Pearson Edexcel

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

November 2022 Exemplar
1MA1-3F Paper 3 (Calculator)
Foundation 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 Foundation 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 Foundation 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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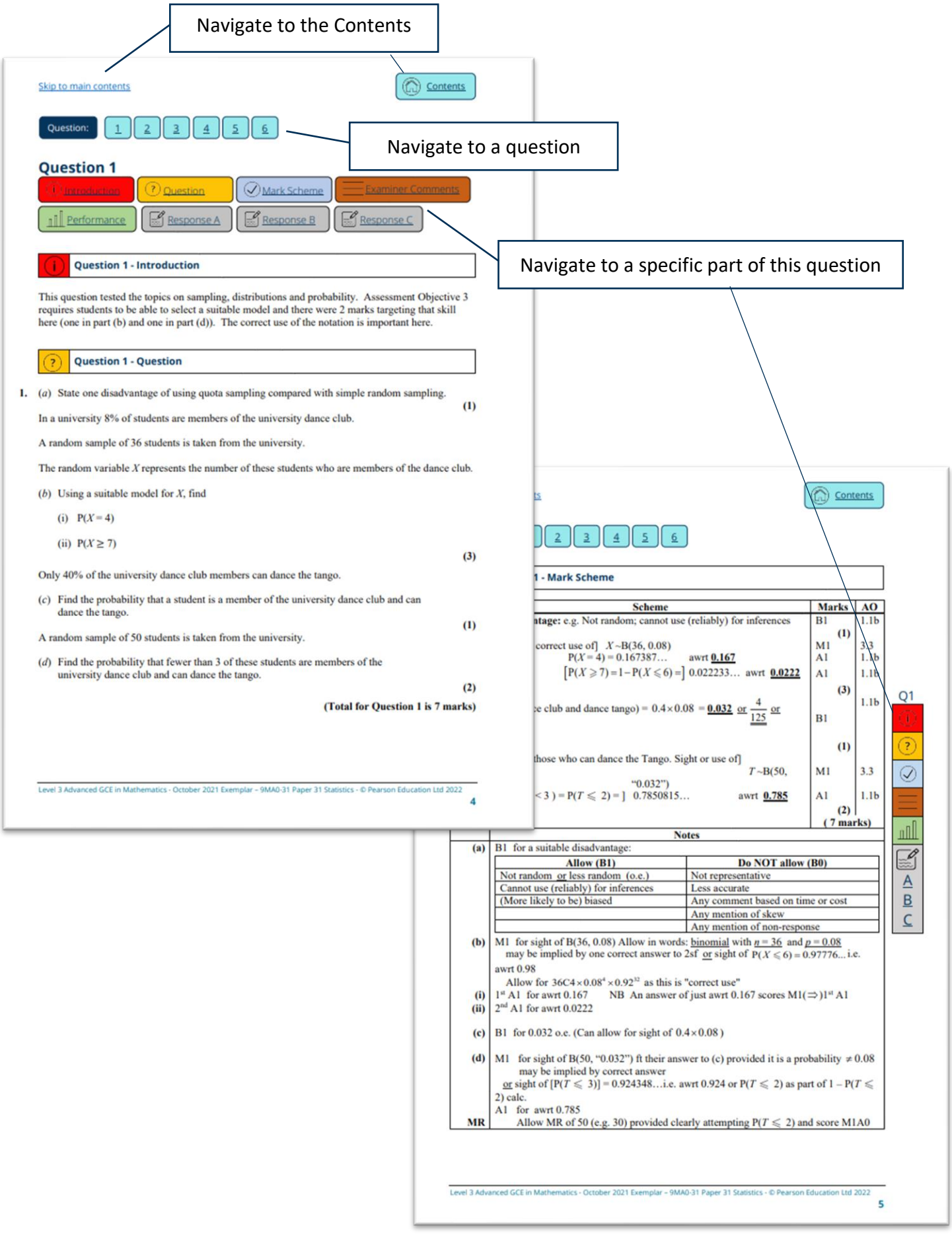
How to use this booklet



General Examiner Feedback

The overall quality of the presentation of work has improved since last year, and even since the summer series. In that series there were too many cases of candidates misreading figures from questions, but that was not the case in November, where candidates showed greater care in reading figures and in presenting their work.

Approaches to questions that required some interpretation or explanation were inconsistent. Questions 10 and 16 were answered well, but poor attempts were made in questions 13b and 22. On too many occasions candidates included contradictory or incorrect statements, which cannot be credited under the definition of a C mark. However, it must be noted that rarely were these questions ignored. Candidates must be congratulated for having attempted these even where they were unsure.

Mathematical performance generally appears to have improved on this paper since last year, though was not always consistently good across the whole paper. Within a broad range of questions the paper was able to discriminate well. Weakest areas continue to be the application of ratios, scales (including scales on graphs) and rates, but also algebraic manipulation and problem solving. Most demonstrated good use of a calculator, though on some occasions it was clear that they did not have an understanding of the way in which their calculator worked or did not have one at all, such as in questions 17 and 29.

Questions which had a slightly unexpected approach, that is required more thought, caused immediate problems for many, even in the earlier part of the paper. This includes question 12 involving simple ratios, and question 15 which involved several stages of calculation. Later in the paper questions 20 and 24 appeared unfamiliar to many, with frequent contradiction in their working. Questions 23, 24, 27 and 28 were the more challenging questions for those striving to demonstrate ability at the highest grades available, and a significant proportion of candidates therefore failed to score many marks on these questions, but again it must be noted that rarely did candidates fail to show some attempt at these questions, and it was not uncommon to find even the weaker candidates picking up some marks.

There were far fewer attempts using trial and improvement approaches. These mainly occurred when candidates showed evidence of not having a calculator, mainly evident in questions 15, 20 and 23.

The inclusion of working out to support answers remains an issue for many; but not only does working out need to be shown, it needs to be shown legibly, demonstrating the processes of calculation that are used. This is most important in longer questions, and in “show that” questions. Examiners reported frequent difficulty in interpreting complex responses, poorly laid out, in questions 7, 15, 20, 23 and 24.

Question 7

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

Question 7 - Question

7 208 bars of chocolate were sold from a shop.

$\frac{1}{4}$ of these bars of chocolate were large bars.

The rest of the bars of chocolate were small bars.

All the large bars of chocolate were sold for £1 each.
All the small bars of chocolate were sold for 60p each.

Work out the total amount of money for which the 208 bars of chocolate were sold.
Give your answer in pounds.

£.....

(Total for Question 7 is 3 marks)

Question 7 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
7	145.60	P1	for a process to work out the value of the large bars eg 208 ÷ 4 (=52 or 5200)	units may be ignored for the process marks
		P1	for a process to work out the value of the small bars eg (208 – "52") × 60 or $(1 - \frac{1}{4}) \times 208 \times 60$ (=9360 or 93.6(0)) **or** for 145.6	work could be in pence or £
		A1	for 145.60 cao (must be correct money notation)	

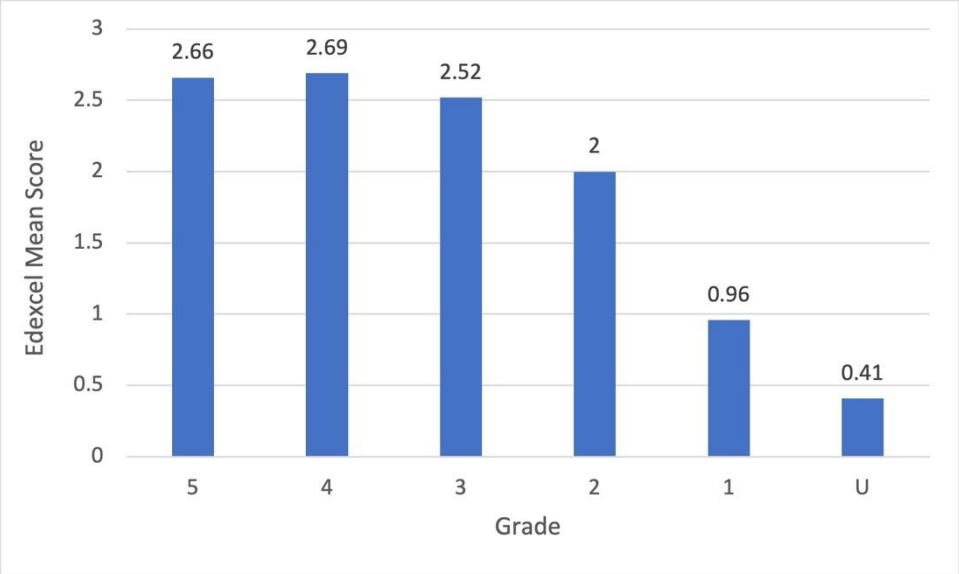
Question 7 - Examiner Comments

The majority of candidates completed this question with no issues. Of those candidates who failed to gain full marks, the most common error was in failing to give their answer in correct money notation, that is stating £145.6 rather than £145.60. This lost the final accuracy mark.

Some candidates lost marks by doing a variety of strange calculations which some checking would have spotted. This included 208 – 0.25, 52 × 93.6, or cases of finding 52 then showing 208 × 60p rather than 52 × 60p.

Question 7 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
2.35	3	78	2.35	2.66	2.69	2.52	2.00	0.96	0.41



Question 7 - Response A

7 208 bars of chocolate were sold from a shop.

$\frac{1}{4}$ of these bars of chocolate were large bars.

The rest of the bars of chocolate were small bars.

All the large bars of chocolate were sold for £1 each.
All the small bars of chocolate were sold for 60p each.

Work out the total amount of money for which the 208 bars of chocolate were sold.
Give your answer in pounds.

208 × $\frac{1}{4}$ = 52 large bars

208 − 52 = 156 small bars

52 bars × £1 = £52.00

156 × 0.60p = £93.60 +

208 bars → £145.60

£ 145.60

(Total for Question 7 is 3 marks)

Q7

A B C

3 /3

P1 for working out the value of the large bars
P1 for working out the value of the small bars
A1 correct answer written with correct money notation

Note: their final answer must be in pounds and use correct money notation. For example, £145.60 shown in working but written as £145.6 on the answer line would lose the accuracy mark.

Question 7 - Response B

7 208 bars of chocolate were sold from a shop.

$\frac{1}{4}$ of these bars of chocolate were large bars.
The rest of the bars of chocolate were small bars.

All the large bars of chocolate were sold for £1 each.
All the small bars of chocolate were sold for 60p each.

Work out the total amount of money for which the 208 bars of chocolate were sold.
Give your answer in pounds.

208 x $\frac{1}{4}$ = 52 Larger bars £1 each £52

208 - 52 = 156 small bars 60p each 2 bars = £1

156 ÷ 0.60 = £260 156 ÷ 0.60 = 2.60

2 x 78 = 156 £260 + £52 = £312

£.....

Q7

1 /3

P1P0A0

P1 Correct process shown to give 52
P0 since they have attempted to find the number of small bars but they have divided by 0.6 instead of multiplying.
A0 incorrect answer.

Question 7 - Response C

7 208 bars of chocolate were sold from a shop.

$\frac{1}{4}$ of these bars of chocolate were large bars.
The rest of the bars of chocolate were small bars.

All the large bars of chocolate were sold for £1 each.
All the small bars of chocolate were sold for 60p each.

Work out the total amount of money for which the 208 bars of chocolate were sold.
Give your answer in pounds.

$\frac{1}{4} = 51$

$51 \times 3 = 153$

153×60
$= £91.80$

£51
$= 142.8$

£ 142.8

0 /3

Q7

A
B
C

P0P0A0

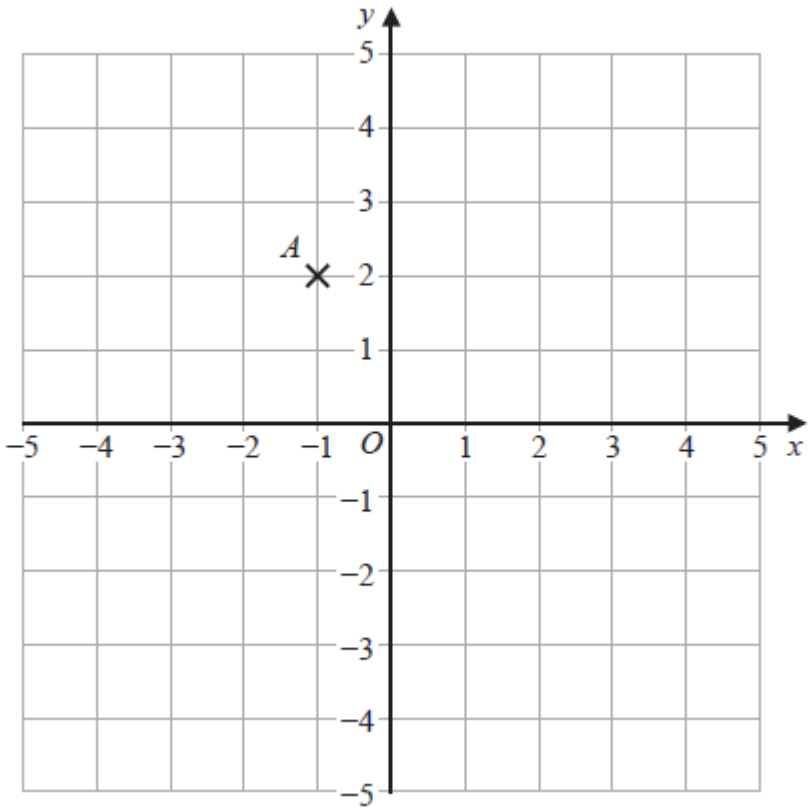
P0 an incorrect (or no) process is shown giving an incorrect answer.
P0 we cannot follow through their 51 as it has not come from a correct process.
A0 incorrect answer.

Question 9

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

Question 9 - Question

9



(a) Write down the coordinates of point A.

(..... , ...)

(1)

(b) On the grid, mark with a cross (×) the point (1, 4)
Label this point B.

(1)

(c) On the grid, draw the line with equation $y = -3$

(1)

(Total for Question 9 is 3 marks)

Question 9 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
9 (a)	(–1,2)	B1	cao	
(b)	(1 ,4) marked	B1	for the point (1, 4) unambiguously marked on the grid	need not be labelled if clear
(c)	$y = -3$ shown	B1	for correct line unambiguously marked	need not be labelled if clear accept a line drawn freehand

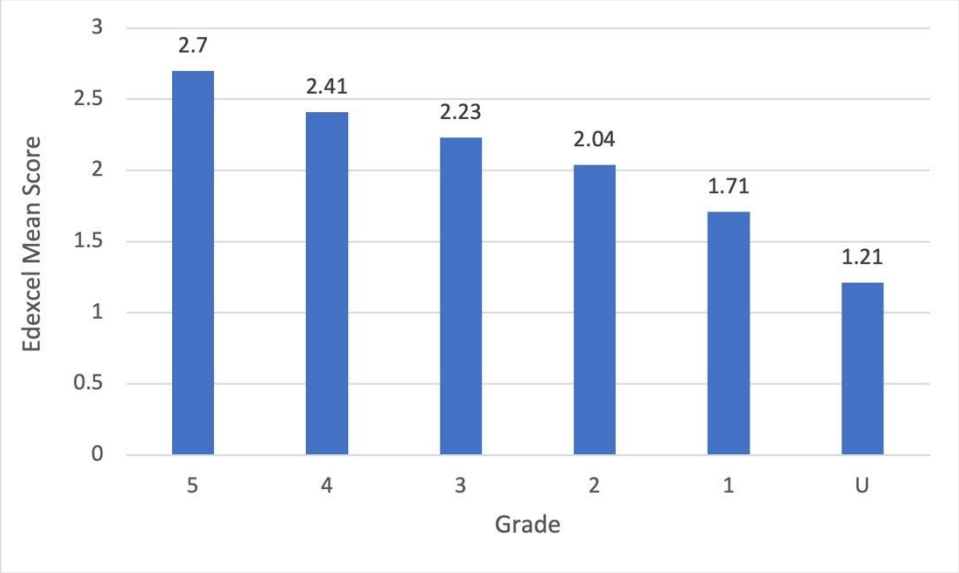
Question 9 - Examiner Comments

Candidates were well practiced with coordinates, and only a few failed to gain the marks in both part (a) and part (b), usually by reversing the coordinates.

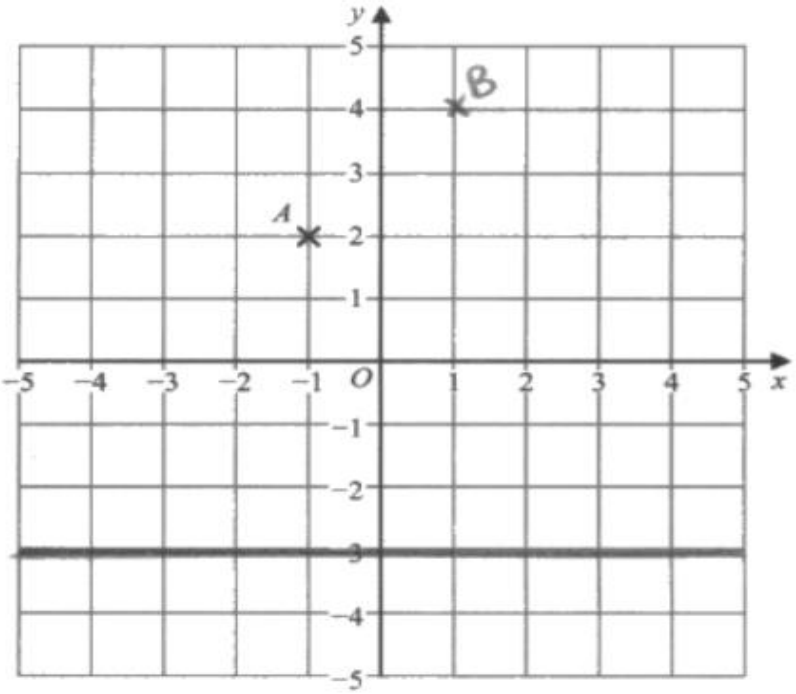
In contrast, it was rare to see a correct answer in part (c). Frequently the y axis (and sometimes the x-axis) was often just marked with a cross. Drawing $x = -3$ was a common incorrect answer, although many candidates felt it needed to be a diagonal line, often going through point B. Another common error was to draw a line through A and B.

Question 9 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
2.20	3	73	2.20	2.70	2.41	2.23	2.04	1.71	1.21



Question 9 - Response A



(a) Write down the coordinates of point *A*.

(−1 , 2)

(1)

(b) On the grid, mark with a cross (×) the point (1, 4)
Label this point *B*.

(1)

(c) On the grid, draw the line with equation $y = -3$

(1)

(Total for Question 9 is 3 marks)

3 /3

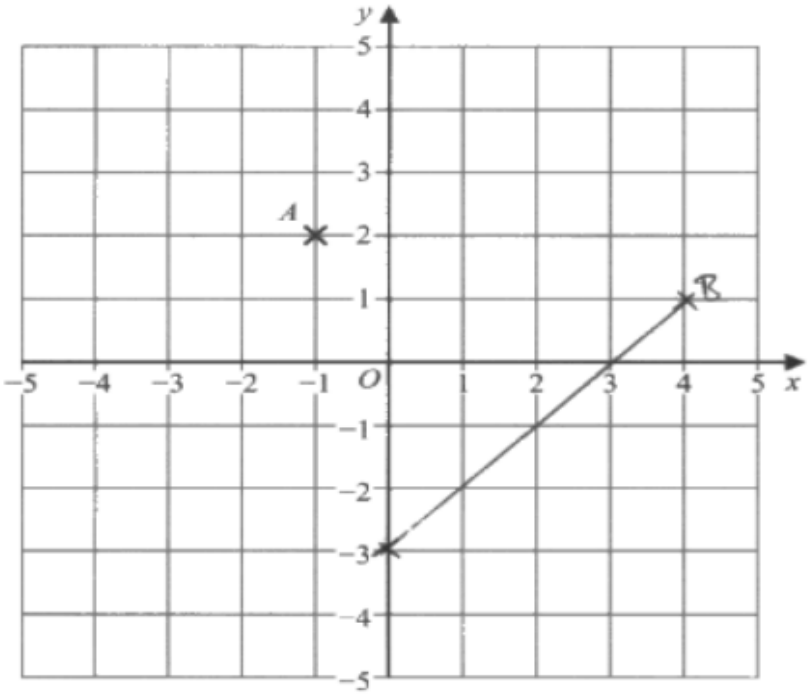
(a)
B1 correct coordinates given

(b)
B1 correct point marked

(c)
B1 $y = -3$ marked. It does not need to be labelled. It needs to be a line rather than a small mark on the axis

Question 9 - Response B

9



(a) Write down the coordinates of point A.

(-1 , 2)

(1)

(b) On the grid, mark with a cross (×) the point (1, 4)
Label this point B.

(1)

(c) On the grid, draw the line with equation $y = -3$

(1)

(Total for Question 9 is 3 marks)

1 /3

(a)
B1 correct coordinates given

(b)
B0 (4, 1) marked

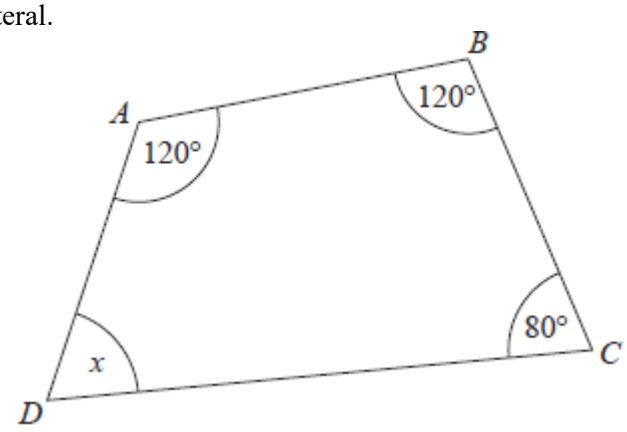
(c)
B0 incorrect line drawn

Question 13a

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

Question 13a - Question

13 *ABCD* is a quadrilateral.



(*a*)(i) Work out the size of angle *x*.

.....°

(1)

(ii) Give a reason for your answer.

.....

.....

.....

(1)

Question 13a - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
13 (a)(i)	40	B1	cao	
(ii)	Reason	C1	Reason given Angles in a quadrilateral add up to 360. Accept "4-sided shape"	Underlined words need to be shown.

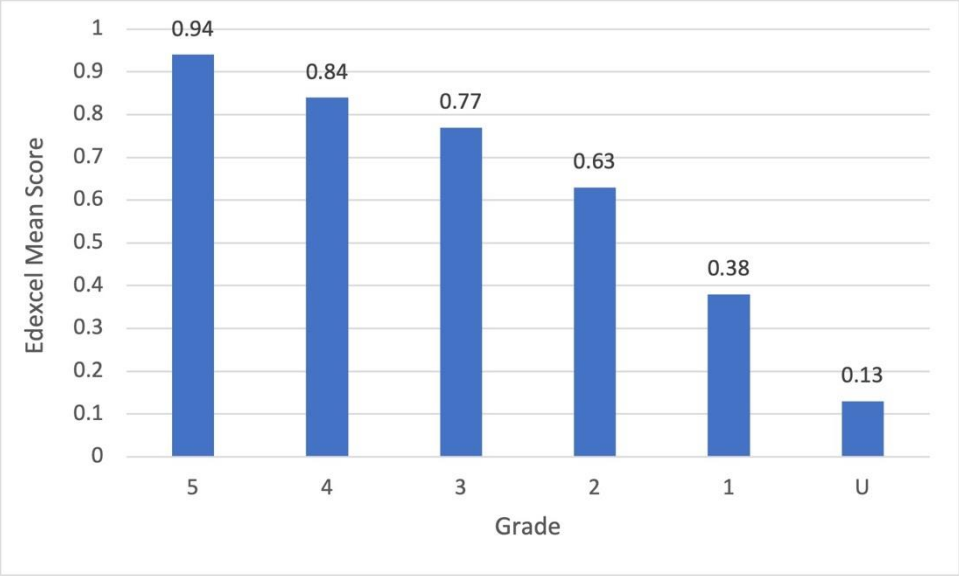
Question 13a - Examiner Comments

In part (a)(i),the answer of 40 was most often correct. The most common incorrect answer for this part was 80,the misconception being that the angles at C and D were equal.

In part (ii),most candidates were able to give the standard response. Some omitted either "angles" or "quadrilateral" from their answer, which was a requirement for the mark.

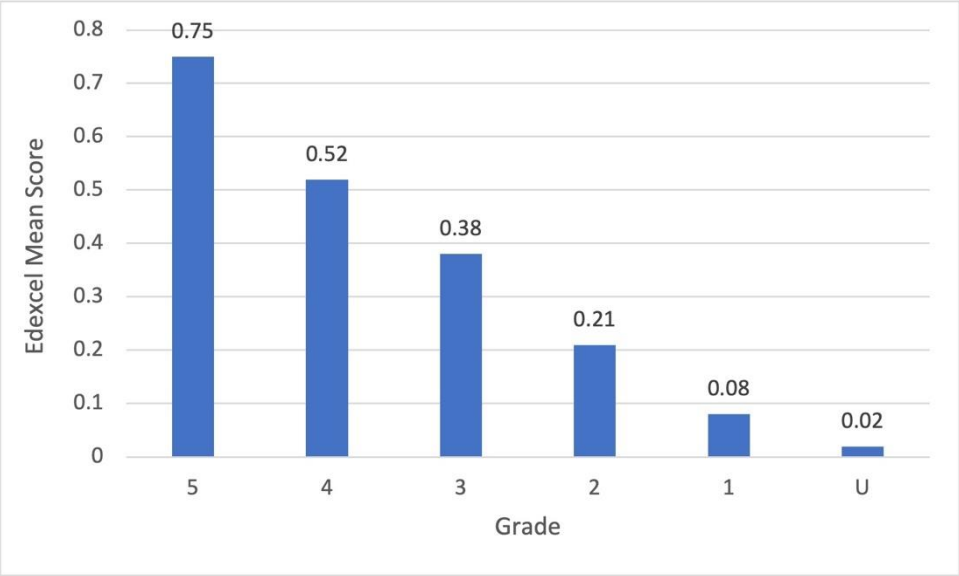
Question 13ai - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
0.73	1	73	0.73	0.94	0.84	0.77	0.63	0.38	0.13



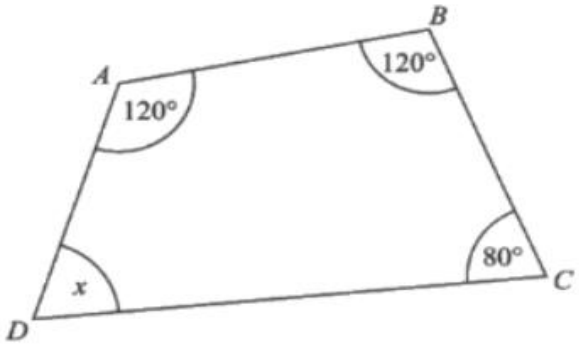
Question 13aii - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
0.36	1	36	0.36	0.75	0.52	0.38	0.21	0.08	0.02



Question 13a - Response A

13 *ABCD* is a quadrilateral.



(a) (i) Work out the size of angle *x*.

120 + 120 + 80 = 320

360 - 320 = 40

40 °

(1)

(ii) Give a reason for your answer.

Quadrilateral is 360 degrees therefore I added all the angles and subtracted from 360.

(1)

Q13a

A B C

2 /2

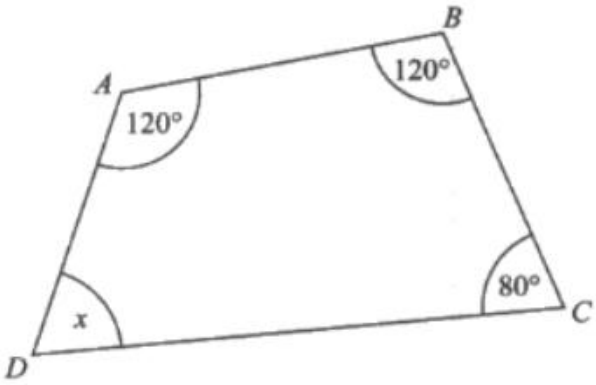
(ai)
B1 Correct answer

(aii)
C1 "Quadrilateral is 360 degrees" alone would score zero. However, "angles" is mentioned on the second line so we can award C1.

Note: Allow poor use of language such as "I added all the angles and subtracted 360", omitting "from"

Question 13a - Response B

13 *ABCD* is a quadrilateral.



(a) (i) Work out the size of angle *x*.

120
120
240
80
320

360 -
320
40

40

(1)

(ii) Give a reason for your answer.

All sides added together gives 360.

(1)

Q13a

1 /2

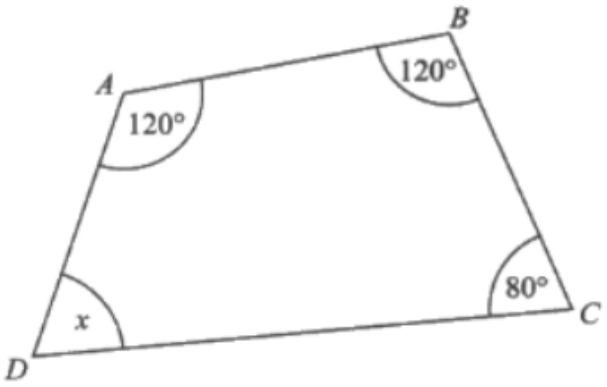
B1C0

(ai)
B1 Correct for 1 mark

(aii)
C0 No mention of the words “angles” and “quadrilateral”.

Question 13a - Response C

13 *ABCD* is a quadrilateral.



(a) (i) Work out the size of angle x.

120+120+80 =320°

60°

(1)

(ii) Give a reason for your answer.

All quadrilaterals add up to 360°.

(1)

Q13a

0 /2

B0C0

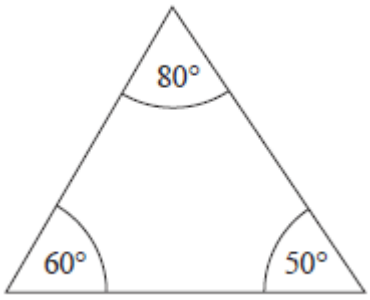
(ai)
B0 60 is incorrect

(aii)
C0 The reason has omitted the word "angles" so is incomplete.

Question 13b

Question 13b - Question

13 The diagram below shows a triangle.



The diagram is wrong.

(b) Explain why.

.....

.....

.....

(1)

(Total for Question 13 is 3 marks)

Question 13b - Mark Scheme

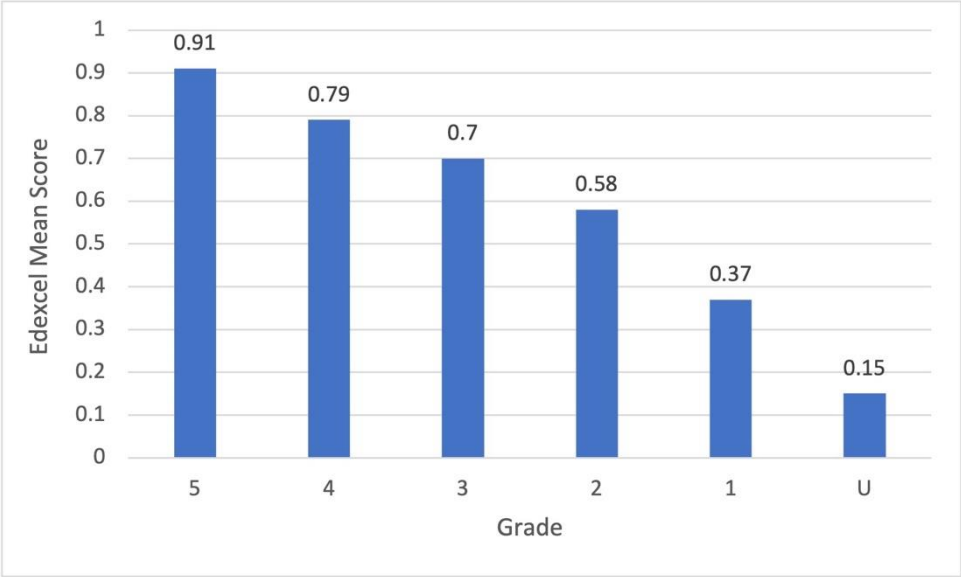
Question	Answer	Mark	Mark scheme	Additional guidance
13 (b)	Explanation	C1	Explanation **Acceptable examples** 190 > 180 It does not add up to 180 80+60+50=190 Angles in a triangle add up to 180 **Not acceptable examples** One of the angles needs to be less You cannot draw this triangle	(

Question 13b - Examiner Comments

In part (b) a high proportion of candidates were able score the C mark. The most common responses included: stating that the angles in a triangle should sum to 180° or that the angles of the given triangle incorrectly sum to 190°. Unfortunately, there were a number of responses seen that either stated incorrectly or spoiled a good response by asserting that the triangle should be equilateral or isosceles, which of course was an incorrect statement. Some also chose to change the 60° angle to 50°; while this answer may imply the correct angle sum it is not a correct statement as that angle did not need to be that size.

Question 13b - Performance

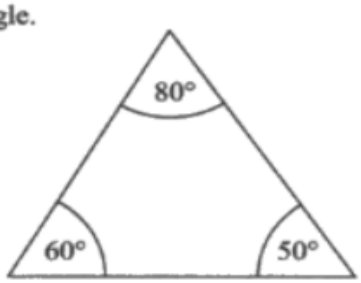
Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
0.68	1	68	0.68	0.91	0.79	0.70	0.58	0.37	0.15



Q13b
A
B
C

Question 13b - Response A

The diagram below shows a triangle.



The diagram is wrong.

(b) Explain why.

60 + 50 = 110 △ = 180°

110 + 80 = 190

(1)

(Total for Question 13 is 3 marks)

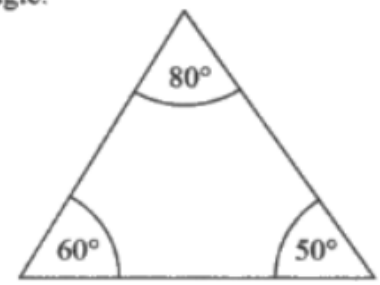
1 /1

Q13b

(b)
C1 for summing the three angles = 190

Question 13b - Response B

The diagram below shows a triangle.



The diagram is wrong.

(b) Explain why.

Because if you add 80°+60°+50°=190° a triangle must should add up to 180°

(1)

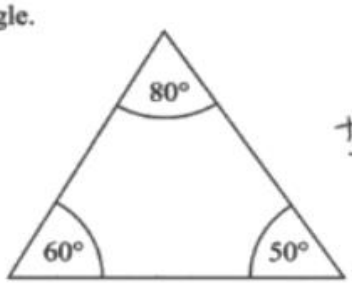
1 /1

(b)
C1 for either correct statement with no contradiction. We do not need to see the word "angle".

Note: If there had been a mistake with working out their values (80+60+50 and not got 190), then the C mark could not be given.

Question 13b - Response C

The diagram below shows a triangle.



80
60
+ 50
190

The diagram is wrong.

(b) Explain why.

The triangle is an equilateral triangle and should come up with 180° but if all are added make 190° ~~the triangle~~ which is wrong.

(1)

0 /1

C0 Stating that the traingle is equilateral (or isosceles) is an incorrect statement so will not get the mark, even though they have summed to angles to 190. The definition of a C mark is: "communication mark awarded for a fully correct statement(s) with no contradiction or ambiguity". Anything within their answer (response) that is incorrect means the C mark cannot be awarded.

Question 15

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

Question 15 - Question

15 2.5 kg of onions and 2 kg of carrots cost a total of £2.36
3 kg of carrots cost £1.74

Stuart has £2
He wants to buy 4 kg of onions.

Does Stuart have enough money to buy 4 kg of onions?
You must show how you get your answer.

(Total for Question 15 is 5 marks)

Question 15 - Mark Scheme

Question	Answer	Mark	Mark scheme		Additional guidance
15	Yes (supported)	P1	for finding the cost of 1 kg of carrots eg 1.74 ÷ 3 (= 0.58)	for finding the cost of 1 kg onions eg 2.(00) ÷ 4 (= 0.5)	for all P marks can work in pence or in £
		P1	for isolating the cost of 2.5 kg of onions eg 2.36 – (2 × "0.58") (= 1.2(0))	for finding the cost of 2.5 kg of onions eg 2.5 × "0.5" (= 1.25)	
		P1	for the cost of 1 kg of onions **or** 0.5 kg of onions, eg "1.20" ÷ 2.5 (= 0.48) **or** "1.20" ÷ 5 (= 0.24) **or** for 4 ÷ 2.5 (= 1.6)	for finding the cost of 2 kg of carrots eg 2.36 – "1.25" (= 1.11)	
		P1	for the cost of 4 kg of onions, eg 4 × "0.48" **or** 8 × "0.24" (= 1.92) **or** for "1.6" × "1.2(0)"	for finding the cost of 3 kg of carrots eg "1.11" ÷ 2 × 3 (= 1.665) *for comparison with 1.74*	
		C1	Yes with correct figures shown eg 192 **or** 1.92 **or** "has 8p left" **or** 166.5		Allow comparison of mixed units eg 192 with £2

Question 15 - Examiner Comments

A significant number of candidates were able to score some marks on this question although only a small proportion of candidates were able to progress through this problem to achieve a conclusion based on correct comparable figures. Most candidates made a good start by finding the cost of 1kg of carrots. Those who were able to progress further then chose to isolate the cost of 2.5kg of onions. Where candidates scored the first P2, many struggled to scale 2.5kg to 4kg and were therefore unable to progress through the remainder of the question correctly. Of the candidates scoring 0 marks, many incorrectly halved the £2.36 to split the cost of the carrots and the onions equally. Common errors that stopped candidates from progressing correctly included the multiplying of different quantities by 2 to get 5kg of onions or 5kg of onions and 4kg carrots or 6kg of carrots. Some good responses might have gained full marks had the candidate fully answered the question by communicating the correct conclusion.

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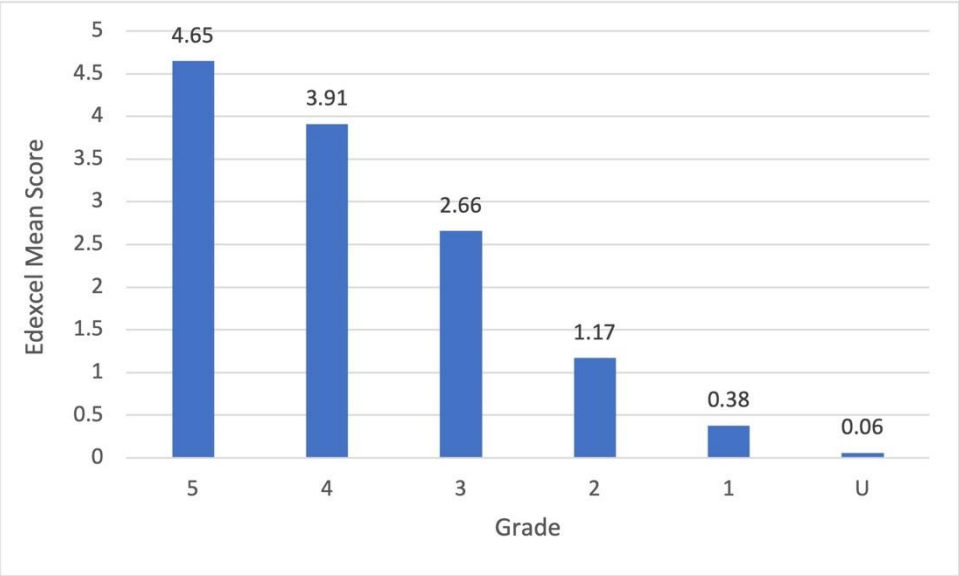
Question 15 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
2.50	5	50	2.50	4.65	3.91	2.66	1.17	0.38	0.06



Question 15 - Response A

15 2.5 kg of onions and 2 kg of carrots cost a total of £2.36
3 kg of carrots cost £1.74

Stuart has £2
He wants to buy 4 kg of onions.

Does Stuart have enough money to buy 4 kg of onions?
You must show how you get your answer.

£1.74 ÷ 3 = 0.58p × 2 = £1.16

£2.36 − £1.16 = £1.20

2.5 K onions = £1.20

£1.20 ÷ 2.5 = 0.48p

0.48 × 4 = £1.42

1.42 × 2 = £3.84

£3.84 for 4 Kg of Onions

Stuart has not got enough.

500grams of onions = 0.48p.

4 /5

P1 for the 0.58
P1 for the 1.20
P1 for the 0.48
P1 for showing 0.48 x 4
C0 because the 0.48 x 4 has been calculated and continued (by multiplying by 2) incorrectly and the final figure and conclusion are incorrect.

Question 15 - Response B

15 2.5 kg of onions and 2 kg of carrots cost a total of £2.36
3 kg of carrots cost £1.74

Stuart has £2
He wants to buy 4 kg of onions.

Does Stuart have enough money to buy 4 kg of onions?
You must show how you get your answer.

2.5 kg onions + 2kg carrots = £2.36

3 kg carrots = £1.74

2kg carrots = £1.16

1.74 ÷ 3 = 0.58

0.58 = 1 kg carrots

2kg = 0.58 x 2
= £1.16

£2.36 − £1.16
= £1.20 = 2.5kg onions

onion

4kg of onions:

~~120~~

1.20 = 2.5 kg onions

1.20 ÷ 0.5 = 2.40

1kg = 1.20 ÷ = 0.3
= 30p

4kg = 0.3 x 4 + 0.15
= £1.35

4kg of onions costs £1.35

Q15

A
B
C

2 /5

P1 for finding 0.58
P1 for using this to find the cost of 2.5kg of onions as 1.20
No further marks can be awarded for their working out.

Note: Following this they divide by 0.5 which is finding the cost of 5kg of onions; this could still lead to a correct answer for 4 kg of onions. Had they then shown this as a complete method using 5kg to obtain 4kg: such as taking their 2.40 (for 5kg) and x 0.8 (to find 4kg) then they can recover and gain the 4 process marks. But their method of finding 4kg is incorrect.

Question 15 - Response C

15 2.5 kg of onions and 2 kg of carrots cost a total of £2.36
3 kg of carrots cost £1.74

Stuart has £2
He wants to buy 4 kg of onions.

Does Stuart have enough money to buy 4 kg of onions?
You must show how you get your answer.

£1.74 ÷ 3 = £0.58

1kg of carrot = 58p

2 kg of carrot = £1.16p

£2.36 − £1.16p = £1.2

onions

2.5 ÷ 1.2 = £2.08p

NO

Q15

2 /5

P1P1P0P0C0

P1 for finding 0.58
P1 for working through to the 1.2. It does not have to be shown in correct money notation (1.20) and could also be shown as 120, as they could be working in pence instead of £ at any stage.
P0 to find the cost of 1kg or 0.5kg of onions. They do 2.5/1.2 which is the wrong way around (they have not recovered by getting 48p) so no further marks

Question 17b

Question 17b - Question

17

(b) Work out $\dfrac{(3.2+3.7)\times 4.9}{5.3-2.8}$

Give your answer as a decimal.

.....

(2)

(Total for Question 17 is 3 marks)

Question 17b - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
17 (b)	13.524	M1	for 33.81 or 2.5 or $\frac{3381}{250}$ or digits 13524	
		A1	cao	

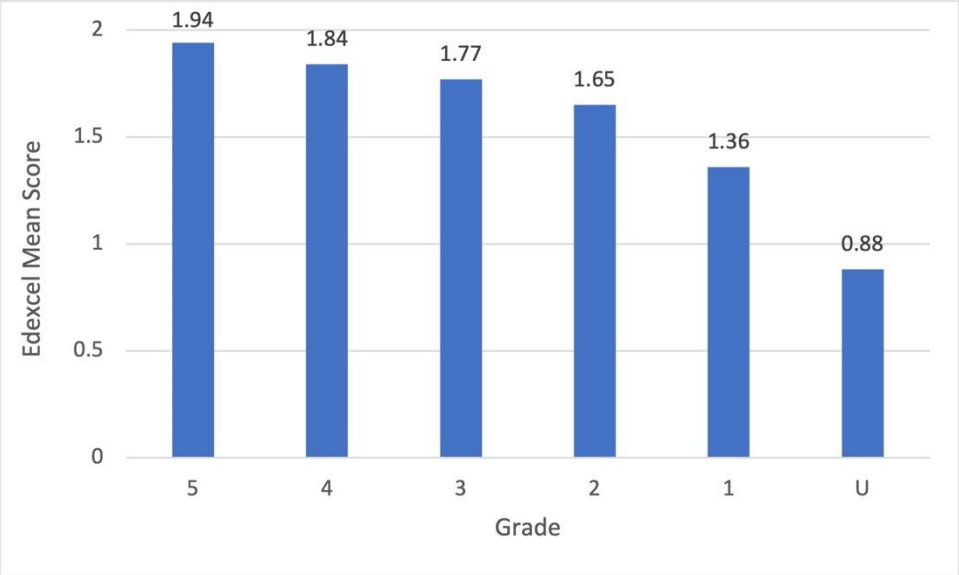
Question 17b - Examiner Comments

Part (a) showed poor understanding of rounding to significant figures with answers of 8, 80 and 87.6 being common. Many candidates gave answers such as 876 or rounded to the nearest thousand (88 000) or rounded down instead of up (87 500) whilst some candidates included a decimal point in their answer.

In part (b), the majority of candidates answered this question correctly, but a written method was rarely seen. There was some evidence of omitting to use brackets in the calculation. Of those who didn't score full marks, many scored the method mark for calculating the numerator or denominator correctly. Indeed, those candidates who worked out the numerator and denominator separately would usually go on to gain full marks. It was surprising that a good number of candidates chose to arbitrarily round their answers to 1 or 2 decimal places and calculate an estimate. Some copied the answer from their calculator incorrectly putting 13.254 thus costing themselves 2 marks.

Question 17b - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
1.73	2	87	1.73	1.94	1.84	1.77	1.65	1.36	0.88



Q17b

A
B
C

Question 17b - Response A

(b) Work out $\frac{(3.2 + 3.7) \times 4.9}{5.3 - 2.8}$

Give your answer as a decimal.

13.524

(2)

2 /2

(b)
M1A1 Fully correct answer. They do not need to show any working out.

Note: An answer with the digits 13524 other than the correct answer scores M1A0

Question 17b - Response B

(b) Work out $\frac{(3.2 + 3.7) \times 4.9}{5.3 - 2.8}$

Give your answer as a decimal.

135·24

(2)

Q17b

1 /2

M1A0

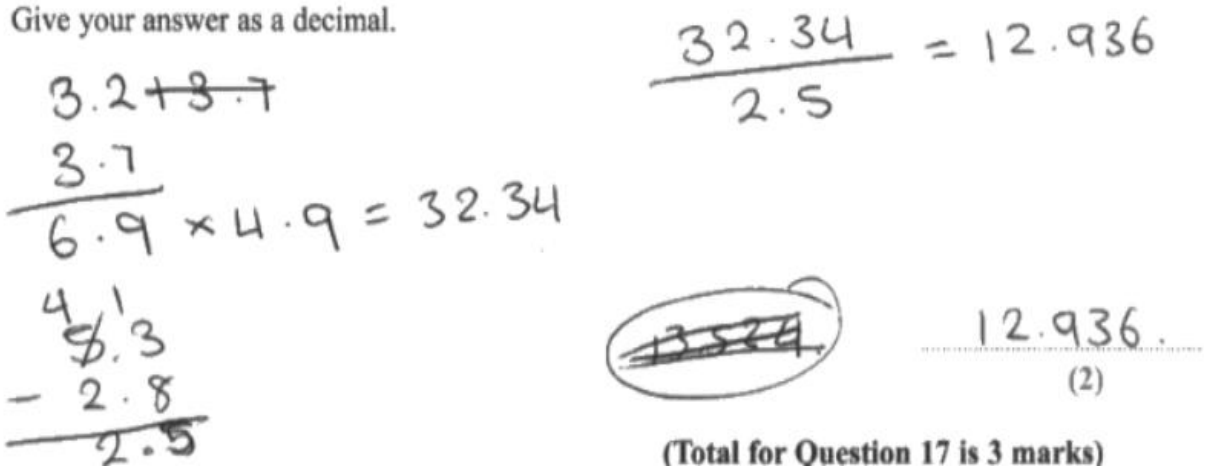
(b)
M1 for an answer with the digits 13524
A0 incorrect answer

Note: An answer of 13.5 or 13.52 (without working) scores M1A0 if they have not already scored marks.

Question 17b - Response C

(b) Work out $\frac{(3.2 + 3.7) \times 4.9}{5.3 - 2.8}$

Give your answer as a decimal.



Q17b

1 /2

M1A0

(b)
M1 for a denominator of 2.5
A0 the answer is incorrect

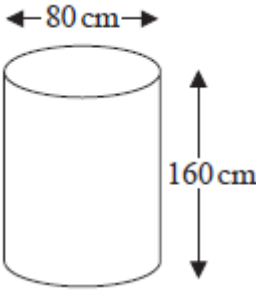
Note: 2.5 can be awarded even if it is not the denominator; the candidate may have just calculated the answer 5.3 - 2.8 and stopped there.

Question 24

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

Question 24 - Question

24 Karina has 4 tanks on her tractor.
Each tank is a cylinder with diameter 80 cm and height 160 cm.



The 4 tanks are to be filled completely with a mixture of fertiliser and water.

The fertiliser has to be mixed with water in the ratio 1 : 100 by volume.
Karina has 32 litres of fertiliser.

1 litre = 1000 cm^3

Has Karina enough fertiliser for the 4 tanks?
You must show how you get your answer.

(Total for Question 24 is 4 marks)

Question 24- Mark Scheme

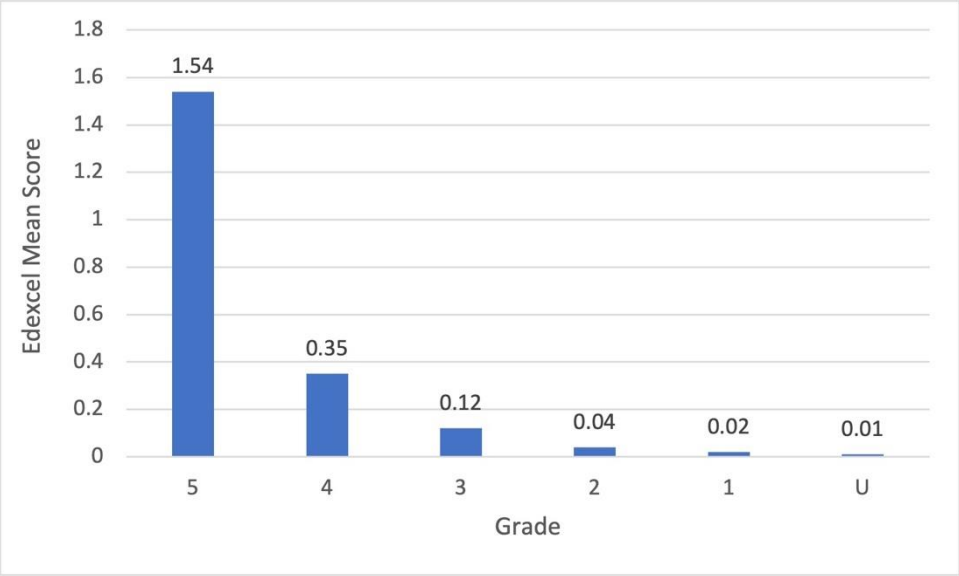
Question	Answer	Mark	Mark scheme	Additional guidance
24	Yes (supported)	P1	for a process to find the volume of 1 tank eg $\pi \times 40^2 \times 160$ (= 804247.7… or 804.2...or 256000π)	Could be truncated or rounded
		P1	for complete process to find the volume of 4 tanks, [volume of tank] × 4 eg $\pi \times 40^2 \times 160 \times 4$ (= 3216990.8… or 3216.9... or 1024000π) **or** for process to find volume of fertiliser available per tank eg 32 × 1000 ÷ 4 (= 8000)	For this mark [volume of tank] must come from a calculation involving π, r^2, h
		P1	for a process to find the amount of mixture for 1 tank eg [volume of tank] ÷ 101 (= 7962.8...) or 4 tanks (= 31851.3…) **OR** for a process to find volume of mixture that 32 litres of fertiliser will make eg 32000 × 101 (= 3232000) or 32 × 101 (= 3232)	For this mark [volume of tank] must come from a calculation involving π, r^2, h **or** be stated as their volume
		C1	for Yes supported by correct figures shown eg a comparable figure in the range 31.8 to 31.9 (litres) **or** in the range 31800 to 31900 with 32000 (cm^3) **or** in the range 3216 to 3217 with 3232 (litres) **or** in the range 3216000 to 3217000 with 3232000 (cm^3) **or** in the range 7958 to 7963 with 8000 (cm^3)	There are other possible pairs of values which can be used in the comparison

Question 24- Examiner Comments

Nearly all responses scored zero marks. Responses that scored all 4 marks were very rare. Very few candidates used the correct formula for the area of the cross-section or for the whole cylinder, many using the diameter rather than the radius. Most candidates failed to find a volume, but simply found the area of a rectangle by multiplying 80 by 160 and worked with 12800 as if it was the volume of one cylinder. The most common way of scoring a mark was for finding the amount of fertiliser for each tank. Where marks were gained this was generally for the process of working out the volume of a single tank or for a process to find the volume of water per tank. A small minority of candidates got 1 mark for showing 8000 in their working. The ratio of 100:1 equalling 101 parts evaded nearly all candidates, resulting in minimal full mark answers.

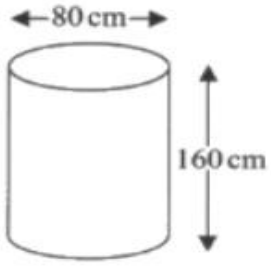
Question 24 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
0.17	4	4	0.17	1.54	0.35	0.12	0.04	0.02	0.01



Question 24 - Response A

24 Karina has 4 tanks on her tractor.
Each tank is a cylinder with diameter 80 cm and height 160 cm.



The 4 tanks are to be filled completely with a mixture of fertiliser and water.

The fertiliser has to be mixed with water in the ratio 1 : 100 by volume.
Karina has 32 litres of fertiliser.

1 litre = 1000 cm³

Has Karina enough fertiliser for the 4 tanks?
You must show how you get your answer.

Volume of 1 tank = $\pi \times 40^2 \times 160 = 804247.7193$

$804247.7193 \times 4 = 32160990.88$ Volume of 4 tanks

$32 \times 1000\ cm^3 = 32000\ cm^3$

$80.4247.7193 \div 101 = 7962.848706$

yes she has got enough for the 4 tanks

Q24

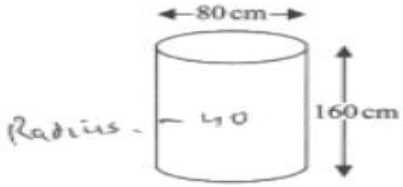
A
B
C

3 /4

P1 for finding the volume of 1 tank as shown by the figure 804247.
P1 for × 4 to find the volume of 4 tanks as shown by the figure 32160990.
P1 for the division by 101 to give the figure of 7962.
C0 This candidate knows what they are doing, but has not fully supported their answer. They have the figure 32000 in working but needed to divide this by 4 to give 8000 as a correct comparable figure with 7962 What they are essentially doing is comparing a figure for 1 tank with one for 4 tanks. Hence C0 rather than C1.

Question 24 - Response B

24 Karina has 4 tanks on her tractor.
Each tank is a cylinder with diameter 80 cm and height 160 cm.



The 4 tanks are to be filled completely with a mixture of fertiliser and water.

The fertiliser has to be mixed with water in the ratio 1 : 100 by volume.
Karina has 32 litres of fertiliser.

1 litre = 1000 cm³

Has Karina enough fertiliser for the 4 tanks?
You must show how you get your answer.

F : W
1 : 100
10x x10
10 : 1000
32/4 = 8
1 : 1000
x32 Fertidar x32
32 litre : 32 000
32000 / 4 tanks = 8000
π r x h
π (40² x 160)
25,600
has 32,000
32,000 - 25,600 = 6400

(Total for Question 24 is 4 marks)

yes she got enough.

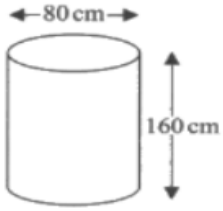
2 /4

P1 for pi (40^2 x 160). They write this as 25 600 incorrectly, ignoring the pi but they can still have the mark since the method is shown. It is worth nothing that sight of 256 000pi could be award the mark, but 256 000 alone would not get the mark.
P1 for 32000/4 (=8000)
No further marks since there is no correct attempt to use the ratio

Note: a common error is to use 80 instead of 40 as the radius. In this case it is possible to earn P0P1P1C0 (see additional guidance)

Question 24 - Response C

24 Karina has 4 tanks on her tractor.
Each tank is a cylinder with diameter 80 cm and height 160 cm.



The 4 tanks are to be filled completely with a mixture of fertiliser and water.

The fertiliser has to be mixed with water in the ratio 1 : 100 by volume.
Karina has 32 litres of fertiliser.

1 litre = 1000 cm³

Has Karina enough fertiliser for the 4 tanks?
You must show how you get your answer.

$\pi r^2 h$

$\pi \times 40^2 \times 160 = 256000\pi$

32 litres = 3200 cm³

$256000\pi \div 3200 = 80\pi$

$80 \times 4 = 320$

Yes Karina has enough fertiliser for the 4 tanks.

Q24

A
B
C

1 /4

P1 for a correct method shown to find the volume of the cylinder, or for 256000pi
P0 since there is no further correct method shown

Overall 1 mark

Question 26

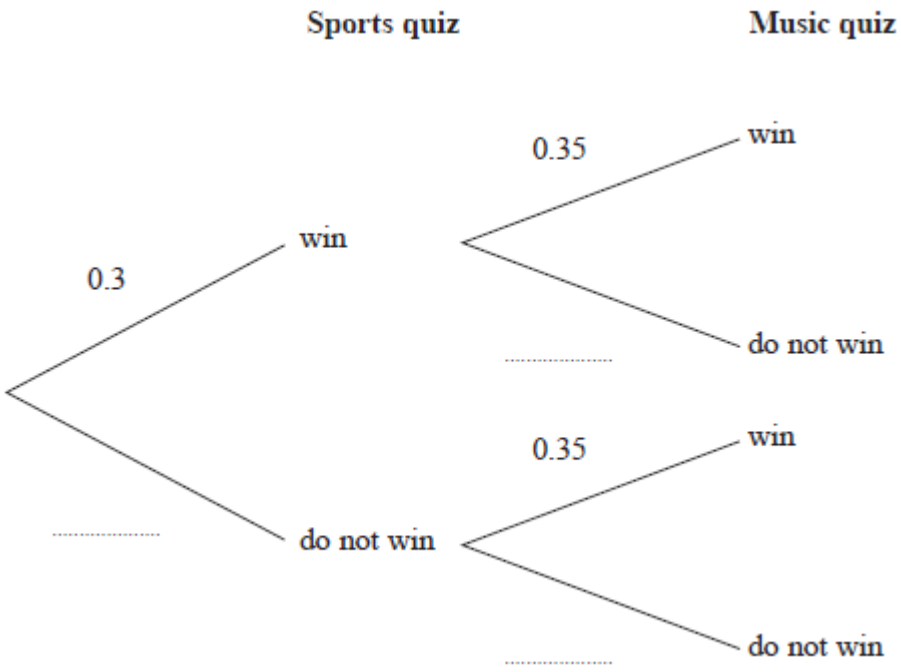
Question | Mark Scheme | Examiner Comments | Performance | Response A | Response B | Response C

Question 26 - Question

26 One weekend the Keddie family is going to do a sports quiz and a music quiz.

The probability that the family will win the sports quiz is 0.3
The probability that the family will win the music quiz is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz

.....

(2)

(Total for Question 26 is 4 marks)

Question 26 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
26 (a)	0.7	B1	for 0.7 on the first branch	Accept equivalent fractions or percentages for probabilities
	0.65, 0.65	B1	for 0.65, 0.65 on the second branches	
(b)	0.105	M1	for 0.3 × 0.35	
		A1	oe	

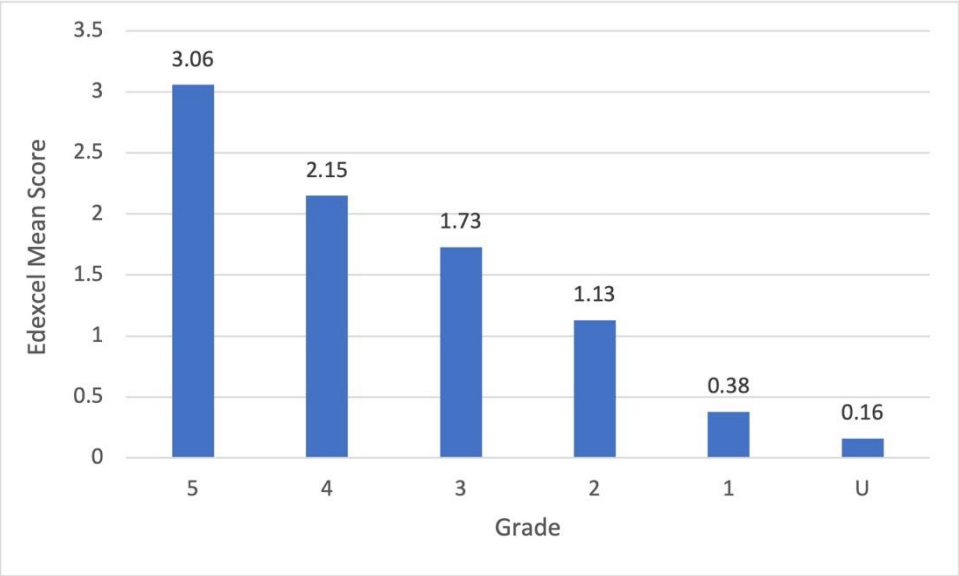
Question 26 - Examiner Comments

In the first part of this question, there was a clear split between those candidates who understood the concepts of a tree diagram and were able to insert the correct probabilities and those that seemed to not know that probabilities needed to sum to 1 and often just repeated values in the tree that they could already see. Full marks and zero marks were the most common, although some students were able to identify the 0.7 but not the other two probabilities.

In part (b) most candidates attempted some form of calculation although 0.3 + 0.35 = 0.65 was the most common approach and led to zero marks. Very few candidates seemed to know that they needed to multiply the probabilities.

Question 26 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
1.63	4	41	1.63	3.06	2.15	1.73	1.13	0.38	0.16

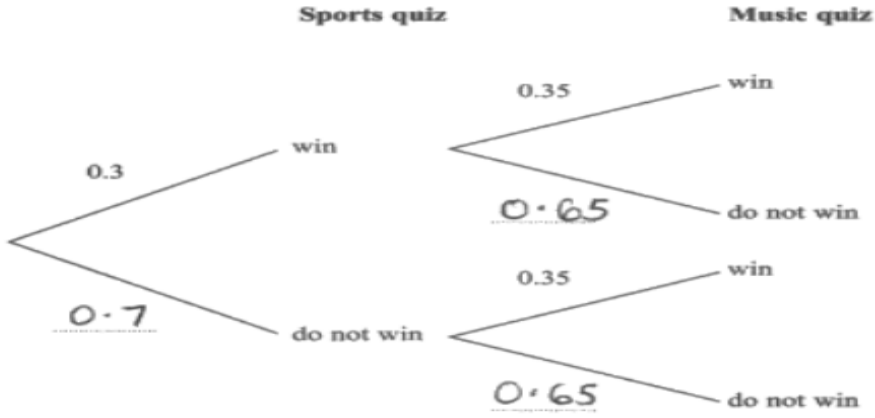


Question 26 - Response A

26 One weekend the Keddie family is going to do a sports quiz and a music quiz.

The probability that the family will win the sports quiz is 0.3
The probability that the family will win the music quiz is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.

0·3 × 0·35

0·105

(2)

4 /4

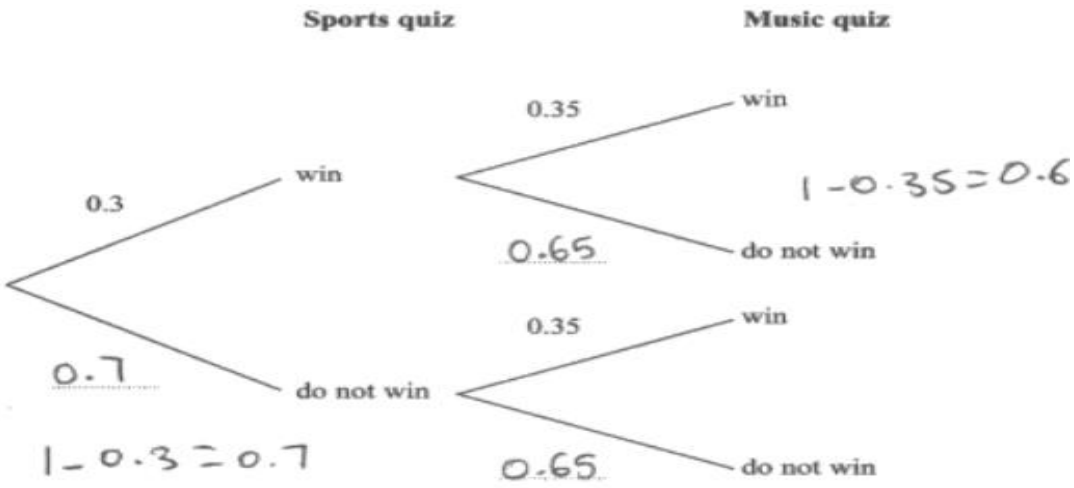
Q26

A B C

(a)
B1 for 0.7 on the first branches
B1 for 0.65, 0.65 on the second branches

(b)
M1 for 0.3 × 0.35
A1 for 0.105

Question 26 - Response B



(2)

(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.

$0.3 + 0.35 = \frac{13}{20}$

$\frac{13}{20}$

(2)

(Total for Question 26 is 4 marks)

Q26

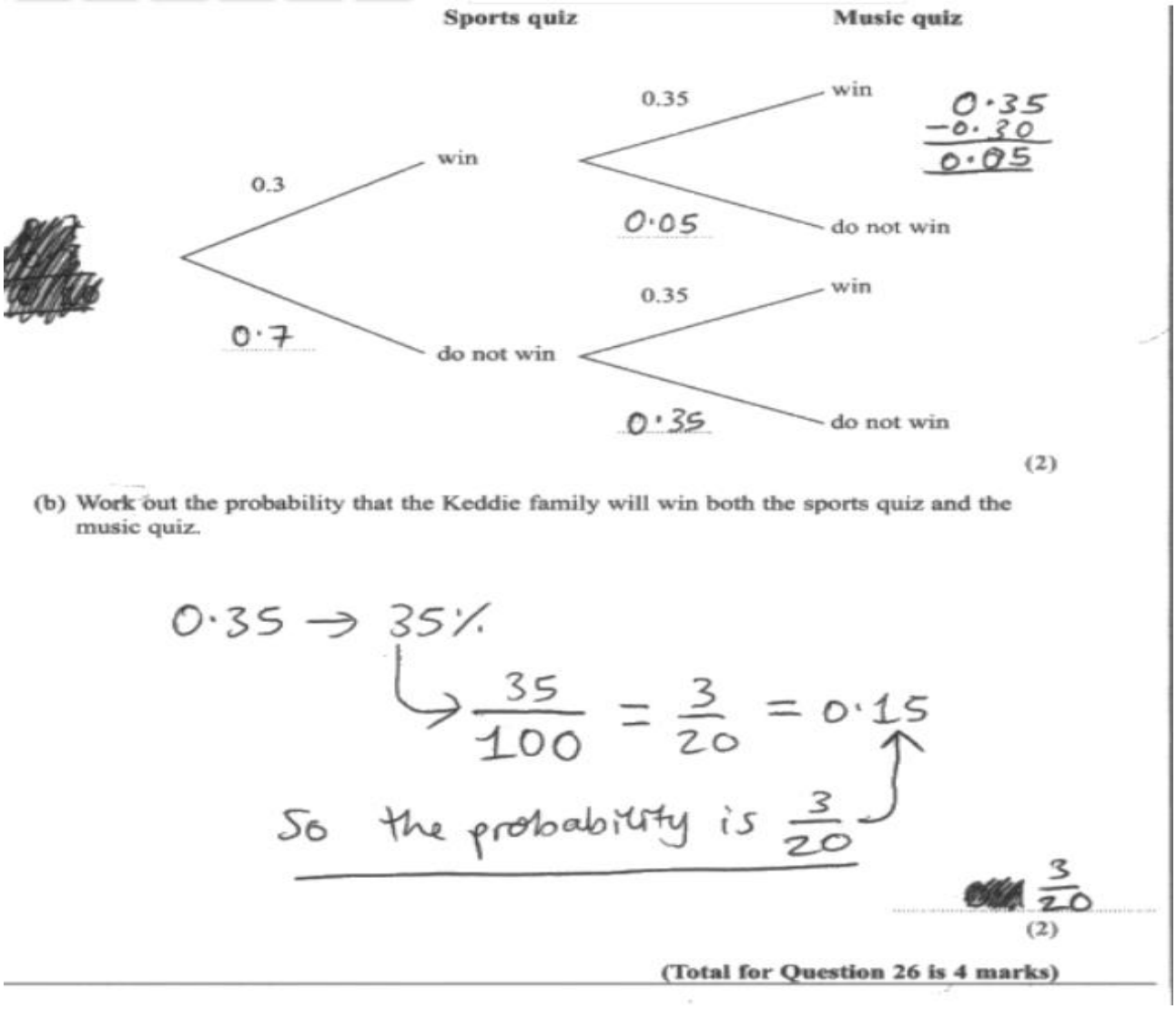
A B C

2 /4

(a)
B1 for 0.7 on the first branch
B1 for 0.65, 0.65 on the second branches

(b)
M0 as probabilities have been added
A0 follows

Question 26 - Response C



(2)

(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.

0·35 → 35%

$\frac{35}{100} = \frac{3}{20} = 0.15$

So the probability is $\frac{3}{20}$

$\frac{3}{20}$

(2)

(Total for Question 26 is 4 marks)

Q26

A B C

1 /4

(a)
B1 for 0.7 on the first branch
B0 for the second branches

(b)
M0A0 no correct working

Question 28

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

Question 28 - Question

28 There are 30 women and 20 men at a gym.

The mean height of all 50 people is 167.6 cm
The mean height of the 20 men is 182 cm

Work out the mean height of the 30 women.

..... cm

(Total for Question 28 is 3 marks)

Question 28 - Mark Scheme

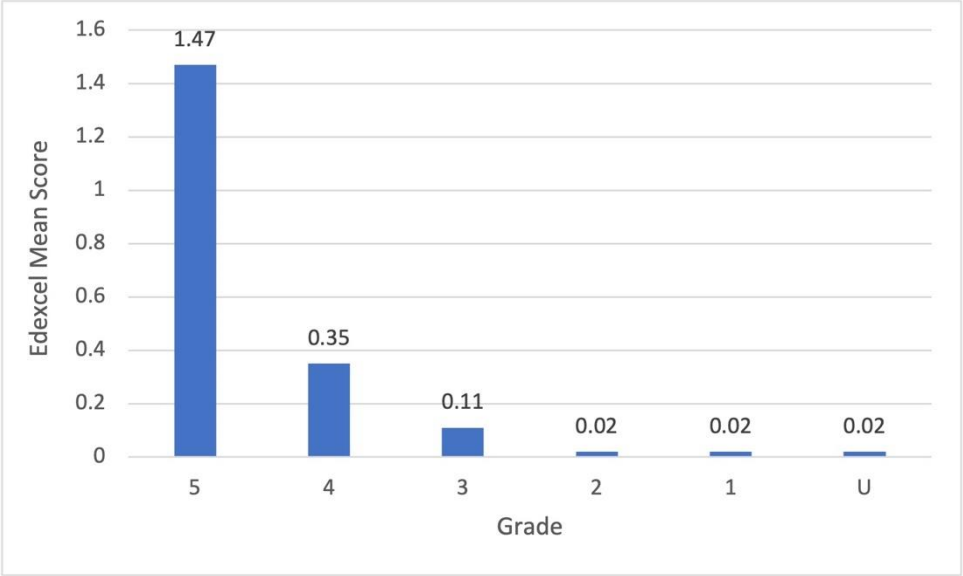
Question	Answer	Mark	Mark scheme	Additional guidance
28	158	P1	for a first step in the process eg 50 × 167.6 (=8380) or 20 × 182 (=3640)	
		P1	for a complete process eg (50 × 167.6 – 20 × 182) ÷ 30 or $\frac{8380-3640}{30}$ or 4740 ÷ 30	
		A1	cao	

Question 28 - Examiner Comments

Only a few candidates were able to gain marks on this question. Those who did were only able to gain one mark for either finding the total mean height 50 × 167.6 (=8380) or the mean height for the 20 men (=3640). The most common mistake was to add both given mean heights (167.6 and 182), halve the sum, then multiply the result by 30. Candidates found it challenging to find the sum of the data when given the mean. Some candidates calculated both totals but then didn't know what to do with the results. A lot of answers simply wouldn't have made any sense if the candidates had actually thought about it needing to be a height.

Question 28 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
0.16	3	5	0.16	1.47	0.35	0.11	0.02	0.02	0.02



Question 28 - Response A

28 There are 30 women and 20 men at a gym.

The mean height of all 50 people is 167.6 cm
The mean height of the 20 men is 182 cm

Work out the mean height of the 30 women.

167.6 × 50 = 8250

182 × 20 = 3640

4610

4610 ÷ 30 = 153.6

153.6 cm

(Total for Question 28 is 3 marks)

Q28

A
B
C

2 /3

P1 for a first step in the process as shown by the correct method, though the figure of 8250 has been incorrectly calculated
P1 for a complete process arises from the addition of 8250 and 3640, and a division by 30
A0 The answer is incorrect due to the previously incorrect calculation.

Question 28 - Response B

28 There are 30 women and 20 men at a gym.

The mean height of all 50 people is 167.6 cm
The mean height of the 20 men is 182 cm

Work out the mean height of the 30 women.

50 people
167.6 cm
20 men
182 cm

11732 ÷ 70 = 167.6 cm

167.6 × 70 = 11732 cm

182 × 20 = 3640 cm

3640 ÷ 20 = 182 cm

3640 cm

(Total for Question 28 is 3 marks)

1 /3

Q28

There are many different calculations here. The marking guidance notes at the front of the mark scheme show how examiners deal with this situation. The answer given is 3640, which comes from 20 × 182, so we ignore everything else on this page, and award marks for this single process shown.

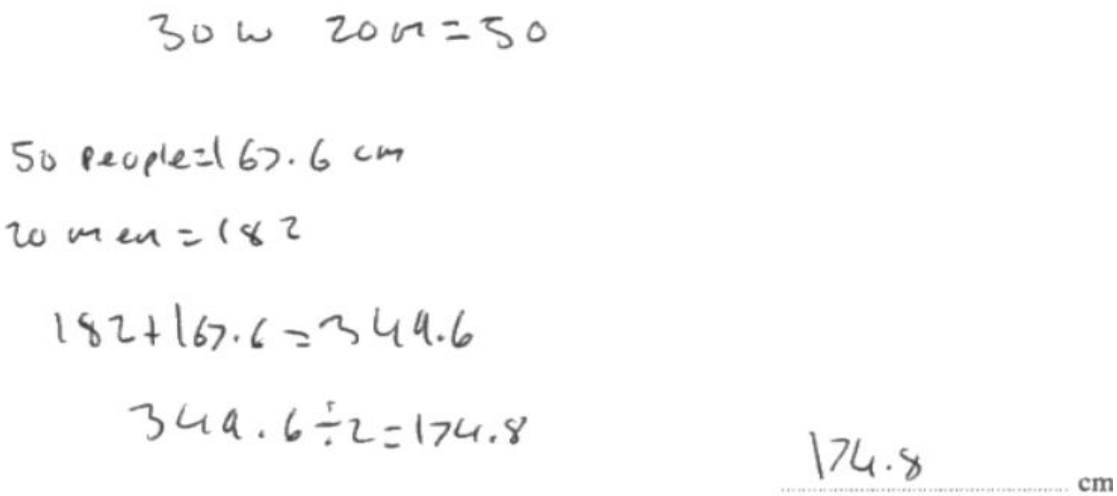
P1 for a first step in the process: 20 × 182 or 3640
P0 since there is no complete process shown
A0 no correct answer

Question 28 - Response C

28 There are 30 women and 20 men at a gym.

The mean height of all 50 people is 167.6 cm
The mean height of the 20 men is 182 cm

Work out the mean height of the 30 women.



(Total for Question 28 is 3 marks)

0 /3

P0P0A0

A common approach to this question.
P0 no first step to find the total height of the 50 people or the total height for the 20 men
P0 no complete process to find the total height of the women and divide by 30
A0 no correct answer

Question 30

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

Question 30 - Question

30 $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

(a) Work out as a column vector

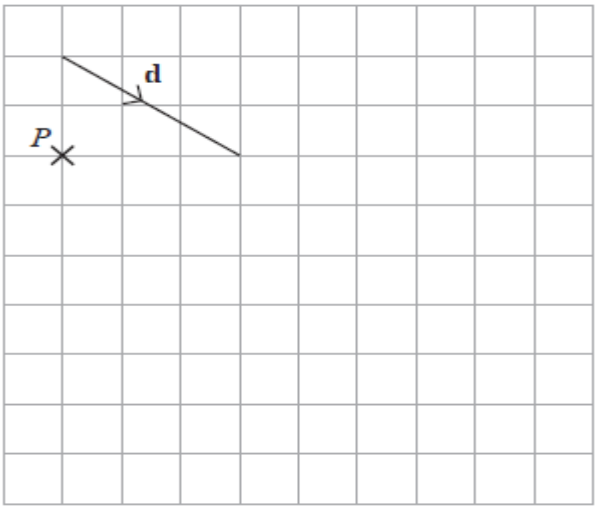
(i) $\mathbf{a} + \mathbf{b}$

(1)

(ii) $2\mathbf{a} - \mathbf{c}$

(2)

The vector **d** is drawn on the grid.



(b) From the point P, draw the vector $2\mathbf{d}$

(1)

(Total for Question 30 is 4 marks)

Question 30 - Mark Scheme

Question	Answer	Mark	Mark scheme	Additional guidance
30 (a)(i)	$\begin{pmatrix}1\\5\end{pmatrix}$	B1	for $\begin{pmatrix}1\\5\end{pmatrix}$	
(ii)	$\begin{pmatrix}0\\5\end{pmatrix}$	M1	for substitution of values eg $\begin{pmatrix}2\times2-4\\3\times2-1\end{pmatrix}$ oe **OR** for $\begin{pmatrix}0\\b\end{pmatrix}$ **or** $\begin{pmatrix}a\\5\end{pmatrix}$ where a, b are integer values.	Need not be shown in brackets at this stage
		A1	for $\begin{pmatrix}0\\5\end{pmatrix}$	
(b)	correct vector drawn	C1	for a correct vector drawn from point P	Need not be labelled but do not award if there is any ambiguity.

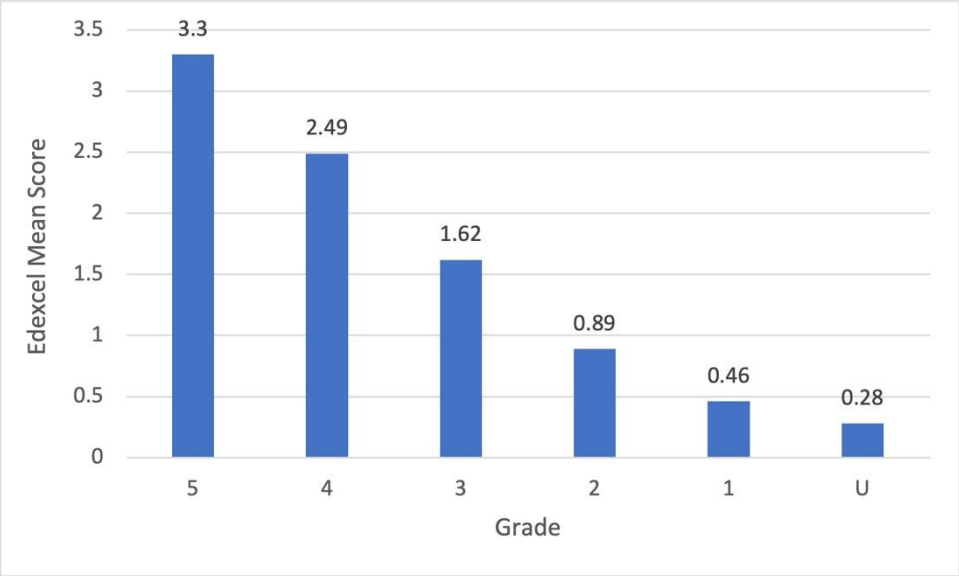
Question 30 - Examiner Comments

Part (a)(i) was surprisingly well answered. A common error was for the numbers to be reversed in the vector. But in contrast part (ii) was not well answered. While many candidates were able to show a substituted expression, they often failed to multiply both the 2 and the 3 of vector a by 2 before doing the subtraction. Some candidates forgot to account for the sign and added the vectors instead.

Many of the candidates failed to attempt part (b). Most of those who did make an attempt did not know (or failed to recognise) that 2**d** would be parallel to **d**, just drawing a random diagonal line. Some of the candidates drew a correct vector but not from point *P*. Copying the vector without doubling it was another common error.

Question 30 - Performance

Mean score	Max score	Mean %	Edexcel averages: mean scored by candidates achieving grade:						
			ALL	5	4	3	2	1	U
1.61	4	40	1.61	3.30	2.49	1.62	0.89	0.46	0.28



Question 30 - Response A

30 $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

(a) Work out as a column vector

(i) $\mathbf{a} + \mathbf{b}$

$\frac{2}{3} + \frac{-1}{2} = \frac{1}{5}$

$\begin{pmatrix} 1 \\ 5 \end{pmatrix}$

(1)

(ii) $2\mathbf{a} - \mathbf{c}$

$2 \times 2 = 4 + = 10$

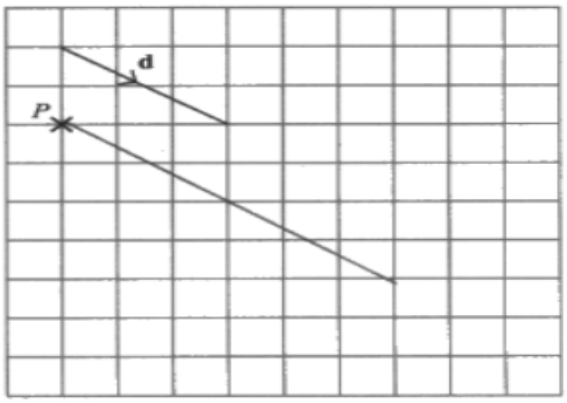
$2 \times 3 = 6$

$4 + 1 = 8$

$\begin{pmatrix} 10 \\ 5 \end{pmatrix}$

(2)

The vector **d** is drawn on the grid.



(b) From the point *P*, draw the vector 2**d**

(1)

(Total for Question 30 is 4 marks)

3 /4

Q30

A B C

(ai)
B1 for correct answer

(aii)
M1A0 for the answer in the form vector [a, 5]

(b)
C1 correct vector 2d

Note: we do not need the arrow, but if it is drawn on their line it should be correct.

Question 30 - Response B

30 $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

(a) Work out as a column vector

(i) $\mathbf{a} + \mathbf{b}$

$\begin{pmatrix} 1 \\ 5 \end{pmatrix}$

(1)

(ii) $2\mathbf{a} - \mathbf{c}$

A C

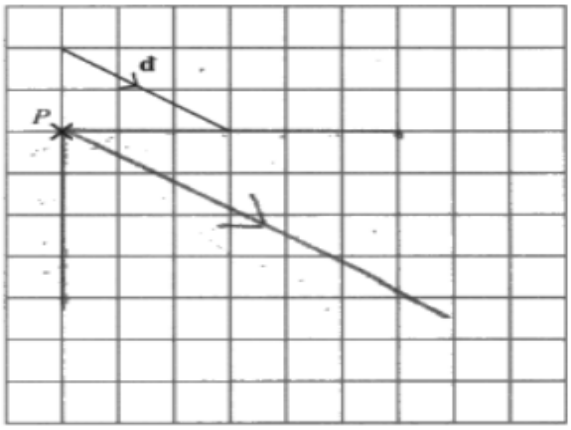
$2 \times 2 = 4 - 4 = 0$

$2 \times 3 = 6 - 1 = 5$

$\begin{pmatrix} 0 \\ 5 \end{pmatrix}$

(2)

The vector **d** is drawn on the grid.



(b) From the point P, draw the vector $2\mathbf{d}$

(1)

(Total for Question 30 is 4 marks)

3 /4

Q30

A B C

(ai)
B1 for correct answer

(aii)
M1A1 correct answer

(b)
C0 the line is in the correct direction but in this case, it is too long

Question 30 - Response C

30 $\mathbf{a} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

(a) Work out as a column vector

(i) $\mathbf{a} + \mathbf{b}$

$\begin{pmatrix} 2 \\ 3 \end{pmatrix} + \begin{pmatrix} -1 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

$\begin{pmatrix} 1 \\ 5 \end{pmatrix}$

(1)

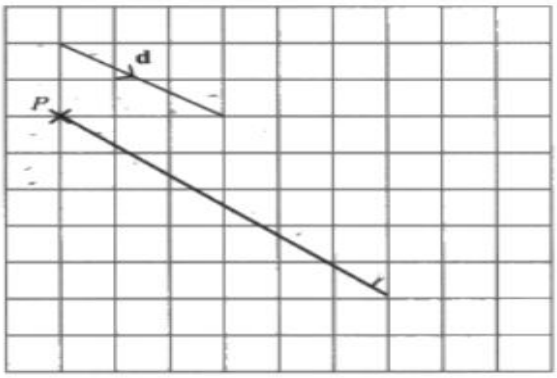
(ii) $2\mathbf{a} - \mathbf{c}$

$\begin{pmatrix} 4 \\ 6 \end{pmatrix} - \begin{pmatrix} 4 \\ 1 \end{pmatrix} = \begin{pmatrix} -10 \\ 3 \end{pmatrix}$

$\begin{pmatrix} -10 \\ 3 \end{pmatrix}$

(2)

The vector $\mathbf{d}$ is drawn on the grid.



(b) From the point P, draw the vector $2\mathbf{d}$

(1)

(Total for Question 30 is 4 marks)

Q30

A B C

1 /4

(ai)
B0 incorrect answer

(aii)
M1A0 the vector [4,6] - vector [4,1] implies the substitution of values so gains M1, but loses the A mark as incorrectly worked out.
Note: [4,6] alone will not get the mark as we need to see intent to subtract [4,1] too.

(b)
C0 incorrect line