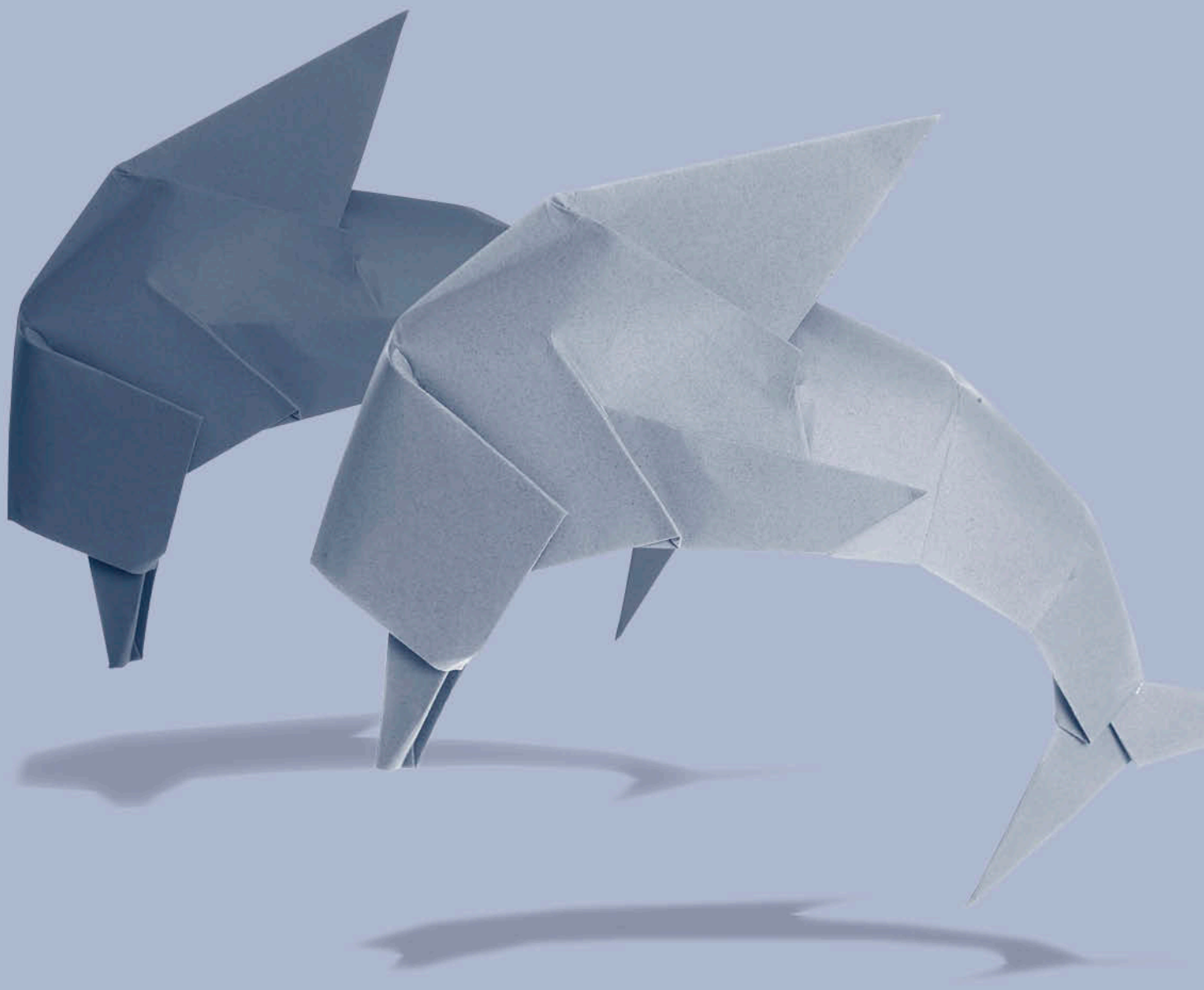
edexcel

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



TRIAL EXEMPLAR STUDENT ANSWERS WITH EXAMINER COMMENTS

First certification 2017

ALWAYS LEARNING

PEARSON

Contents

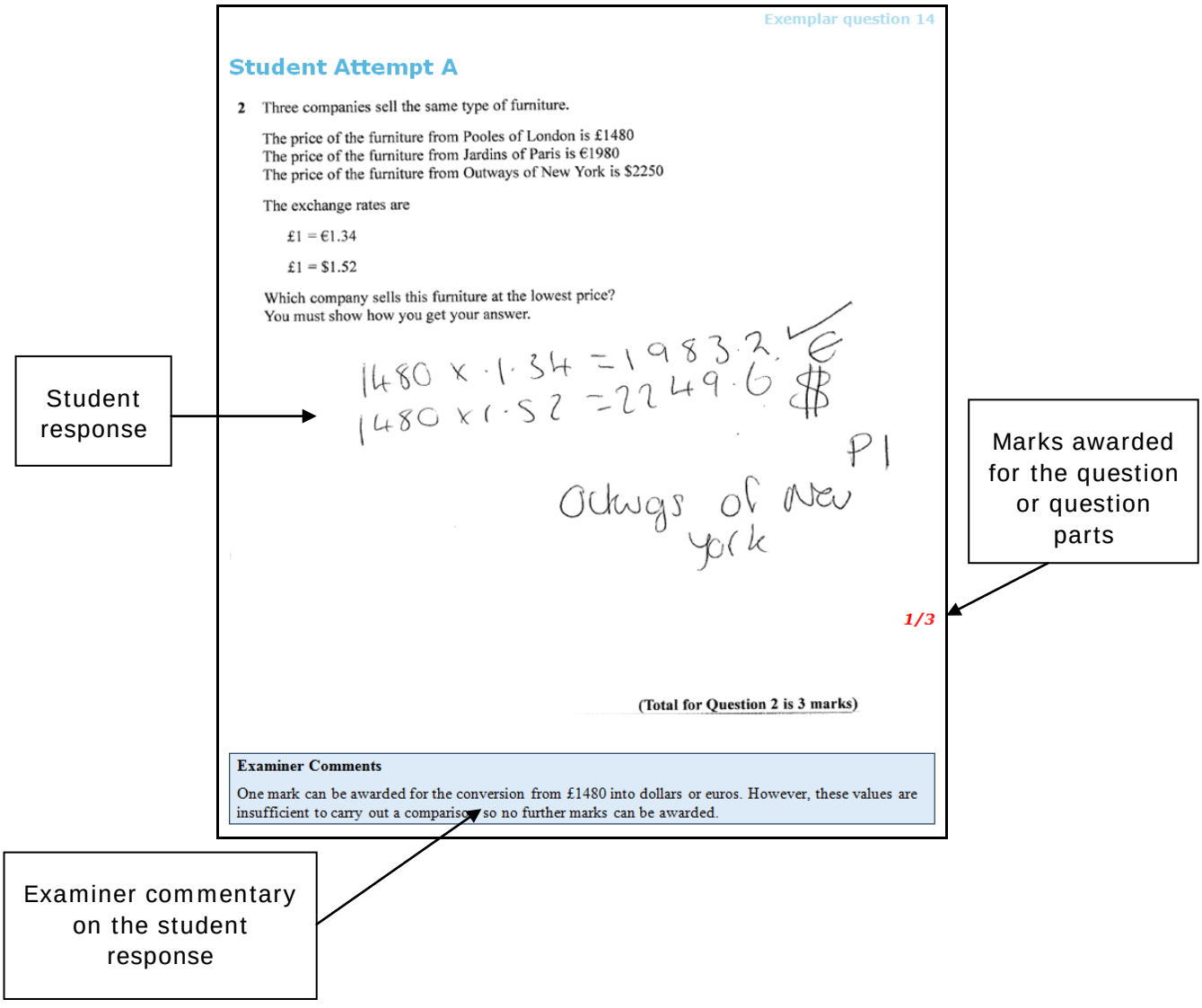
About this booklet

This booklet has been produced to support mathematics teachers delivering the new GCSE Mathematics specification (first assessment summer 2017).

The booklet looks at a selection of questions from the Specimen Papers set 1, which was used in the trial undertaken at the end of 2015. It shows real student responses to these questions, and how the examining team follow the mark schemes to demonstrate how the students would be awarded marks on these questions.

How to use this booklet

Our examining team have selected student responses to 22 questions from the trialling of the Specimen Papers set 1. Following each question you will find the mark scheme for that question and then a range of student responses with accompanying examiner comments on how the mark scheme has been applied and the marks awarded, and on common errors for this sort of question.



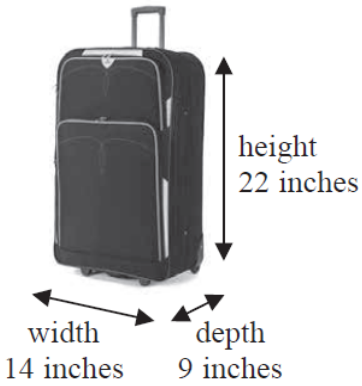
Paper 1F (non-calculator)

Exemplar Question 1

Foundation tier Paper 1

10 An American airline has a maximum size for bags on its planes.

The diagram shows the maximum dimensions.



Chris has a bag.

It has

height 50 cm

width 40 cm

depth 20 cm

1 inch = 2.54 cm

Can Chris take this bag on the plane?

You must show your working.

(Total for Question 10 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
10		No (supported)	P1 starts the process by converting one dimension A1 converts at least one measurement C1 conclusion eg No, since the 40 cm > 14 inches

Student Attempt A

10 An American airline has a maximum size for bags on its planes.
The diagram shows the maximum dimensions.

Chris has a bag.

It has
height 50 cm
width 40 cm
depth 20 cm

1 inch = 2.54 cm

Can Chris take this bag on the plane?
You must show your working.

NO

2·54 x 10 = 25·4
2·54 x 4 = 10·16
= 35·56

1inch = 2·54

14 inchs = 2·54 x 14 = 35·56 cm. width

9 inchs = 2·54 x 9 = 22·86 cm. depth

2·54
2·54
2·54
2·54
2·54
2·54
2·54
4 2·54
22·86

22 inches = 1·54 x 22 = 55·88 height cm

2·54 x 10 = 25·4
×20 = 50·8.
2·54 x 2 = 5·08
2·54
5·08

2 / 3

(Total for Question 10 is 3 marks) 2

Examiner Comments

In a question like this it is vital that candidates give a reason for their conclusion. This candidate has carried out all the correct calculations but has then not explained the reason for their answer, thus losing the final mark.

Student Attempt B

10 An American airline has a maximum size for bags on its planes.
The diagram shows the maximum dimensions.

Chris has a bag.

It has
height 50 cm
width 40 cm
depth 20 cm

1 inch = 2.54 cm

Can Chris take this bag on the plane?
You must show your working.

50 ÷ 2.54 =
40 ÷ 2.54 =
20 ÷ 2.54 =

1 / 3

(Total for Question 10 is 3 marks)

Examiner Comments

Process (or method) marks are awarded for sight of the correct process – this may not be evaluated. This candidate clearly realised what calculations need to be done but was unable to make further progress.

Student Attempt C

10 An American airline has a maximum size for bags on its planes.
The diagram shows the maximum dimensions.

Chris has a bag.

It has
height 50 cm
width 40 cm
depth 20 cm

1 inch = 2.54 cm

Can Chris take this bag on the plane?
You must show your working.

22 × 2.54 = 55.88 – too high

25.4
25.4
50.8

2.54
2.54
5.08

55.88

9 × 2.54 =
22.86 – too deep

2 / 3

No he can't

(Total for Question 10 is 3 marks) 2

Examiner Comments

In this question it was common for candidates to give the correct conclusion but for the wrong reason. This candidate has made that error. All the calculations are correct but show that the height and depth will fit.

Student Attempt D

10 An American airline has a maximum size for bags on its planes.
The diagram shows the maximum dimensions.

Chris has a bag.

It has
height 50 cm
width 40 cm
depth 20 cm

1 inch = 2.54 cm

Can Chris take this bag on the plane?
You must show your working.

50 ÷ 2.5 = 20 Yes

40 ÷ 2.5 = 16 no

20 ÷ 2.5 = 8 Yes

No he can not because it is too wide.

3 / 3

(Total for Question 10 is 3 marks) 3

Examiner Comments

This candidate has opted to use 2.5 rather than 2.54; this is a sensible way to proceed. The calculations are fully correct and the decision is made for the right reason.

Exemplar Question 2

Foundation tier Paper 1

14 A unit of gas costs 4.2 pence.

On average Ria uses 50.1 units of gas a week.

She pays for the gas she uses in 13 weeks.

(*a*) Work out an estimate for the amount Ria pays.

.....

(3)

(*b*) Is your estimate to part (*a*) an underestimate or an overestimate?
Give a reason for your answer.

.....

.....

(1)

(Total for Question 14 is 4 marks)

Mark Scheme

Question	Working	Answer	Notes
14 (a)		2000p–2600p	P1 Evidence of estimate, e.g. 4 or 50 used in calculation P1 complete process to solve problem A1 2000p–2600p or £20–£26
(b)		under	C1 underestimate as values have been rounded down

Student Attempt A

14 A unit of gas costs 4.2 pence.

On average Ria uses 50.1 units of gas a week.
She pays for the gas she uses in 13 weeks.

(a) Work out an estimate for the amount Ria pays.

50 x 4 = 200 x 13 = 2600

50.1 = 50

4.2 = 4

2 / 3

2600p

(3) 2

(b) Is your estimate to part (a) an underestimate or an overestimate?
Give a reason for your answer.

1 / 1

An underestimate because the decimal have been rounded down.

(1)

(Total for Question 14 is 4 marks) 1

Examiner Comments

The candidate has clearly worked out a correct estimate but an answer of 2600 is not acceptable – as indicated by the examiner, the answer should have been given as 2600p (or £26). When units are not supplied on the answer line then candidates must give correct units, where appropriate, with their answer.

Student Attempt B

14 A unit of gas costs 4.2 pence.

On average Ria uses 50.1 units of gas a week.
She pays for the gas she uses in 13 weeks.

(a) Work out an estimate for the amount Ria pays.

4pence :unit
50units
0.4 × 50 = £20 £20 × 13 = 260

£2 - 5units
50 ÷ 5 = 10
£2 × 10 = £20

2 / 3

£260

(3) 2

(b) Is your estimate to part (a) an underestimate or an overestimate?
Give a reason for your answer.

1 / 1

Underestimate because I rounded the numbers down so it would be less.

(1) 1

(Total for Question 14 is 4 marks)

Examiner Comments

This candidate has carried out an estimate but has made an error with their units – 4.2p has been rounded to 4p but then written as (£)0.4 rather than 0.04. This type of error is common when dealing with prices in pounds and pence.

Student Attempt C

14 A unit of gas costs 4.2 pence.

On average Ria uses 50.1 units of gas a week.
She pays for the gas she uses in 13 weeks.

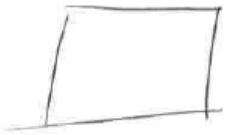
3 months 1 week.

(a) Work out an estimate for the amount Ria pays.

50. 1 a week.

50 a week.

50 × 13 = 650.



1 / 3

£650

(3)

(b) Is your estimate to part (a) an underestimate or an overestimate?
Give a reason for your answer.

1 / 1

An underestimate I rounded 50.1 down to 50 and timesed by 13.

(1)

(Total for Question 14 is 4 marks)

Examiner Comments

The candidate has made a start to the process and showed the use of a rounded number and so gains the first process mark. This is also sufficient to enable the mark in part (b) to be awarded. It is always worth having a go at a problem even if it is only the first step that is carried out.

Exemplar Question 3

Foundation tier Paper 1

19 A shop sells milk in 1 pint bottles and in 2 pint bottles.

Each 1 pint bottle of milk costs 52p.

Each 2 pint bottle of milk costs 93p.

Martin has **no** milk.

He assumes that he uses, on average, $\frac{3}{4}$ of a pint of milk each day.

Martin wants to buy enough milk to last for 7 days.

(*a*) Work out the smallest amount of money Martin needs to spend on milk.
You must show all your working.

£.....

(3)

Martin actually uses more than $\frac{3}{4}$ of a pint of milk each day.

(*b*) Explain how this might affect the amount of money he needs to spend on milk.

.....

.....

.....

(1)

(Total for Question 19 is 4 marks)

Mark Scheme

Question	Working	Answer	Notes
19 (a)			P1 begins to work with figures, e.g. finding 7× ¾ (=5.25)
			P1 works with integers eg 5.25 as 6 pints and 3 × 2 pints
		2.79	A1 cao
(b)		pay more	C1 deduces he may have to pay more [if he uses more than 0.857 pints a day]

Student Attempt A

19 A shop sells milk in 1 pint bottles and in 2 pint bottles.

Each 1 pint bottle of milk costs 52p.
Each 2 pint bottle of milk costs 93p.

Martin has **no** milk.

He assumes that he uses, on average, $\frac{3}{4}$ of a pint of milk each day.

Martin wants to buy enough milk to last for 7 days.

(a) Work out the smallest amount of money Martin needs to spend on milk.
You must show all your working.

3 × 2 pint bottle = 6 pints = 93 = £2·76

93
93
93
2·76

1·5 = 2 days
3 = 4 days
0·75 = 1 day
5·25 = 7 days = 6 pints

cheaper

OR

6 × 1 pint bottle = 6 pints = 52

52
52
52
1·56 × 2 =

1·56
1·56
3·12

£2·76

(3)

2 / 3

Martin actually uses more than $\frac{3}{4}$ of a pint of milk each day.

(b) Explain how this might affect the amount of money he needs to spend on milk.

He may need to buy an extra pint which would add 52p extra.

1 / 1

(1)

(Total for Question 19 is 4 marks)

Examiner Comments

The candidate clearly works out that 5 ¼ pints of milk would be needed. The correct process to find the total price is seen but there is an error in the arithmetic so the final mark cannot be awarded in part (a). In part (b) the candidate has realised that Martin **may** need to buy some more milk.

Student Attempt B

19 A shop sells milk in 1 pint bottles and in 2 pint bottles.

Each 1 pint bottle of milk costs 52p. £2.73
Each 2 pint bottle of milk costs 93p. £2.63

Martin has **no** milk.

He assumes that he uses, on average, $\frac{3}{4}$ of a pint of milk each day.

Martin wants to buy enough milk to last for 7 days.

(a) Work out the smallest amount of money Martin needs to spend on milk.
You must show all your working.

5 1/4 pints a week ✓

93 ÷ 2 = 46.5

93 ÷ 4 = 23.2

5 × 52p = £2.60

52p ÷ 4 = 13p

93
93
46.5
£232.5

50 | 2 → £260
5 | 250 | 10

13
4 | 52

2.73

2.32
2.3.7
2.55
2.63

£ 2.63

(3)

1 / 3

Martin actually uses more than $\frac{3}{4}$ of a pint of milk each day.

(b) Explain how this might affect the amount of money he needs to spend on milk.

If he had to use more milk it would affect the amount of money spent as he would need to buy more meaning the price would increase.

(1)

(Total for Question 19 is 4 marks)

0 / 1

Examiner Comments

The candidate clearly works out that 5 ¼ pints of milk would be needed. However, the working is then very muddled, the candidate never gets as far as realising that three 2-pint bottles of milk should be bought. In part (b) the conclusion is wrong as the statement implies that he would definitely need to buy more milk, not realising that the need to buy more depends on how much extra Martin uses.

Student Attempt C

19 A shop sells milk in 1 pint bottles and in 2 pint bottles.

Each 1 pint bottle of milk costs 52p.
Each 2 pint bottle of milk costs 93p.

Martin has **no** milk.

He assumes that he uses, on average, $\frac{3}{4}$ of a pint of milk each day.

Martin wants to buy enough milk to last for 7 days.

(a) Work out the smallest amount of money Martin needs to spend on milk.
You must show all your working.

1 2 3 4 5 6 7
$\frac{3}{4}$ 1 1/2 2 1/4 3 3 3/4 4 1/2 5 1/4

In 7 days he uses 5 1/4 pints

93
93
93
279

3 / 3

£2·79
(3)

Martin actually uses more than $\frac{3}{4}$ of a pint of milk each day.

(b) Explain how this might affect the amount of money he needs to spend on milk.

If he uses more milk he will need more pints of milk which will cost him more money.

0 / 3

(1)

(Total for Question 19 is 4 marks)

Examiner Comments

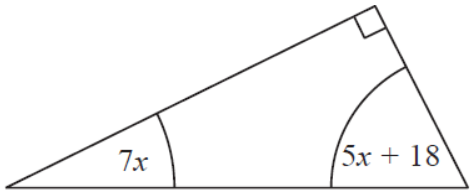
A fully correct solution is seen in part (a). In part (b) the statement is incorrect.

Paper 1F/Paper 1H common questions (non-calculator)

Exemplar Question 4

Foundation tier/Higher tier Paper 1

20/1 The diagram shows a right-angled triangle.



All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

.....°

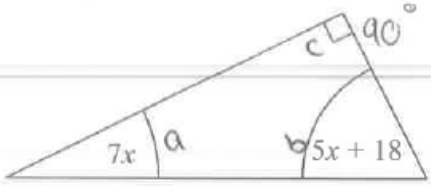
(Total for Question 20/1 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
20/1		42	P1 process to start problem solving, e.g. forms an appropriate equation P1 complete process to solve equation A1 cao

Student Attempt A

20 The diagram shows a right-angled triangle.



All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

③ 7 x 7 = 49 ? a

5 x 7 + 8 = 53 ? B

① 7x + 5x + 18 = 90

② 7x + 5x = 72 − 18

9x = 72 ÷ 9

x = 7

2 / 3

49

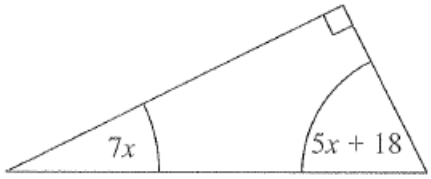
(Total for Question 20 is 3 marks) 2

Examiner Comments

A correct equation is formed; the candidate does then clearly show the correct method of solution but makes arithmetic errors. All the process marks can be awarded but not the final accuracy mark. It is common to see arithmetic errors such as these on papers.

Student Attempt B

1 The diagram shows a right-angled triangle.



All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

$90 + 7x + (5x+18) = 180$

$7x + (5x+18) = 90$

$7x + 5x = 72$

$12x = 72$

$x = 6$

2 / 3

1

6

2

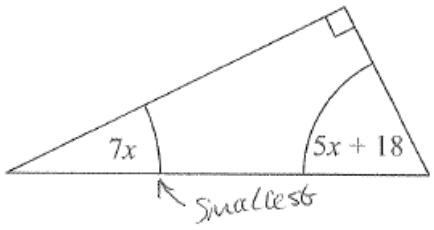
(Total for Question 1 is 3 marks)

Examiner Comments

It is common for candidates to fail to answer the question set. This is the case here – the candidate has correctly found the value of *x* but not the smallest angle of the triangle as required by the question.

Student Attempt C

1 The diagram shows a right-angled triangle.



All the angles are in degrees.

Work out the size of the smallest angle of the triangle.

90°
5x + 18
12x
180 ✓ p1

90 + 18
108 + 12x = 180
− 108
12x = 72 ✓ p1
3 ÷ 12
x = 7 ✗

7 × 7 = 49

49 2°

2/3

(Total for Question 1 is 3 marks)

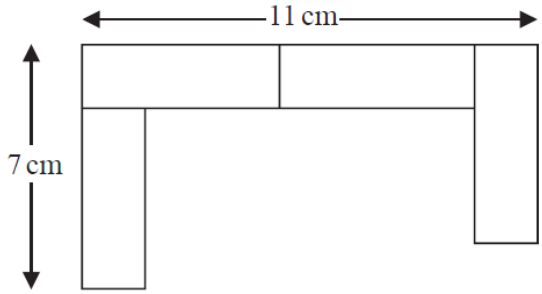
Examiner Comments

Poor arithmetic in this response (72 ÷ 12 evaluated as 7) is the reason for the loss of a mark in this question. It is also worth noting that it is possible from the arrow and smallest on the diagram that the candidate has assumed that the angle labelled $7x$ is the smallest angle in the triangle. In this instance, with a correct value for x of 6, the $7x$ angle does work out to be the smallest but assumptions should not be made from diagrams.

Exemplar Question 5

Foundation tier / Higher tier Paper 1

23/4 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

..... cm^2

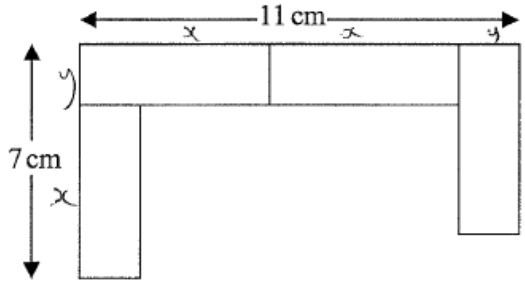
(Total for Question 23/4 is 4 marks)

Mark Scheme

Question	Working	Answer	Notes	
23/4		48	P1	begins to work with rectangle dimensions e.g. $l+w=7$ or $2\times l+w$ (=11)
			C1	shows a result for a dimension e.g. using $l=4$ or $w=3$
			P1	begins process of finding total area e.g. 4 × "3" × "4"
			A1	cao

Student Attempt A

4 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

$2x + y = 11$

$- \quad x + y = 7$

$x = 4$

$4 + y = 7$

$y = 3$

2 / 4

$7 \times 4 = 28\text{ cm}^2$

$28\text{ cm}^2 \times 4 = 112\text{ cm}^2$

112 cm²

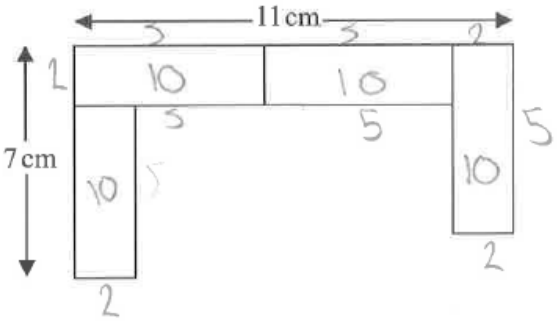
(Total for Question 4 is 4 marks)

Examiner Comments

The use of algebra is a good method to solve problems of this nature. Unfortunately, having set up and correctly solved a pair of simultaneous equations, this candidate then uses the wrong length (7 instead of 4) for each rectangle and therefore loses the last two marks.

Student Attempt B

23 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

10 × 4 = 40

0 / 4

40 cm² 2

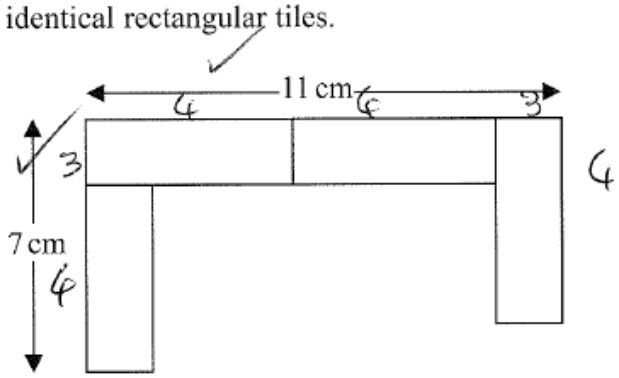
(Total for Question 23 is 4 marks) 0

Examiner Comments

When candidates come up with values with no method shown then, if their values are incorrect, no credit can be awarded for using these. Here the candidate has assumed that the length and width of each rectangle is 5 cm and 2 cm respectively. These are then used to find the area correctly but no credit can be awarded.

Student Attempt C

4 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

$4 \times 3 = 12$

$12 \times 4 = 28$

3 / 4

28 cm²

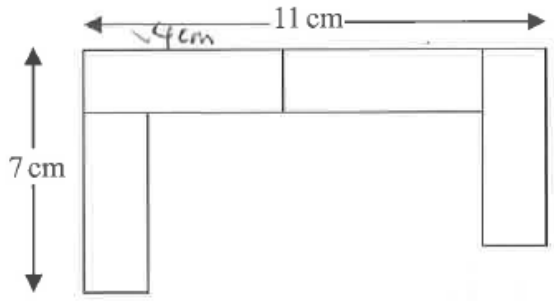
(Total for Question 4 is 4 marks)

Examiner Comments

This candidate does not show how he has obtained the values of 3 and 4 but, as they are correct, the first two marks can be awarded. The correct area of a rectangle is seen but there is then an arithmetic error in the final evaluation so the final accuracy mark cannot be awarded.

Student Attempt D

23 A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

11 - 7 = 4

7 - 4 = 3

7 x 3 = 21

21 x 2 = 42

42 x 2 = 84

2 / 4

84 cm²

(Total for Question 23 is 4 marks)

Examiner Comments

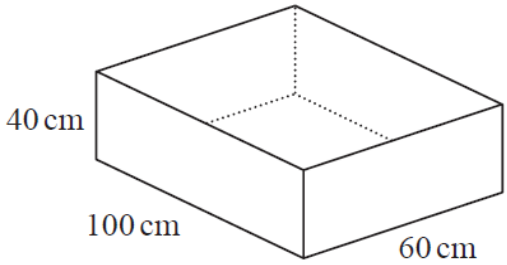
This candidate has clearly shown the processes used to work out the length and width of a rectangle, which gains the first two marks. Unfortunately, he has then used 7 rather than 4 as the length of the rectangle, despite showing 4 on the diagram.

Exemplar Question 6

Foundation tier / Higher tier Paper 1

24/5 The diagram shows a sand pit.

The sand pit is in the shape of a cuboid.



Sally wants to fill the sand pit with sand.

A bag of sand costs £2.50.

There are 8 litres of sand in each bag.

Sally says,

"The sand will cost less than £70."

Show that Sally is wrong.

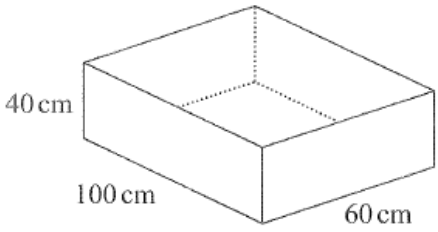
(Total for Question 24/5 is 5 marks)

Mark Scheme

Question	Working	Answer	Notes	
24/5		explanation	M1 works with volume e.g. 240 000	begins working back e.g. 70÷2.50
			M1 uses conversion 1 litre = 1000 cm^3	uses conversion 1 litre = 1000 cm^3
			M1 uses 8000 eg vol ÷ 8000 (=30)	uses 8000 eg "28"× 8000 (=224 000)
			M1 uses "30" eg "30" × 2.50	works with vol. eg 224 000
			C1 for explanation and 75 stated	for explanation with 240 000 and 224 000

Student Attempt A

5 The diagram shows a sand pit.
The sand pit is in the shape of a cuboid.



Sally wants to fill the sand pit with sand.
A bag of sand costs £2.50
There are 8 litres of sand in each bag.

Sally says,

"The sand will cost less than £70"

Show that Sally is wrong.

8000cm³

0.4 × 1 = 0.4 × 0.6 = 0.24 m³

40 × 100 = 4000 × 60 = 2,400,000

2,400,000 / 8000 = 300 bags ✓

300 × 2.50 = £750

no it will not be less than £70 ✗

4 / 5

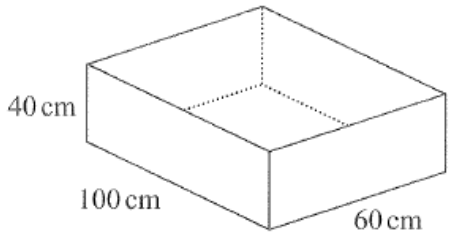
(Total for Question 5 is 5 marks)

Examiner Comments

This candidate shows a fully correct method but makes an early arithmetic error (40 × 100 is evaluated as 40 000). All the method marks can be awarded as each stage is clearly seen but the final accuracy mark cannot be awarded.

Student Attempt B

5 The diagram shows a sand pit.
The sand pit is in the shape of a cuboid.



Sally wants to fill the sand pit with sand.
A bag of sand costs £2.50
There are 8 litres of sand in each bag.

Sally says,

"The sand will cost less than £70"

Show that Sally is wrong.

1 L = 1000 cm³

40 × 100
= 4,000

4,000 × 60
60
0,000
24 0,000

240,000 cm³
= 240L

30
8 | 240

30 bags are needed
30 × £2.50
= £75

She is wrong because the sand costs £5 more than £70

5/5

(Total for Question 5 is 5 marks)

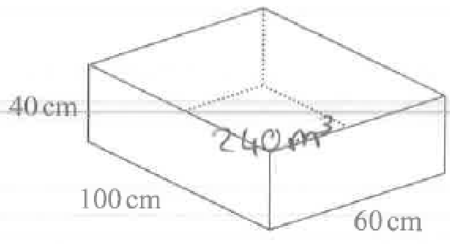
Examiner Comments

A fully correct solution with all steps is clearly seen and arithmetic is accurate throughout.

Student Attempt C

24 The diagram shows a sand pit.
The sand pit is in the shape of a cuboid.

Sally wants to fill the sand pit with sand.
A bag of sand costs £2.50
There are 8 litres of sand in each bag.



Sally says,

"The sand will cost less than £70"

Show that Sally is wrong.

100 × 60 × 40 =

① 600 × 40 = 24,000 cm³

~~8~~÷~~24~~

② 240 ÷ 8 = 30

2.50

30 × ~~70~~ = ~~[illegible]~~ 6.

30

2 60 =£75 in total

0.5 15

Sally will have to pay £5 over what she thought was the maximum it would cost.

3 / 5

(Total for Question 24 is 5 marks) 3

Examiner Comments

It was possible to arrive at the 'correct' answer in this question through incorrect working. This is the case here; the candidate has made an early arithmetic error when evaluating 100 × 60 × 40. The wrong conversion from cm^3 to litres has then been used. Therefore, the mark available for the use of 1 litre = 1000 cm^3 cannot be awarded and neither can the final accuracy mark.

Exemplar Question 7

Foundation tier / Higher tier Paper 1

25/6 Four friends each throw a biased coin a number of times.

The table shows the number of heads and the number of tails each friend got.

	Ben	**Helen**	**Paul**	**Sharif**
heads	34	66	80	120
tails	8	12	40	40

The coin is to be thrown one more time.

(*a*) Which of the four friends' results will give the best estimate for the probability that the coin will land heads?

Justify your answer.

.....

.....

.....

(1)

Paul says,

"With this coin you are twice as likely to get heads as to get tails."

(*b*) Is Paul correct?
Justify your answer.

.....

.....

.....

(2)

The coin is to be thrown twice.

(*c*) Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

.....

(2)

(Total for Question 25/6 is 5 marks)

Mark Scheme

Question		Working	Answer	Notes	
25/6	(a)		Sharif	B1	Sharif with mention of greatest total throws
	(b)		Decision	P1	starts working with proportions
			(supported)	A1	Conclusion: correct for Paul, but not for the rest; or ref to just Paul's results
	(c)	Tot: H 300 T 100	$\frac{9}{16}$	P1	selects Sharif or overall and multiplies P(heads)×P(heads) e.g. ¾ × ¾
				A1	oe

Student Attempt A

25 Four friends each throw a biased coin a number of times.
The table shows the number of heads and the number of tails each friend got.

	Ben	Helen	Paul	Sharif
heads	34	66	80	120
tails	8	12	40	40

80+40=120

The coin is to be thrown one more time.

(a) Which of the four friends' results will give the best estimate for the probability that the coin will land heads?
Justify your answer.

1 / 1

Sharif because he collects the most data. 34+8=42 66+12=80 80+40=120 120+40=160

(1) 1

Paul says,

"With this coin you are twice as likely to get heads as to get tails."

(b) Is Paul correct?
Justify your answer.

1 / 2

no because when sharif threw the coin he got 4 times more heads than ~~tails~~ tails (40x4=120)

(2) 1

The coin is to be thrown twice.

(c) Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

0 / 2

(2) 0

(Total for Question 25 is 5 marks)

Examiner Comments

In part (a) it was essential that candidates did justify their answer – as this candidate has done. In part (b) candidates did need to use all the data in order to score both marks; referring to the data for just a single person, as here, was sufficient to gain the first mark.

Student Attempt B

6 Four friends each throw a biased coin a number of times.
The table shows the number of heads and the number of tails each friend got.

	Ben	Helen	Paul	Sharif
heads	34	66	80	120
tails	8	12	40	40

The coin is to be thrown one more time.

(a) Which of the four friends' results will give the best estimate for the probability that the coin will land heads?
Justify your answer.

Sharif because he threw the coin the greatest number of times and so his estimate will be the most accurate.

1 / 1

(1)

Paul says,

"With this coin you are twice as likely to get heads as to get tails."

(b) Is Paul correct?
Justify your answer.

2 / 2

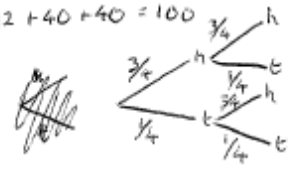
Paul is not correct because, although his results show this, as he got twice as many heads as tails, the other results do not. Also, overall 3 times as many heads were thrown as tails. For example, Sharif got 3 times as many heads as tails after throwing the coin more times than Paul.

(2)

The coin is to be thrown twice.

(c) Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

$34+66+80+120=300$
$8+12+40+40=100$



h = heads
t = tails

$\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$

2 / 2

9/16

(2)

(Total for Question 6 is 5 marks)

Examiner Comments

A very comprehensive answer.

Student Attempt C

25 Four friends each throw a biased coin a number of times.
The table shows the number of heads and the number of tails each friend got.

	Ben	Helen	Paul	Sharif
heads	34	66	80	120
tails	8	12	40	40

The coin is to be thrown one more time.

(a) Which of the four friends' results will give the best estimate for the probability that the coin will land heads?
Justify your answer.

Sharifs because he's thrown ~~it out of~~ more times and will give a more specific ~~for~~ result

1 / 1

(1)

Paul says,

"With this coin you are twice as likely to get heads as to get tails."

(b) Is Paul correct?
Justify your answer.

2 / 2

No because ~~its no spec~~ they all have different results and that's is just the results ~~of~~ Paul got.

(2) 2

The coin is to be thrown twice.

(c) Use all the results in the table to work out an estimate for the probability that the coin will land heads both times.

$34+66+80+120=300$ +
$8+12+40+40=100$
400

$\frac{300}{400} \times \frac{300}{400} = \frac{90000}{160000} = \frac{9}{16}$

2 / 2

$\frac{9}{16}$

(2) 2

(Total for Question 25 is 5 marks)

Examiner Comments

In the response to part (b) the candidate refers to the fact that it is just Paul's results for which the statement is true. The justification given here is just about sufficient to gain both marks.

Paper 1H (non-calculator)

Exemplar Question 8

Higher tier Paper 1

8 The mass of Jupiter is 1.899×10^{27} kg.

The mass of Saturn is 0.3 times the mass of Jupiter.

(*a*) Work out an estimate for the mass of Saturn.
Give your answer in standard form.

..... kg

(3)

(*b*) Give evidence to show whether your answer to (*a*) is an underestimate or an overestimate.

.....

.....

(1)

(Total for Question 8 is 4 marks)

Mark Scheme

Question	Working	Answer	Notes
8 (a)		5.7×10^{26} to 6×10^{26}	B1 uses estimates e.g. 1.899 to 1.9 or 2 M1 process of multiplication e.g. 0.57×10^{27} A1 between 5.7×10^{26} and 6×10^{26}
(b)		explanation	C1 e.g. underestimate a number is rounded up

Student Attempt A

8 The mass of Jupiter is 1.899×10^{27} kg.
The mass of Saturn is 0.3 times the mass of Jupiter.

(a) Work out an estimate for the mass of Saturn.
Give your answer in standard form.

$0.3 \times 2 \times 10^{27} = 0.6 \times 10^{27}$
$= 6 \times 10^{26}$

3 / 3

✓

6×10^{26} kg

(3)

(b) Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

$2 > 1.899$ so it is an overestimate. ✓

1 / 1

(1)

(Total for Question 8 is 4 marks)

Examiner Comments

Estimation is clearly used and the result is converted correctly to standard form. Evidence is clearly given in part (b).

Student Attempt B

8 The mass of Jupiter is 1.899×10^{27} kg.
The mass of Saturn is 0.3 times the mass of Jupiter.

(a) Work out an estimate for the mass of Saturn.
Give your answer in standard form.

5.7×10^{27} kg

B1

1.899 → 1.9

1.9×0.3 M1

$5^{2}7$

0 0

2 / 3

5.7×10^{27} kg

(3)

(b) Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

My estimate is an ~~underest~~ overestimate as I rounded 1.899 up to 1.9 so higher than the true value.

1 / 1

(1)

(Total for Question 8 is 4 marks)

Examiner Comments

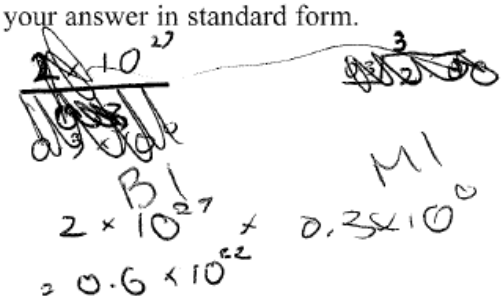
The candidate has used estimation and carried out the correct calculation in part (a) but an arithmetic error has occurred (1.9 × 0.3 evaluated as 5.7) so the accuracy mark cannot be awarded. Clear evidence is given for the answer in (b).

Student Attempt C

8 The mass of Jupiter is 1.899×10^{27} kg.
The mass of Saturn is 0.3 times the mass of Jupiter.

(a) Work out an estimate for the mass of Saturn.
Give your answer in standard form.

0.3 = 0.3×10^0



A0
X

0.6×10^{27} kg

(3)

2 / 3

(b) Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

it is an over estimate because 1.899 to 1 significant figure is 2 so the value will be larger

(1)

1 / 1

(Total for Question 8 is 4 marks)

Examiner Comments

The answer in (a) is correct but has not been converted into standard form so the final accuracy mark cannot be awarded. The answer in part (b) is correct with evidence supplied.

Paper 2F (calculator)

Exemplar Question 9

Foundation tier Paper 2

10 The manager of a clothes shop recorded the size of each dress sold one morning.

10	10				
12	12				
14	14	14	14	14	14
16	16	16	16		
18	18	18			
20	20	20			

The sizes of dresses are always even numbers.

The mean size of the dresses sold that morning is 15.3.

The manager says,

"The mean size of the dresses is **not** a very useful average."

(i) Explain why the manager is right.

.....

.....

(ii) Which is the more useful average for the manager to know, the median or the mode?
You must give a reason for your answer.

.....

.....

.....

(Total for Question 10 is 2 marks)

Mark Scheme

Question	Working	Answer	Notes
10 i			C1 for correct criticism of use of mean, e.g.. "there is no dress size of 15.3"
ii			C1 Mode (=14) is most useful since it shows the most popular size

Student Attempt A

10 The manager of a clothes shop recorded the size of each dress sold one morning.

10	10				
12	12				
14	14	14	14	14	14
16	16	16	16		
18	18	18			
20	20	20			

The sizes of dresses are always even numbers.
The mean size of the dresses sold that morning is 15.3

The manager says,

"The mean size of the dresses is **not** a very useful average."

(i) Explain why the manager is right.

Because that isn't a dress that 15.3 size

1 / 1

(ii) Which is the more useful average for the manager to know, the median or the mode?
You must give a reason for your answer.

mode - as then you know what the most popular dress size is.

1 / 1

(Total for Question 10 is 2 marks)

Examiner Comments

Both reasons are sufficient to earn the mark.

Student Attempt B

10 The manager of a clothes shop recorded the size of each dress sold one morning.

10 10
12 12
14 14 14 14 14 14
16 16 16 16
18 18 18
20 20 20

NUM = 20
Total = 306
Mean = 15.3
Mode = 14
median = 15

The sizes of dresses are always even numbers.
The mean size of the dresses sold that morning is 15.3

The manager says,

"The mean size of the dresses is **not** a very useful average."

(i) Explain why the manager is right.

It doesn't tell him/her anything about the most commonly bought dress, which would be more useful information

1 / 1

(ii) Which is the more useful average for the manager to know, the median or the mode?
You must give a reason for your answer.

The mode is the most useful, because it tells the manager which dress size is most popular and from that, order more of that size

1 / 1

(Total for Question 10 is 2 marks)

Examiner Comments

Both reasons are sufficient to earn the mark.

Student Attempt C

10 The manager of a clothes shop recorded the size of each dress sold one morning.

10	10				
12	12				
14	14	14	14	14	14
16	16	16	16		
18	18	18			
20	20	20			

The sizes of dresses are always even numbers.
The mean size of the dresses sold that morning is 15.3

The manager says,

"The mean size of the dresses is **not** a very useful average."

(i) Explain why the manager is right.

Because 15.3 is an odd number ✗ not enough.

0 / 1

(ii) Which is the more useful average for the manager to know, the median or the mode?
You must give a reason for your answer.

Mode because the manger will know which size is the most common ✓

1 / 1

(Total for Question 10 is 2 marks)

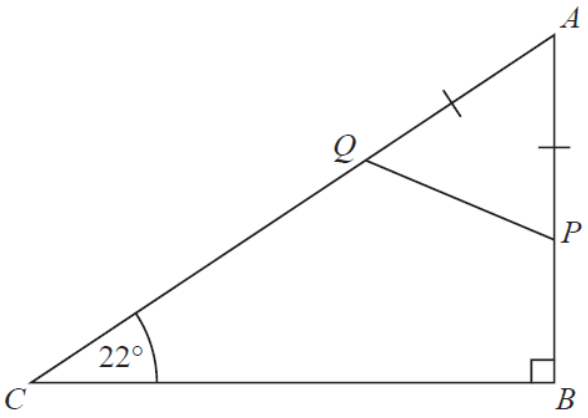
Examiner Comments

The reason in (i) is not sufficient.

Exemplar Question 10

Foundation tier Paper 2 (calculator)

17 *ABC* is a right-angled triangle.



P is a point on *AB*.

Q is a point on *AC*.

AP = *AQ*.

Work out the size of angle *AQP*.

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

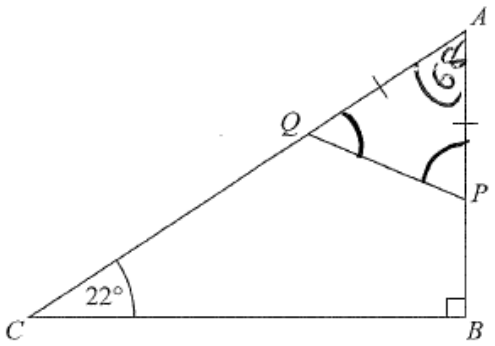
(Total for Question 17 is 4 marks)

Mark Scheme

Question	Working	Answer	Notes	
17		56° with reasons	M1	for a method leading to the evaluation of another angle, e.g. angle *A* =180 – 90 – 22 (=68)
			M1	for correctly using the isosceles property in identifying two equal angles, e.g. (180 – "68")÷2 (= 56)
			C1	for at least one correct reason given linked to clear working.
			C1	For all correct reasons included Reasons as appropriate from: sum of angles in a triangle = 180° base angles of isosceles triangle are equal sum of angles on a straight line = 180° sum of angles in a quadrilateral = 360°

Student Attempt A

17 *ABC* is a right-angled triangle.



P is a point on *AB*.
Q is a point on *AC*.
AP = *AQ*.

Work out the size of angle *AQP*.
You must give a reason for each stage of your working.

90 + 22 = 112 } angle of
180 − 112 = 68° } CAB.
(all angles in a triangle add up to 180°)

180 − 68 = 112
112 ÷ 2 = 56 } Base angles equal sides in an isosceles triangles have equal angles

AQP = 56°

4 / 4

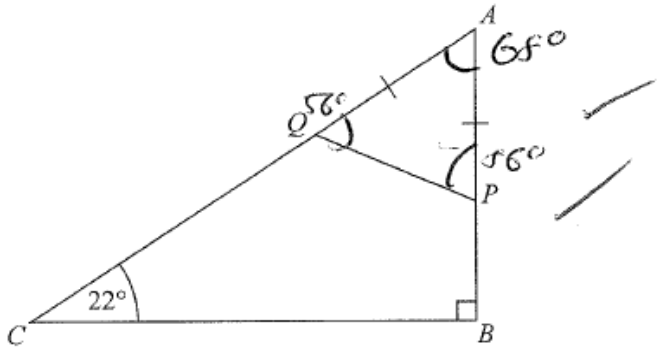
(Total for Question 17 is 4 marks)

Examiner Comments

The value given for the angle is correct. All necessary reasons are given.

Student Attempt B

17 *ABC* is a right-angled triangle.



P is a point on *AB*.
Q is a point on *AC*.
AP = *AQ*.

Work out the size of angle *AQP*.
You must give a reason for each stage of your working.

90+22 = 112
180 − 112 = 68 − size of angle A
180 − 68 = 112
112 ÷ 2 = 56 − Angle P and Q must be same so split remaing angle size into 2

Angle AQP = 56°

2 / 4

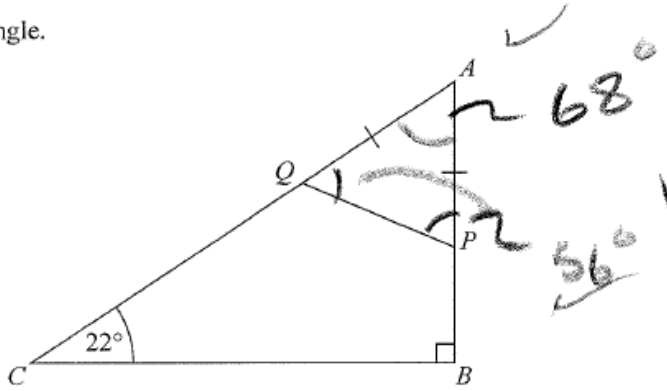
(Total for Question 17 is 4 marks)

Examiner comments

The value given for angle *AQP* is correct. However, there are no correct reasons given so only the first two marks can be awarded.

Student Attempt C

17 *ABC* is a right-angled triangle.



68°

56°

$\frac{112}{2} = 56$

P is a point on *AB*.
Q is a point on *AC*.
AP = *AQ*.

Work out the size of angle *AQP*.
You must give a reason for each stage of your working.

right angle = 90°

angles in a triangle = 180°

22° + 90° = 112°

180° − 112° =

68°

3/4

3

(Total for Question 17 is 4 marks)

Examiner Comments

The answer is written by angle *AQP* and is correct. One correct reason is given; the candidate has not explained why angles *AQP* and *APQ* are equal so only 3 of the 4 marks can be awarded.

Paper 2F/Paper 2H common questions (calculator)

Exemplar Question 11

Foundation tier/Higher tier Paper 2 (calculator)

21/2 Three companies sell the same type of furniture.

The price of the furniture from Pooles of London is £1480

The price of the furniture from Jardins of Paris is €1980

The price of the furniture from Outways of New York is $2250

The exchange rates are

£1 = €1.34

£1 = $1.52

Which company sells this furniture at the lowest price?

You must show how you get your answer.

(Total for Question 21/2 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes	
21/2		Jardins of Paris	P1	correct process to convert one price to another currency, e.g. 1980 ÷ 1.34
			P1	for a complete process leading to 3 prices in the same currency
			C1	for 3 correct and consistent results and a correct comparison made.

Student Attempt A

2 Three companies sell the same type of furniture.

The price of the furniture from Pooles of London is £1480
The price of the furniture from Jardins of Paris is €1980
The price of the furniture from Outways of New York is $2250

The exchange rates are

£1 = €1.34

£1 = $1.52

Which company sells this furniture at the lowest price?
You must show how you get your answer.

1480 x 1.34 = 1983.2 €
1480 x 1.52 = 2249.6 $

P1

Outways of New York

1 / 3

(Total for Question 2 is 3 marks)

Examiner Comments

One mark can be awarded for the conversion from £1480 into dollars or euros. However, these values are insufficient to carry out a comparison so no further marks can be awarded.

Student Attempt B

21 Three companies sell the same type of furniture.

The price of the furniture from Pooles of London is £1480
The price of the furniture from Jardins of Paris is €1980
The price of the furniture from Outways of New York is $2250

The exchange rates are

£1 = €1.34

£1 = $1.52

Which company sells this furniture at the lowest price?
You must show how you get your answer.

1980 ÷ 1.34 = 1477 cheap
2250 ÷ 1.62 = 1480

2 / 3

(Total for Question 21 is 3 marks)

Examiner Comments

The correct conversions have been done so the candidate does have three values to compare. However, they have failed to answer the question – the word 'cheap' next to the lowest value is not sufficient to answer the question, 'Which company sells the furniture at the lowest price?'.

Student Attempt C

21 Three companies sell the same type of furniture.

The price of the furniture from Pooles of London is £1480
The price of the furniture from Jardins of Paris is €1980
The price of the furniture from Outways of New York is $2250

The exchange rates are

£1 = €1.34

£1 = $1.52

Which company sells this furniture at the lowest price?
You must show how you get your answer.

Jardins
€1980 ÷ €1.34 = £1477.60
Outways
$2250 ÷ $1.52 = £1480.26
Pooles
£1480 =
£1480
lowest price

Pooles sells the cheapest furniture

2 / 3

(Total for Question 21 is 3 marks)

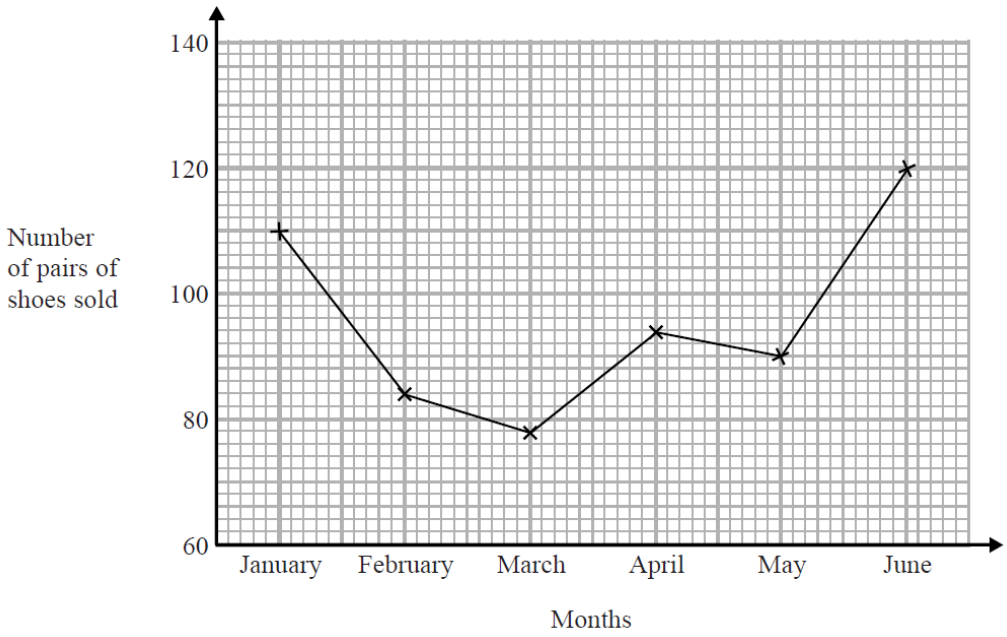
Examiner Comments

The candidate has carried out the correct conversions and has three correct prices to compare. However, the wrong company has been selected; this is a common error in questions of this nature.

Exemplar Question 12

Foundation tier / Higher tier Paper 2 (calculator)

22/3 The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014.



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

Did the shoe shop meet this sales target?

You must show how you get your answer.

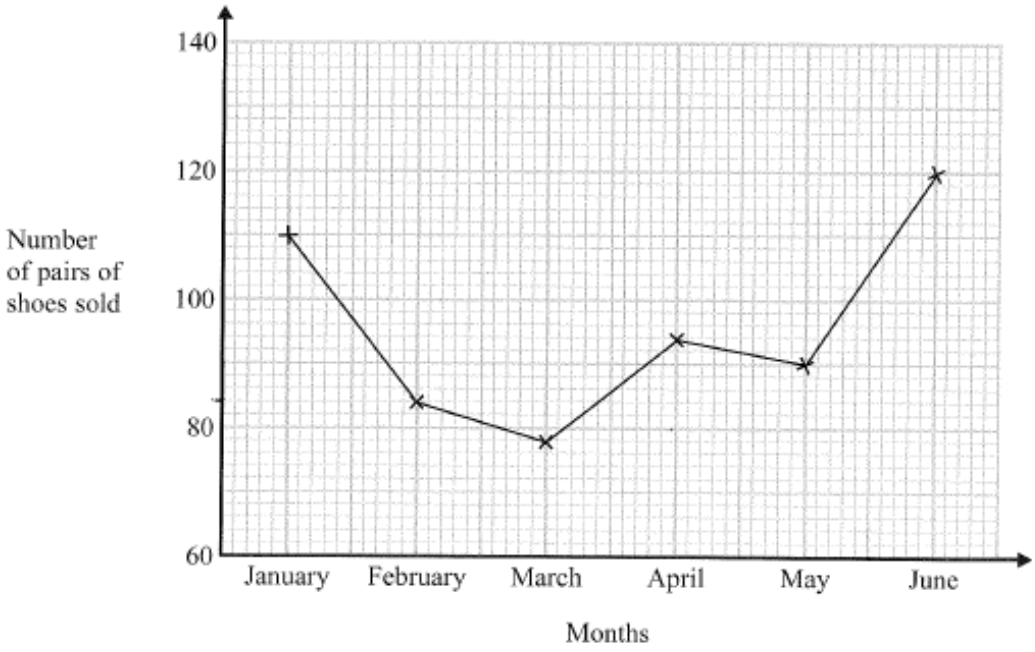
(Total for Question 22/3 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
22/3		Mean of 96 or net deviation of 0 so target met	M1 for correct interpretation of the graph, with at least one correct reading or a line drawn through 96 with at least one correct deviation M1 complete method to find mean of six months sales, e.g. (110+84+78+94+90+120)÷6 (= 96) or the mean of six deviations, e.g. (14–12–16–2–6+24)÷6 (= 0) C1 for a correct answer of 96 or 0 with correct conclusion

Student Attempt A

22 The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

Did the shoe shop meet this sales target?
You must show how you get your answer.

410
−84
74
92
−90
+120
570

570 ÷ 7 = 81.428

no thy did not

1

1 / 3

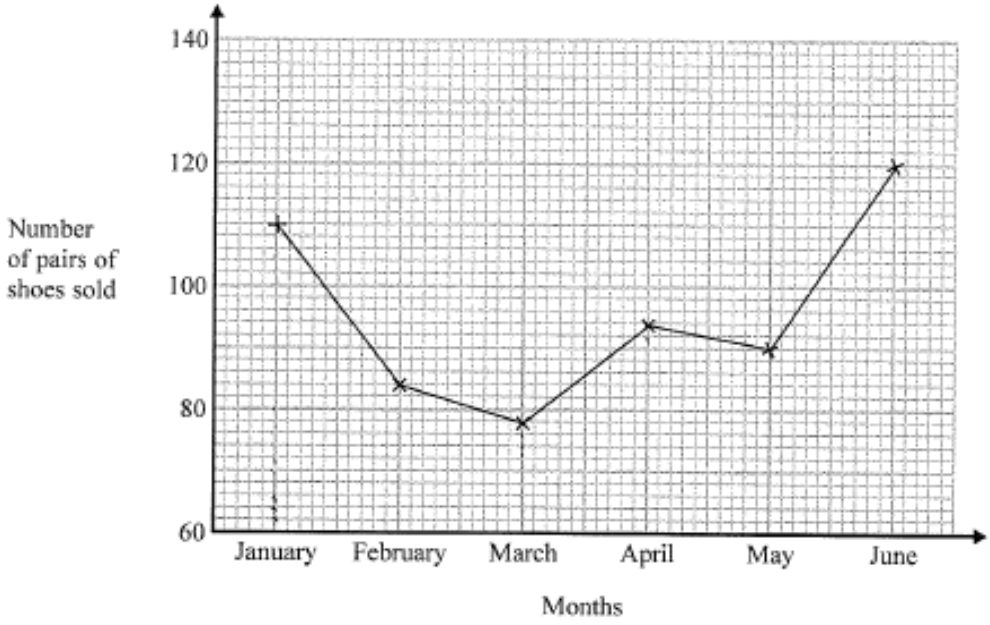
(Total for Question 22 is 3 marks)

Examiner Comments

It is not unusual to see candidates read scales incorrectly; that is the case here with two values incorrect. Unfortunately, the candidate has also divided by 7 rather than 6 when attempting to find the mean. The result of these errors mean that a candidate who clearly understands the processes has ended up with just 1 mark out of the 3 available.

Student Attempt B

22 The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

Did the shoe shop meet this sales target?
You must show how you get your answer.

110
84
68
94
90
120
566

566 ÷ 6 = 94.3

2 / 3

NO. they didn't meet the sales target

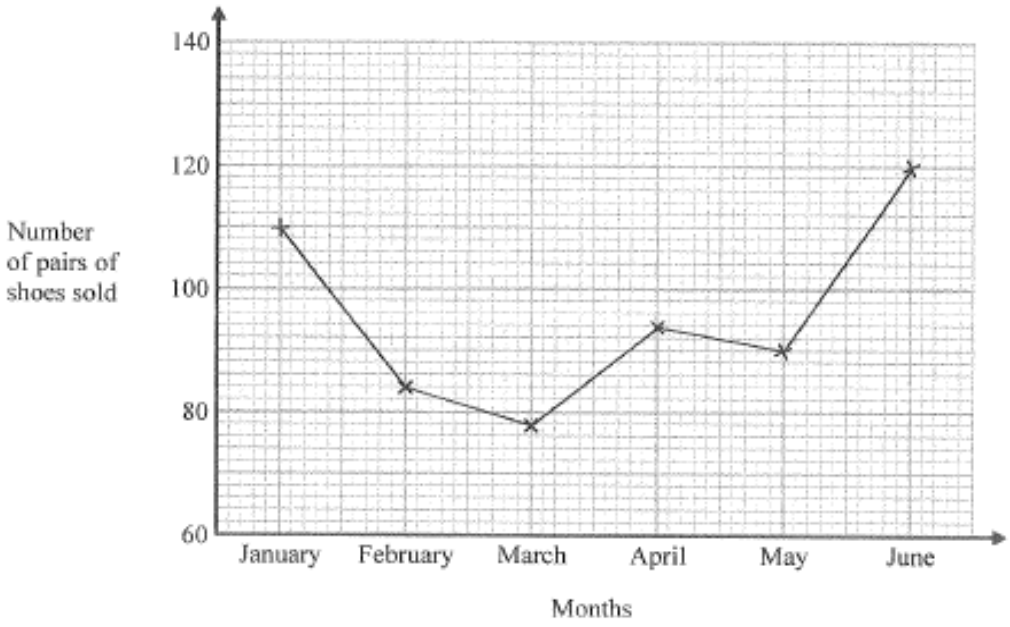
(Total for Question 22 is 3 marks)

Examiner Comments

One error in reading the scale on the *y* axis means that this candidate gains the first two marks but not the third as the final answer is incorrect.

Student Attempt C

3 The time-series graph gives some information about the number of pairs of shoes sold in a shoe shop in the first six months of 2014



The sales target for the first six months of 2014 was to sell a mean of 96 pairs of shoes per month.

Did the shoe shop meet this sales target?
You must show how you get your answer.

M1 110 + 84 + 78 + 94 + 90 +
120 = 486 ✗ M1
486 ÷ 6 = 81
NO they didn't
✗

2 / 3

(Total for Question 3 is 3 marks) 2

Examiner Comments

This candidate has all the correct values from the graph and the correct method but has made a careless error in adding up the values. The final mark cannot therefore be awarded.

Exemplar Question 13

Foundation tier / Higher tier Paper 2 (calculator)

23/4 The grouped frequency table gives information about the heights of 30 students.

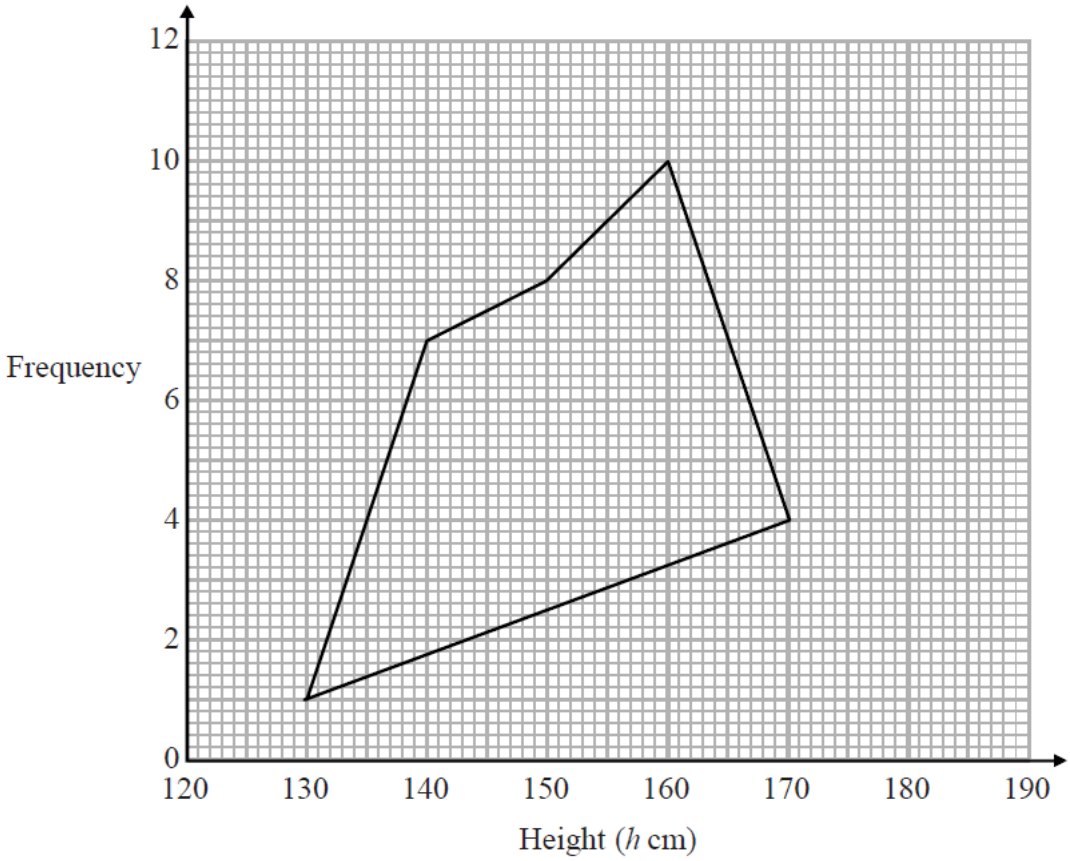
Height (h cm)	Frequency
$130 < h \leq 140$	1
$140 < h \leq 150$	7
$150 < h \leq 160$	8
$160 < h \leq 170$	10
$170 < h \leq 180$	4

(a) Write down the modal class interval.

.....

(1)

This incorrect frequency polygon has been drawn for the information in the table.



(*b*) Write down two things wrong with this incorrect frequency polygon.

1.....

2.....

(Total for Question 23/4 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
23 a		$160 < h \leq 170$	B1 for identifying the correct class interval
b		1. Points should be plotted at mid-interval values 2. The polygon should not be closed	C1 for a correct error identified C1 for a correct error identified

Student Attempt A

23 The grouped frequency table gives information about the heights of 30 students.

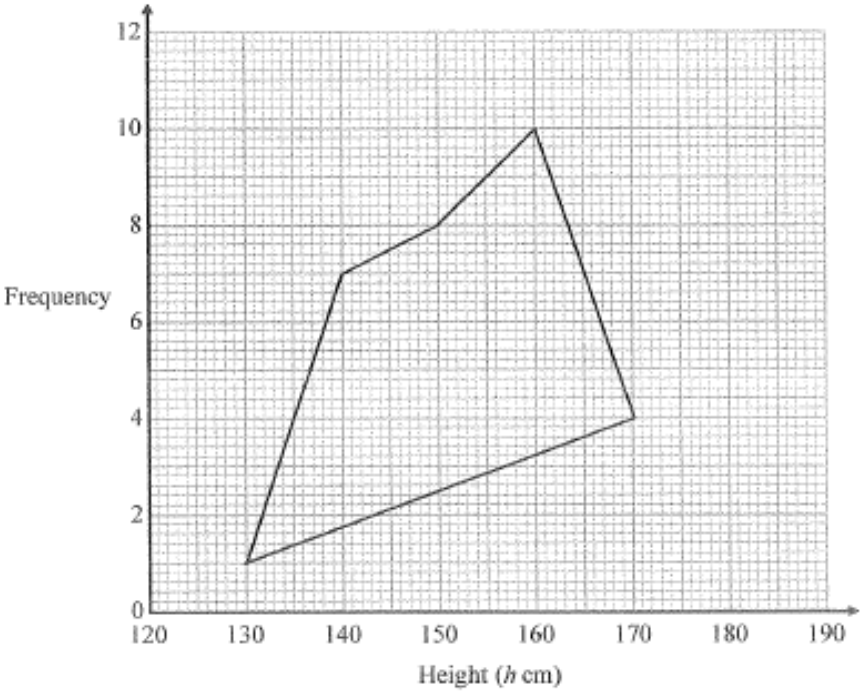
Height (h cm)	Frequency
$130 < h \leqslant 140$	1
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	8
$160 < h \leqslant 170$	10
$170 < h \leqslant 180$	4

(a) Write down the modal class interval.

✓ 160 < h ≤ 170

(1) **1 / 1**

This incorrect frequency polygon has been drawn for the information in the table.



(b) Write down two things wrong with this incorrect frequency polygon.

1 It should be marked within the 2 heights

2 There should be no straight line at the bottom

(2) **1 / 2**

(Total for Question 23 is 3 marks)

Examiner Comments

In part (b) the first reason is not explicit enough; had the candidate used the word 'mid-point' rather than 'within the 2 heights' then full marks would have been awarded.

Student Attempt B

23 The grouped frequency table gives information about the heights of 30 students.

Height (h cm)	Frequency
$130 < h \leqslant 140$	1
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	8
$160 < h \leqslant 170$	10
$170 < h \leqslant 180$	4

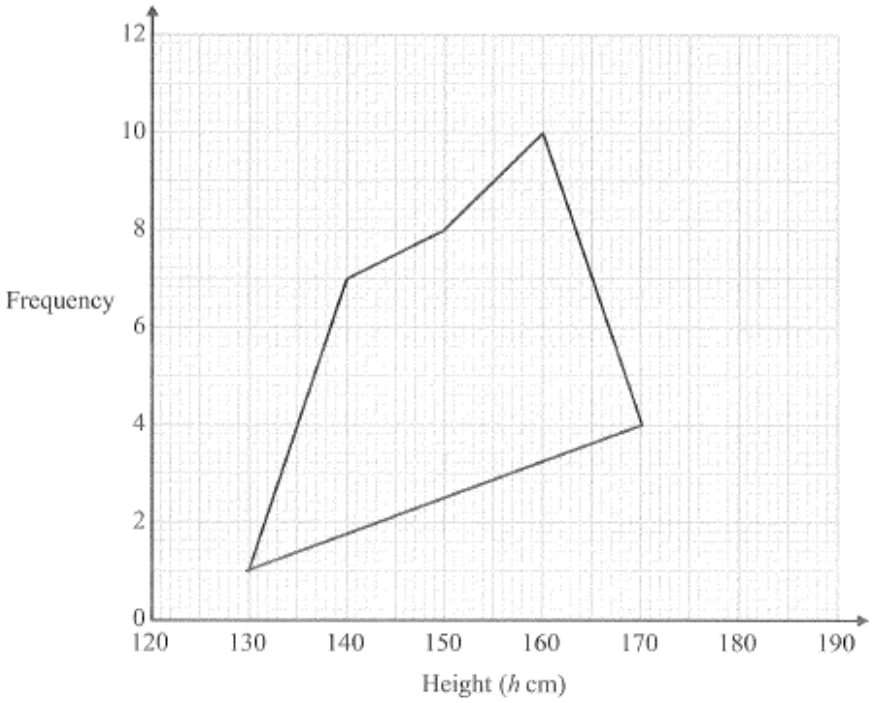
(a) Write down the modal class interval.

160 < h ≤ 170 ✓

(1)

1 / 1

This incorrect frequency polygon has been drawn for the information in the table.



(b) Write down two things wrong with this incorrect frequency polygon. ✓

1 used the minimum value in class interval

2 connected all the points not enough

(2)

1 / 2

(Total for Question 23 is 3 marks)

Examiner Comments

The first reason in part (b) is sufficient. However, the second reason is not quite clear enough.

Student Attempt C

23 The grouped frequency table gives information about the heights of 30 students.

Height (h cm)	Frequency
$130 < h \leqslant 140$	1
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	8
$160 < h \leqslant 170$	10
$170 < h \leqslant 180$	4

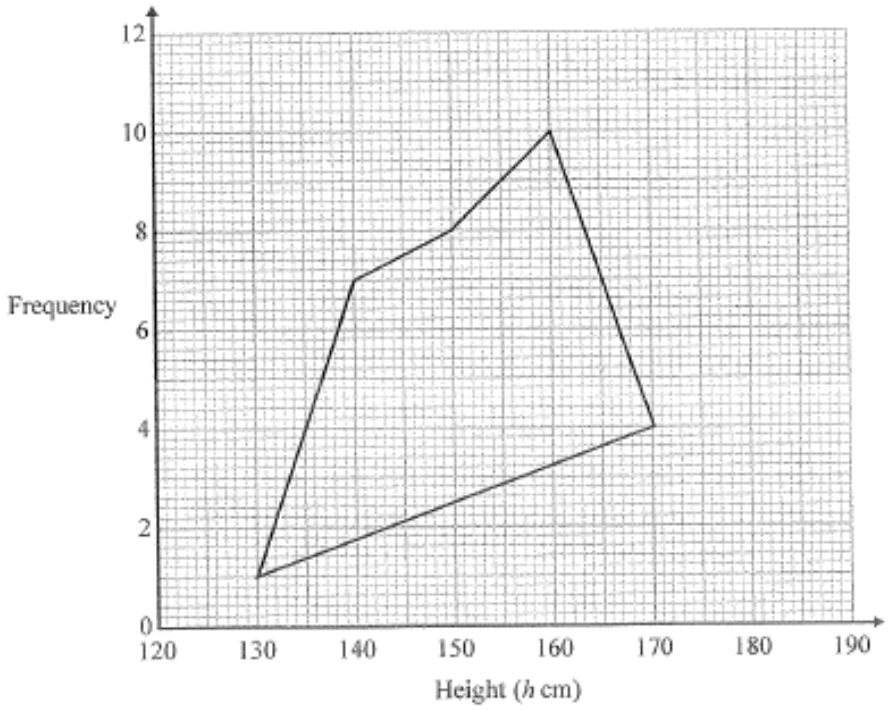
(a) Write down the modal class interval.

160<h≤170

(1)

1 / 1

This incorrect frequency polygon has been drawn for the information in the table.



(b) Write down two things wrong with this incorrect frequency polygon.

1 ~~Not~~ All the points are joined togeth

2 There are no crosses (x)

The end joins to the beginning

(2)

(Total for Question 23 is 3 marks)

1 / 2

Examiner Comments

In part (b) the first reason is not sufficient, neither is the reason 'there are no crosses'. However, a mark can be awarded for the final statement of 'the end joins to the beginning'.

Exemplar Question 14

Foundation tier / Higher tier Paper 2 (calculator)

26/7 Becky has some marbles.

Chris has two times as many marbles as Becky.

Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says,

"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?

You must show how you get your answer.

(Total for Question 26/7 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
26/7		No, with supporting evidence	P1 for the start of a correct process, e.g. two of x, $2x$ and $2x+7$ oe or a fully correct trial, e.g. 5 + 10 + 17 = 32 P1 for setting up an equation in x. e.g. $x + 2x + 2x + 7 = 57$ or a correct trial totalling 57, e.g. 10 + 20 + 27 = 57 C1 (dep on P2) for at least one correct result and for a correct deduction from their answers found, e.g. Chris has 20 so it is impossible for all to have 20 since 60 marbles would be needed.

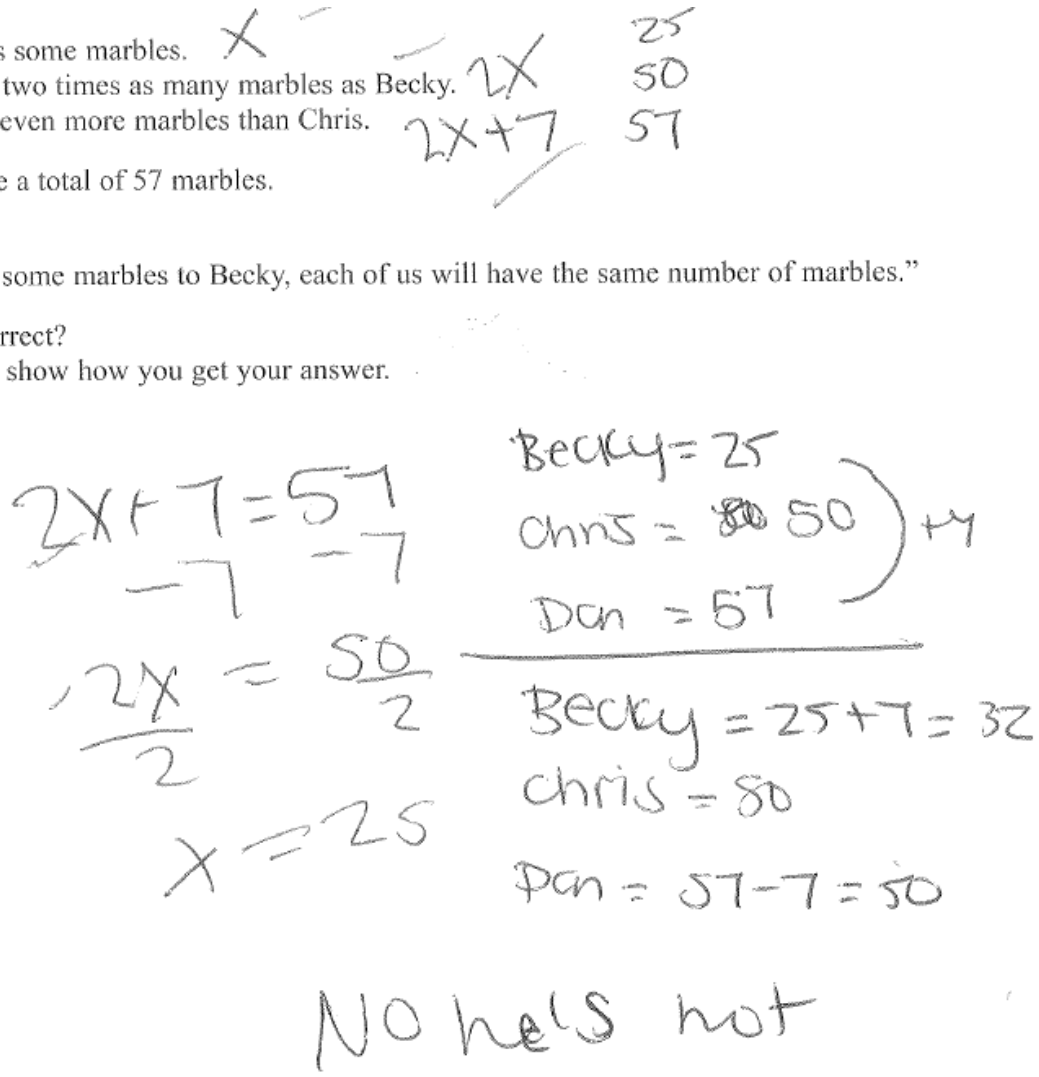
Student Attempt A

26 Becky has some marbles.
Chris has two times as many marbles as Becky.
Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says,
"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.



1 / 3

(Total for Question 26 is 3 marks)

Examiner Comments

This candidate has made a start using algebra with a correct expression given for each person. Unfortunately, the equation formed only uses one of these expressions.

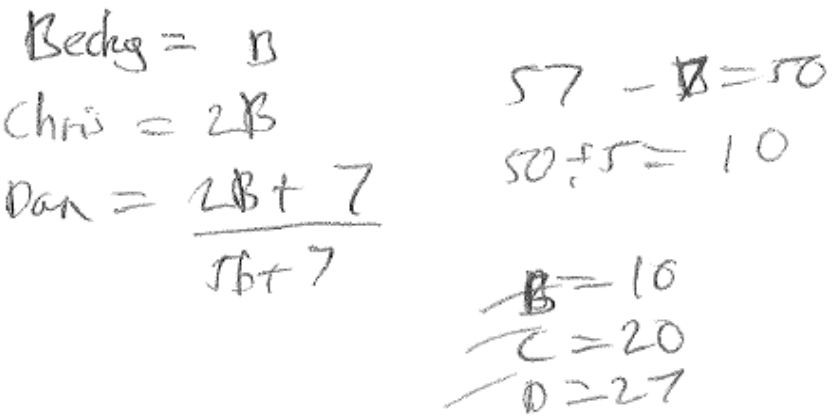
Student Attempt B

26 Becky has some marbles.
Chris has two times as many marbles as Becky.
Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says,
"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.



Dan is not correct be cause Becky would still need 3 if Dan and Chris have the same

2 / 3

(Total for Question 26 is 3 marks)

Examiner Comments

In this question, it was common to see candidates getting the correct number of marbles for each person, as seen here, but then fail to explain why Dan's statement was wrong. This candidate has made an attempt but hasn't gone far enough with their explanation.

Student Attempt C

26 Becky has some marbles.
Chris has two times as many marbles as Becky.
Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says,
"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.

50 - 7 = 50 20 + 20 + 10 = 50

Dan Chris Becky
27 ✓ 20 ✓ 10 ✓

Dan is incorrect because he can only give Becky 7 marbles and that won't be enough and if he gives her anymore than 7 then Chris will have more than Dan. ✓

3 / 3

(Total for Question 26 is 3 marks)

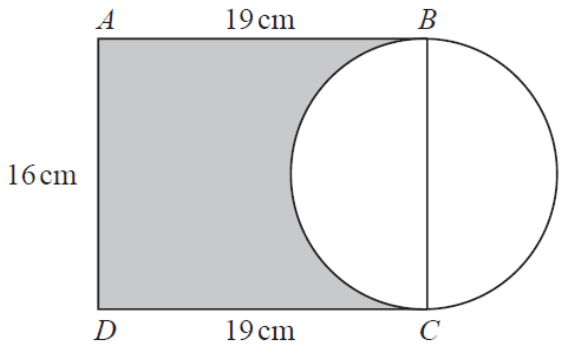
Examiner Comments

This candidate has found the correct number of marbles for each person and supplied a correct explanation as to why Dan is wrong.

Exemplar Question 15

Foundation tier / Higher tier Paper 2 (calculator)

27/8 Here is a diagram showing a rectangle, *ABCD*, and a circle.



BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.

Give your answer correct to 1 decimal place.

.....%

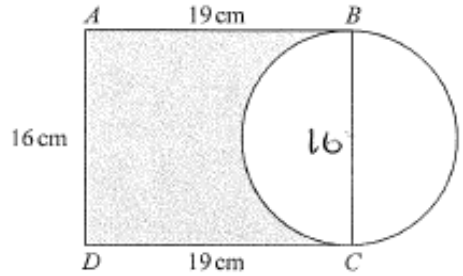
(Total for Question 27/8 is 4 marks)

Mark Scheme

Question	Working	Answer	Notes
27/8		66.9	P1 for process to find the area of one shape, e.g. 19×16 (= 304) or $\pi \times 8^2$ (= 201.06...) P1 for process to find the shaded area, e.g. "304" – "201.06" ÷2 (= 203.46...) P1 for a complete process to find required percentage, e.g. $\frac{"203.46"}{304} \times 100$ A1 for answer in range 66 to 68

Student Attempt A

27 Here is a diagram showing a rectangle, *ABCD*, and a circle.



BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.
Give your answer correct to 1 decimal place.

$\pi \times r^2 = \frac{\pi \times 8^2}{2} = 100.53096491$

$19 \times 16 = 304$

$304 - 100.53096491 = 203.46903509$

$100\% = 19 \times 16 = 304$

$304 + 100.53096491 = 404.53096491$

$404.53096491 \div 203.46903509 = 1.988169673$

Area of shaded

$\frac{203.46903509}{404.53096491} = 0.502975202 \times 100 = 50.29752029$

Circle = 360
Rectangle = 19 × 16 = 304

2 **2 / 4**

50.3 %

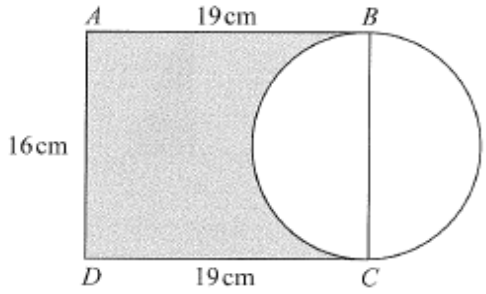
(Total for Question 27 is 4 marks)

Examiner Comments

The area of the shaded region has been found correctly to gain the first two process marks. However, the candidate has then gone on to find the percentage of the shape that is shaded rather than the percentage of the rectangle that is shaded.

Student Attempt B

27 Here is a diagram showing a rectangle, *ABCD*, and a circle.



BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.
Give your answer correct to 1 decimal place.

area of circle = π × 16² × 50.265

Area of rec. = 19 × 16 = 304 ✓

50.265 ÷ 2 = 25.133

Shaded part of rectangle 304 − 25.133 = 278.867

= 278.9

×

1 / 4

.....%

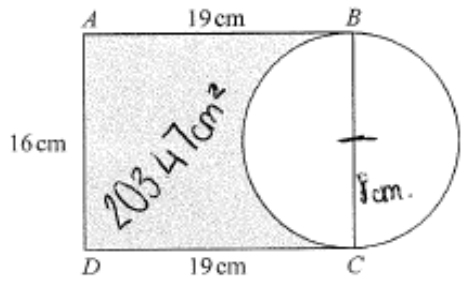
(Total for Question 27 is 4 marks)

Examiner Comments

A common error when tackling questions involving circles is the use of the wrong formula. This is seen clearly here with the use of the formula for the circumference rather than the area. The only mark that can therefore be awarded is the first mark for the area of the rectangle.

Student Attempt C

27 Here is a diagram showing a rectangle, $ABCD$, and a circle.



πr^2

BC is a diameter of the circle.

Calculate the percentage of the area of the rectangle that is shaded.
Give your answer correct to 1 decimal place.

$8^2 = 64 \times \pi = 201.06 \div 2 = 100.53$.

$16 \times 19 = 304$.

$304 - 100.53 = 203.47$.

$304 \div 100 = 30.4$.

$304 \times 203.47 = 618.5$. $= 61.85$.

61.9%

1

2 / 4

61.9 %

(Total for Question 27 is 4 marks)

Examiner Comments

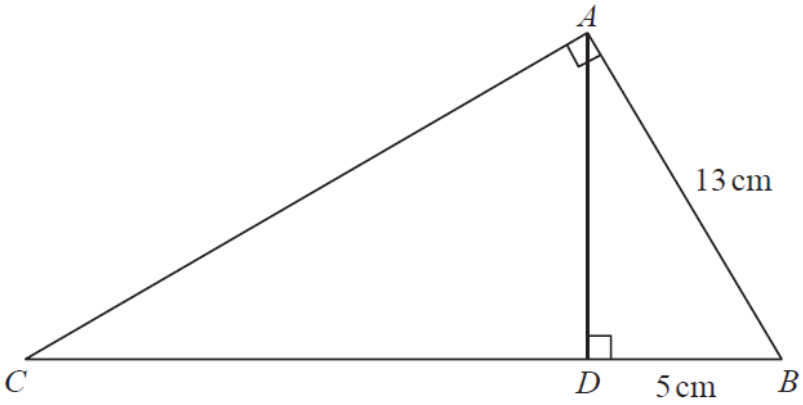
The shaded area and the area of the rectangle have both been found correctly but then the candidate is unable to use these correctly to calculate the required percentage.

Paper 2H (calculator)

Exemplar Question 16

Higher tier Paper 2 (calculator)

14 *ABC* and *ABD* are two right-angled triangles.



Angle *BAC* = angle *ADB* = 90°

AB = 13 cm

DB = 5 cm

Work out the length of *CB*.

..... cm

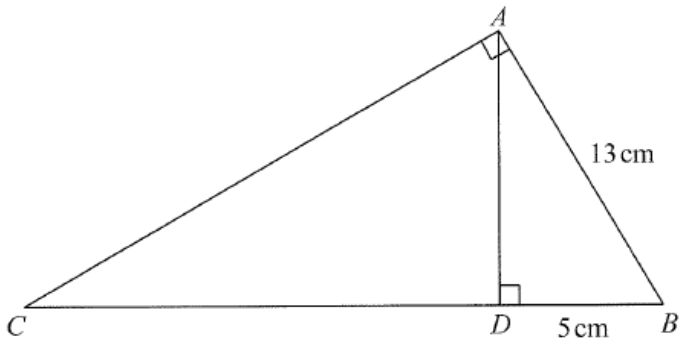
(Total for Question 14 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
14		33.8	P1 for recognition of similar triangles or equal ratio of sides P1 for process to find *CB*, e.g. $\frac{5}{13} = \frac{13}{CB}$ A1 for 33.8

Student Attempt A

14 *ABC* and *ABD* are two right-angled triangles.



Angle *BAC* = angle *ADB* = 90°

AB = 13 cm
DB = 5 cm

Work out the length of *CB*.

SOH CAH TOA

sin(Angle DAB) = 5/13
= 0·38

Angle DAB = $\sin^{-1}$ 0·38
= 22·62° ✓

Angle CAD = 90 − 22·62°
= 67·38° ✓

AD = $\sqrt{13^2 - 5^2}$
= 12 ✓

CD = tan(67·38°) × 12
= 28·8

CB = 28·8 + 5
= 33·8 cm ✓

3 / 3

33·8 cm ✓

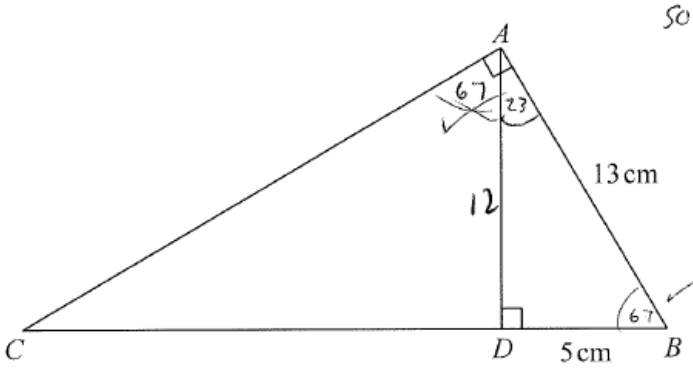
(Total for Question 14 is 3 marks) 3

Examiner Comments

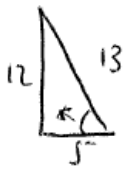
The most efficient way to solve this problem was to use similar triangles. However, the most common method of solution was to use trigonometry and/or Pythagoras's theorem. Candidates who maintained accuracy throughout their solution generally scored full marks.

Student Attempt B

14 *ABC* and *ABD* are two right-angled triangles.



SOHCAHTOA



$\tan = \frac{12}{5}$

$\tan^{-1} = 67.38$

$67 + 90 = 157$

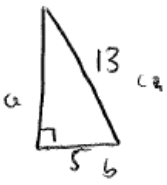
$180 - 157 = 73$

Angle BAC = angle ADB = 90°

AB = 13 cm

DB = 5 cm

Work out the length of CB.



$a^2 + b^2 = c^2$

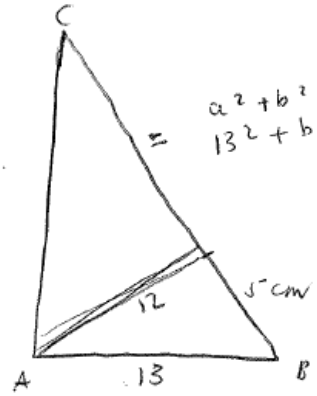
~~$a = 5^2 +$~~

$13^2 = a^2 + 5^2$

$169 = a^2 + 25$

$169 - 25 = 144 = 12^2$

$a = 12$



$a^2 + b^2 = c^2$

$13^2 + b^2 = (x+5)^2$

2 / 3

$\sin(67) = \frac{x}{30.7}$

$x = \sin(67) \times 30.7$

~~$\cos(67) = \frac{12}{x}$~~

~~$\tan(67) =$~~

$= 28.27$

$\cos(67) = \frac{12}{x} =$

$x = \frac{12}{\cos 67} = 30.7$

$28.27 + 5 = 33.27$

33.27 x cm

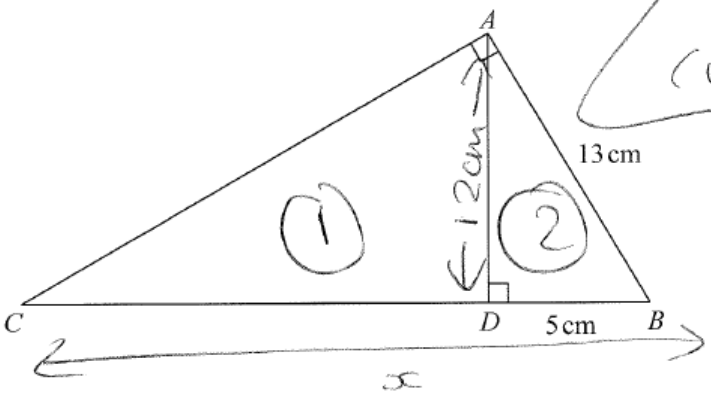
(Total for Question 14 is 3 marks) 2

Examiner Comments

This is a good example of the loss of the final accuracy mark due to premature rounding. The method shown here is fully correct but, with so many stages, accuracy has been lost along the way.

Student Attempt C

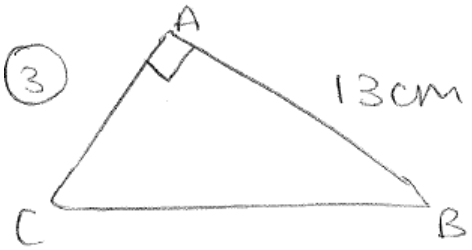
14 *ABC* and *ABD* are two right-angled triangles.



Angle *BAC* = angle *ADB* = 90°

AB = 13 cm
DB = 5 cm

Work out the length of *CB*.



$c^2 = a^2 + b^2$
$13^2 = a^2 + 5^2$
$169 = a^2 + 25$
$144 = a^2$
$a = 12$

X

0 / 3

..... cm

(Total for Question 14 is 3 marks) 0

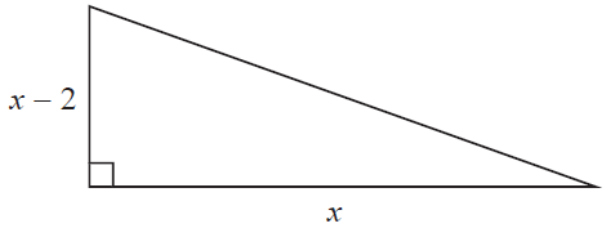
Examiner Comments

This candidate does have a correct first step using Pythagoras's Theorem. However, as this is the start of an inefficient method, it is therefore necessary to make further progress before a mark can be awarded.

Exemplar Question 17

Higher tier Paper 2 (calculator)

19 Here is a right-angled triangle.



All measurements are in centimetres.

The area of the triangle is 2.5 cm^2.

Find the perimeter of the triangle.

Give your answer correct to 3 significant figures.

You must show all of your working.

..... cm

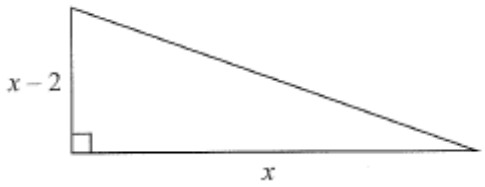
(Total for Question 19 is 6 marks)

Mark Scheme

Question	Working	Answer	Notes
19		8.63 to 8.65	P1 for a start of process, eg. $0.5x(x-2) = 2.5$ P1 for rearranging to give a quadratic equation, e.g. $x^2 - 2x - 5 = 0$ oe. P1 for a process to solve the quadratic equation, condoning one sign error in use of formula ($x = 3.449...$ and $x = -1.449...$) P1 for selecting the positive value of x and applying Pythagoras to find the hypotenuse, e.g. $\sqrt{(3.449^2 + 1.449^2)}$ (= 3.74...) for complete process to find perimeter P1 for answer in the range 8.63 to 8.65 A1

Student Attempt A

19 Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm².

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

$2.5 = \frac{x \times x-2}{2}$ ✓

$2.5 = \frac{x^2 - 2x}{2}$

$5 = x^2 - 2x$ ✓

$5 = x(x-2)$

$5 = x^2 - 2x$

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

$\text{hyp} = \sqrt{x^2 + x^2 + 4}$

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

$= \sqrt{2x^2} + 2$

2 / 6

X ..... cm

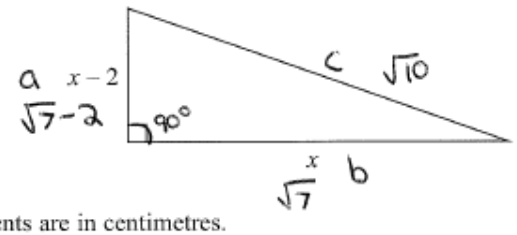
(Total for Question 19 is 6 marks) 2

Examiner Comments

It was common to see missing brackets in an otherwise correct algebraic statement – as seen in the first line of working here. However, in this case, the candidate recovers their error in the second line of working. This candidate gets to the correct quadratic equation but is then unable to solve this – the quadratic formula must be learnt.

Student Attempt B

19 Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm².

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

$\sqrt{7} - 2 + \sqrt{7} + \sqrt{10}$

$= 6.453780282$

$\frac{1}{2} \times a \times b \times \sin(c) = \text{area}$

$\frac{1}{2} \times x - 2 \times x \times \sin(90) = 2.5$ ✓

$\div \frac{1}{2}$

$x - 2 \times x \times \sin(90) = 5$

$\div \sin(90)$

$x - 2 \times x = 5$

$+2$

$x \times x = 7$

$x^2 = 7$

$\sqrt{}$

$x = 2.645751311$ ✗

$c^2 = a^2 + b^2$

$c^2 = (\sqrt{7} - 2)^2 + \sqrt{7}^2$

$c^2 = 7 - 4 + 7$

$c^2 = 3 + 7$

$c^2 = 10$

$\sqrt{}$

$c = \sqrt{10}$

6.45 cm ✗

3 / 6

(Total for Question 19 is 6 marks)

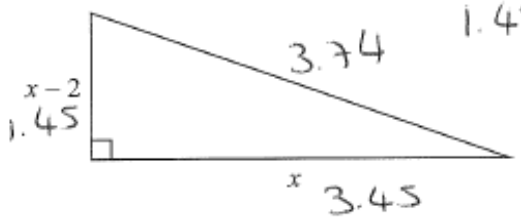
Examiner Comments

The candidate has formed a correct equation apart from the lack of brackets around $x - 2$. The candidate never recovers from this and so fails to find a correct value for x. However, they are able to use their value to go on to find the lengths of the other sides of the triangle and thus the perimeter, so some of the later process marks can be awarded.

Student Attempt C

19 Here is a right-angled triangle.

$1.45^2 + 3.45^2 = 3.74^2$



All measurements are in centimetres.
The area of the triangle is 2.5 cm².

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

$\frac{1}{2} x \times (x-2) = 2.5$

$(\frac{1}{2}(x^2 - 2x) = 2.5$

$x^2 - 2x = 5$

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

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

$a = 1 \quad b = -2 \quad c = -5$

$= \frac{2 \pm \sqrt{4 - 4(1 \times -5)}}{2 \times 1}$

$= \frac{2 \pm \sqrt{4 + 20}}{2}$

$= \frac{2 \pm \sqrt{24}}{2}$

$+ = 3.45 \quad x = 3.45$

$- = -1.45$

$3.45 - 2 = 1.45$

$3.45 + 1.45 + 3.74 = 8.64$

8.64 cm

6 / 6

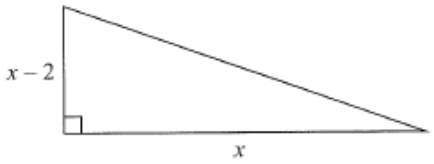
(Total for Question 19 is 6 marks)

Examiner Comments

It was encouraging to see a number of fully correct solutions to this problem – as seen here.

Student Attempt D

19 Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm^2.

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

$b \times h \times \frac{1}{2}$

$x(x-2)\frac{1}{2} = 2.5$

$\frac{1}{2}(x^2 - 2x) = 2.5$

$x^2 - 2x = 5$

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

-5 1
-1 5

x	-5
+	-2

$\frac{-b \pm \sqrt{a^2c^2 - b^2(4 \times a \times c)}}{2a}$

$x = 6.123$

637.3165

$(6.123-2)^2 \times 6.123^2 = 25.2451$

$\sqrt{25.2451} = 5.024$

$\sqrt{637.3165} = 25.245$

35.49cm

2

(Total for Question 19 is 6 marks)

5.0244 + 6.123 + (6.123 - 2) =

15.27

25.245 + 6123 + (6123 - 2) = 35.49

5

2 / 6

Examiner Comments

This candidate gets to the correct quadratic but then is unable to remember the quadratic formula correctly. The subsequent work is also incorrect with a multiplication rather than an addition sign in the attempt at using Pythagoras's Theorem.

Exemplar Question 18

Higher tier Paper 2 (calculator)

21 The number of bees in a beehive at the start of year n is P_n.

The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$

At the start of 2015 there were 9500 bees in the beehive.

How many bees will there be in the beehive at the start of 2018?

.....

(Total for Question 21 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
21		10169 or 10170	P1 for correct use of formula to find number in 2016, e.g. 1.05(9500 – 250) (= 9712.5) P1 for complete iterative process, e.g. 2017: 1.05(9712.5 – 250) (= 9935.625) 2018: 1.05(9935.625 – 250) C1 for answer of 10169.90... correctly rounded or truncated to nearest whole number

Student Attempt A

21 The number of bees in a beehive at the start of year n is P_n.
The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$

At the start of 2015 there were 9500 bees in the beehive.

How many bees will there be in the beehive at the start of 2018?

confusing

1.05 (9500 - 250) = 9725 - 2016

1.05 (9725 - 250) = 9948.75 - 2017

1.05 (9948.75 - 250) = 10183.6875 - 2018

2 / 3

10,184

~~10183.6875~~

(Total for Question 21 is 3 marks)

Examiner Comments

The first substitution is correct but has been evaluated incorrectly. However, the candidate has clearly shown the subsequent substitutions so both process marks (but not the accuracy mark) can be awarded.

Student Attempt B

21 The number of bees in a beehive at the start of year n is P_n.
The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$

At the start of 2015 there were 9500 bees in the beehive.

How many bees will there be in the beehive at the start of 2018?

$P_{2016} = 1.05 \times (9500 - 250)$

$P_{2016} = 9712.5$

$P_{2017} = 1.05 (+9712.5 - 250)$

$P_{2017} = 9935.625$

$P_{2018} = (9935.625 - 250) 1.05$

2 / 3

10169.91

(Total for Question 21 is 3 marks)

Examiner Comments

There will be questions, as here, where candidates will need to think about the accuracy of their answer. Here, the question is about the number of bees and so an integer answer was expected. For that reason, this candidate loses the final accuracy mark for giving a decimal answer.

Student Attempt C

21 The number of bees in a beehive at the start of year n is P_n.
The number of bees in the beehive at the start of the following year is given by

$$P_{n+1} = 1.05(P_n - 250)$$ – annual

At the start of 2015 there were 9500 bees in the beehive.

How many bees will there be in the beehive at the start of 2018? – 3 years

$P = 9500$

$P_{3+1} = 1.05(P_3 - 250)$

$P_4 = 1.05(P_3 - 250)$

~~9500_4~~ $= 1.05(9500 - 250)$ ✓

~~39837.5~~ 19687.5 19688

~~39638~~ 19688 ~~39638~~

1 / 3

(Total for Question 21 is 3 marks)

Examiner Comments

The 4th line of working shows the correct substitution to find the population at the end of year 1 and so gains the first process mark. Some further figures are given but these are incorrect and no working is shown to explain where they have come from so no further marks can be awarded.

Paper 3F (calculator)

Exemplar Question 19

Foundation tier Paper 3 (calculator)

5 There are 1.5 litres of water in a bottle.

There are 250 millilitres of water in another bottle.

Work out the total amount of water in the two bottles.

.....

(Total for Question 5 is 3 marks)

Mark Scheme

Question	Working	Answer	Notes
5		1.75 *l* or 1750 m*l*	B1 for knowledge of 1 litre is 1000 millilitres P1 for adding their two amounts C1 for 1.75 *l* or 1750 m*l* (must include units)

Student Attempt A

5 There are 1.5 litres of water in a bottle.

There are 250 millilitres of water in another bottle.

Work out the total amount of water in the two bottles.

1·5
+ 0·25
= 1·75

2 / 3

1·75

(Total for Question 5 is 3 marks)

Examiner Comments

The candidate has used the correct method; the answer is correct but no units have been given. Where there are no units given on the answer line these must be provided, when appropriate, by the candidate.

Student Attempt B

5 There are 1.5 litres of water in a bottle.

There are 250 millilitres of water in another bottle.

Work out the total amount of water in the two bottles.

1.5 litres = 150 millilitres ✗

150 + 250 = 400 miliilitres = 4 Litres ✗

1 / 3

4 litres

(Total for Question 5 is 3 marks)

Examiner Comments

Candidates are expected to know all the appropriate conversions for metric units. It was very common in this question to see the wrong conversion factor being used. In this case 100 rather than 1000 is used for the conversion from litres to millilitres.

Student Attempt C

5 There are 1.5 litres of water in a bottle.

There are 250 millilitres of water in another bottle.

Work out the total amount of water in the two bottles.

250ml = 25cl = 0.25L ✓

1 / 3

✗

1.525L

(Total for Question 5 is 3 marks)

Examiner Comments

One mark can be awarded here for the correct conversion from millilitres to litres. There is then no method shown so it isn't clear where the (incorrect) answer of 1.525 litres has come from. Candidates should show all stages of their working.

Exemplar Question 20

Foundation tier Paper 3 (calculator)

8 Jayne writes down the following

$3.4 \times 5.3 = 180.2$

Without doing the exact calculation, explain why Jayne's answer cannot be correct.

.....

.....

(Total for Question 8 is 1 mark)

Mark Scheme

Question	Working	Answer	Notes
8		Statement	C1 for a full explanation

Student Attempt A

8 Jayne writes down the following

$$3.4 \times 5.3 = 180.2$$

Without doing the exact calculation, explain why Jayne's answer cannot be correct.

because 180.2 is way too big to be correct.

0 / 1

(Total for Question 8 is 1 mark)

Examiner Comments

The candidate is right, 180.2 is 'way too big' but there is nothing to explain how they have come to this conclusion.

Student Attempt B

8 Jayne writes down the following

$$3.4 \times 5.3 = 180.2$$

Without doing the exact calculation, explain why Jayne's answer cannot be correct.

Because they both only have one didget bfore the deimal.

0 / 1

(Total for Question 8 is 1 mark)

Examiner Comments

This candidate is nearly there but, in order to gain the mark, needs to be more specific and state that the answer should have two digits after (rather than before) the decimal point.

Student Attempt C

8 Jayne writes down the following

$$3.4 \times 5.3 = 180.2$$

Without doing the exact calculation, explain why Jayne's answer cannot be correct.

3 x 5 = 15

Therefore it's not going to be in the hundreds.

1 / 1

(Total for Question 8 is 1 mark)

Examiner Comments

This candidate has used an estimate to show that the answer cannot be correct.

Paper 3H (calculator)

Exemplar Question 21

Higher tier Paper 3 (calculator)

8 Ian invested an amount of money at 3% per annum compound interest.

At the end of 2 years the value of the investment was £2652.25.

(*a*) Work out the amount of money Ian invested.

£.....

(3)

Noah has an amount of money to invest for five years.

Saver Account	Investment Account
4% per annum compound interest.	21% interest paid at the end of 5 years.

Noah wants to get the most interest possible.

(*b*) Which account is best?
You must show how you got your answer.

(2)

(Total for Question 8 is 5 marks)

Mark Scheme

Question	Working	Answer	Notes
8(a)		2500	P1 for use of 1.03 P1 for a full method equivalent to $\div 1.03^2$ A1 2500
8(b)		Saver account with support	P1 process to find a comparable total interest figure A1 for conclusion with supporting statement e.g.21.(665..) > 21

Student Attempt A

8 Ian invested an amount of money at 3% per annum compound interest.
At the end of 2 years the value of the investment was £2652.25

(a) Work out the amount of money Ian invested.

$x + 1.03^{x2} = £2652.25$

$2652.25 - 1.03^{2}$

2651.19

~~2651.16~~

£.....

(3)

1 / 3

Noah has an amount of money to invest for five years.

Saver Account	Investment Account
4% per annum compound interest.	21% interest paid at the end of 5 years.

Noah wants to get the most interest possible.

(b) Which account is best?
You must show how you got your answer.

Saver:
Assume Noah invests £1000.

$1000 \times 1.04^{5} = £1216.65$

Investment:

$1000 \times 1.21 = £1210$ ∴ The saver account is best.

2

(2)

2 / 2

(Total for Question 8 is 5 marks)

Examiner Comments

In part (a) the candidate gains one mark for the correct multipliers but has used the wrong operation. The most common method of solution in part (b) was to assume that Noah invested a certain amount of money and work with that amount.

Student Attempt B

8 Ian invested an amount of money at 3% per annum compound interest.
At the end of 2 years the value of the investment was £2652.25

(a) Work out the amount of money Ian invested.

$2652 \cdot 25 \div 1 \cdot 03^2 = 2500$

3 / 3

£ 2500

(3)

Noah has an amount of money to invest for five years.

Saver Account	Investment Account
4% per annum compound interest.	21% interest paid at the end of 5 years.

Noah wants to get the most interest possible.

(b) Which account is best?
You must show how you got your answer.

Saver account

$n \times 1 \cdot 04^5$

$= 1 \cdot 21\,665\,2902n$

Investment Acc.

$n \times 1 \cdot 21$

$= 1 \cdot 21n$

2 / 2

Saver Account is better by 0·006652902 times.

(2)

(Total for Question 8 is 5 marks)

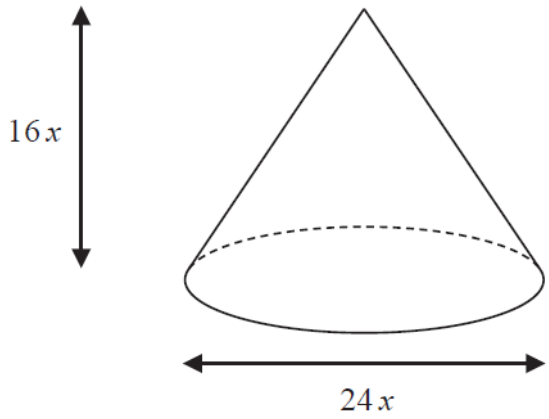
Examiner Comments

In part (b) this candidate has worked with multipliers – realising that the amount of money invested is irrelevant.

Exemplar Question 22

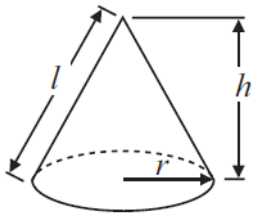
Higher tier Paper 3 (calculator)

17 The diagram shows a solid cone.



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



The diameter of the base of the cone is $24x$ cm.

The height of the cone is $16x$ cm.

The curved surface area of the cone is 2160π cm^2.

The volume of the cone is $V\pi$ cm^3, where V is an integer.

Find the value of V.

.....

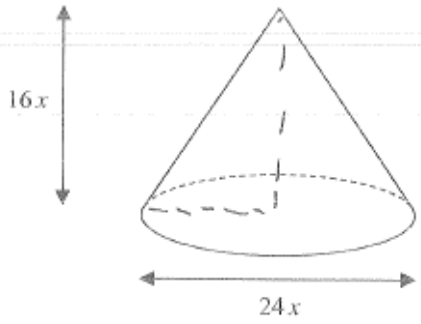
(Total for Question 17 is 5 marks)

Mark Scheme

Question	Working	Answer		Notes
17	$l = 20x$ $x = 3$	20736	P1	for a method to find the slant height of the cone e.g. $\sqrt{16x^2 + 12x^2}$ or by similar triangles and Pythagorean triples
			P1	for setting up an equation for the curved surface area in terms of x e.g. $2160\pi = \pi \times 12x \times 20x$
			P1	for complete method to find the value of x
			P1	for a method to find the volume
			A1	cao

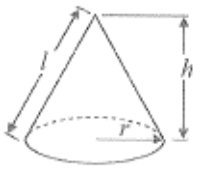
Student Attempt A

17 The diagram shows a solid cone.



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



The diameter of the base of the cone is $24x$ cm.
The height of the cone is $16x$ cm.

The curved surface area of the cone is 2160π cm^2.
The volume of the cone is $V\pi$ cm^3, where V is an integer.

Find the value of V.

$\pi \times 12x \times L = 2160\pi$

$12x \times L = 2160 cm^2$

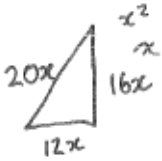
$xL = \frac{2160}{12}$

$xL = 180 cm^2$ P1

$20x^2 = 180 cm^2$ P1

$x^2 = 9$

$x = 3$ P1



$\frac{1}{3} \times \pi \times 12x^2 \times 16x$

$\pi \times 12x3^2 \times 16x3 =$

$\div \pi$

$5428.679 =$

1728

$1728\pi cm^3$

3 / 5

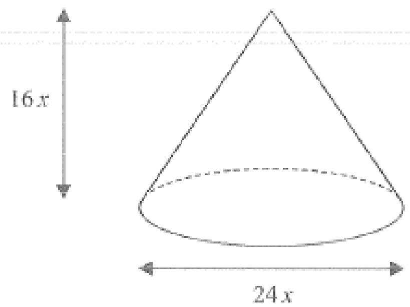
(Total for Question 17 is 5 marks)

Examiner Comments

A common error when dealing with algebra and squaring expressions is to omit brackets. This can be seen in this example where the candidate writes an expression for the volume of the cone and uses $12x^2$ instead of the correct $(12x)^2$. Up to this point the solution was correct.

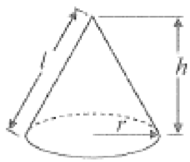
Student Attempt B

17 The diagram shows a solid cone.



Volume of cone $= \frac{1}{3}\pi r^2 h$

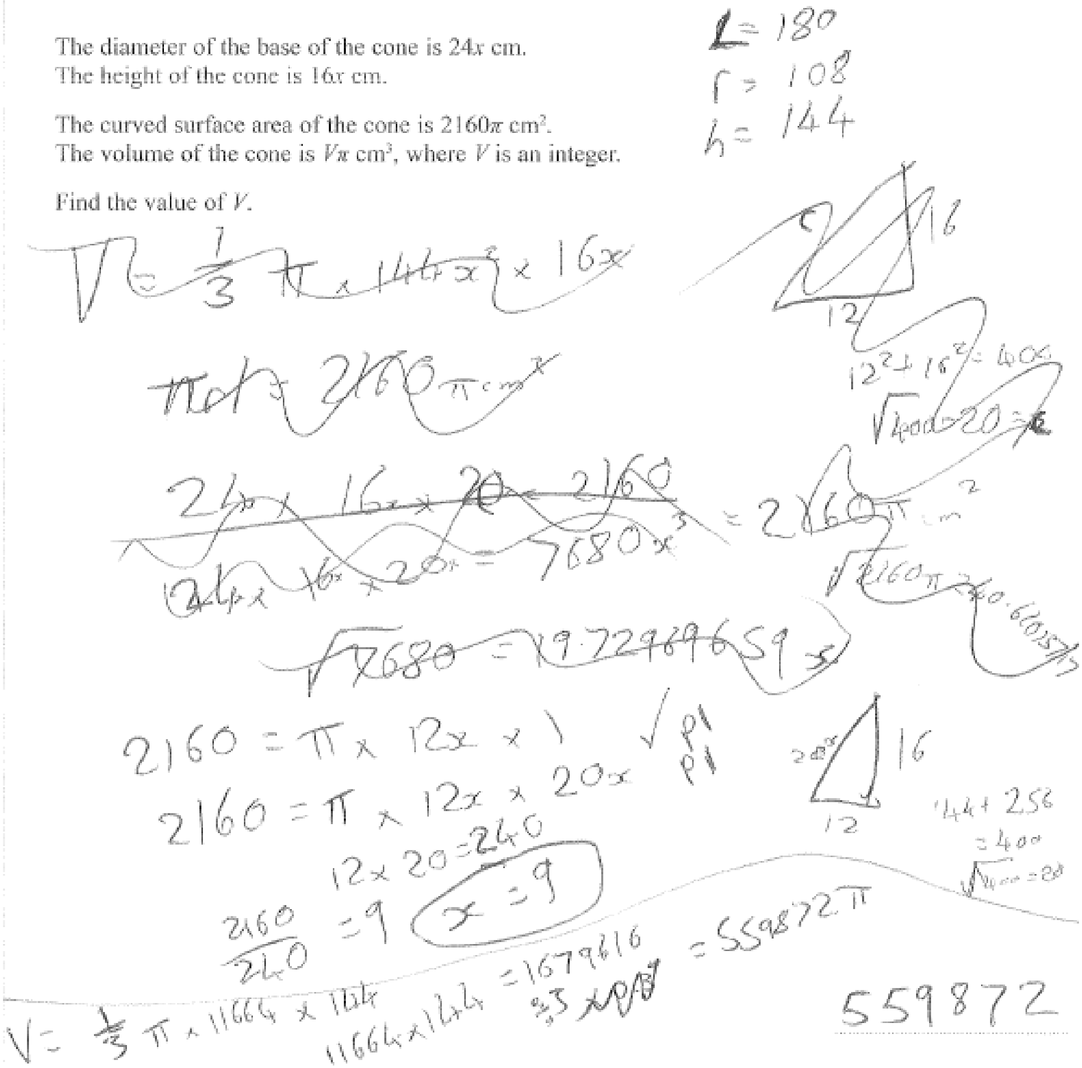
Curved surface area of cone $= \pi r l$



The diameter of the base of the cone is $24x$ cm.
The height of the cone is $16x$ cm.

The curved surface area of the cone is 2160π cm^2.
The volume of the cone is $V\pi$ cm^3, where V is an integer.

Find the value of V.



(Total for Question 17 is 5 marks)

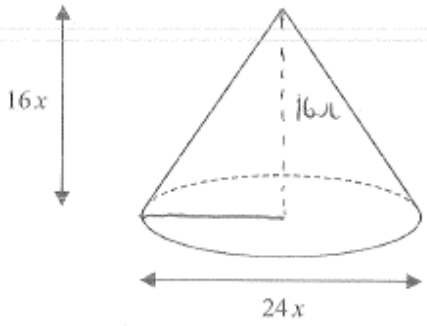
2 / 5

Examiner Comments

It can sometimes be very difficult to follow work through – as is the case here. On close inspection, the candidate has used Pythagoras's Theorem correctly to arrive at $20x$ for the height of the cone and then used this in the formula for the curved surface area. However, the final value for x is incorrect – 9 instead of 3. From this point onwards the working is not clear, values have been used for the volume but there is no indication where these have come from so no further marks can be awarded.

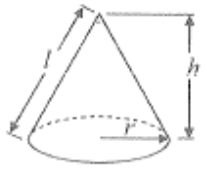
Student Attempt C

17 The diagram shows a solid cone.



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



The diameter of the base of the cone is $24x$ cm.
The height of the cone is $16x$ cm.

The curved surface area of the cone is 2160π cm^2.
The volume of the cone is $V\pi$ cm^3, where V is an integer.

Find the value of V.

$2160\pi = (16x \times 24x)\pi$

$2160\pi = 384x^2\pi$

$2160 = 384x^2$

$5.625 = x^2$

$x = 2.371708245$

$2160\pi = 192x^2\pi$

$2160 = 192x^2$

$11.25 = x^2$

$x = 3.354101966$

$\frac{16(3) \times (12(3))^2 \times \pi}{3}$

$\frac{48 \times (36)^2 \pi}{3} = \frac{62208\pi}{3} = 20736\pi$

$20736\pi \text{ cm}^3$

$\sqrt{(16x)^2 + (12x)^2}$

$\sqrt{256x^2 + 144x^2}$

$\sqrt{400x^2}$

$\sqrt{20x} = l$

2160π

$2160\pi = 20x \times 12x\pi$

$2160\pi - 2160\pi = 240x^2\pi$

$2160\pi - 2160 = 240x^2$

$964 = x^2$

$x = 3$

P3

P1

A0

(Total for Question 17 is 5 marks)

4/5

Examiner Comments

A fully correct solution but the final mark is lost as the candidate has not provided the answer that the question requires. The candidate has given the volume of the cone rather than the value of V and so loses the final mark.