Pearson Edexcel

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

November 2022 Exemplar
1MA1-1H Paper 1 (Non-Calculator)
Higher Tier

Senior Examiner's feedback on student responses

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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 November 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 November 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, the marks awarded, and the common errors for this sort of question

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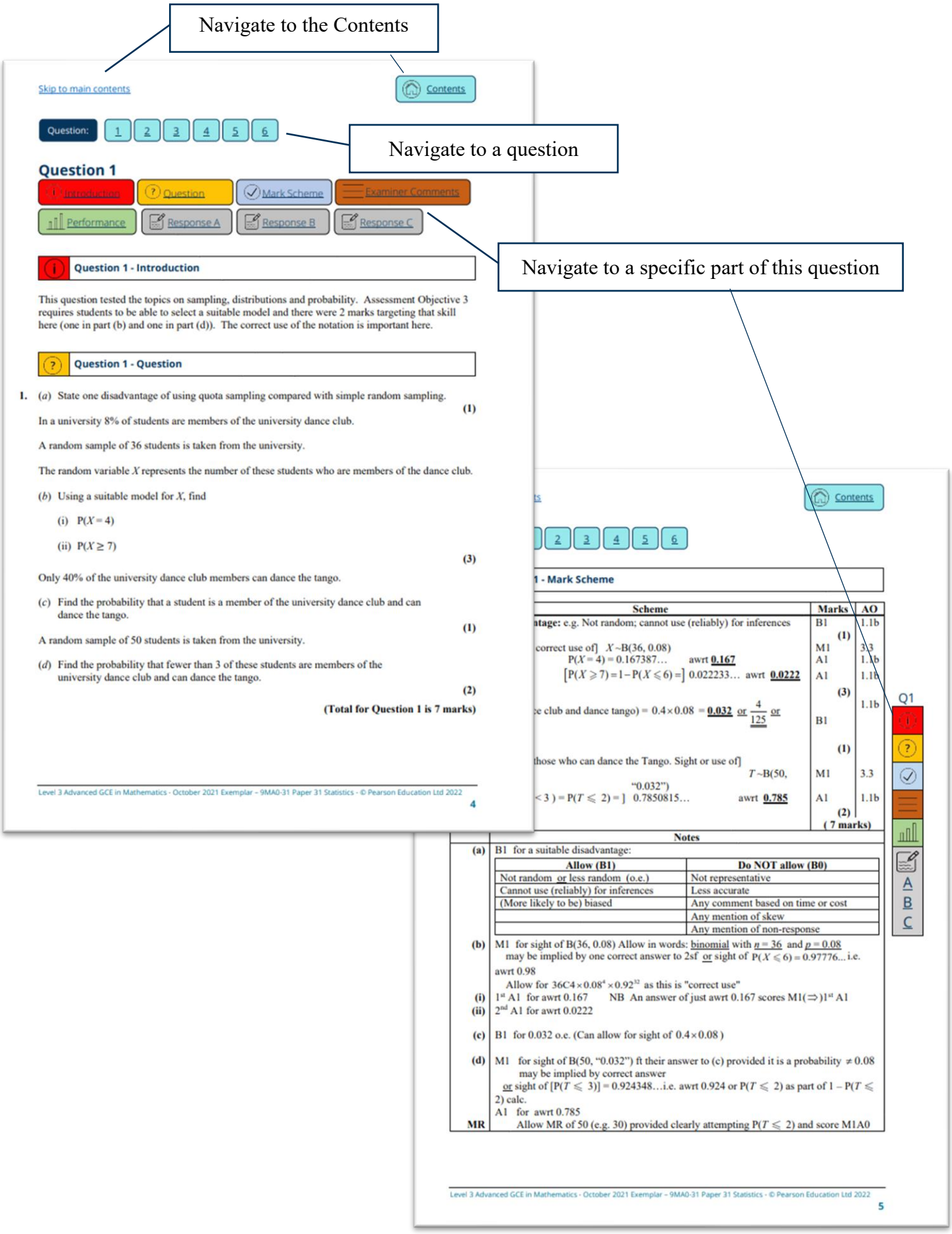
How to use this booklet



General Examiner Feedback

The early questions on the paper were generally answered well. Questions towards the end of the paper were more challenging and it was clear some students struggled with these.

Students appeared well prepared for topics such as prime factors, fraction arithmetic, using the pressure formula and simultaneous equations. There were also many well plotted cubic graphs. Problems with algebraic manipulation prevented many students from making progress in Q16 and Q19. Geometric reasoning and communication was generally weak in Q11 and Q18.

Poor arithmetic often let students down on this non-calculator paper and multiplication and division calculations were often carried out poorly. Many simple arithmetic errors were made when students knew the correct processes and these errors resulted in a loss of marks. Students should be encouraged to check their calculations, especially in the easier and more straightforward questions.

Question 2

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

Question 2 - Question

2 (a) Work out $1\frac{3}{5}+2\frac{1}{4}$

Give your answer as a mixed number.

.....

(2)

(b) Show that $2\frac{2}{3}\div 6=\frac{4}{9}$

(2)

(Total for Question 2 is 4 marks)

Question 2 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
2 (a)	$3\frac{17}{20}$	M1	for finding two fractions with a correct common denominator (multiple of 20), with at least one correct corresponding numerator, eg $\frac{12}{20}, \frac{5}{20}$ or $\frac{32}{20}, \frac{45}{20}$	May be from $\frac{3}{5}$ and $\frac{1}{4}$ or from $\frac{8}{5}$ and $\frac{9}{4}$
		A1	for $3\frac{17}{20}$ or an equivalent mixed number SC B1 for an answer of 3.85 if M0 scored	
(b)	shown	M1	for $\frac{8}{3}\times\frac{1}{6}$ oe or $\frac{4}{9}\times\frac{6}{1}$ oe or $\frac{8}{3}\times\frac{9}{4}$ oe	
		A1	for unsimplified fraction which could lead to $\frac{4}{9}$, eg $\frac{8}{18}$ or for $\frac{4}{3}\times\frac{1}{3}$ or $\frac{24}{9}\div 6$ **or** for unsimplified fraction which could lead to $2\frac{2}{3}$, eg $\frac{24}{9}$ **or** for unsimplified fraction which could lead to 6, eg $\frac{72}{12}$	

Q2

A B C

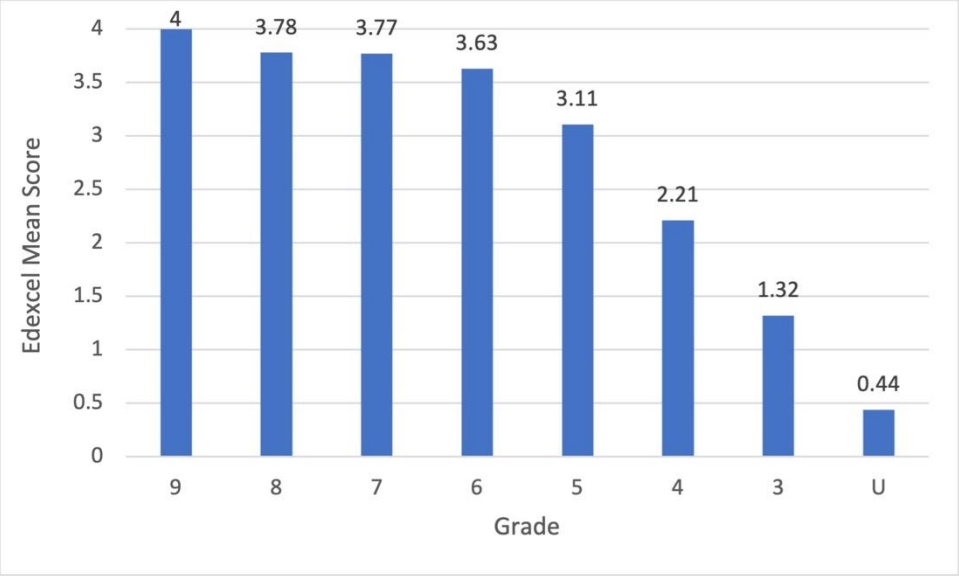
Question 2 - Examiner Comments

Part (a) was generally answered well. The most common method was to convert both mixed numbers into improper fractions and then write both fractions over a common denominator. Many students gained at least one of the two marks for getting this far. The accuracy mark was often lost because students failed to write their answer as a mixed number or made an arithmetic error. Fewer students chose to add the whole numbers and deal with the fractional parts separately but those that did were often successful. Considering that this is a familiar question early in the paper, a surprising number of students were unable to achieve both marks.

A similar proportion of students gained full marks in part (b) as in part (a) but a greater number of students gained no marks. Students who showed a correct method usually went on to get full marks. Most of the successful students started with $\frac{8}{3}\times\frac{1}{6}$ and evaluated this as $\frac{8}{18}$ or cancelled to get $\frac{4}{3}\times\frac{1}{3}$. Some students answered the question by showing that $2\frac{2}{3}\div\frac{4}{9}=6$ or $\frac{4}{9}\times6=2\frac{2}{3}$ but these approaches were rare.

Question 2 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
2.60	4	65	2.60	4.00	3.78	3.77	3.63	3.11	2.21	1.32	0.44



Q2

Question 2 - Response A

2 (a) Work out $1\frac{3}{5} + 2\frac{1}{4}$

Give your answer as a mixed number.

$1\frac{3}{5} + 2\frac{1}{4}$ $1\frac{12}{20} + 2\frac{5}{20}$ $3\frac{17}{20}$

$3\frac{17}{20}$

(2)

(b) Show that $2\frac{2}{3} \div 6 = \frac{4}{9}$

$\frac{8}{3} \times \frac{1}{6} = \frac{4}{9}$

4 /4

Q2

A B C

(a)

M1 for writing both $\frac{3}{5}$ and $\frac{1}{4}$ correctly with a common denominator.

A1 for a correct mixed number.

(b)

M1 for $\frac{8}{3}\times\frac{1}{6}$

A1 for cancelling to $\frac{4}{3}\times\frac{1}{3}$

Note: for A1 it is not necessary to see '= $\frac{4}{9}$' but if $\frac{4}{3}\times\frac{1}{3}$ is evaluated incorrectly then the A mark is not awarded.

Question 2 - Response B

2 (a) Work out $1\frac{3}{5} + 2\frac{1}{4}$

Give your answer as a mixed number.

$\frac{8}{5} + \frac{9}{4} = \frac{32}{20} + \frac{45}{20} = \frac{77}{20}$

32
45
77

3 . 8
20 | 77 . 17 0 0

$3\frac{8}{20}$

$3\ 8/20$

(2)

(b) Show that $2\frac{2}{3} \div 6 = \frac{4}{9}$

$2\frac{2}{3} \Rightarrow \frac{8}{3}$

$\frac{8}{3} \div 6 = \frac{4}{9}$

$\frac{8}{3} \div \frac{4}{9} = 6$

$\frac{8}{3} \times \frac{9}{4} = \frac{72}{12}$

$\frac{72}{12}$ simplified $= 6$

So $2\frac{2}{3} \div 6 = \frac{4}{9}$

Evidence

(2)

Q2

A B C

3 /4

(a)

M1 for writing both fractions correctly with a common denominator.

A0 although $\frac{77}{20}$ is correct the final mixed number is not.

Note: the final answer must be a mixed number.

(b)

M1: $\frac{8}{3} \times \frac{9}{4}$

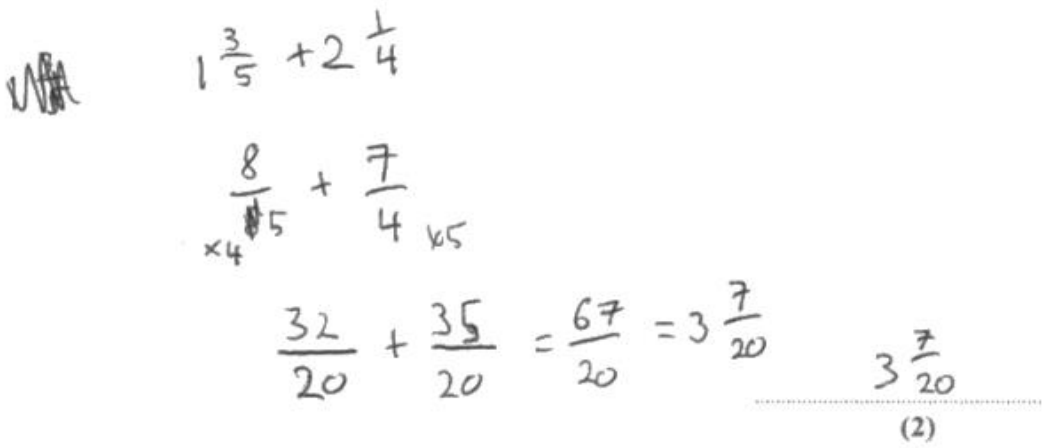
A1 for the unsimplified fraction $\frac{72}{12}$, which leads to 6.

Note: $\frac{72}{12}$ is sufficient for A1 but if it is evaluated the answer must be 6.

Question 2 - Response C

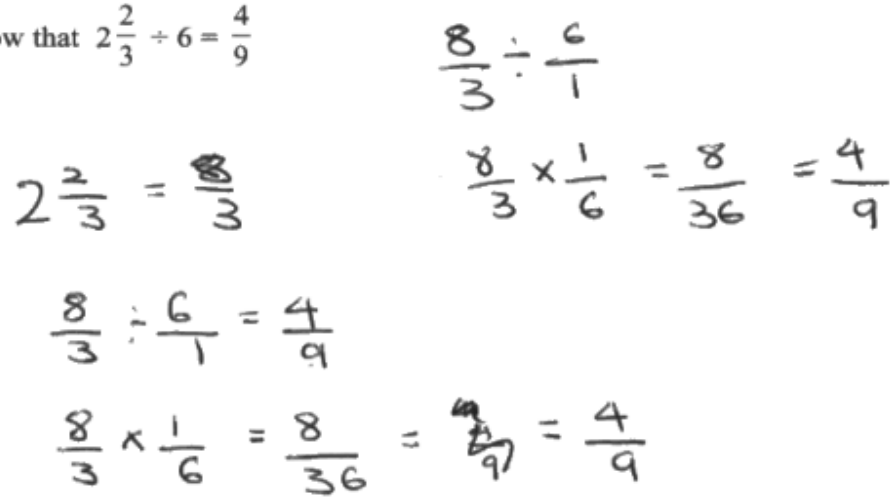
2 (a) Work out $1\frac{3}{5} + 2\frac{1}{4}$

Give your answer as a mixed number.



(2)

(b) Show that $2\frac{2}{3} \div 6 = \frac{4}{9}$



2 /4

Q2

A B C

(a)

M1 for writing both fractions with a common denominator with one numerator correct.
A0 as the final answer is incorrect.

Note: if both improper fractions are incorrect then it is not possible to award M1.

(b)

M1 for $\frac{8}{3} \times \frac{1}{6}$

A0 as an arithmetic error means that the calculation leads to $\frac{8}{36}$, not $\frac{8}{18}$

Question 3

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

Question 3 - Question

3 Simplify $(2^{-5} \times 2^{8})^{2}$

Give your answer as a power of 2

.....

(Total for Question 3 is 2 marks)

Question 3 - Mark Scheme

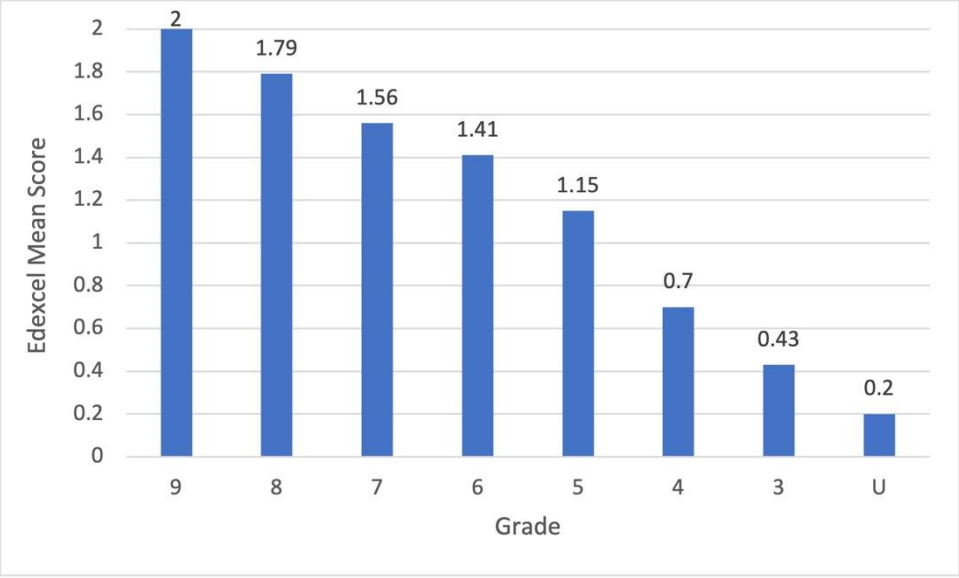
Question	Answer	Mark	Mark scheme	Additional guidance
3	2^{6}	M1	for the start of a method of simplification, eg 2^{-5+8} (= 2^{3}) or $2^{-5\times2}$ (= 2^{-10}) or $2^{8\times2}$ (= 2^{16})	
		A1	cao SC B1 for answer of 64 or 8^{2} or 4^{3} if M0 scored.	

Question 3 - Examiner Comments

Many students made a good start by working out $2^{-5} \times 2^{10}$ as 2^3. Others gained the first mark for squaring 2^{-5} or 2^8. Not all these students went on to complete the simplification correctly. A common mistake was $(2^3)^2 = 4^6$. A significant number of students could not show a correct first step and gained no marks. In some responses 2^{-5} was identified as –32.

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
0.98	2	49	0.98	2.00	1.79	1.56	1.41	1.15	0.70	0.43	0.20



Question 3 - Response A

3 Simplify $(2^{-5} \times 2^{8})^{2}$

Give your answer as a power of 2

$(2^{-5})^{2} \times (2^{8})^{2} = \cancel{2^{-10}} \times 2^{-10} \times 2^{16}$

$= 2^{-10+16}$

$= 2^{6}$

2^{6}

2 /2

M1 for either $\left(2^{-5}\right)^{2} = 2^{-10}$ or $\left(2^{8}\right)^{2} = 2^{16}$

A1 for the correct final answer.

Question 3 - Response B

3 Simplify $(2^{-5} \times 2^{8})^{2}$

Give your answer as a power of 2

$(2^{-5} \times 2^{8}) = (2^{3})^{2} = 46$

46

1 /2

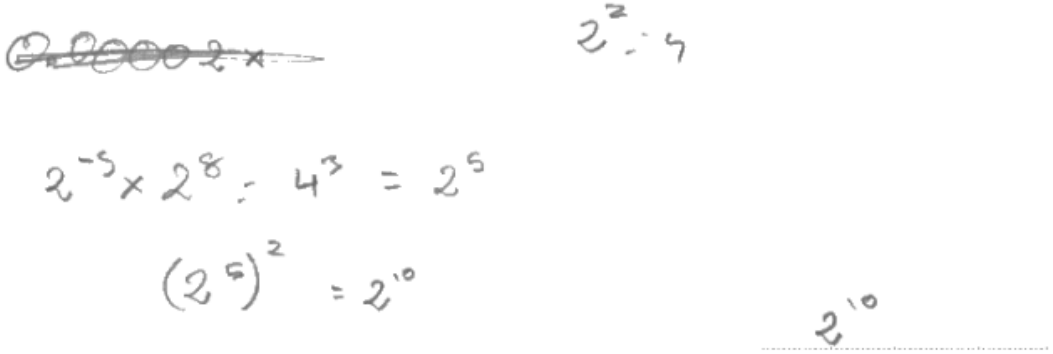
M1 for a correct start, $2^{-5} \times 2^{8} = 2^{3}$

A0 as the final answer is incorrect.

Question 3 - Response C

3 Simplify $(2^{-5} \times 2^{8})^{2}$

Give your answer as a power of 2



Q3

0 /2

M0 because the start of the method, $2^{-5} \times 2^{8} = 4^{3}$, is not correct.

A0 as the final answer is incorrect.

Note: there is no mark for a correct use of indices following an incorrect start.

A B C

Question 5

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

Question 5 - Question

5 A car factory is going to make four different car models **A**, **B**, **C** and **D**.

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

The factory is going to make 40 000 cars next year.

Work out how many model **B** cars the factory should make next year.

.....

(Total for Question 5 is 2 marks)

Question 5 - Mark Scheme

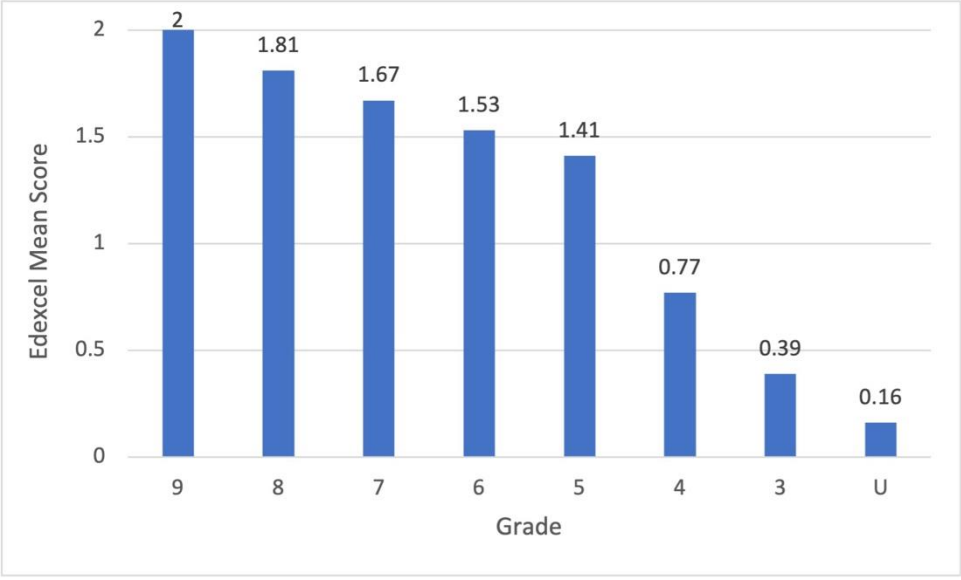
Question	Answer	Mark	Mark scheme	Additional guidance
5	7500	M1	for method to find expected number of model B, eg $\frac{15}{80} \times 40000$ oe **or** $\frac{15}{"23+15+30+12"} \times 40000$ oe	
		A1	cao	

Question 5 - Examiner Comments

Students who showed a correct method to work out how many model B cars the factory should make generally went on to give the correct answer. Some, however, made an arithmetical error when working out 40000 ÷ 80 × 15 and gained one mark only. A common incorrect method was 40 000 ÷ 15. Some students attempted to find 15% of 40 000 leading to an incorrect answer of 6000.

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
1.07	2	54	1.07	2.00	1.81	1.67	1.53	1.41	0.77	0.39	0.16



Question 5 - Response A

5 A car factory is going to make four different car models **A**, **B**, **C** and **D**.

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

The factory is going to make 40 000 cars next year.

Work out how many model **B** cars the factory should make next year.

$\frac{15}{80} = \frac{3}{16}$ Ratio of people wanting Model B

$40{,}000 \times \frac{3}{16} = \frac{120{,}000}{16} = 7{,}500$

$$\begin{array}{r} 7{,}500 \\ 16\overline{)120{,}000} \\ -112 \\ \hline 80 \\ -80 \\ \hline 0 \end{array}$$

7,500 model B's

Q5

A B C

2 /2

M1 for a method to find the expected number of model B, $40000 \times \frac{3}{16}$

A1 for a correct final answer.

Question 5 - Response B

5 A car factory is going to make four different car models **A**, **B**, **C** and **D**.

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

The factory is going to make 40 000 cars next year.

Work out how many model **B** cars the factory should make next year.

80 total

40 000 ÷ 80 = 500

500 × 15 = 2500 + 500 = 3000

15/80 × 40 000 = 3000

3000

Q5

A B C

1 /2

M1 for a method to find the expected number of model B, $\frac{15}{80}\times 40000$

A0 as the final answer is incorrect due to an arithmetic error.

Question 5 - Response C

5 A car factory is going to make four different car models **A**, **B**, **C** and **D**.

80 people are asked which of the four models they would be most likely to buy.

The table shows information about the results.

Car model	Number of people
A	23
B	15
C	30
D	12

The factory is going to make 40 000 cars next year.

Work out how many model **B** cars the factory should make next year.

15/80 500/40 000

0 500
8 ⟌4000

15/80 40 000

500 × 8 = 4000

500

0 /2

Q5

A B C

M0 as the method that leads to the final answer is incomplete.

The proportion of model Bs, $\frac{15}{80}$, is shown but the final answer comes from dividing 40000 by 80.

A0 as the final answer is incorrect.

Question 9

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

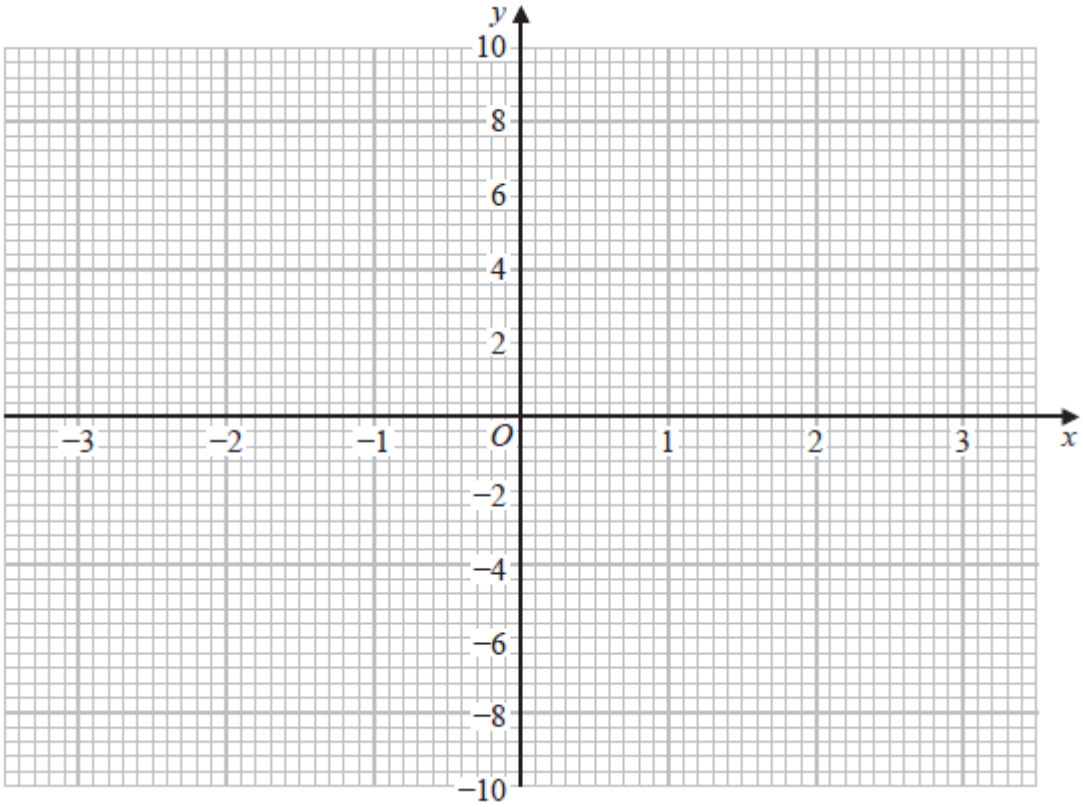
Question 9 - Question

9 (a) Complete the table of values for $y = 6x - x^3$

x	−3	−2	−1	0	1	2	3
y	9					4	−9

(2)

(b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from −3 to 3



(2)

(Total for Question 9 is 4 marks)

Question 9 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	(9), –4, –5, 0, 5, (4), (–9)	B2 (B1	for all 4 values correct for 2 or 3 correct values)	
(b)	Graph drawn	B2 (B1	for a fully correct graph ft (dep on B1 in (a)) for plotting at least 5 of the points from their table correctly)	Accept a freehand curve drawn that is not made of line segments Ignore anything outside the required range

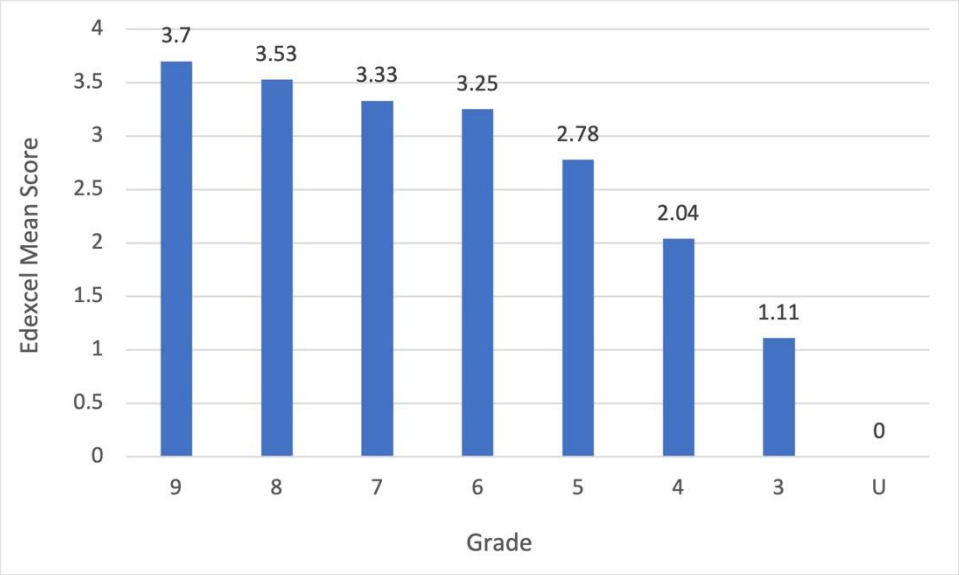
Question 9 - Examiner Comments

This question was answered quite well by the majority of students. The table in part (a) was often completed correctly. Most errors occurred with the substitution of the negative values of x into the equation and evaluating y as 4 when $x = –2$ was a common error.

In part (b) the plotting of the points was usually accurate. Most students realised that a curve was needed to join the points and it was pleasing to see many freehand curves drawn that passed through all the points. When the points were joined with line segments a maximum of one mark could be awarded. Students who had gained just one mark in part (a) generally went on to gain one mark in part (b) for plotting at least five of the points from their table correctly. Students should be encouraged to make sure that their curve passes through all of the points and doesn't consist of more than one curve between any two points.

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
2.34	4	59	2.34	3.70	3.53	3.33	3.25	2.78	2.04	1.11	0.00



Question 9 - Response A

9 (a) Complete the table of values for $y = 6x - x^3$

$-6 - -1 = -5$

$6 \times -2 = -12$

$-12 - -8 = -4$

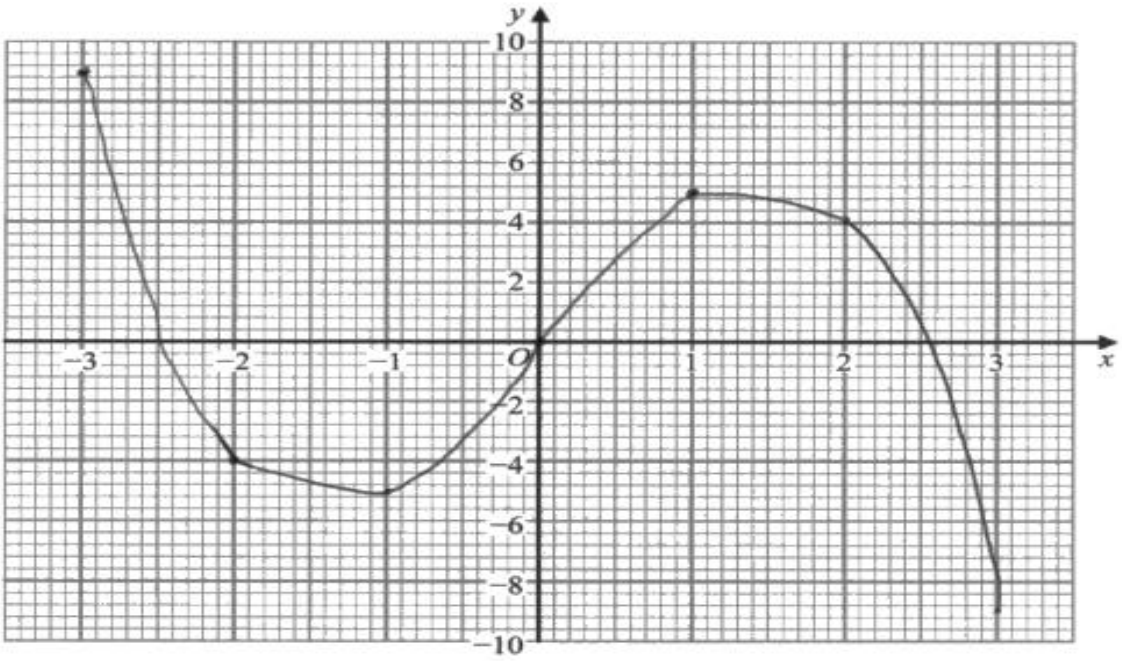
$-2^3 = -8$

$6 - 1 = 5$

x	−3	−2	−1	0	1	2	3
y	9	−4	−5	0	5	4	−9

(2)

(b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from −3 to 3



(2)

4 /4

(a)
B2 for all 4 values correct in the table.

(b)
B2 for a fully correct graph.

Q9
A
B
C

Question 9 - Response B

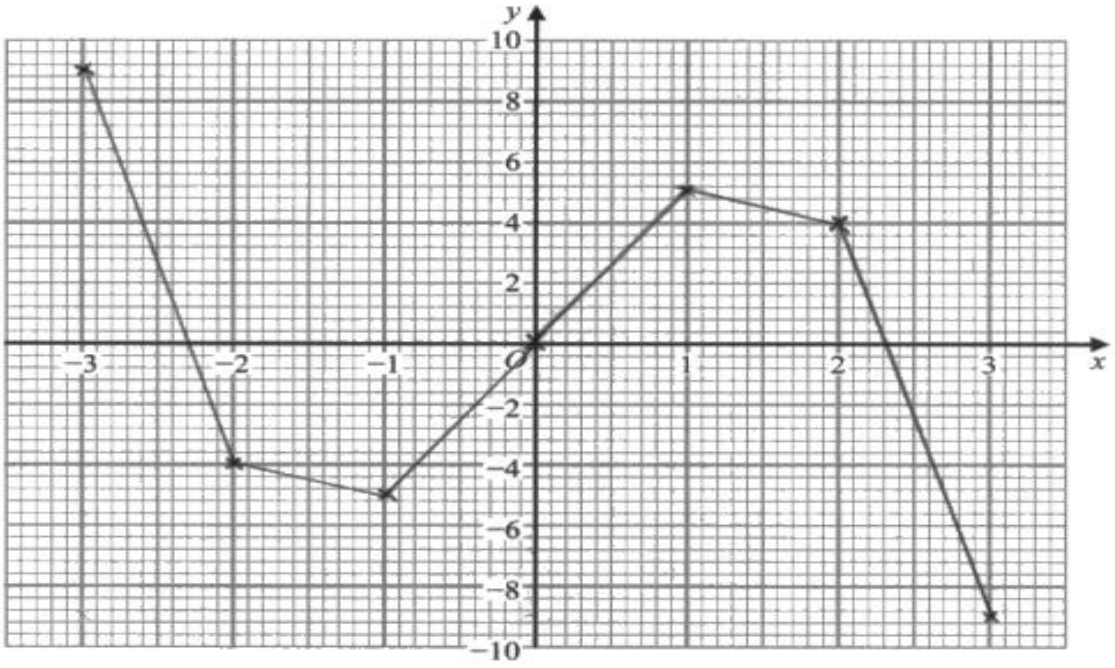
9 (a) Complete the table of values for $y = 6x - x^3$

$3^2 = 9$ $3^3 = 27$ $6 \times 3 = 18$ $18 - 27$ $-18 - -27$ $-18 + 27$ $6 - 1$ $-6 + 1$ $0 - 0^3$

x	−3	−2	−1	0	1	2	3
y	9	−4	−5	0	5	4	−9

(2)

(b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from −3 to 3



(2)

3 /4

(a)
B2 for all 4 values correct in the table.

(b)
B1 for plotting at least 5 points from the table correctly (all are correct in this case). The graph is not fully correct as the points have been joined with line segments, not with a freehand curve

Q9
A
B
C

Question 9 - Response C

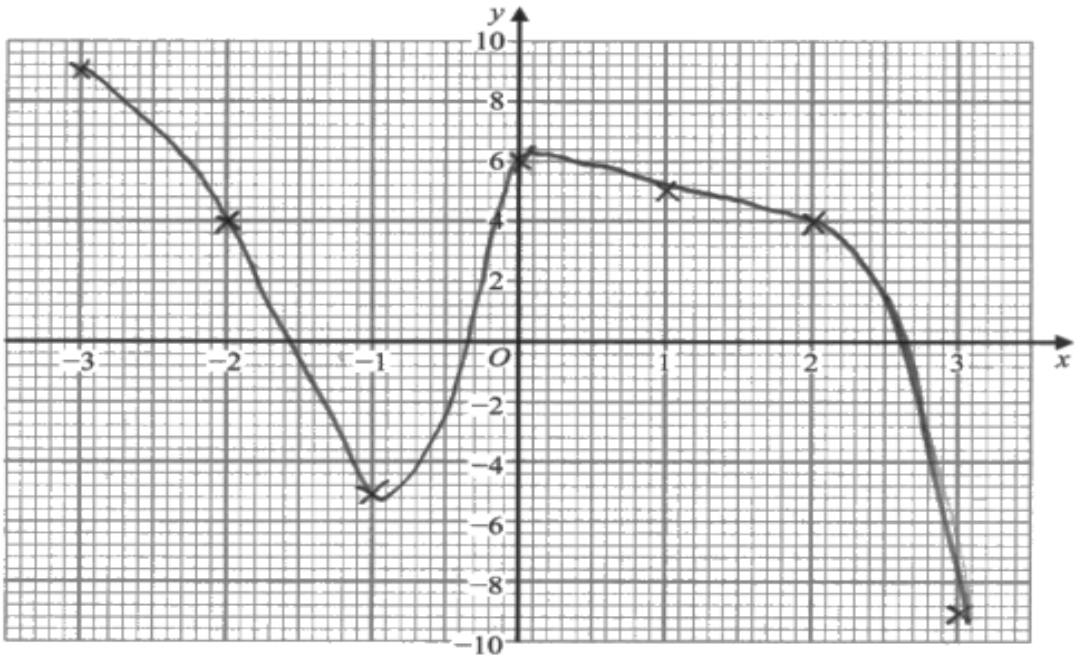
9 (a) Complete the table of values for $y = 6x - x^3$

$6(-1) - (-1)^3$ $-6 - -(-1)$ $6(-2) - (-2)^3$ $-12 - -8$ $6(1) - (1)^3$ $1 \times 1 \times 1 = 1$

x	−3	−2	−1	0	1	2	3
y	9	4	−5	6	5	4	−9

(2)

(b) On the grid, draw the graph of $y = 6x - x^3$ for values of x from −3 to 3



(2)

Q9

A B C

2 /4

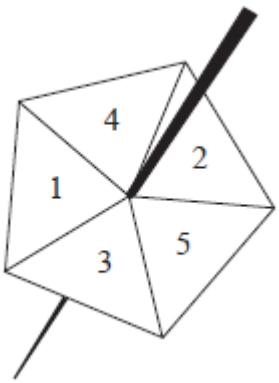
(a)
B1 for 2 values correct in the table.

(b)
B1 for plotting at least 5 points from the table correctly. Note that this mark is dependent on at least B1 in (a).

Question 10

Question 10 - Question

10 Lina spins a biased 5-sided spinner 40 times.



Here are her results.

Score	1	2	3	4	5
Frequency	6	8	9	7	10

Lina is now going to spin the spinner another two times.

(a) Work out an estimate for the probability that she gets a score of 5 both times.

.....

(2)

Derek is going to spin the spinner a large number of times.

(b) Work out an estimate for the percentage of times Derek can expect to get a score of 1

.....%

(2)

(Total for Question 10 is 4 marks)

Question 10 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
10 (a)	$\frac{1}{16}$	M1	for method to find probability of getting a score of 5, eg $\frac{10}{6+8+9+7+10}$ (= $\frac{10}{40}$) oe	
		A1	for $\frac{1}{16}$ oe	Accept any equivalent fraction, decimal form 0.06(25) or 0.063, percentage form 6(.25)% or 6.3% Ignore subsequent incorrect attempts to write the correct answer in a different form.
(b)	15	M1	for method to find the proportion of 1s, eg $\frac{6}{40}$ oe	
		A1	cao	

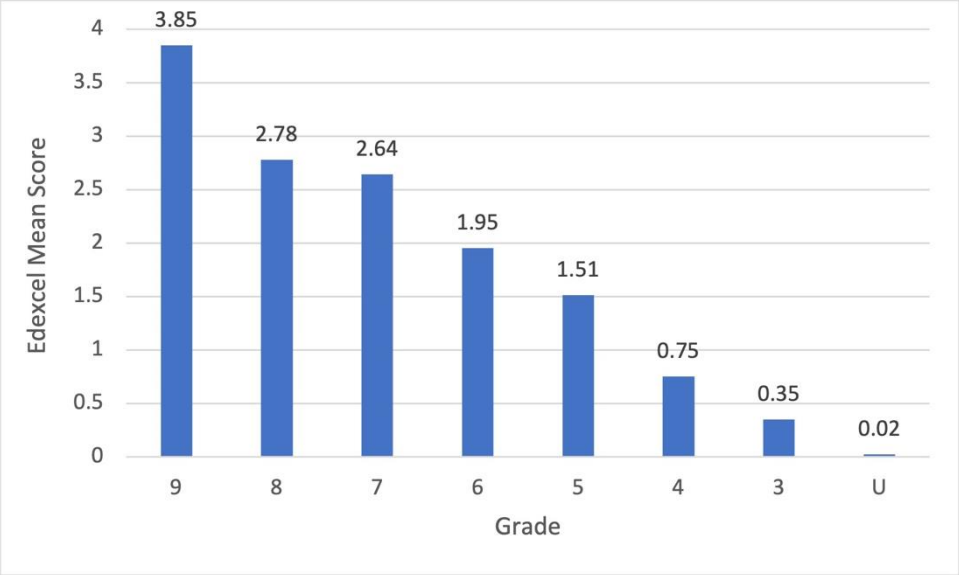
Question 10 - Examiner Comments

Part (a) was answered quite poorly. Those who used the table to find that the probability of getting a 5 is $\frac{10}{40}$ gained the method mark but many students ignored the fact that the spinner is biased and gave the probability of getting a 5 as $\frac{1}{5}$. Using $\frac{10}{40}$ to work out an estimate of scoring 5 both times proved to be beyond many students. A common incorrect method was $\frac{10}{40} + \frac{10}{40} = \frac{1}{2}$ and often $\frac{10}{40}$ or $\frac{1}{4}$ was given as the final answer.

In part (b) many of the students who gained the method mark for identifying the proportion of 1s as $\frac{6}{40}$ were able to write this as 15%. Some students showed a method to write $\frac{6}{40}$ as a percentage, e.g. $\frac{6}{40} \times 100$, but could not complete the calculation whereas others did not know how to write it as a percentage. Dividing 40 by 6 was a common error. There were many students who did not identify the proportion of 1s as $\frac{6}{40}$.

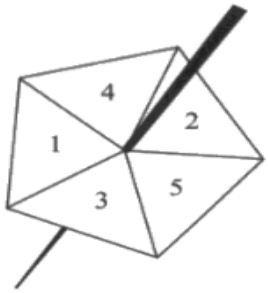
Question 10 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
1.32	4	33	1.32	3.85	2.78	2.64	1.95	1.51	0.75	0.35	0.02



Question 10 - Response A

10 Lina spins a biased 5-sided spinner 40 times.



Here are her results.

Score	1	2	3	4	5
Frequency	6	8	9	7	10

Lina is now going to spin the spinner another two times.

(a) Work out an estimate for the probability that she gets a score of 5 both times.

5 probability = $\frac{10}{40}$

$\frac{10}{40} \times \frac{10}{40} = \frac{100}{1600} = \frac{10}{160}$

$\frac{10}{160}$

(2)

Derek is going to spin the spinner a large number of times.

(b) Work out an estimate for the percentage of times Derek can expect to get a score of 1

$6/40 = 3/20 \rightarrow \frac{15}{100} = 15\%$ (×5)

if he spins 100 times ...

15 %

(2)

4 /4

Q10

(a) M1 for $\frac{10}{40}$

A1 for $\frac{10}{160}$ which is equivalent to $\frac{1}{16}$

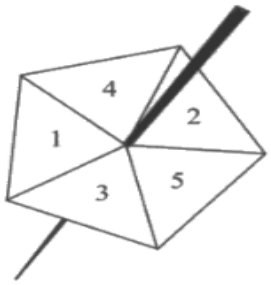
(b)

M1 for finding the proportion of 1s, $\frac{6}{40}$

A1 for the correct final answer.

Question 10 - Response B

10 Lina spins a biased 5-sided spinner 40 times.



Here are her results.

25%

Score	1	2	3	4	5
Frequency	6	8	9	7	10

= 40

Lina is now going to spin the spinner another two times.

(a) Work out an estimate for the probability that she gets a score of 5 both times.

25% ÷ 2 = ~~12.5%~~
12.5%

12.5%
(2)

Derek is going to spin the spinner a large number of times.

(b) Work out an estimate for the percentage of times Derek can expect to get a score of 1

$\frac{6}{40} : \frac{3}{20}$

$3\overline{)20}$ = $6.\dot{6}$

*

$6.\dot{6}$ %
(2)

2 /4

Q10

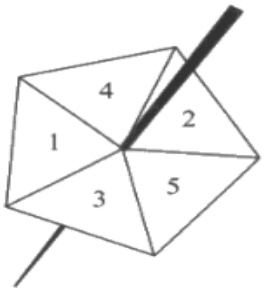
A
B
C

(a)
M1 for 25% given as the probability of getting a score of 5.
A0 as the final answer is incorrect.

(b)
M1 for finding the proportion of 1s, $\frac{6}{40}$
A0 as the final answer is incorrect.

Question 10 - Response C

10 Lina spins a biased 5-sided spinner 40 times.



Here are her results.

Score	1	2	3	4	5
Frequency	6	8	9	7	10

Lina is now going to spin the spinner another two times.

(a) Work out an estimate for the probability that she gets a score of 5 both times.

$\frac{1}{4}$ $\frac{1}{5} \times \frac{1}{5}$ $\frac{1}{5}$ first time

$= \frac{1}{2}$ $\frac{1}{5}$ 2nd time

$\frac{1}{25}$

(2)

Derek is going to spin the spinner a large number of times.

(b) Work out an estimate for the percentage of times Derek can expect to get a score of 1

6 34 0.176 34|6.000040

$\frac{6}{34}$

341
682
1364
2728
2 3857
2046

18 %

(2)

0 /4

Q10

(a)

M0 as $\frac{1}{5}$ is not the probability of getting a score of 5

A0 as the final answer is incorrect.

(b)

M0 incorrect method to find the proportion of 1s, $\frac{6}{34}$ is used instead of $\frac{6}{40}$

A0 as the final answer is incorrect.

Question 14

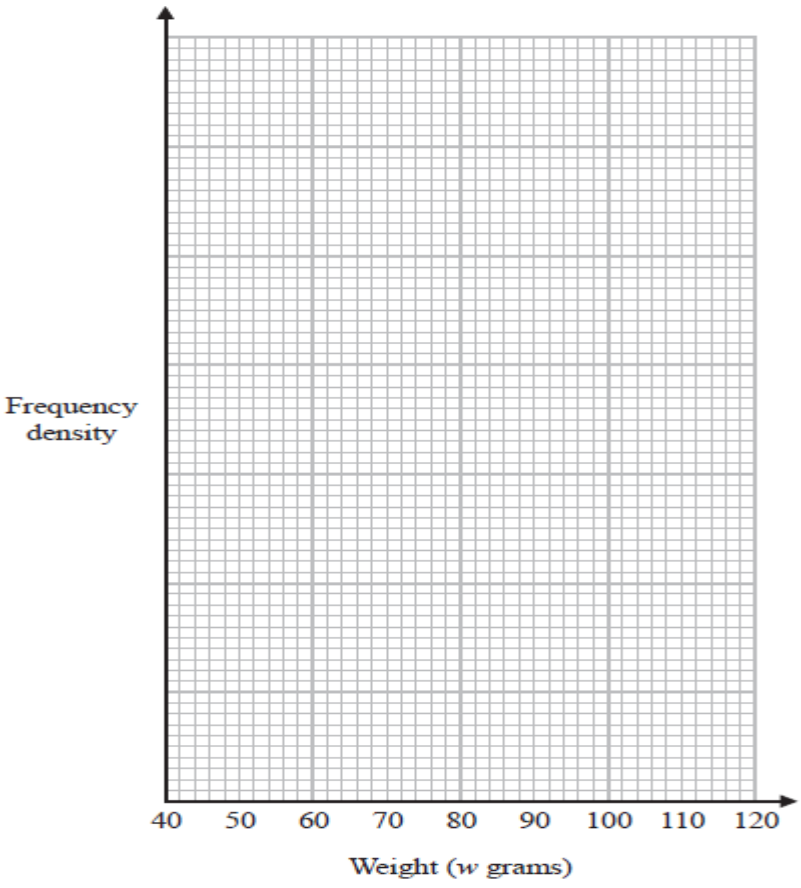
Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 14 - Question

14 The table shows information about the weights, in grams, of some potatoes.

Weight (w grams)	**Number of potatoes**
$50 < w \leq 70$	20
$70 < w \leq 80$	50
$80 < w \leq 90$	60
$90 < w \leq 110$	30

On the grid, draw a histogram for this information.



(Total for Question 14 is 3 marks)

Question 14 - Mark Scheme

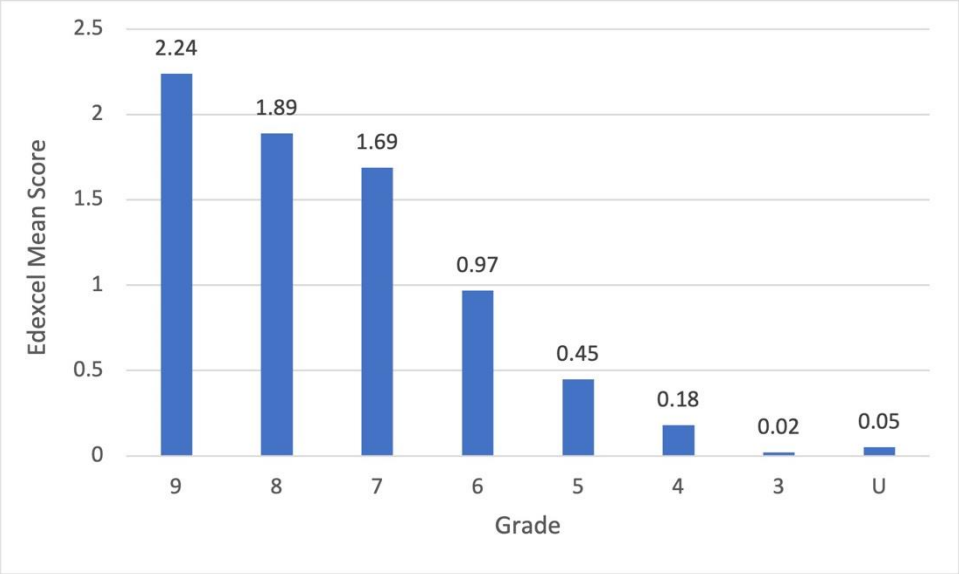
Question	Answer	Mark	Mark scheme	Additional guidance
14	Histogram drawn	B3	for fully correct histogram, eg relative heights 1, 5, 6, 1.5	Frequency densities are 1, 5, 6, 1.5
		(B2	for 3 correct bars **or** for frequency ÷ class interval for at least 3 frequencies and 2 correct bars of different widths)	
		(B1	for 2 correct bars of different widths **or** for frequency ÷ class interval for at least 3 frequencies)	

Question 14 - Examiner Comments

The students who worked out frequency densities and used these to draw a histogram often gained all three marks. Some students drew the first three bars correctly but then made an error drawing the bar representing the interval $90 < w \leq 110$ and gained two of the three marks. A few students with the correct frequency densities did not draw the bars in the correct intervals and gained one mark only. Weaker students often did not recognise the need to find frequency densities and drew a bar chart. Some students used the midpoints of the class intervals and the frequencies to get values which they then used to draw a frequency polygon.

Question 14 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
0.58	3	19	0.58	2.24	1.89	1.69	0.97	0.45	0.18	0.02	0.05

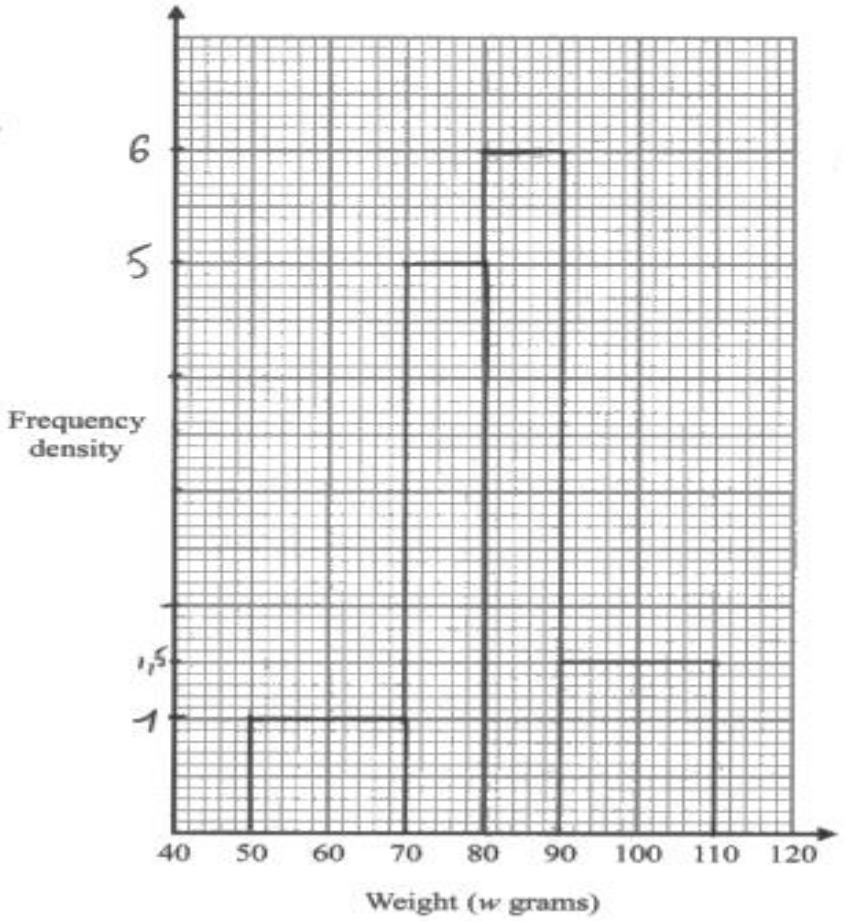


Question 14 - Response A

14 The table shows information about the weights, in grams, of some potatoes.

Weight (w grams)	Number of potatoes
$50 < w \leqslant 70$	20
$70 < w \leqslant 80$	50
$80 < w \leqslant 90$	60
$90 < w \leqslant 110$	30

On the grid, draw a histogram for this information.



3 /3

B3 for a fully correct histogram.

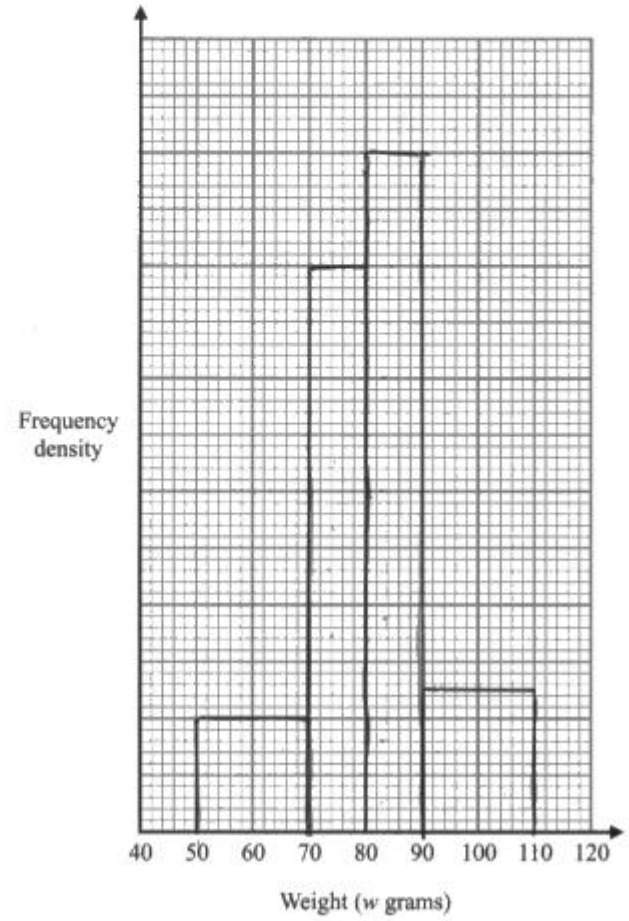
Note: we do not need to see numbering on the frequency density axis.

Question 14 - Response B

14 The table shows information about the weights, in grams, of some potatoes.

Weight (w grams)	Number of potatoes
$50 < w \leqslant 70$	20
$70 < w \leqslant 80$	50
$80 < w \leqslant 90$	60
$90 < w \leqslant 110$	30

On the grid, draw a histogram for this information.



2 /3

B2 for a histogram with 3 correct bars.

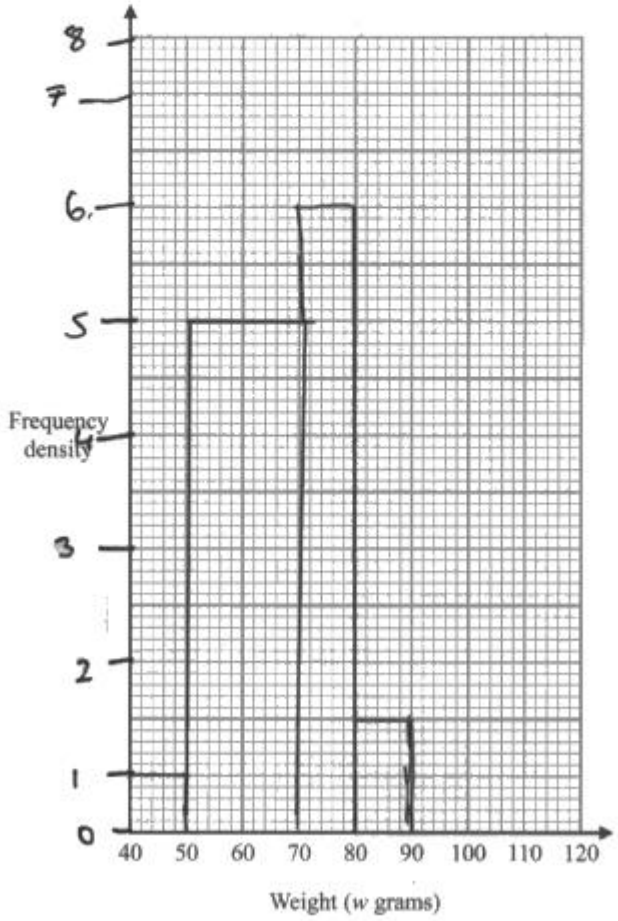
No frequency densities are shown and there is no numbering on the vertical axis but the first 3 bars have been drawn in the correct positions with the correct relative heights.

Question 14 - Response C

14 The table shows information about the weights, in grams, of some potatoes.

Weight (w grams)	Number of potatoes	Frequency density
$50 < w \leqslant 70$ 20	20	1
$70 < w \leqslant 80$ 10	50	5
$80 < w \leqslant 90$ 10	60	6
$90 < w \leqslant 110$ 20	30	1.5

On the grid, draw a histogram for this information.



Q14

A B C

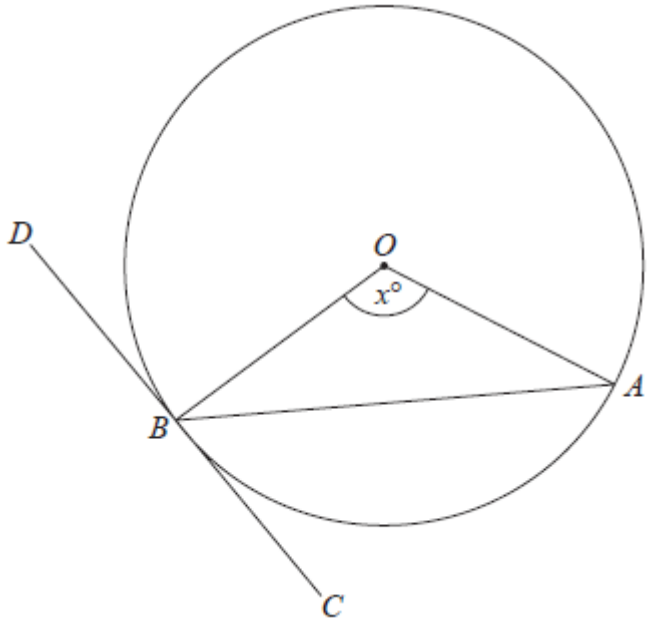
1 /3

B1 for at least 3 correct frequency densities. None of the bars are correct.

Question 18

Question 18 - Question

18



A and B are points on a circle, centre O.
DBC is the tangent to the circle at B.
Angle $AOB = x°$

Show that angle $ABC = \frac{1}{2}x°$

You must give a reason for each stage of your working.

(Total for Question 18 is 3 marks)

Question 18 - Mark Scheme

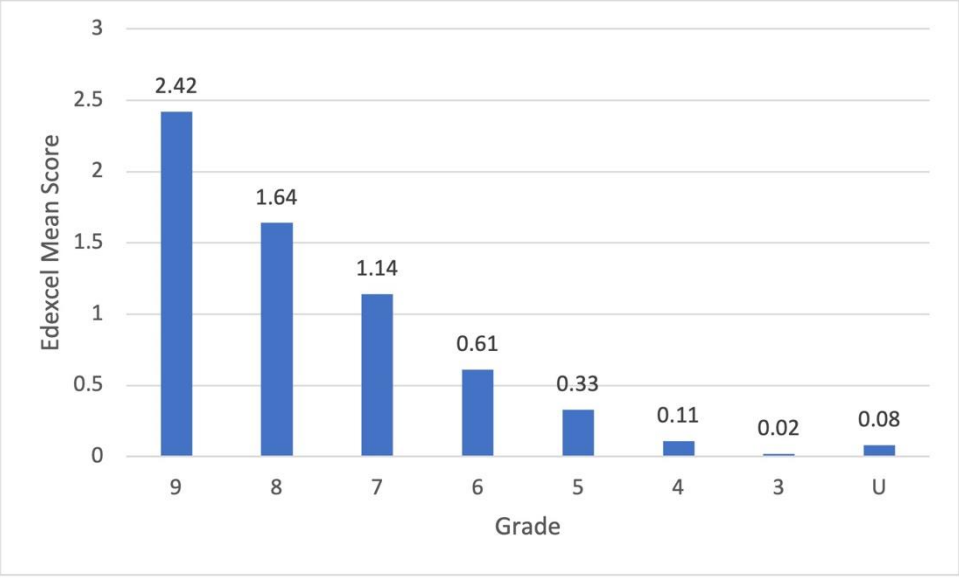
Question	Answer	Mark	Mark scheme	Additional guidance
18	Result shown	M1	for angle $OBC = 90$ **or** for method to find angle OBA or angle OAB, eg $\frac{180-x}{2}$ oe **or** for angle $ABC = 90 -$ angle OBA, eg angle $ABC = 90 - y$ **or** marks point on circumference and draws triangle using A and B and point marked	Angles must be clearly labelled on the diagram or otherwise identified. Correct method can be implied from angles on the diagram if no ambiguity or contradiction.
		M1	for method to find angle ABC, eg 90 – "$\frac{180-x}{2}$" oe **or** for $x = 180 - 2 \times$ angle OBA, eg $x = 180 - 2y$ **or** for angle at circumference = $\frac{1}{2}x$	
		C1	for correct algebra leading to angle $ABC = \frac{1}{2}x$ **and** one circle theorem relevant to their method, eg The tangent to a circle is perpendicular to the radius **OR** for $x = 180 - 2y$ and angle $ABC = 90 - y$ **and** one circle theorem relevant to their method, eg The tangent to a circle is perpendicular to the radius **OR** for angle $ABC = \frac{1}{2}x$ **and** one circle theorem relevant to their method, eg The angle at the centre of a circle is twice the angle at the circumference or Alternate segment theorem	Underlined words need to be shown; reasons need to be linked to their method.

Question 18 - Examiner Comments

This question was answered very poorly. Some students scored the first mark for angle $OBC = 90^{\circ}$ which was often marked on the diagram but could then make no further meaningful progress. Many could not even get that far. Some students correctly identified an isosceles triangle, but used arbitrary numerical values, e.g. 45, instead of an algebraic approach. Those with some idea usually found expressions for angles in terms of x although other approaches were occasionally seen. Some students labelled angle OBA or angle ABC as y and used the relationship between x and y to show the required result and a few students marked a point on the circle and formed a triangle with AB as the base. Full marks were awarded surprisingly rarely. Some answers were let down by poor algebra but some students who did show correct working leading to the required result then failed to correctly state the one circle theorem that was needed for the final mark. Some gave no reason, others gave a description which did not include the required key words.

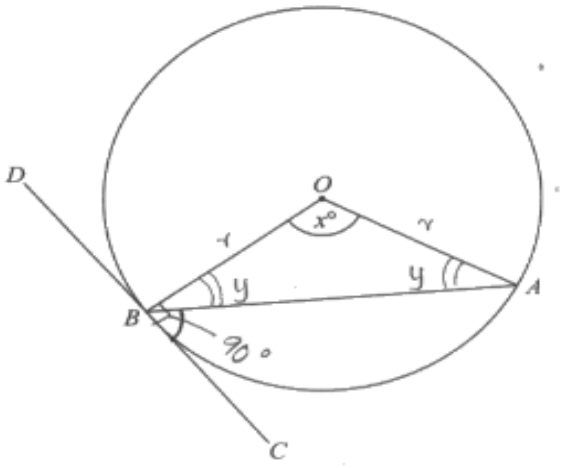
Question 18 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
0.41	3	14	0.41	2.42	1.64	1.14	0.61	0.33	0.11	0.02	0.08



Question 18 - Response A

18



A and *B* are points on a circle, centre *O*.
DBC is the tangent to the circle at *B*.
Angle $AOB = x°$

Show that angle $ABC = \frac{1}{2}x°$

You must give a reason for each stage of your working.

$\angle OBA = \angle OAB = y$ (isosceles Δ base angles are equal, let's call it y)

$y = \frac{180 - x}{2}$ (sum of all angle in a Δ = 180°)

$\angle OBC = 90°$ (line from radius to point where circle meets tangent gives a perpendicular angle)

$\angle OBC = \angle OBA + \angle ABC$

$90° = \frac{180 - x}{2} + \angle ABC$

$\angle ABC = 90 - \left(\frac{180 - x}{2}\right)$

$= 90 - 90 + \frac{x}{2}$

$\angle ABC = \frac{x°}{2}$

Q18

A B C

3 /3

M1 for angle $OBC = 90$ or for angle $OBA = \frac{180-x}{2}$

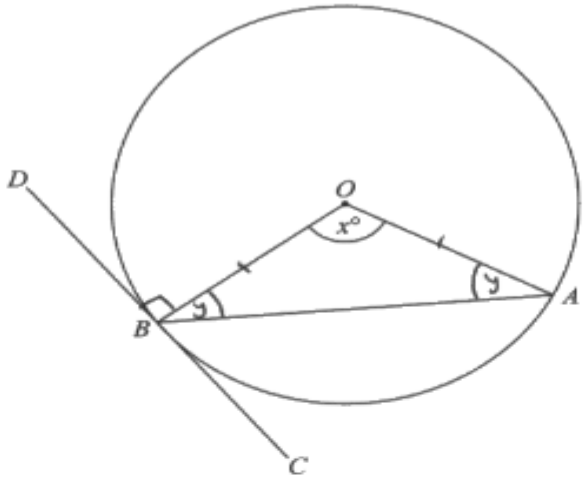
M1 for method to find angle ABC, $90 - \frac{180-x}{2}$

C1 for correct algebra leading to angle $ABC = \frac{1}{2}x$ and one relevant circle theorem.

Note: the circle theorem stated must include the words underlined in the mark scheme.

Question 18 - Response B

18



A and *B* are points on a circle, centre *O*.
DBC is the tangent to the circle at *B*.
Angle $AOB = x°$

Show that angle $ABC = \frac{1}{2}x°$
You must give a reason for each stage of your working.

$x = 180 - 2y$ (isosceles triangle)
$ABC = 90 - y$ (angles in a right angle)

$\frac{x}{ABC} = \frac{180 - 2y}{90 - y} = 2$

Q18

A
B
C

2 /3

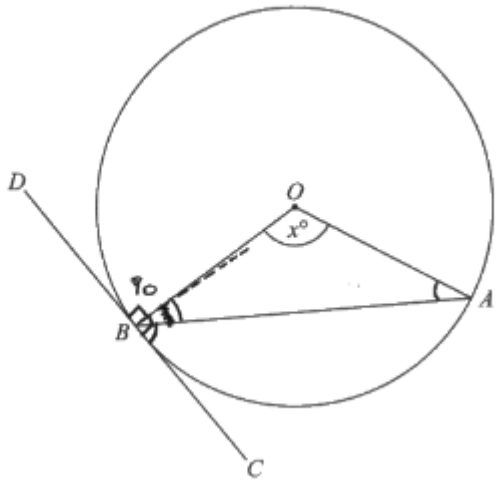
M1 for angle $ABC = 90 - y$

M1 for $x = 180 - 2y$

C0 $\frac{x}{ABC} = 2$ is just sufficient to show that angle $ABC = \frac{1}{2}x$ but the relevant circle theorem is also needed for this mark.

Question 18 - Response C

18



A and *B* are points on a circle, centre *O*.
DBC is the tangent to the circle at *B*.
Angle $AOB = x°$

Show that angle $ABC = \frac{1}{2}x°$

You must give a reason for each stage of your working.

Angle OBD and OBC = 90° tangents meets radius at 90°

$OBC - ABC = 90 - x = 180$

$x = \frac{1}{2}°$

angle $ABC = \frac{1}{2}x°$

Q18

A
B
C

1 /3

M1 for angle *OBC* = 90

M0 as the second line of working is incorrect.

C0: the correct circle theorem is given but 'angle *ABC* = $\frac{1}{2}x$' does not come from correct algebra.

Note: the circle theorem statement in this response is acceptable as the words underlined in the mark scheme are shown.

Question 19

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

Question 19 - Question

19 Solve $\frac{1}{x}-\frac{1}{x+1}=4$

Give your answer in the form $a \pm b\sqrt{2}$ where a and b are fractions.

.....

(Total for Question 19 is 5 marks)

Question 19 - Mark Scheme

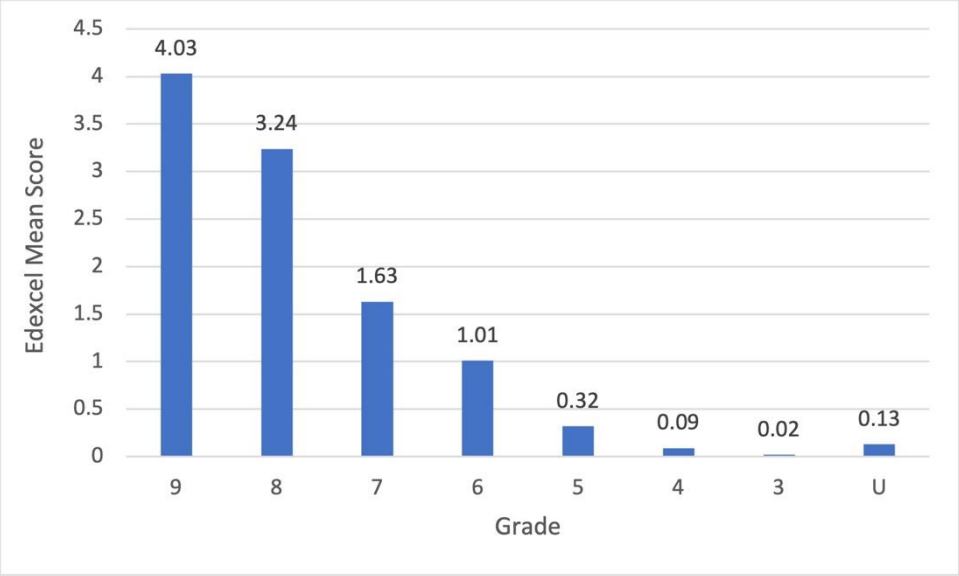
Question	Answer	Mark	Mark scheme	Additional guidance
19	$-\frac{1}{2}\pm\frac{1}{2}\sqrt{2}$	P1	for using a common denominator, eg $\frac{x+1}{x(x+1)}-\frac{x}{x(x+1)}$ (= 4) or $\frac{x+1-x}{x(x+1)}$ (= 4) **or** $x+1-x = 4x(x+1)$	
		P1	for expanding and rearranging to get $4x^2 + 4x - 1$ (= 0)	Note we don't need to see "= 0"; just the LHS is sufficient Accept other forms of the 3 term quadratic, eg $4x^2 + 4x = 1$
		P1	(dep P1) ft for a method to solve their 3 term quadratic equation, eg $\frac{-4\pm\sqrt{4^2-4\times4\times-1}}{2\times4}$ or $4\left[\left(x+\frac{1}{2}\right)^2-\left(\frac{1}{2}\right)^2\right]-1=0$ oe	Correct use of formula or completing the square
		A1	for values of x, eg $\frac{-4\pm\sqrt{32}}{8}$ or $\pm\sqrt{\frac{1}{2}}-\frac{1}{2}$ oe	
		A1	for $-\frac{1}{2}\pm\frac{1}{2}\sqrt{2}$ oe in the form $a\pm b\sqrt{2}$ where are a and b are fractions	Accept $a = -\frac{1}{2}$, $b = \frac{1}{2}$ or $a = -\frac{1}{2}$, $b = -\frac{1}{2}$

Question 19 - Examiner Comments

Some students correctly wrote the two fractions with a common denominator and gained the first mark but many were then unable to carry the algebraic solution any further. Those that did reduce the equation to a 3-term quadratic sometimes made errors when rearranging and did not get the second mark. Substitution into the quadratic equation formula was generally done well. Some students who did not get a correct quadratic equation were still able to gain the third mark for dealing correctly with their 3-term quadratic equation. The first of the two accuracy marks was awarded for two correct values of x, e.g. $\frac{-4\pm\sqrt{32}}{8}$. Some students gave this as the final answer and others made errors when attempting to write it in the required form. Only a few students could demonstrate the necessary skills of algebraic manipulation to solve the equation and give the answer in the required form.

Question 19 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
0.62	5	12	0.62	4.03	3.24	1.63	1.01	0.32	0.09	0.02	0.13



Question 19 - Response A

19 Solve $\frac{1}{x} - \frac{1}{x+1} = 4$

Give your answer in the form $a \pm b\sqrt{2}$ where a and b are fractions.

$$\frac{x+1-x}{x(x+1)} = 4$$

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

$$1 = 4x^2 + 4x$$

$$4x^2+4x-1=0$$

$$16+16 = 32$$

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

$$= \frac{-4 \pm \sqrt{4^2-4\times4\times(-1)}}{2\times4}$$

$$= \frac{-4 \pm \sqrt{32}}{8} \quad \text{*} 16\times2$$

$$= \frac{-4 \pm 4\sqrt{2}}{8}$$

$$= \frac{-1 \pm \sqrt{2}}{2} = -\frac{1}{2} \pm \frac{\sqrt{2}}{2}$$

$$x = -\frac{1}{2} + \frac{\sqrt{2}}{2} \text{ or } x = -\frac{1}{2} - \frac{\sqrt{2}}{2}$$

5 /5

P1 for using a common denominator.
P1 for expanding and rearranging to get the correct quadratic, $4x^2 + 4x - 1$. Note that other forms of the 3-term quadratic, e.g. $4x^2 + 4x = 1$ are acceptable.
P1(dep P1) for a method to solve the quadratic - in this case using the quadratic formula. The mark is awarded for the correct substitution into the formula.
A1 for the correct values of x, $\frac{-4\pm\sqrt{32}}{8}$
A1 as a correct solution is given in the form required by the question.

Question 19 - Response B

19 Solve $\frac{1}{x} - \frac{1}{x+1} = 4$

Give your answer in the form $a \pm b\sqrt{2}$ where a and b are fractions.

$2+2\sqrt{2}$
$= 4\sqrt{2}$

$2\sqrt{2}$

$\sqrt{32}$

$\sqrt{8}$ $\sqrt{4}$

$\sqrt{2}$ $\sqrt{4}$ 2

$\frac{(x+1)}{x(x+1)} - \frac{x}{x(x+1)}$

$\frac{x+1-x}{x(x+1)} = 4$

$\frac{1}{x(x+1)} = \frac{4}{1}$

$\frac{1}{x^2+x} = \frac{4}{1}$

$4(x^2+x) = 1$

$4x^2 + 4x = 1$

$4x^2 + 4x - 1 = 0$

$4x^2 + 4x - 1 = 0$

$a = 4$

$b = 4$

$c = -1$

$x = \frac{-4 \pm \sqrt{4^2 - (4 \times 4 \times -1)}}{2 \times 4}$

$x = \frac{-4 \pm \sqrt{16+16}}{8}$

$x = \frac{-4 \pm \sqrt{32}}{8}$

$x = \frac{-2 \pm \sqrt{16}}{4}$

$-4 \pm 4\sqrt{2}$

Q19

A B C

4 /5

P1 for using a common denominator.

P1 for expanding and rearranging to get the correct quadratic.

P1 (dep P1) for correct substitution into the formula.

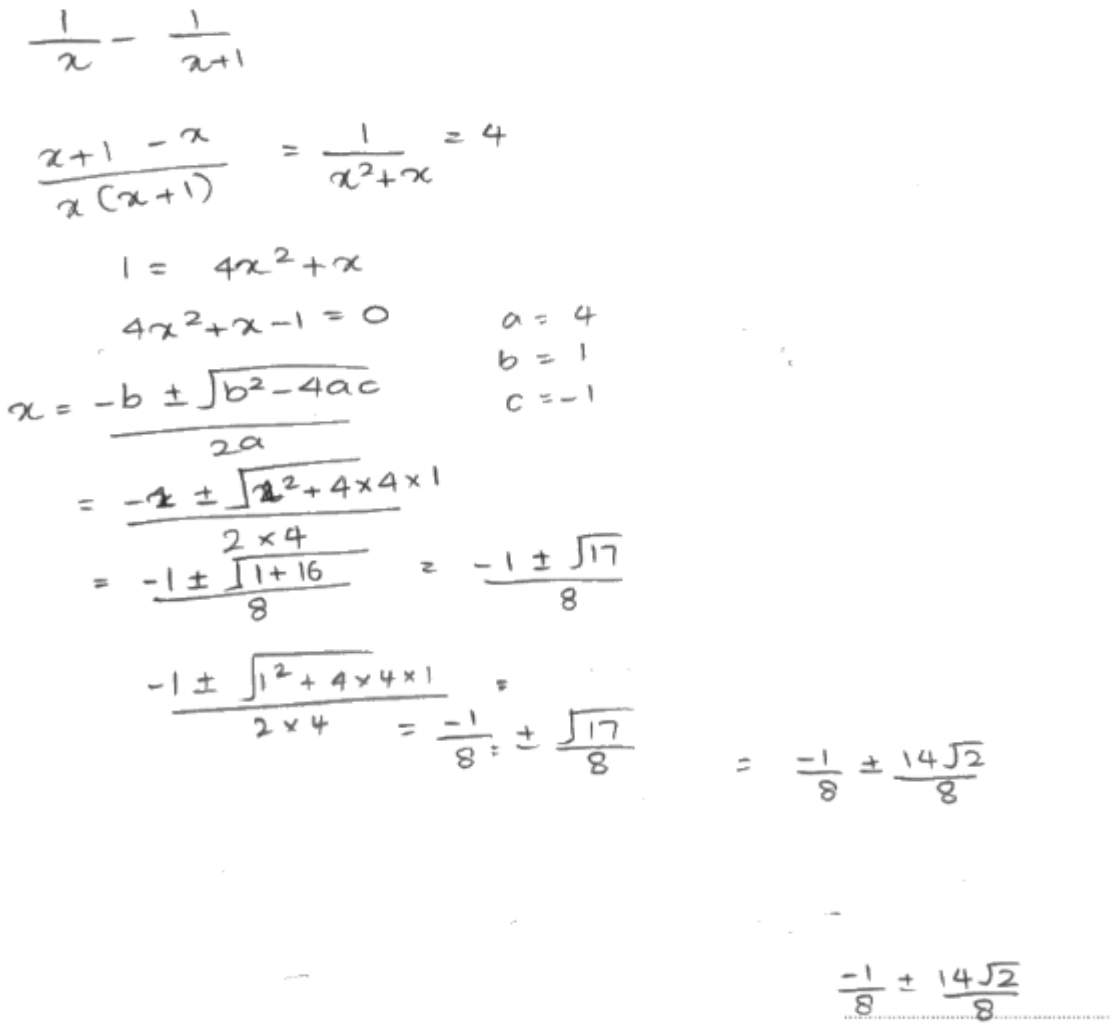
A1 for the correct values of x, $\frac{-4 \pm \sqrt{32}}{8}$

A0 as the final answer is incorrect.

Question 19 - Response C

19 Solve $\frac{1}{x} - \frac{1}{x+1} = 4$

Give your answer in the form $a \pm b\sqrt{2}$ where a and b are fractions.



Q19

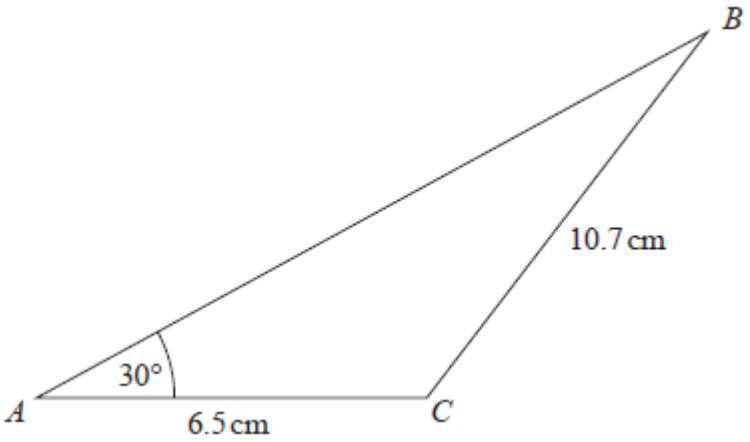
2 /5

P1 for using a common denominator - at this stage an equation is not required but the numerator(s) must be correct.
P0 because the correct quadratic is not reached.
P1 (dep P1) for correct substitution into the formula to solve their 3-term quadratic equation.
A0 as the values of x are incorrect.
A0 as the final answer is incorrect.

Question 22

Question 22 - Question

22 Here is a triangle ABC.



Work out the value of sin ABC

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

.....

(Total for Question 22 is 4 marks)

Question 22 - Mark Scheme

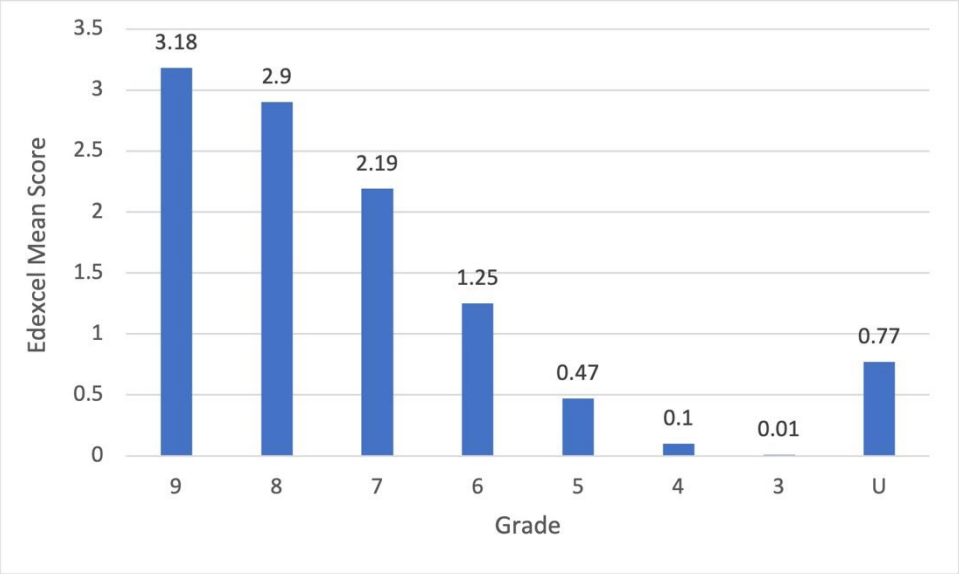
Question	Answer	Mark	Mark scheme	Additional guidance
22	$\frac{65}{214}$	B1	for sin 30 = 0.5	
		P1	for use of the sine rule with values substituted, eg $\frac{6.5}{\sin ABC}=\frac{10.7}{\sin 30}$ oe	
		P1	for (sin *ABC* =) $\frac{6.5\times\sin 30}{10.7}$ oe **or** for a complete process to find sin *ABC*, eg (sin *ABC* =) $\frac{6.5\times[0.5]}{10.7}$ oe	Answer of $\frac{3.25}{10.7}$ or $\frac{6.5}{21.4}$ gets 3 marks Where [0.5] is their value of sin30
		A1	for $\frac{65}{214}$ oe eg $\frac{325}{1070}$	Answer must be in the form $\frac{m}{n}$ where *m* and *n* are integers

Question 22 - Examiner Comments

A small proportion of students gained at least one mark for giving the value of sin30 as 0.5 or for a correct sine rule statement with 6.5, 10.7 and 30 substituted. Students who did not know the correct value of sin30 were still able to gain two of the four marks if they showed a complete process to find sin *ABC*. Many of those who gained the first three marks by showing a complete process to find sin *ABC* using sin30 = 0.5 did not gain the accuracy mark because they did not give their answer in the form $\frac{m}{n}$ where *m* and *n* are integers. The final answer was often given as $\frac{3.25}{10.7}$ or $\frac{6.5}{21.4}$. Many students showed a lack of understanding of the mathematical requirements of the question, resorting to right-angled trigonometric calculations and/or Pythagoras' Theorem.

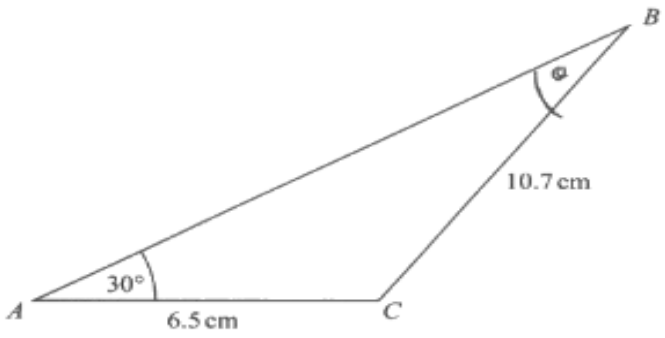
Question 22 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:								
			ALL	9	8	7	6	5	4	3	U
0.71	4	18	0.71	3.18	2.90	2.19	1.25	0.47	0.10	0.01	0.77



Question 22 - Response A

22 Here is a triangle ABC.



Work out the value of sin ABC

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

$\frac{10.7}{\sin 30} = \frac{6.5}{\sin B}$

$\frac{10.7}{\frac{1}{2}} = \frac{6.5}{\sin B}$

$21.4 = \frac{6.5}{\sin B}$

$\sin B = \frac{6.5}{21.4} \times \frac{10}{10}$

$= \frac{65}{214}$

$\frac{65}{214}$

Q22

A
B
C

4 /4

B1 for sin30 = 0.5

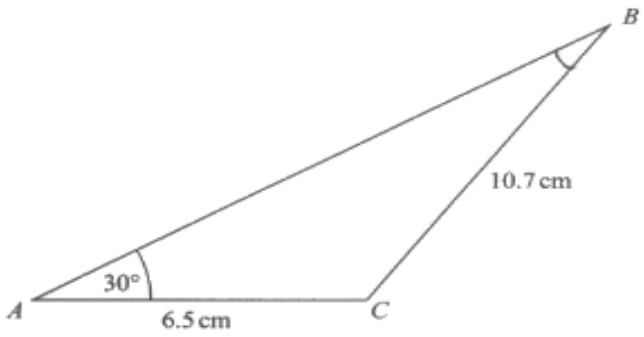
P1 for use of the sine rule.

P1 for a correct process to find sinABC

A1 for a correct final answer in the required form.

Question 22 - Response B

22 Here is a triangle ABC.



Work out the value of $\sin ABC$

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

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

$\frac{10.7}{\sin 30} = \frac{6.5}{\sin B}$ → $\sin B = \frac{6.5 \times 0.5}{10.7} = \frac{3.25}{10.7}$

$\frac{3.25}{10.7}$

Q22

3 /4

B1 for sin30 = 0.5

P1 for use of the sine rule.

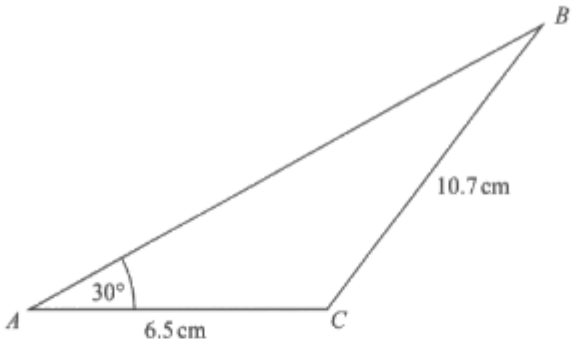
P1 for a correct process to find sinABC

A0: 3.25/10.7 is a correct value for sinABC but the answer is not in the required form.

Note: the final answer must be in the form $\frac{m}{n}$ where m and n are integers.

Question 22 - Response C

22 Here is a triangle ABC.



Work out the value of sin ABC

Give your answer in the form $\frac{m}{n}$ where m and n are integers.

$$\frac{AC}{\sin B} = \frac{BC}{\sin A}$$

$$\frac{6.5}{\sin B} = \frac{10.7}{\sin 30}$$

$$\sin ABC = \frac{\sin 30 \times 6.5}{10.7}$$

Q22

A
B
C

2 /4

B0 as sin30 = 0.5 is not shown

P1 for use of the sine rule with values substituted

P1 for a correct process to find sin ABC

A0: no final answer is given.

Note: students who use an incorrect value or no value for sin30 can still access the two P marks.