Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2021

Mathematics

StemUp Model Solution

Unit M2
(With calculator)
Foundation Tier



[GMC21]

GMC21

MONDAY 29 NOVEMBER, 9.15am–11.00am

TIME

1 hour 45 minutes.

INSTRUCTIONS TO CANDIDATES

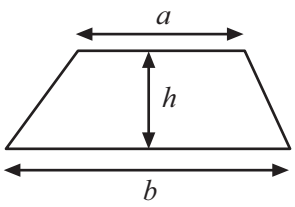
Write your Centre Number and Candidate Number in the spaces provided at the top of this page. **You are provided with Foundation Tier Additional Support Materials for use with this paper.**
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all twenty-six** questions.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

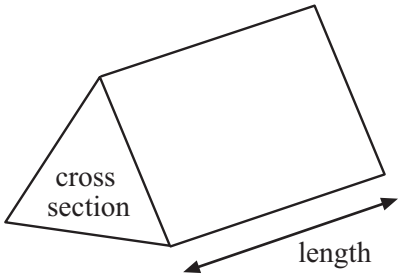
Functional Mathematics is assessed in this unit.
The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page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

Formula Sheet

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



Volume of prism = area of cross section × length



stemup.co.uk

1 Five friends had these bank balances.

	£
Bernie	230
Jonny	–570
Sara	65
Wendy	460
Jason	–190

(a) List the balances in order, starting with the **lowest**.

−570, *−190*, *65*, *230*, *460* [2]

(b) Jason receives £120 for his birthday and puts it into his bank account.

What is his new balance?

−190 + 120 = −70

Answer *−70* [1]

(c) How much more money is in Bernie's bank account than in Jonny's?

230 − (−570) = 230 + 570 = 800

Answer £ *800* [1]

[Turn over

2 The ages, in years, of a family are shown.

Dave 47 Ellie 21 Fergus 18 Geri 44 Harry 10 Ivy 25

(a) What is the range of the ages?

47 − 10 = 37

Answer 37 years [1]

(b) What is the mean age?

47 + 21 + 18 + 44 + 10 + 25 = 165

165 ÷ 6 = 27.5

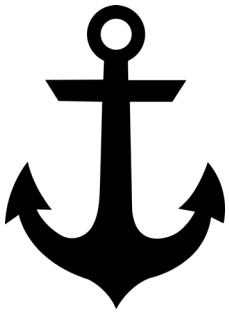
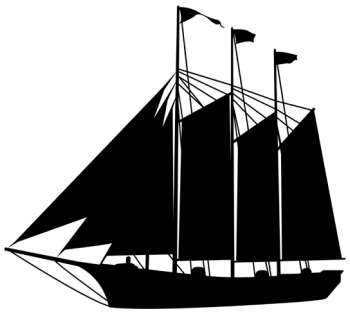
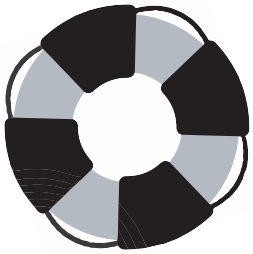
Answer 27.5 years [3]

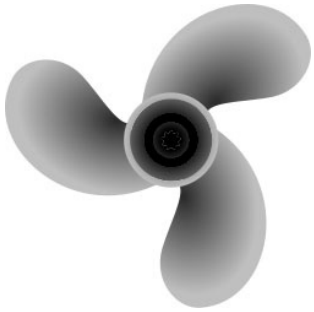
(c) What was the mean age of the family two years ago?

27.5 − 2 = 25.5

Answer 25.5 years [1]

3 Five drawings related to sailing are shown.

		
Anchor	Boat	Lifebuoy

	
Wheel	Propeller

(a) Which drawing has rotational symmetry of order 3?

Answer Propeller [1]

(b) Which drawing has exactly 1 line of symmetry?

Answer Anchor [1]

(c) Which two drawings have both line symmetry and rotational symmetry?

Answer Lifebuoy and Wheel [1]

[Turn over

4 Pupils were asked which activity they prefer.

The results were

Cinema	35% of the pupils
Bowling	$\frac{2}{5}$ of the pupils
Ice skating	$\frac{1}{4}$ of the pupils

(a) The teacher says "Bowling was more popular than cinema."

Is the teacher correct?

You must show working to explain your answer.

Bowling $\frac{2}{5} = 2 \div 5 = 0.4 = 40\%$

Cinema = 35%

40% > 35%

Answer Yes because 40% is greater than 35%

[2]

(b) 15 pupils said they preferred ice skating.

How many pupils were asked altogether?

$\frac{1}{4}$ of the pupils = 15

15 × 4 = 60

Answer 60 [2]

5 Mr Evans booked a family holiday.

He paid a deposit of £300

He then paid £45.50 each week for 26 weeks.

How much did he pay in total?

26 × 45.50 = 1183

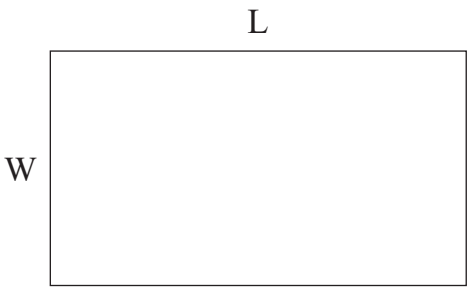
1183 + 300 = 1483

Answer £ 1483 [3]

[Turn over

6 Jessica fits guttering around buildings.

She measures the length (L) and width (W) for rectangular sheds in metres.



To work out the total amount (T) of guttering needed, Jessica uses the formula

$$T = 2L + 2W$$

(a) How much guttering will Jessica need for this shed?

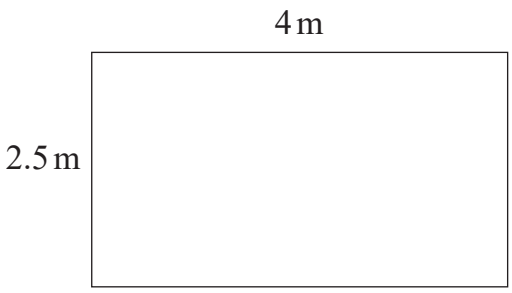


diagram not drawn accurately

$T = 2 \times 4 + 2 \times 2.5$

$T = 8 + 5$

$T = 13$

Answer 13 m [2]

(b) Jessica measured another shed.

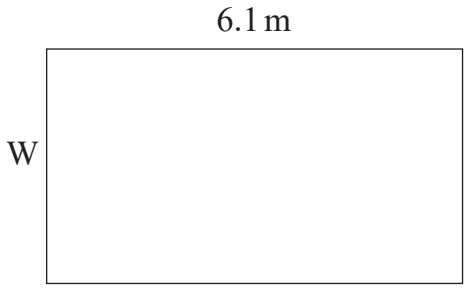


diagram not drawn accurately

The total (T) was 19.9 m.

Work out the width (W) of this shed.

$19.9 = 2 \times 6.1 + 2W$

$19.9 = 12.2 + 2W$

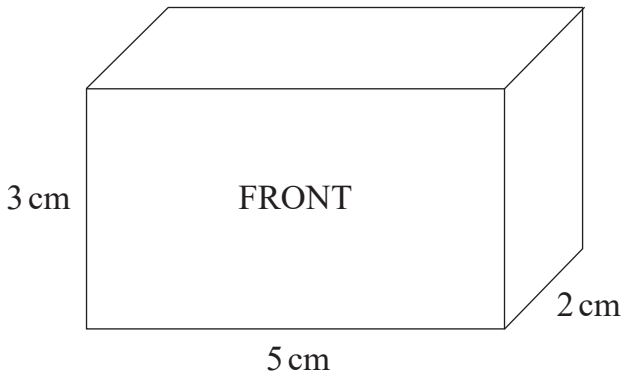
$2W = 19.9 - 12.2 = 7.7$

$W = 7.7 \div 2 = 3.85$

Answer 3.85 m [3]

[Turn over

7 Here is a cuboid.



(a) What is the area of the front face of the cuboid?

5 × 3 = 15

Answer 15 cm^2 [1]

(b) Work out the volume of the cuboid.

V = 5 × 2 × 3

V = 30

Answer 30 cm^3 [2]

8 Dylan needs to get part of his house painted.

He has a budget of £200

He needs to buy 3 tins of paint, each costing £16.75

He employs a painter who is paid £12.30 per hour.

How many **full** hours will the painter have to complete the work without going over Dylan's budget?

3 × 16.75 = 50.25

200 − 50.25 = 149.75 left for the painter

149.75 ÷ 12.30 = 12.17...

so 12 full hours

Answer 12 [3]

[Turn over

9

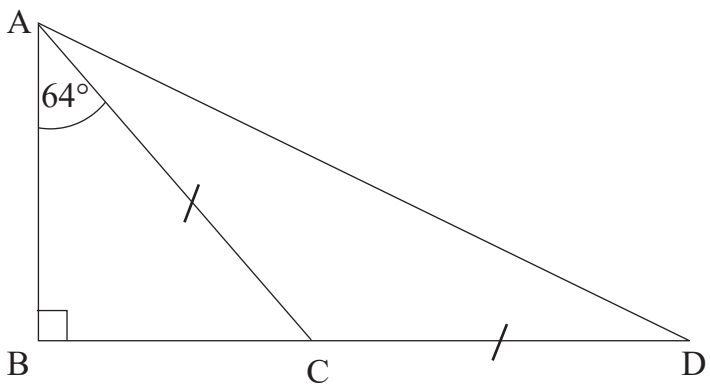


diagram not drawn accurately

ABC is a right-angled triangle.
ACD is an isosceles triangle.
BCD is a straight line.

Calculate the size of

(a) angle ACB,

angle ACB = 180 − 90 − 64 (angles in a triangle)

= 26°

Answer 26 ° [2]

(b) angle ADC.

angle ACD = 180 − 26 = 154° (angles on a straight line)

AC = CD so angle CAD = angle ADC (isosceles triangle)

angle ADC = (180 − 154) ÷ 2

= 26 ÷ 2 = 13°

Answer 13 ° [3]

10 Guttering costs £4.30 per metre.

Martin bought 11 metres of guttering and 7 metres of downpipe.

He paid £66.55 in total.

How much does downpipe cost per metre?

$11 \times 4.30 = 47.30$

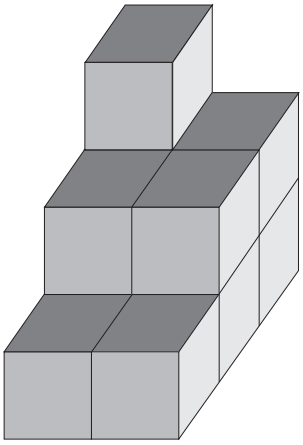
$66.55 - 47.30 = 19.25$

$19.25 \div 7 = 2.75$

Answer £ 2.75 [4]

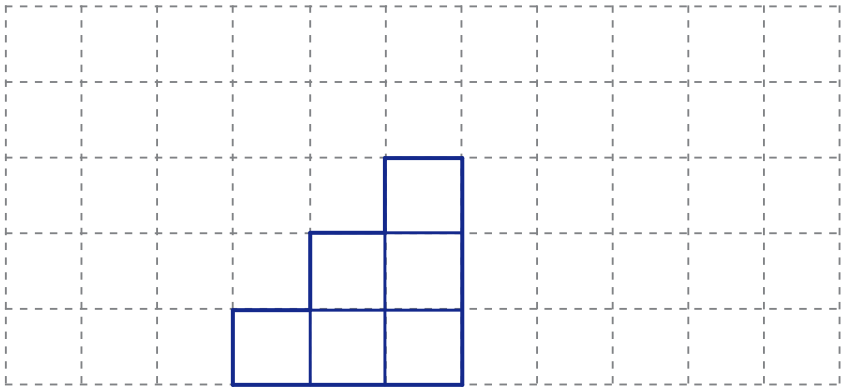
[Turn over

11 A solid is made from 1 cm cubes.





(a) On the grid below draw the side elevation of the solid.



[2]

(b) What is the smallest number of cubes you would need to add to the solid to make it into a cube?

Cube needs 3 × 3 × 3 = 27 cubes

Solid has 2 + 4 + 5 = 11 cubes

27 − 11 = 16

Answer 16 [1]

12 In a group of students,

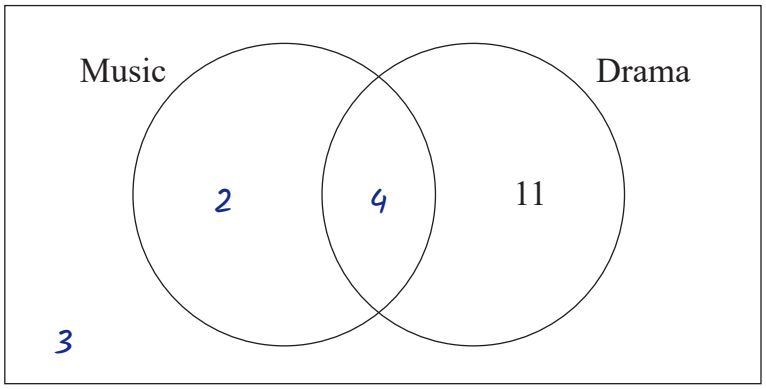
6 study Music

15 study Drama

11 students study only Drama

3 study neither subject.

Complete the Venn diagram to show this information.



[3]

[Turn over

13 A manager is preparing to draw a pie chart to display how 40 workers travel to work.

The table below shows some of her information.

Transport	Number of workers	Angle
Car	5	45°
Bus	12	108°
Walk	7	63°
Train	10	90°
Bike	6	54°
	Total = 40	360°

Use the information in the table to work out what angle will represent those who travel by bike.

Show all your working clearly.

40 workers = 360°, so 1 worker = 360 ÷ 40 = 9°

Car: 45 ÷ 9 = 5 workers Bus: 108 ÷ 9 = 12 workers

Walk: 7 × 9 = 63° Train: 10 × 9 = 90°

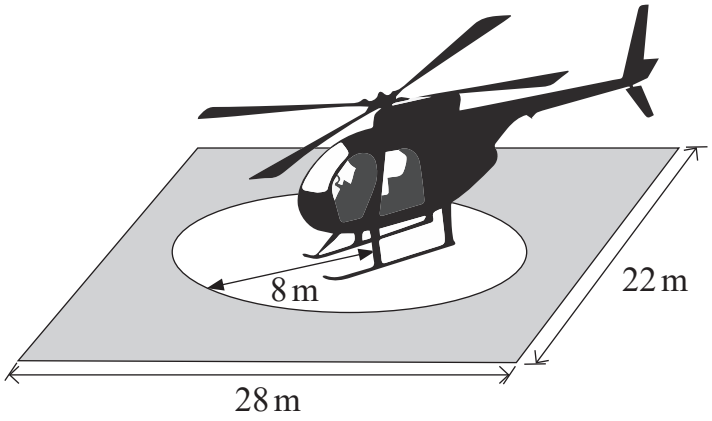
Bike: 40 − (5 + 12 + 7 + 10) = 40 − 34 = 6 workers

Bike angle = 6 × 9 = 54°

Answer 54 ° [4]

14 The landing pad for a helicopter is a white circle of radius 8 m.

It is painted on a black rectangular plot 28 m by 22 m.



What area of the plot is **not** painted white?

Give units with your answer.

Plot: $28 \times 22 = 616\ m^2$

Circle: $\pi \times 8^2 = 201.0619298...\ m^2$

Not white = $616 - 201.0619298...$

$= 414.9380702...$

$= 414.94\ m^2$

Answer $414.94\ m^2$ [5]

[Turn over

15 A tracksuit normally cost £75

(a) In a sale the price was reduced by 15%

Calculate the sale price of the tracksuit.

15% of 75 = 0.15 × 75 = 11.25

75 − 11.25 = 63.75

Answer £ 63.75 [3]

(b) The following week the shop displayed this sign.

FINAL STOCK CLEARANCE
A FURTHER 20% OFF ALL SALE PRICES

Show that the tracksuit now costs £51

20% of 63.75 = 0.2 × 63.75 = 12.75

63.75 − 12.75 = £51

[2]

(c) Rhys says, "I am getting 15% off, then 20% off, so I am getting 35% off the £75."

Is he correct?

You must show working to explain your answer.

35% of 75 = 26.25, 75 − 26.25 = £48.75, £48.75 ≠ £51

Answer No because 35% off gives £48.75, not £51

(15% off then 20% off is 0.85 × 0.8 = 0.68, so only 32% off) [2]

16 A girl collects the following data in metres (m) in a Science experiment.

0.32 0.51 0.43 0.64 0.39 0.49 0.62 0.54 0.52 0.36 0.54 0.68 0.48 0.52 0.60

(a) She states, "The median is the one in the middle so my median is 0.54 m."

Explain why she is not correct.

Answer *the data is not in order (it must be ordered first)*

[1]

(b) She then decides to show her data in a stem and leaf diagram.

The first three are recorded.

Complete the stem and leaf diagram.

0.3	2 6 9
0.4	3 8 9
0.5	1 2 2 4 4
0.6	0 2 4 8

KEY: 0.3 | 2 = 0.32 m

[2]

(c) Give **one** advantage of displaying the data in a stem and leaf diagram.

Answer *the data is now in order, so it is easier to read*

[1]

(d) Use the stem and leaf diagram to write down the correct median.

Answer *0.52* m [1]

[Turn over

17 The attendance for some classes is shown below.

Class A 17 pupils out of 20 were present.

Class B 21 pupils out of 24 were present.

Class C 19 pupils out of 22 were present.

Which class had the **highest percentage attendance**?

You must show working to justify your answer.

A: $17 \div 20 \times 100 = 85\%$

B: $21 \div 24 \times 100 = 87.5\%$

C: $19 \div 22 \times 100 = 86.36...\%$

Answer B [3]

18 John receives a wage of £400 per week.

$\frac{2}{5}$ of his wage is spent on rent.

$\frac{1}{4}$ of his wage is spent on food.

$\frac{3}{20}$ of his wage is used to pay other bills.

What **fraction** of John's wage is left?

$\frac{2}{5} + \frac{1}{4} + \frac{3}{20} = \frac{8}{20} + \frac{5}{20} + \frac{3}{20} = \frac{16}{20}$

$1 - \frac{16}{20} = \frac{4}{20} = \frac{1}{5}$

Answer $\frac{1}{5}$ [3]

19 (a)

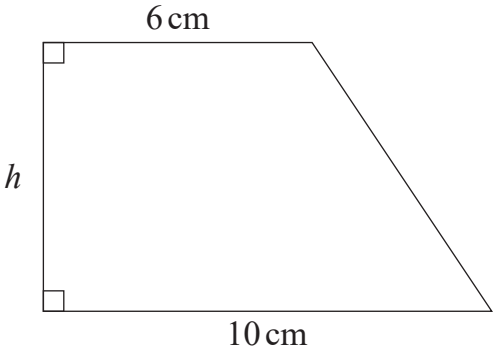


diagram
not drawn
accurately

The area of the trapezium is 36 cm^2
Calculate its height h.

$\frac{1}{2}(6 + 10) \times h = 36$

$8h = 36$

$h = 36 \div 8 = 4.5$

Answer 4.5 cm [2]

(b) A different trapezium is drawn below.

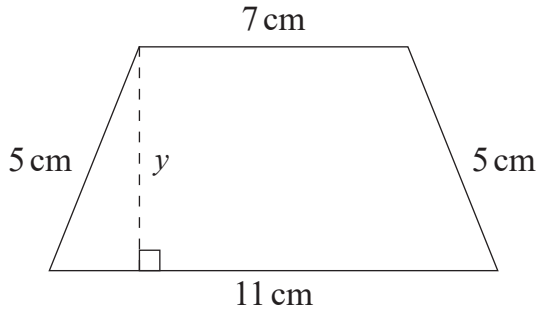


diagram
not drawn
accurately

Calculate its height y.

base of triangle $= (11 - 7) \div 2 = 2$ cm

$2^2 + y^2 = 5^2$

$y^2 = 25 - 4 = 21$

$y = \sqrt{21} = 4.582575...$

Answer 4.58 cm [4]

[Turn over

20 A number, expressed as a product of its prime factors, is $2^2 \times 3 \times 5^2$

(a) What is the number?

$4 \times 3 \times 25 = 300$

Answer 300 [1]

(b) (i) This number is multiplied by 9

Write the new number as a product of its prime factors.

$2700 = 2^2 \times 3 \times 5^2 \times 3^2$

Answer $2^2 \times 3^3 \times 5^2$ [1]

(ii) Is this new number a square number?

You must explain your answer.

Answer No because the power of 3 is odd (3^3), so not all the prime factors are squared [1]

21 Jane completes a 5 km race in 24 minutes.

Calculate her average speed in km/hr.

24 minutes = 24 ÷ 60 = 0.4 hours

speed = 5 ÷ 0.4

= 12.5 km/hr

Answer 12.5 km/hr [2]

22 Last year a company made a profit of £152 650

This year the company made a profit of £104 760

Work out the percentage decrease in the company's profit.

Give your answer to 1 decimal place.

152 650 − 104 760 = 47 890

47 890 ÷ 152 650 × 100 = 31.3724...

= 31.4% (1 d.p.)

Answer 31.4 % [3]

[Turn over

23 James can throw a javelin 49 metres.

His target is to throw it 4% further each year.

If he stays on target, how many years will it be before he can throw the javelin 55 metres?

You must show working to justify your answer.

After 1 year: $49 \times 1.04 = 50.96$ m

After 2 years: $49 \times 1.04^2 = 52.9984$ m

After 3 years: $49 \times 1.04^3 = 55.118336$ m

55.118... > 55, so 3 years

Answer 3 years [4]

24 The number of hours of daily sunshine is recorded at a resort during four months.

Hours of daily sunshine	Frequency	Midpoint	f × x
$0 < h \leq 3$	18	1.5	27
$3 < h \leq 6$	45	4.5	202.5
$6 < h \leq 9$	37	7.5	277.5
$9 < h \leq 12$	19	10.5	199.5
$12 < h \leq 15$	4	13.5	54

Calculate an estimate of the mean number of hours of daily sunshine at the resort during the four months.

$\Sigma fx = 27 + 202.5 + 277.5 + 199.5 + 54 = 760.5$

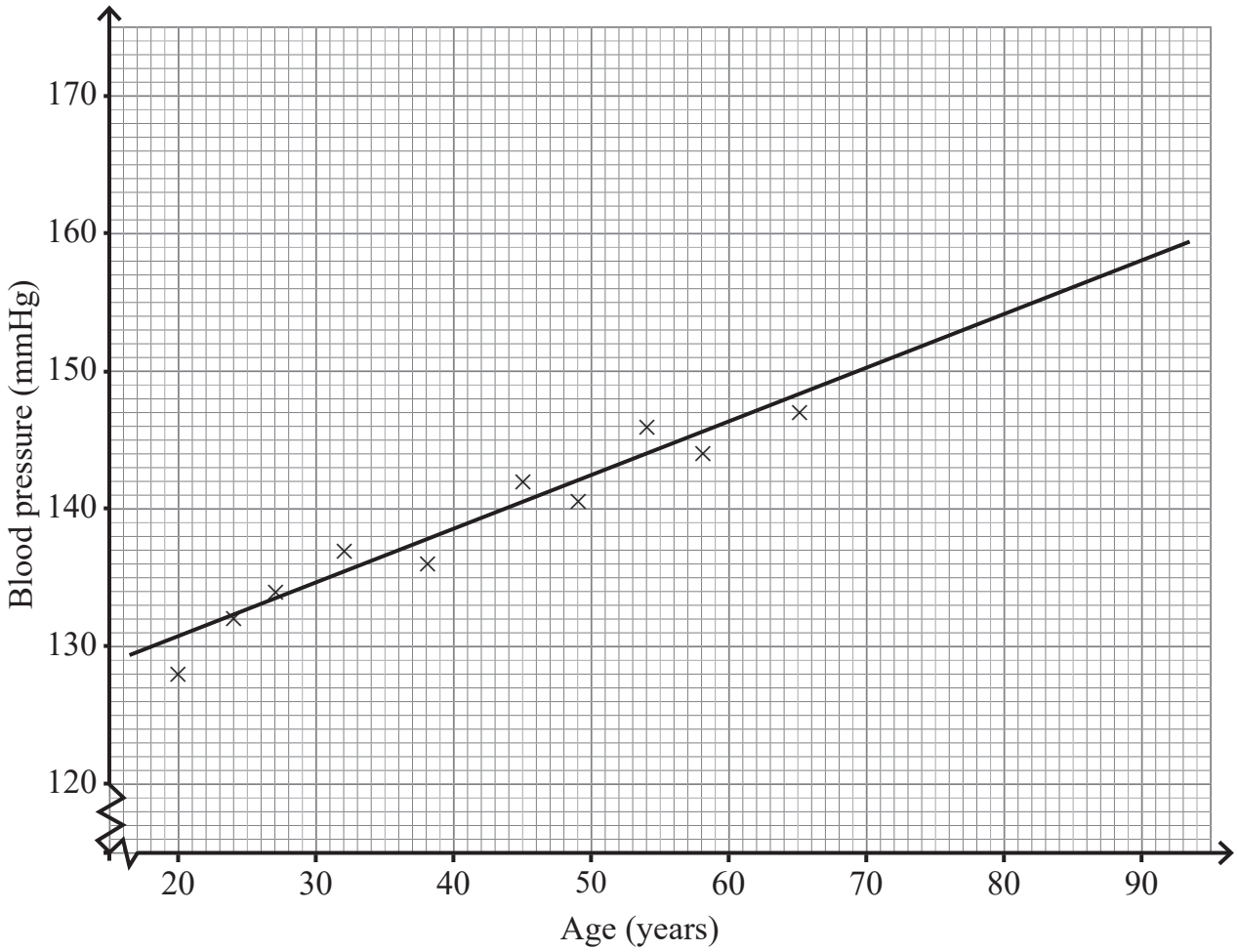
$\Sigma f = 18 + 45 + 37 + 19 + 4 = 123$

mean $= 760.5 \div 123 = 6.1829...$

Answer 6.18 hours [4]

[Turn over

25 Janet sees a scatter graph which displays the age and blood pressure of 10 adults.



Janet is aged 41 and her father is 84

She comments that a good estimate for her blood pressure would be 139 whilst a good estimate for her father's would be 156

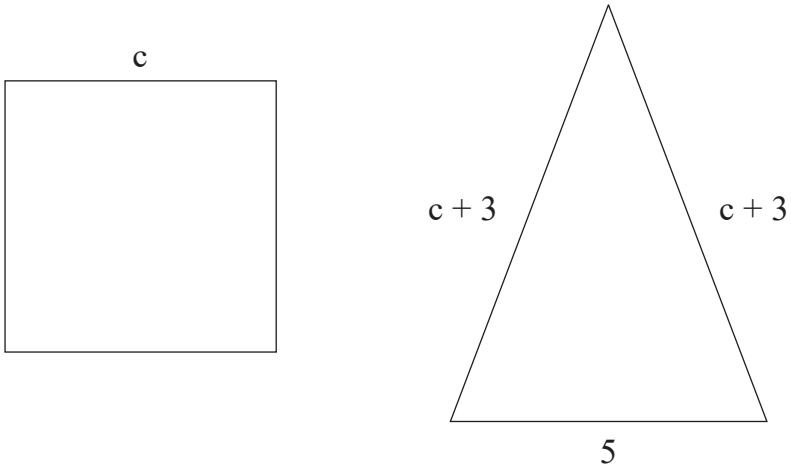
Do you think her estimates are reliable? Explain your reasoning clearly.

Her estimate is reliable as 41 is within the ages on the graph,

but her father's is not reliable as 84 is outside the range of

the data, so the line of best fit cannot be trusted there. [2]

26 The diagrams below show a square and an isosceles triangle.



diagrams not drawn accurately

They have the same perimeter.

By forming and solving an equation, work out the perimeter.

Square perimeter = 4c

Triangle perimeter = c + 3 + c + 3 + 5 = 2c + 11

4c = 2c + 11

2c = 11

c = 5.5

Perimeter = 4 × 5.5 = 22

Answer *22* [4]

THIS IS THE END OF THE QUESTION PAPER

Sources: All images © CCEA

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
Total Marks	

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA will be happy to rectify any omissions of acknowledgement in future if notified.