Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2024

Mathematics

StemUp Model Solution

Unit M2
(With calculator)
Foundation Tier



[GMC21]

GMC21

TUESDAY 19 NOVEMBER, 9.15am–11.00am

TIME

1 hour 45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Questions which require drawing or sketching should be completed using an HB pencil.
All working **must** be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.
Answer **all thirty** questions.

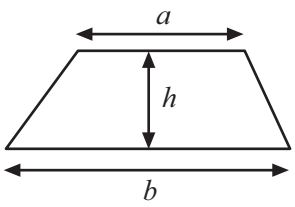
INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

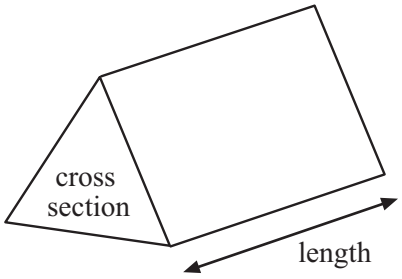
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Formula Sheet

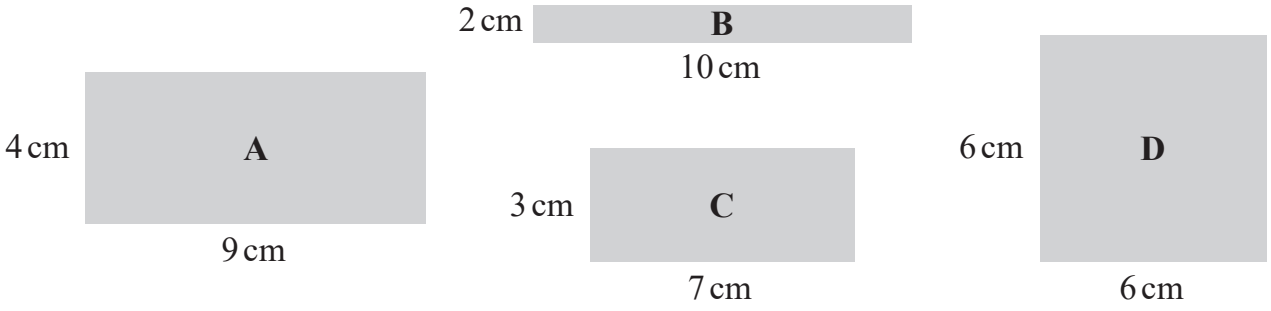
Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = area of cross section × length



1 **(a)** Four shapes are shown.



(i) What is the perimeter of rectangle **C**?

7 + 3 + 7 + 3 = 20

Answer 20 cm [1]

(ii) Which two shapes have the same area?

A: 4 × 9 = 36 B: 2 × 10 = 20

C: 3 × 7 = 21 D: 6 × 6 = 36

Answer Shapes A and D [1]

(b) A rectangle, **E**, has an area of 42 cm^2

It has a length of 6 cm.

What is the perimeter of this rectangle?

width = 42 ÷ 6 = 7 cm

perimeter = 7 + 6 + 7 + 6 = 26

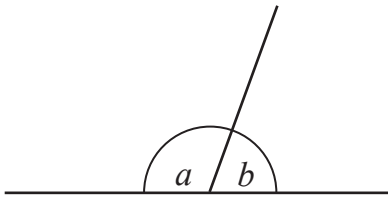
Answer 26 cm [2]

[Turn over

2 Angle a is twice the size of angle b.

The diagram is not drawn accurately.

What size is angle a?



$a + b = 180$ (angles on a straight line)

$2b + b = 180$ so $3b = 180$

$b = 180 \div 3 = 60$

$a = 60 \times 2 = 120$

Answer $a =$ 120 ° [2]

3 The weights, in kg, of rugby players are shown below.

125	111	125	117	116	108	105	107

(a) What is the range of the weights?

125 − 105 = 20

Answer 20 kg [1]

(b) Calculate the mean weight.

(125 + 111 + 125 + 117 + 116 + 108 + 105 + 107) ÷ 8

= 914 ÷ 8

= 114.25

Answer 114.25 kg [3]

(c) Find the median weight.

105, 107, 108, 111, 116, 117, 125, 125

(111 + 116) ÷ 2 = 227 ÷ 2 = 113.5

Answer 113.5 kg [2]

[Turn over

4 The final scores in a golf competition are shown below.

Team Europe		Team USA	
Rory	+ 7	James	– 2
Tommy	– 3	Jordan	+ 4
Justin	– 5	Scottie	– 6
Seve	+ 2	Patrick	+ 1

(a) The best player was the player with the **lowest** score.

Who was the best player?

Answer Scottie [1]

(b) What was the difference between the scores for Rory and Justin?

+7 – (–5) = 7 + 5 = 12

Answer 12 [1]

(c) The team with the **lowest total** score won the competition.

Which team won the competition?

Show your working out clearly.

Europe: 7 – 3 – 5 + 2 = +1

USA: –2 + 4 – 6 + 1 = –3

Answer Team USA because Europe total = +1, USA total = –3 and –3 is lower than +1 [2]

5 $\frac{2}{3}$ of the students in a school were entitled to free school meals.

There were 741 students in the school.

How many students were entitled to free school meals?

741 ÷ 3 = 247

247 × 2 = 494

Answer 494 [2]

6 Two shops were offering money off a games console.

Shop	Price	Discount
Play Away	£580	15%
Game Garden	£560	20%

Which shop offered more money off?

Show your working out clearly.

Play Away: 15% of 580 = 0.15 × 580 = £87

Game Garden: 20% of 560 = 0.2 × 560 = £112

£112 > £87

Answer Game Garden [3]

[Turn over

7 Maisie has 33 vitamin tablets.

She takes 7 vitamin tablets each week.

How many vitamin tablets will she have left over after 4 weeks?

$4 \times 7 = 28$

$33 - 28 = 5$

Answer 5 [2]

8 Damian is a delivery driver for a food takeaway.

He is paid £3 for each local delivery (L) and £5 for each non-local delivery (N).

To calculate the total amount of money (T) he is paid, Damian uses the formula

$$\mathbf{T = 3L + 5N}$$

Use the formula to calculate the total amount he is paid when he makes 8 local deliveries and 5 non-local deliveries.

$T = 3 \times 8 + 5 \times 5$

$= 24 + 25$

$= 49$

Answer £ 49 [2]

9 Matthew, Karen and Jamie were trying to work out the value of 5^3

Matthew thought it was 15

Karen thought it was 125

Jamie thought it was 8

Who was correct?

Explain your answer clearly.

$5^3 = 5 \times 5 \times 5 = 25 \times 5 = 125$

Answer Karen was correct because $5^3 = 5 \times 5 \times 5$

$= 125$ [2]

[Turn over

10 Ciara and Len were each given £40 as a Christmas present.

Ciara spent $\frac{17}{20}$ of the money she was given.

Len spent 80% of the money he was given.

Who spent more of their money?

Explain your answer clearly.

Ciara: $\frac{17}{20} \times 40 = £34$ (= 85%)

Len: 80% of 40 = 0.8 × 40 = £32

Answer Ciara because she spent £34 (85%) and Len spent only £32 (80%) [2]

11 At a paint shop

Emulsion paint costs £4.25 per litre

Gloss paint costs £6 per litre

Masonry paint costs £10.50 per litre

Orla bought 12 litres of emulsion paint, 2.5 litres of gloss paint and some masonry paint.

She paid £134.25 in total.

How many litres of masonry paint did she buy?

Emulsion: 4.25 × 12 = £51

Gloss: 6 × 2.5 = £15

134.25 − 51 − 15 = £68.25

Masonry: 68.25 ÷ 10.50 = 6.5

Answer 6.5 litres [4]

[Turn over

12

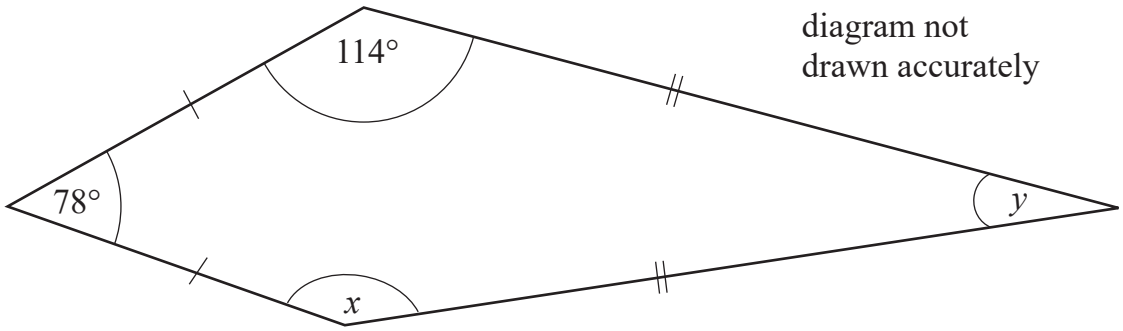


diagram not drawn accurately

The diagram shows the size of two angles in a kite.

Find the size of

(a) angle x

$x = 114$ (a kite has one pair of equal angles)

Answer 114 ° [1]

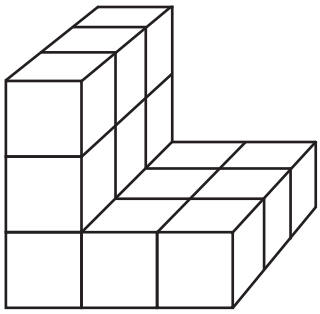
(b) angle y

$360 - (78 + 114 + 114)$

$= 360 - 306 = 54$

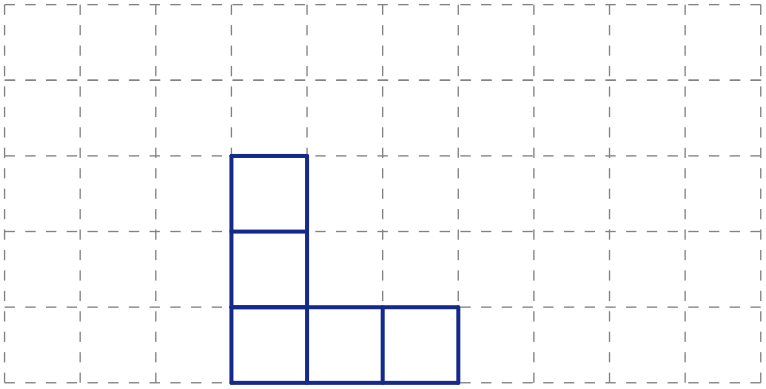
Answer 54 ° [2]

13 The diagram below shows a 3D shape made with centimetre cubes.

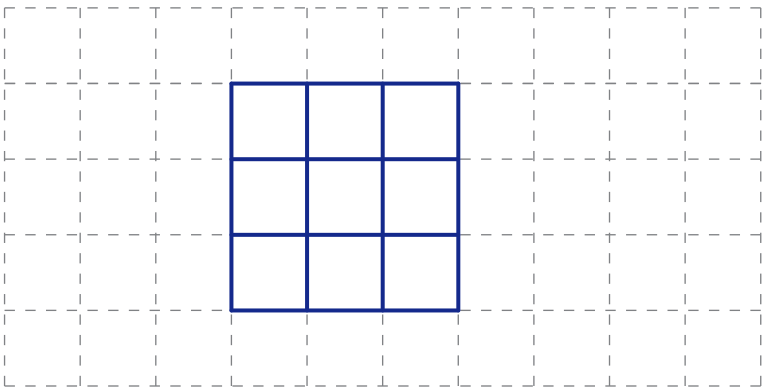


FRONT

(a) On the centimetre square grid below, draw the front elevation of the shape. [2]



(b) On the centimetre square grid below, draw the plan of the shape. [1]



[Turn over

14 The incomplete two-way table shows some information about cinema-goers one Saturday.

	Child	Adult	Senior citizen
Male	42	33	18
Female	78	27	12

(a) Use the following information to complete the two-way table.

In total there were 30 senior citizens.

There were 4 times as many children as senior citizens. [2]

Children = 4 × 30 = 120

120 − 78 = 42 30 − 18 = 12

(b) A child ticket is £3, an adult ticket is £7 and a senior citizen ticket is £5.50

The manager claims there was over £1000 in ticket sales.

Is he correct?

Show your working out clearly.

Adults = 33 + 27 = 60

120 × 3 + 60 × 7 + 30 × 5.50

= 360 + 420 + 165

= £945

Answer No because the total was only £945 which is less than £1000 [2]

15 A group of people were surveyed about the number of driving lessons they had before passing their driving test.

The results are shown in the stem and leaf diagram.

1	2	3	5	5	8	KEY: 3 | 6 = 36 lessons
2	0	3	5	9		
3	1	6				
4	4					
5	0	1				

(a) How many people were asked?

5 + 4 + 2 + 1 + 2 = 14

Answer 14 [1]

(b) What is the range?

51 − 12 = 39

Answer 39 [1]

(c) Find the median.

7th and 8th values: (23 + 25) ÷ 2 = 24

Answer 24 [1]

(d) Alice passes her test.
When her number of driving lessons is included in the stem and leaf diagram, the range increases by 2 and the median decreases by 1

Work out the number of driving lessons Alice had.

Range up by 2: 10 or 53 (new range 41)

Median goes down, so value is below 24

With 10: 15 values, 8th value = 23 = 24 − 1

Answer 10 [2]

[Turn over

16 **(a)** Simplify $7g - 5h - 2g + 8h$

$7g - 2g = 5g, \quad -5h + 8h = 3h$

Answer $5g + 3h$ [2]

(b) Solve $4f + 9 = 37$

$4f = 37 - 9$

$4f = 28$

$f = 28 \div 4 = 7$

Answer $f =$ 7 [2]

(c) Expand $3(4e + 5)$

Answer $12e + 15$ [1]

(d) Factorise $18c - 30$

Answer $6(3c - 5)$ [1]

17 A club has 160 members.

104 members attended an event.

(a) What **percentage** of club members attended the event?

$\frac{104}{160} \times 100 = 65$

Answer 65 % [2]

(b) The cost per ticket to attend the event last year was £7.50

This year it increased by 18%

How much did it cost per ticket to attend the event this year?

18% of 7.50 = 7.50 ÷ 100 × 18 = 1.35

7.50 + 1.35 = 8.85

Answer £ 8.85 [3]

[Turn over

18 Astrid says $\sqrt{16}+3$ can equal 7 or -1

Explain why she is correct.

√16 can be 4 or −4 because 4 × 4 = 16 and −4 × −4 = 16

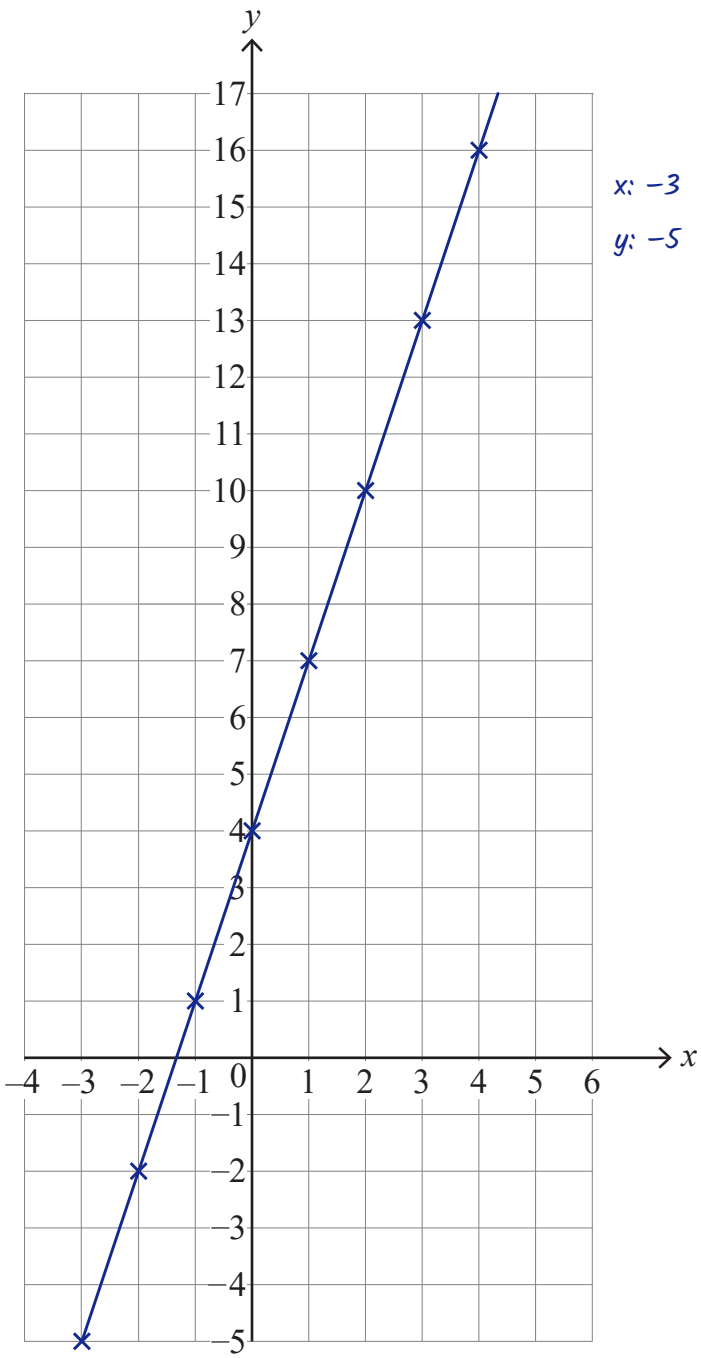
4 + 3 = 7

−4 + 3 = −1

so √16 + 3 can equal 7 or −1

[2]

19 Draw the graph of $y = 3x + 4$ on the grid below.



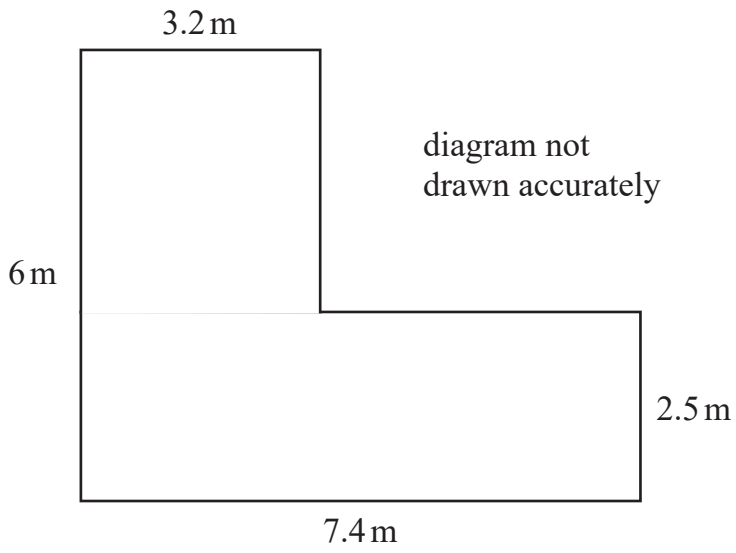
x: −3 −1 0 1 2 4

y: −5 1 4 7 10 16

[3]

[Turn over

20 The diagram shows a sketch of a garden.



Rolls of grass are to be bought to cover the garden.

Each roll covers 1 square metre.

Each roll costs £4.50

Only **complete** rolls can be bought.

How much will it cost to buy enough rolls to cover the garden?

Show your working out clearly.

$6 \times 3.2 = 19.2$

$(7.4 - 3.2) \times 2.5 = 4.2 \times 2.5 = 10.5$

$19.2 + 10.5 = 29.7\ m^2$ so 30 rolls

$30 \times 4.50 = £135$

Answer £ 135 [4]

21

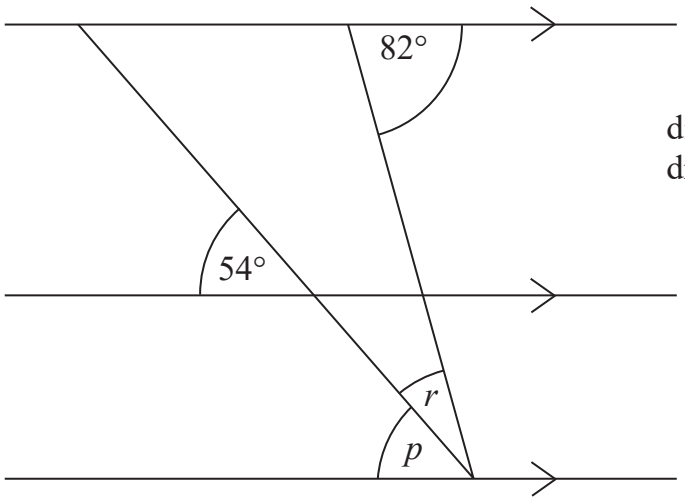


diagram not drawn accurately

Find

(a) angle p

$p = 54$ (alternate angles)

Answer 54 ° [1]

(b) angle r

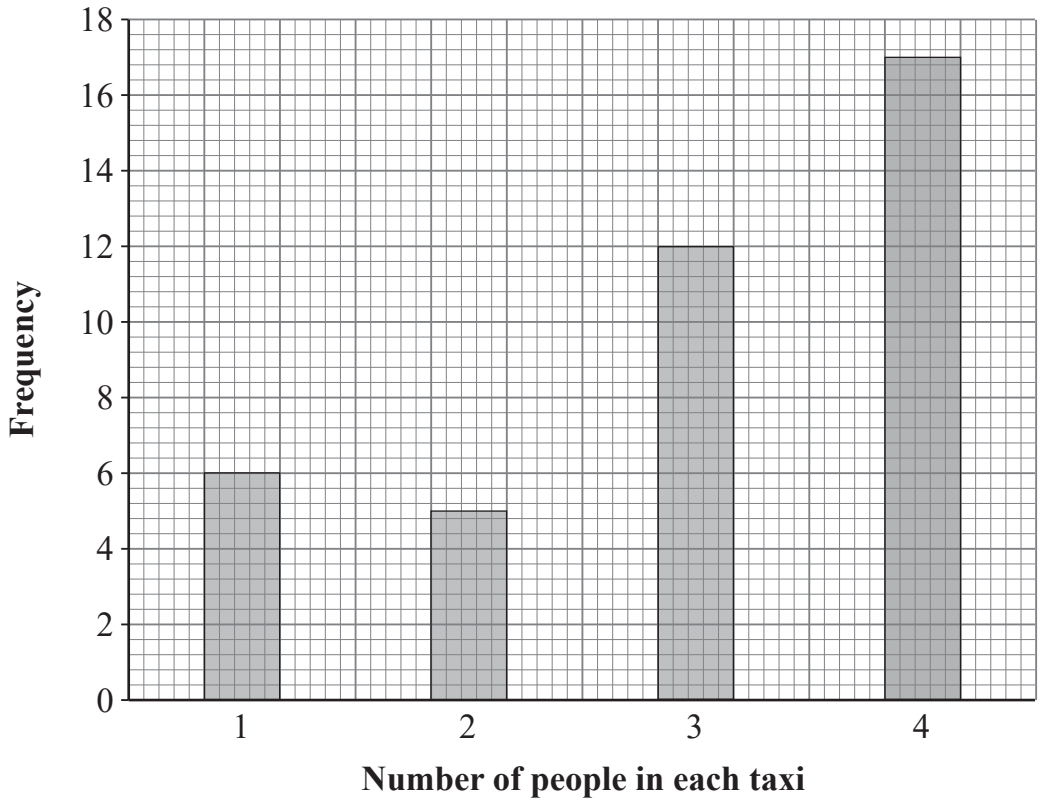
angle at the bottom $= 180 - 82 = 98$ (co-interior)

$r = 180 - 98 - 54 = 28$ (angles in a triangle)

Answer 28 ° [2]

[Turn over

22 The bar chart shows the number of people in each taxi booked from a taxi company one Saturday night.



Calculate the mean number of people in each taxi.

Show your working out clearly.

Frequencies: 6, 5, 12, 17

Total taxis = 6 + 5 + 12 + 17 = 40

(1 × 6) + (2 × 5) + (3 × 12) + (4 × 17)

= 6 + 10 + 36 + 68 = 120

Mean = 120 ÷ 40 = 3

Answer 3 [4]

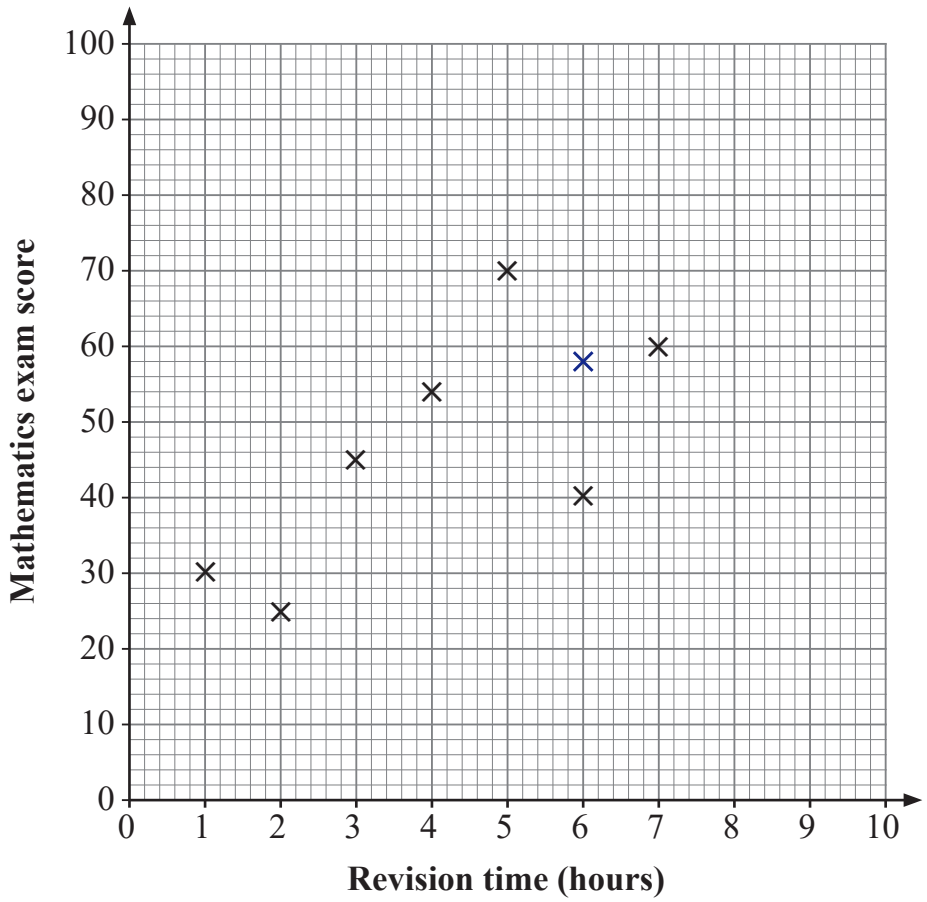
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(Questions continue overleaf)

[Turn over

23 The scatter graph shows the number of hours of revision completed by seven students and their Mathematics exam scores.



(a) Jake sat the exam late and his data was not recorded on the graph.

He spent 6 hours revising and scored 58

Plot Jake's point on the scatter graph. [1]

(b) Describe the relationship between the revision time in hours and the score in the Mathematics exam.

Answer *Positive correlation: the more hours spent revising,*

the higher the Mathematics score [1]

(c) Jake claims that if he had revised for 10 hours he would have scored above 90

Comment on the reliability of his claim.

Answer *Not reliable: 10 hours is outside the range of the data,*

so the trend may not continue (extrapolation) [1]

24 Anne invested £18 000 in an account paying 4% per annum compound interest.

After how many years will the value of her investment exceed £20 200?

Show your working out clearly.

Year 1: 4% of 18000 = 720, 18000 + 720 = 18720

Year 2: 4% of 18720 = 748.80, 18720 + 748.80 = 19468.80

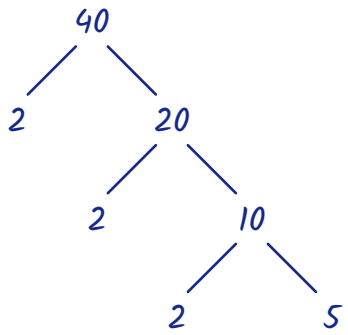
Year 3: 4% of 19468.80 = 778.752

19468.80 + 778.752 = 20247.552 > 20200

Answer *3 years* [3]

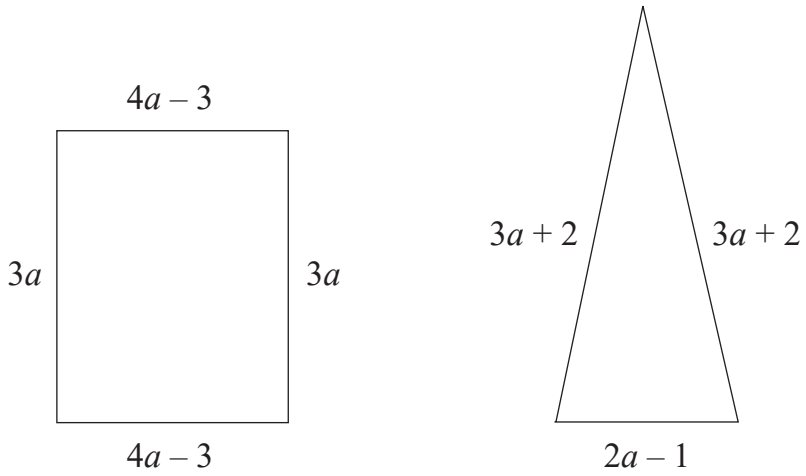
[Turn over

25 Write 40 as a product of prime factors.



Answer 2 × 2 × 2 × 5 [2]

26 The rectangle and triangle drawn below have the **same perimeter**.



Work out the value of a, showing your method clearly.

Rectangle: $4a - 3 + 4a - 3 + 3a + 3a = 14a - 6$

Triangle: $3a + 2 + 3a + 2 + 2a - 1 = 8a + 3$

$14a - 6 = 8a + 3$

$14a - 8a = 3 + 6$

$6a = 9$

$a = 9 \div 6 = 1.5$

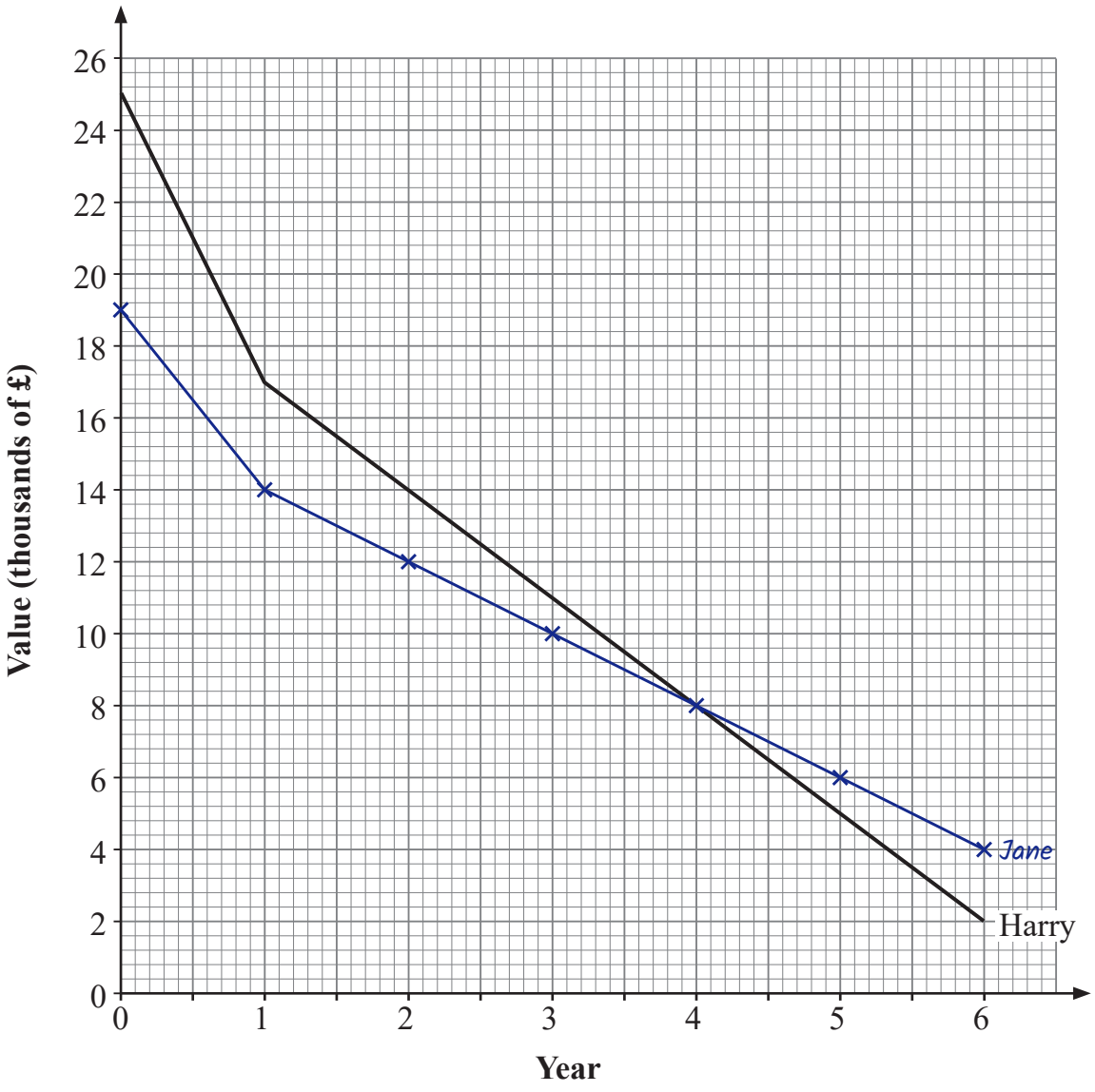
Answer $a =$ 1.5 [4]

[Turn over

27 Six years ago, Harry and Jane each bought a new car.

Harry bought his car for £25 000
In the first year, it decreased in value by £8 000
After that, it decreased in value by £3 000 each year.

A graph showing the value of Harry's car each year is shown below.



Jane bought her car for £19 000
In the first year, it decreased in value by £5 000
After that, it decreased in value by £2 000 each year.

(a) On the grid opposite, draw a graph showing the value of Jane's car each year. [2]

(b) Use the graph you have drawn to write down the year when Harry's car and Jane's car had the same value.

Answer Year 4 [1]

28 A doormat is in the shape of a semicircle with diameter 82 cm.

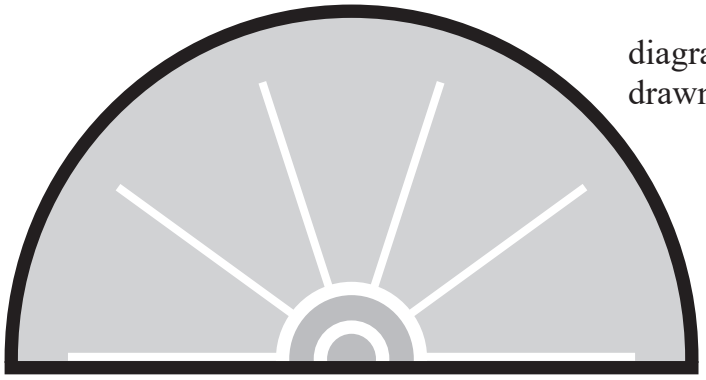


diagram not drawn accurately

Calculate the perimeter of the doormat.

Curved part = π × 82 ÷ 2

= 257.6105976... ÷ 2 = 128.8052988...

Perimeter = 128.8052988... + 82

= 210.8052988... = 210.8

Answer 210.8 cm [3]

[Turn over

29

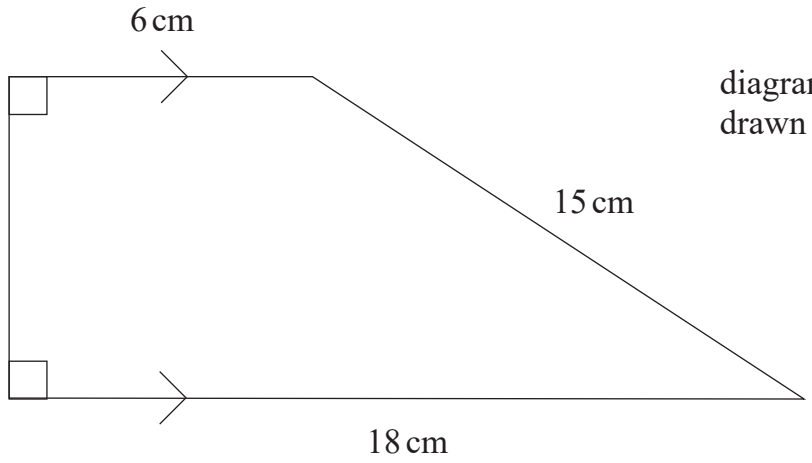


diagram not drawn accurately

Calculate the area of the trapezium.

$18 - 6 = 12$

$h^2 + 12^2 = 15^2$

$h^2 = 225 - 144 = 81$

$h = \sqrt{81} = 9$ cm

$\text{Area} = \frac{1}{2}(6 + 18) \times 9$

$= 12 \times 9 = 108$

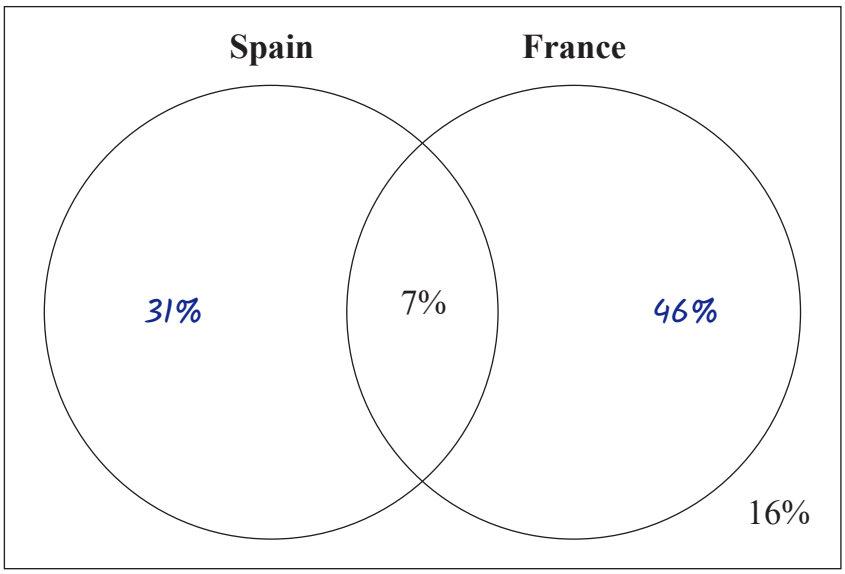
Answer 108 cm^2 [5]

30 Pupils in a year group were asked whether they had travelled to Spain or France.

Some information is shown in the Venn diagram.

53% had travelled to France.

Complete the Venn diagram below.



[2]

France only = 53 − 7 = 46%

Spain only = 100 − 53 − 16 = 31%

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Question Number	**Marks**
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Examiner Number

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