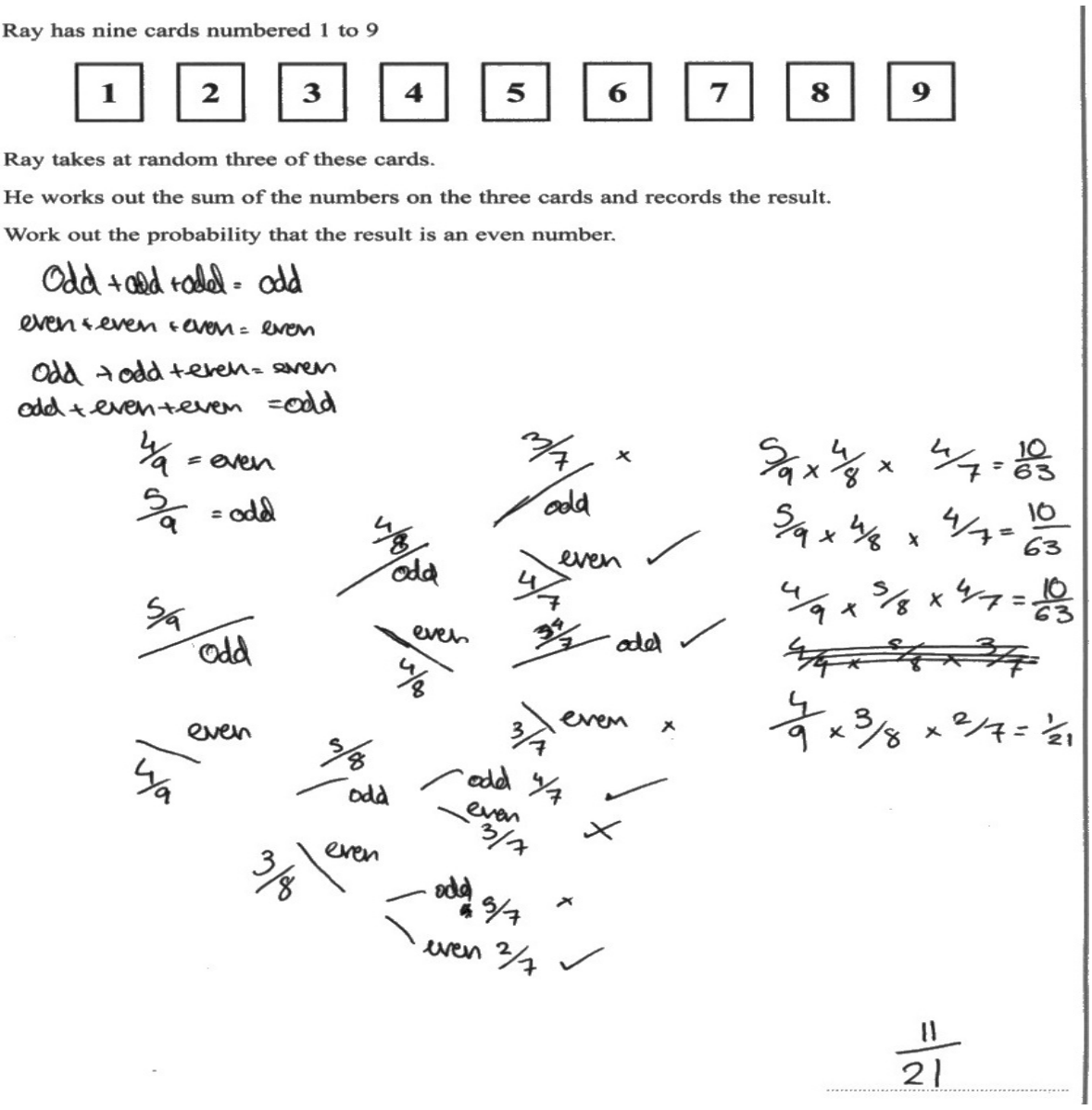
21 Ray has nine cards numbered 1 to 9

1	2	3	4	5	6	7	8	9

Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

Work out the probability that the result is an even number.



Q21

A B C

4 /4

P1 for a product of 3 fractions with denominators 9, 8 and 7

P1 for any one correct product of 3 probabilities that would give an even sum

P1 Although the addition of at least three correct triples has not been shown the correct answer implies this step. In fact, the student has all four correct products.

A1 for a correct answer

Question 21 - Response B

21 Ray has nine cards numbered 1 to 9

O E O E O E O E O

1	2	3	4	5	6	7	8	9

Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

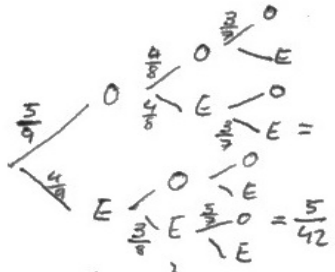
Work out the probability that the result is an even number.

$\frac{5}{9}$ = odd

$\frac{4}{9}$ = even

odd + odd + odd = odd
even + odd + odd = even
even + even + odd = odd
even + even + even = even

~~even × odd × odd = even~~



$\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7} = \frac{5}{42}$

$= \frac{5}{42}$ ~~probability of even~~

$\frac{4}{9} \times \frac{3}{8} \times \frac{5}{7}$

$= \frac{5}{42}$

$\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7}$

$= \frac{5}{42}$

$\frac{5}{42} \times 3$

$= \frac{15}{42}$ = the chance of sum being odd

$1 - \frac{15}{42} = \frac{9}{14}$

$\frac{9}{14}$

3 /4

Q21

A
B
C

Note that in their working, the student has clearly indicated they are using the approach,
P(even) = 1 - P(odd), (see near foot of page). Marks are awarded appropriately if it is clear this is being done.

P1 for a product of 3 probabilities showing this is a case of non – replacement, ie with fractions which have denominators 9, 8 and 7.

P1 for a correct product of 3 probabilities giving the probability of a sum which is odd

P1 for summing the product of at least 3 triples which would lead to a sum which is odd.

A0 for an incorrect answer

NB The second and third P marks for a probability or probabilities of a sum which is odd can only be awarded if we are convinced the student is using P(even) = 1 - P(odd)

Question 21 - Response C

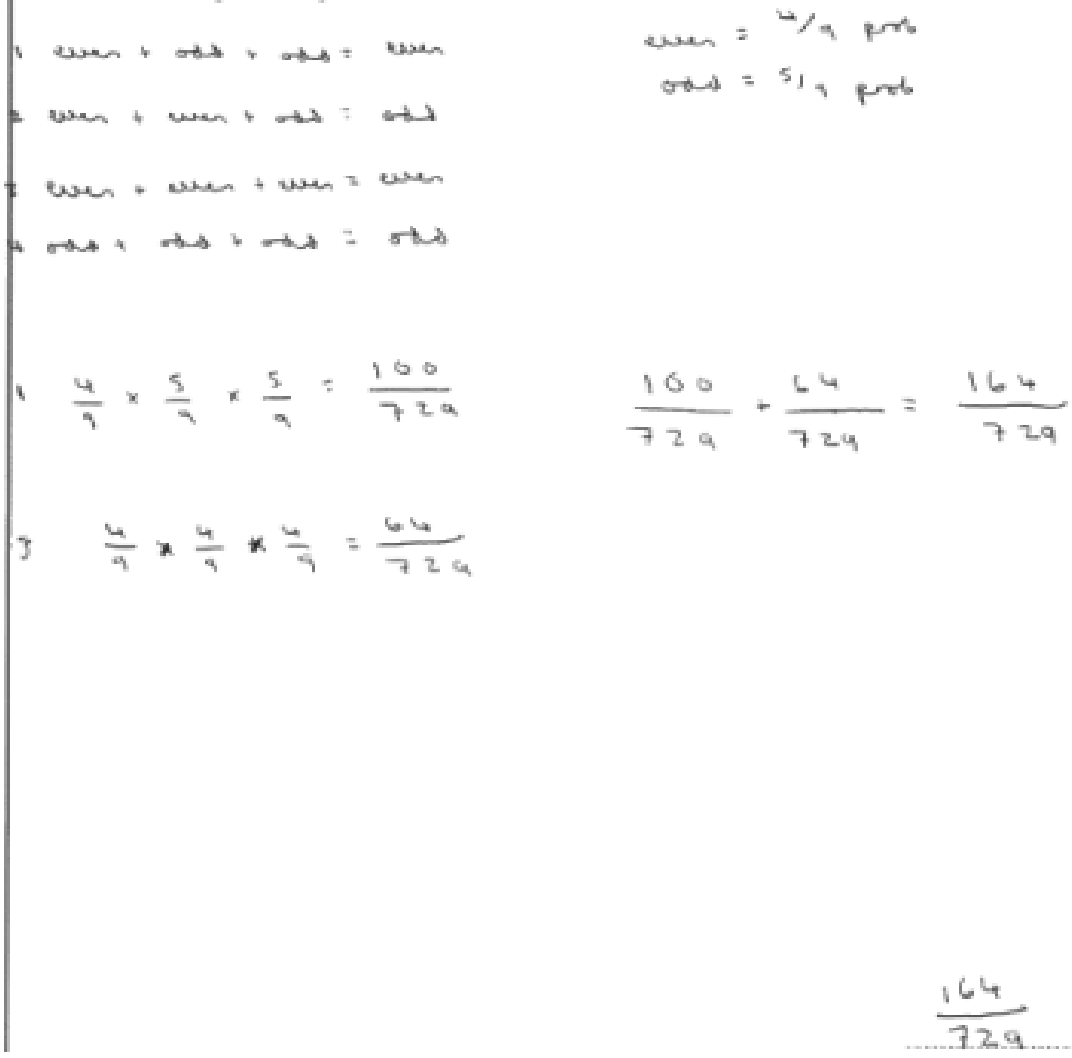
21 Ray has nine cards numbered 1 to 9

1	2	3	4	5	6	7	8	9

Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

Work out the probability that the result is an even number.



$\frac{164}{729}$

0 /4

P0 because the students has not shown they understand that the situation is one of non-replacement by using fractions with denominators 9, 8 and 7

P0 because there is no correct product of 3 probabilities that give an even sum

P0 because there is not at least 3 correct triples

A0 for an incorrect answer

Note that if a student has not appreciated that the situation is one of non – replacement and so have scored P0 A0, they can score 1 mark for a final answer of $\frac{364}{729}$, the answer which should be obtained if the cards are replaced each time.

Question 22

Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 22 - Question

22 **L** is the straight line with equation $y = 2x - 5$

C is a graph with equation $y^2 = 6x^2 - 25x - 8$

Using algebra, find the coordinates of the points of intersection of **L** and **C**.
You must show all your working.

(..... , ...)

(..... , ...)

(Total for Question 22 is 5 marks)

Question 22 - Mark Scheme

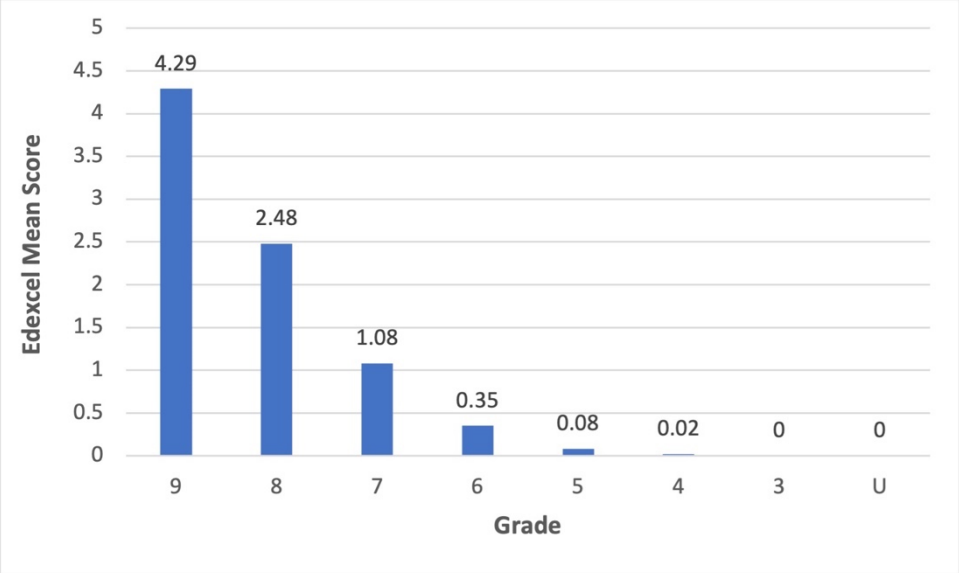
Question	Answer	Mark	Mark scheme	Additional guidance
22	(– 3 , – 11) and (5.5, 6)	M1	for method to eliminate one variable, eg $(2x – 5)^2 = 6x^2 – 25x – 8$ or $y^2 = 6\left(\frac{y+5}{2}\right)^2 – 25\left(\frac{y+5}{2}\right) – 8$	
		M1	for expanding the square to give, eg. $4x^2 – 20x + 25 = 6x^2 – 25x – 8$ or $y^2 = 6\left(\frac{y^2+10y+25}{4}\right) – 25\left(\frac{y+5}{2}\right) – 8$	
		M1	for method to solve equation $2x^2 – 5x – 33$ (= 0), eg $(2x – 11)(x + 3)$ (= 0) or $x = \frac{--5\pm\sqrt{(-5)^2-4\times2\times-33}}{2\times2}$ or –3, 5.5 oe or for method to solve equation $2y^2 + 10y – 132$ (= 0), eg. $(2y + 22)(y – 6)$ (= 0) or $y = \frac{-10\pm\sqrt{10^2-4\times2\times-132}}{2\times2}$ or –11, 6	
		A1	for (– 3, – 11)	
		A1	for (5.5, 6) oe	

Question 22 - Examiner Comments

This question was accessible to and discriminated well between the most high attaining students sitting this paper. These students often gave a complete and fully correct solution and scored full marks. They usually used the approach of eliminating y to get an equation in x. This was more straightforward to deal with than the corresponding equation in y. The most common errors made by students included expanding $(2x – 5)^2$ incorrectly, often as $4x^2 + 25$, and making errors when re-arranging their quadratic equation to get all terms on one side of the equation. Some students who did get the correct quadratic equation to solve, made errors when trying to factorise and so restricted themselves to the award of 2 marks.

Question 22 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.13	5	23	1.13	4.29	2.48	1.08	0.35	0.08	0.02	0.00	0.00



Question 22 - Response A

22 **L** is the straight line with equation $y = 2x - 5$

C is a graph with equation $y^2 = 6x^2 - 25x - 8$

Using algebra, find the coordinates of the points of intersection of **L** and **C**.
You must show all your working.

$(2x-5)^2 = 6x^2 - 25x - 8$

$4x^2 - 20x + 25 = 6x^2 - 25x - 8$

$-4x^2 \quad +20x \quad -25$

$2x^2 - 5x - 33$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{5 \pm \sqrt{-5^2-(4\times2\times-33)}}{2\times2} = \frac{11}{2}$ or $-3 = x$

$x = \frac{11}{2}$ or -3

$y = \frac{11}{2} \times 2 - 5 = 11 - 5 = 6 = y$ $\quad y = 6$ or -11

$y = -3 \times 2 - 5 = -6 - 5 = -11 = y$

$(\frac{11}{2}, 6)$ and $(-3, -11)$

(11/2 , 6)

(−3 , −11)

5 /5

M1 for a method to eliminate one variable, in this case for $(2x - 5)^2 = 6x^2 - 25x - 8$

M1 for the correct expansion of $(2x - 5)^2$ as part of a correct equation in one variable, in this case for $4x^2 - 20x + 25 = 6x^2 - 25x - 8$

M1 for a correct method to solve a correct equation. Evidence of this is given here by the correct values for x, $\frac{11}{2}$ and -3

A1 for one correct pairing, $(-3, -11)$

A1 for a second correct pairing, $(\frac{11}{2}, 6)$

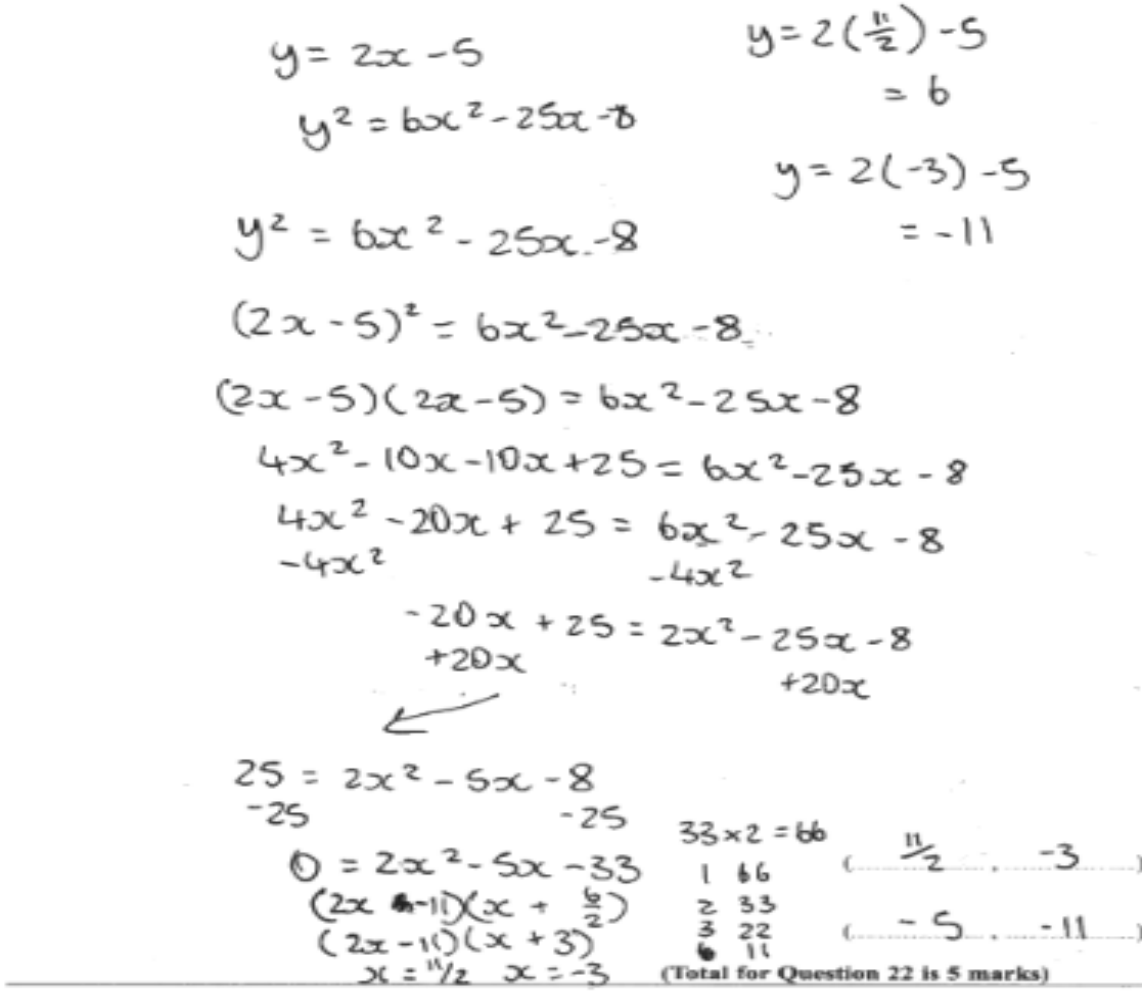
Note that appropriate marks can be given for eliminating x to get an equation in y only

Question 22 - Response B

22 **L** is the straight line with equation $y = 2x - 5$

C is a graph with equation $y^2 = 6x^2 - 25x - 8$

Using algebra, find the coordinates of the points of intersection of **L** and **C**.
You must show all your working.



(Total for Question 22 is 5 marks)

Q22

A B C

3 /5

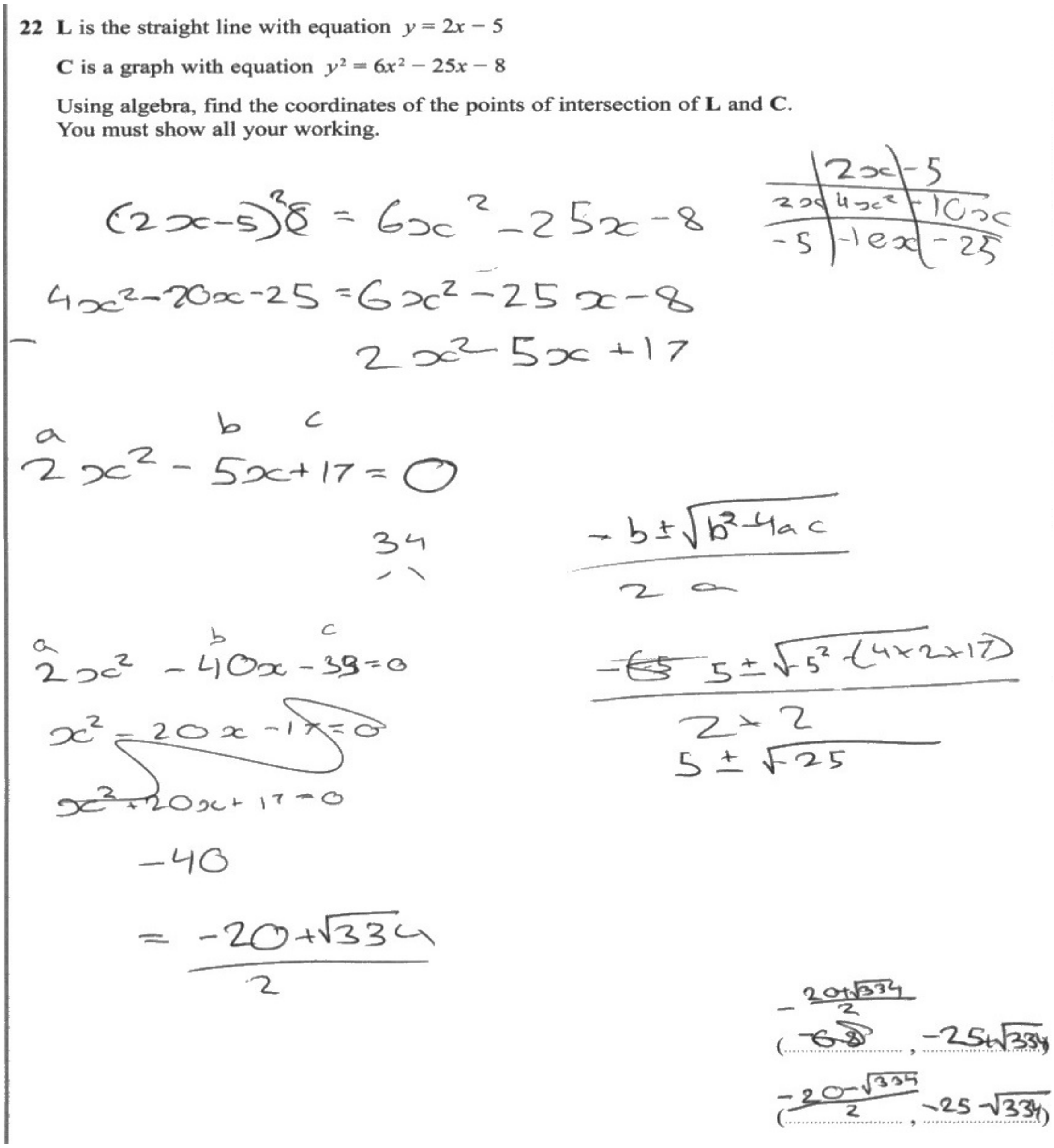
M1 for $(2x - 5)^2 = 6x^2 - 25x - 8$

M1 for $4x^2 - 20x + 25 = 6x^2 - 25x - 8$

M1 for $(2x - 11)(x + 3)$, the correct factorisation of the correct equation, or for -3, $\frac{11}{2}$.

A0 A0 because neither solution is correct.

Question 22 - Response C



22 **L** is the straight line with equation $y = 2x - 5$

C is a graph with equation $y^2 = 6x^2 - 25x - 8$

Using algebra, find the coordinates of the points of intersection of **L** and **C**.
You must show all your working.

$(2x-5)^2 = 6x^2 - 25x - 8$

$4x^2 - 20x - 25 = 6x^2 - 25x - 8$

$2x^2 - 5x + 17$

$2x^2 - 5x + 17 = 0$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\frac{5 \pm \sqrt{5^2 - (4 \times 2 \times 17)}}{2 \times 2}$

$5 \pm \sqrt{25}$

$2x^2 - 40x - 39 = 0$

$x^2 - 20x - 17 = 0$

$x^2 + 20x + 17 = 0$

-40

$= \frac{-20 + \sqrt{334}}{2}$

$\left(\frac{-20+\sqrt{334}}{2}, -25 + \sqrt{334}\right)$

$\left(\frac{-20-\sqrt{334}}{2}, -25 - \sqrt{334}\right)$

1 /5

M1 for a correct equation in one variable.

M0 because there is an error made in expanding the square. No further marks can be awarded.
(A common error made by lower attaining students is to expand $(2x - 5)^2$ as $4x^2 + 25$)

M0 as the equation is incorrect so this mark and any further marks cannot be awarded.

A0 A0 there are no correct solutions