New Specification

Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2019

Mathematics

StemUp Model Solution

Unit M2
(With calculator)
Foundation Tier



[GMC21]

GMC21

TUESDAY 8 JANUARY, 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.**
Answer **all twenty-five** 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.

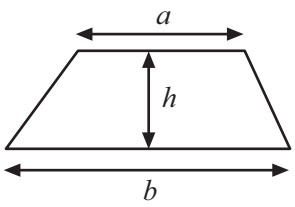
INFORMATION FOR CANDIDATES

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.

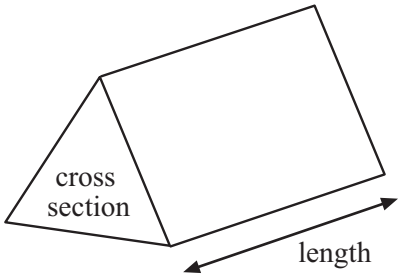
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Formula Sheet

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

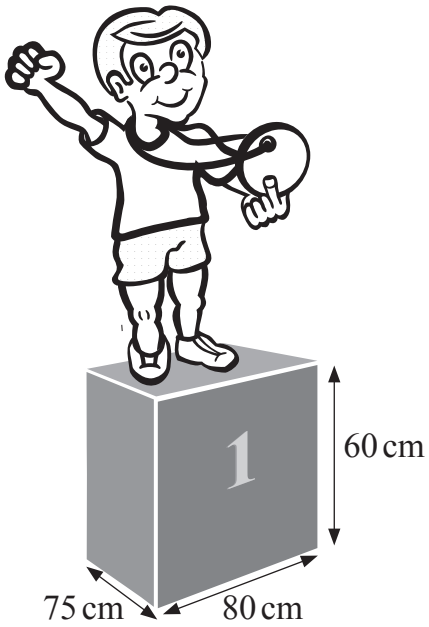


Volume of prism = area of cross section × length



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1 A winners' podium (a cuboid) is shown.



(a) How many **vertices** has the podium?

Answer 8 vertices [1]

(b) What is the area of the **base** of the podium?

80 × 75 = 6000

Answer 6000 cm^2 [2]

(c) What is the volume, in m^3, of the podium?

75 cm = 0.75 m, 80 cm = 0.8 m, 60 cm = 0.6 m
0.75 × 0.8 × 0.6 = 0.36

Answer 0.36 m^3 [2]

[Turn over

2 Eight leaders and 143 members of a youth club go by bus to a bowling alley.

The Beezer Bus Company has buses for hire that hold 32 passengers each.

(a) How many buses will the youth club need to hire?

8 + 143 = 151 people
151 ÷ 32 = 4.71875
4 buses is not enough, so 5 buses

Answer 5 [3]

(b) How many spare seats will there be altogether?

5 × 32 = 160 seats
160 − 151 = 9

Answer 9 [2]

(c) Each bus costs £140 to hire.

The cost is split equally between the members.

The leaders do not pay.

How much does each member need to pay to cover the cost of hiring the buses?

5 × £140 = £700
£700 ÷ 143 = 4.895104...
≈ £4.90

Answer £ 4.90 [3]

[Turn over

3 The average monthly temperatures in Colorado during the ski season are shown below.

December	January	February	March	April
−14°C	−15°C	−13°C	−9°C	−5°C

(a) Which month was warmest?

Answer April [1]

(b) What was the difference in temperature between the warmest and coldest months?

$-5 - (-15) = 10$

Answer 10 °C [1]

4 The hourly rates of pay for some jobs in a warehouse are shown below.

Warehouse Associate	£8.07
Warehouse Worker	£8.24
Health and Safety Officer	£9.94
Picker	£7.59

(a) Work out the mean of these four hourly rates.

8.07 + 8.24 + 9.94 + 7.59 = 33.84
33.84 ÷ 4 = 8.46

Answer £ 8.46 [3]

(b) What is the range of the hourly rates?

9.94 − 7.59 = 2.35

Answer £ 2.35 [1]

[Turn over

5 Work out the size of the missing angle in each of the diagrams below.

(a)

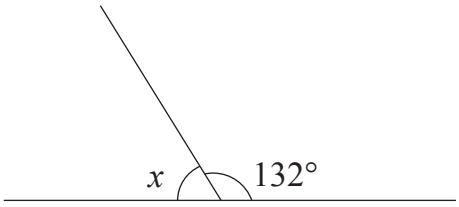


diagram not drawn accurately

180 − 132 = 48

Answer x = 48 ° [1]

(b)

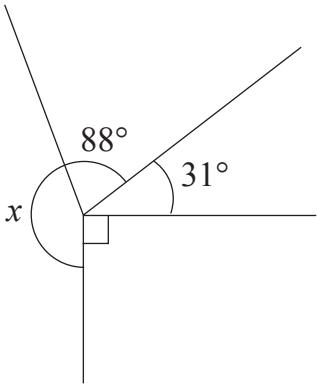


diagram not drawn accurately

360 − 90 − 88 − 31 = 151

Answer x = 151 ° [1]

(c)

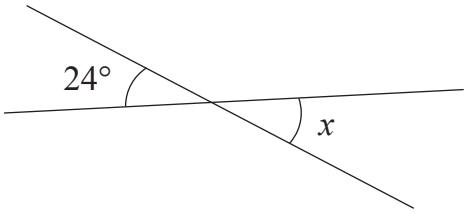


diagram not drawn accurately

vertically opposite angles are equal

Answer x = 24 ° [1]

6 **(a)** Simplify $9a - 5a + 2a$

Answer 6a [1]

(b) Solve $4y = 60$

$y = 60 \div 4$

Answer $y =$ 15 [1]

(c) Solve $m - 4 = 9$

$m = 9 + 4$

Answer $m =$ 13 [1]

7 Brian hired some equipment.

There was a fixed charge of £45 plus a hire fee of £13.50 per day.

He paid £274.50 in total.

How many days did he hire the equipment for?

£274.50 − £45 = £229.50
£229.50 ÷ £13.50 = 17

Answer 17 [3]

[Turn over

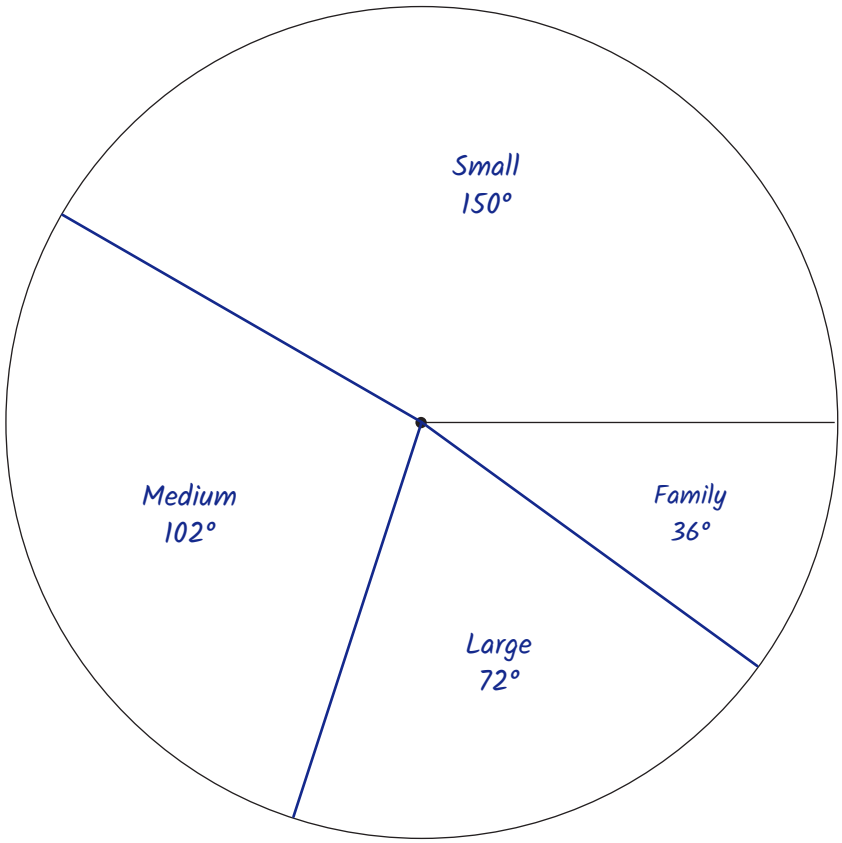
8 **(a)** Dodd's Ice Cream shop sold four sizes of ice cream tubs.

The owner wants to see a pie chart showing the numbers of tubs sold.

Size of tub	Number of tubs sold	Angle
Small	50	50 × 3 = 150
Medium	34	34 × 3 = 102
Large	24	24 × 3 = 72
Family	12	12 × 3 = 36

Draw a pie chart to show this information.

50 + 34 + 24 + 12
= 120
360 ÷ 120 = 3



[4]

(b) Complete the table to find the total number of scoops used.

Size of tub	Number of tubs sold	Number of scoops per tub	Number of scoops used
Small	50	1	50
Medium	34	2	68
Large	24	3	72
Family	12	10	120
		Total	310

[2]

24 × 3 = 72, 12 × 10 = 120
50 + 68 + 72 + 120 = 310

[Turn over



9 Place a digit from 1, 2, 3, 4, 5 in each box to make a true statement.

1	+	4	×	5	= 21

[2]

1 + 4 × 5 = 1 + 20 = 21

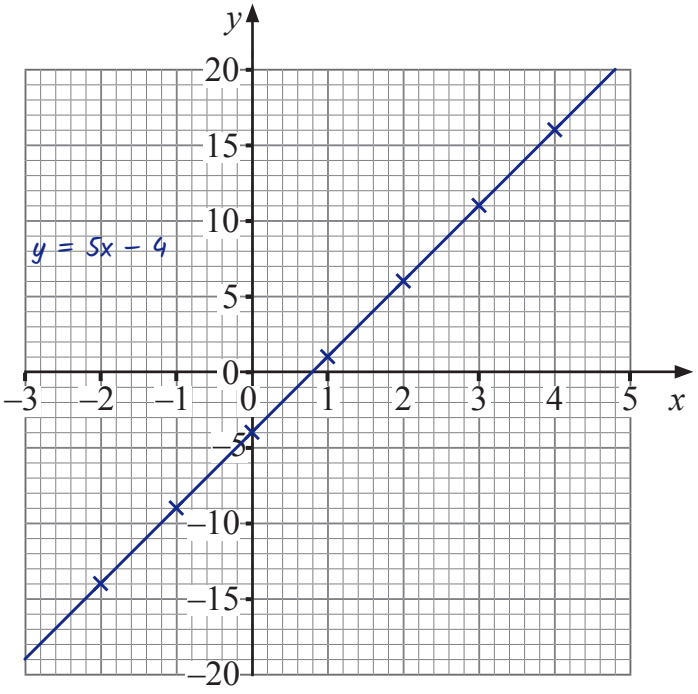
stemup.co.uk

10 **(a)** Complete the table below for $y = 5x - 4$

x	−2	−1	0	1	2	3	4
y	−14	−9	−4	1	6	11	16

[1]

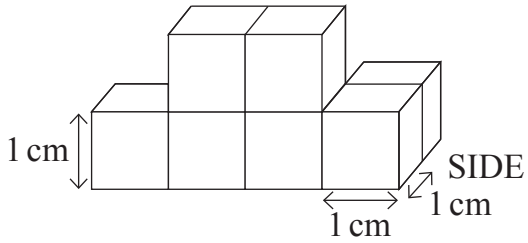
(b) On the grid below, draw the graph of $y = 5x - 4$



[2]

[Turn over

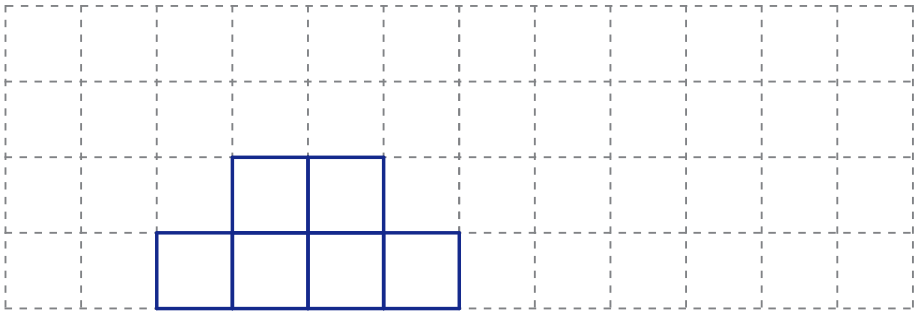
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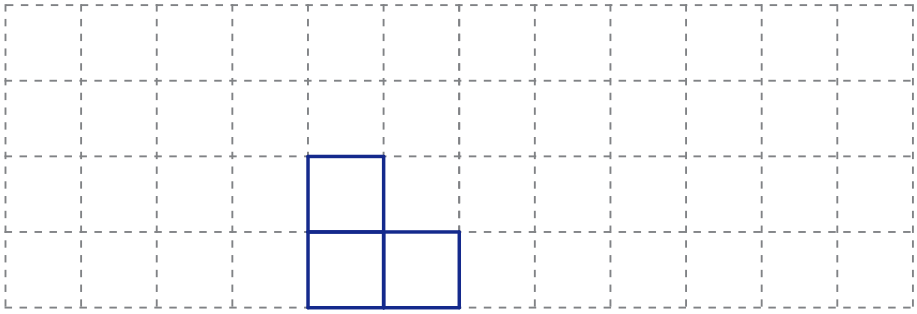
FRONT

Draw the front and side elevations on the grid below.

FRONT



SIDE



[3]

12 Mary raised some money.

She gave $\frac{2}{5}$ of the money to a charity.

She gave $\frac{1}{4}$ of the money to a housing project.

She gave the rest of the money to a first aid group.

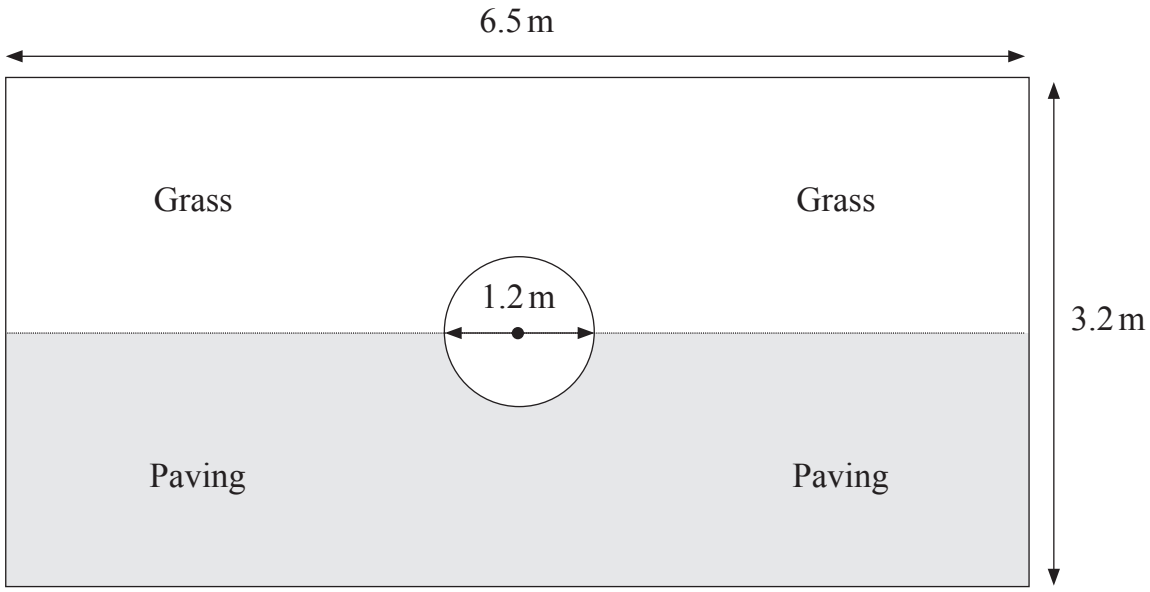
What **percentage** of the money did the first aid group receive?

2/5 = 40%
1/4 = 25%
40% + 25% = 65%
100% − 65% = 35%

Answer 35 % [4]

[Turn over

13 The diagram below shows a rectangular garden with a circular pond in the centre.



(a) Work out the area of the pond.

State the units of your answer.

radius = 1.2 ÷ 2 = 0.6 m
Area = π × 0.6^2
= 1.130973355...
= 1.13 m^2

Answer 1.13 m^2 [3]

(b) Paving costs £30 per square metre.

It can only be bought in whole square metres.

How much will it cost to pave the section shown on the diagram?

$6.5 \times 3.2 = 20.8\ m^2$
$20.8 - 1.130973... = 19.669...$
$19.669... \div 2 = 9.834...\ m^2$ (paving half)
must buy whole m^2, so $10\ m^2$
$10 \times £30 = £300$

Answer £ 300 [4]

[Turn over

14 Leah wants to check how economical her car is.

She travels 275 miles, using 22 litres of petrol.

(a) How many miles does her car travel per litre of petrol?

275 ÷ 22 = 12.5

Answer 12.5 miles [1]

(b) The 275 mile journey took Leah 5 hours 30 minutes.

What was her average speed for the journey?

5 hours 30 minutes = 5.5 hours
275 ÷ 5.5 = 50

Answer 50 miles per hour [3]

15 Dean bought a new car.

He had to pay £220 plus 20% VAT per month for 3 years.

The mileage allowed before any charge was 30 000 miles for the 3 years.

Each additional mile was charged at 8p per mile.

After 3 years Dean had driven 37 200 miles.

How much did Dean pay in total for the 3-year period?

20% of £220 = 0.2 × 220 = £44
£220 + £44 = £264 per month
3 years = 36 months
36 × £264 = £9504
37 200 − 30 000 = 7200 extra miles
7200 × £0.08 = £576
£9504 + £576 = £10 080

Answer £ 10 080 [5]

[Turn over

16 Jayne owns a hotel.

On Monday morning 54 of her 75 guests had breakfast.

What percentage had breakfast?

$\frac{54}{75} \times 100 = 72$

Answer 72 % [2]

17 **(a)** Multiply out $5(2t + 7)$

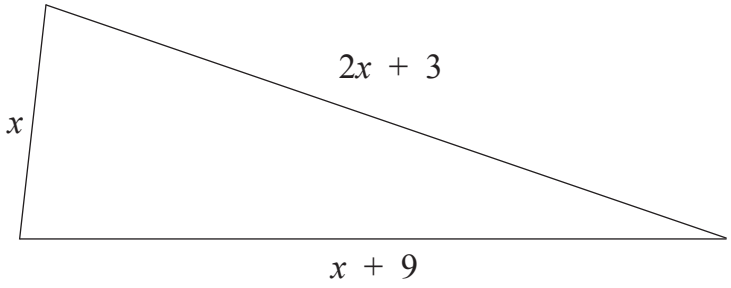
Answer $10t + 35$ [1]

(b) Factorise $16r - 8$

Answer $8(2r - 1)$ [1]

18 **(a)** Write an expression, in terms of x, for the perimeter of the triangle shown.

Give your answer in its simplest form.



2x + 3 + x + x + 9

Answer 4x + 12 [2]

(b) The perimeter of this triangle is 32

(i) Write down an equation in terms of x.

Answer 4x + 12 = 32 [1]

(ii) Solve your equation to find x.

4x + 12 = 32
4x = 32 − 12 = 20
x = 20 ÷ 4

Answer 5 [1]

[Turn over

19 (a) (i) Fiona wanted to do a survey about attendance at her school.

She designed a questionnaire for students to complete.

One of the questions was:

"How many days have you had off school?"

State **one** criticism of her question.

Answer No time period is given (e.g. this term or this year).

[1]

(ii) She decides to give her questionnaires out to the first 20 students coming out of the Year 12 assembly one Monday.

State **two** reasons why her sample may not be representative of the whole school population.

Answer She only asks Year 12 students, not all year groups.

She only asks students who were in school that day,

so pupils who were absent are missed.

[2]

(b) Fiona asked the school office for information about pupils who had arrived late to school on a certain day.

They told her that 14 pupils were late that day.

The list below shows how many minutes late each pupil was.

8	12	15	27	19	26	24
38	29	14	11	16	23	16

Show this information in an ordered stem and leaf diagram.

0	8
1	1 2 4 5 6 6 9
2	3 4 6 7 9
3	8

Key: 3 | 8 means 38 minutes

[3]

[Turn over

20 A badge is the shape of a quarter circle as shown below.

Calculate the perimeter of the badge.

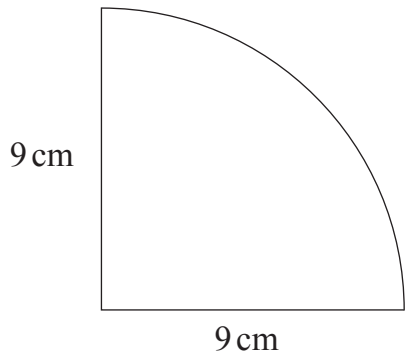


diagram not
drawn accurately

Arc = 2 × π × 9 ÷ 4
= 56.5486677... ÷ 4
= 14.1371669...
Perimeter = 14.137... + 9 + 9
= 32.137... = 32.14

Answer 32.14 cm [3]

21 The test scores for the 10 boys in a class are

7 8 5 8 7 9 4 5 3 9

The mean test score for the 5 girls in the class is 8

Calculate the mean for this class.

Show your working clearly.

Boys total = 7 + 8 + 5 + 8 + 7 + 9 + 4 + 5 + 3 + 9 = 65
Girls total = 5 × 8 = 40
Class total = 65 + 40 = 105
Mean = 105 ÷ 15 = 7

Answer 7 [3]

[Turn over

22 **(a)** Given that $4\,500 = 2^a \times 3^2 \times 5^b$

work out the values of a and b.

4500 = 2 × 2250
2250 = 2 × 1125
1125 = 3 × 375
375 = 3 × 125
125 = 5 × 5 × 5
4500 = 2 × 2 × 3 × 3 × 5 × 5 × 5
= $2^2 \times 3^2 \times 5^3$

Answer a = 2 b = 3 [3]

(b) Hence, write down the lowest value by which 4 500 needs to be multiplied to make a **cube** number.

cube: $2^3 \times 3^3 \times 5^3$
so × 2 × 3 = 6

Answer 6 [2]

23 The speeds of cars on a road were recorded over a period of time.

The results are recorded in the grouped frequency table.

Speed (s miles per hour)	**Frequency**	Midpoint	Midpoint × f
$20 < s \leqslant 30$	12	25	25 × 12 = 300
$30 < s \leqslant 40$	16	35	35 × 16 = 560
$40 < s \leqslant 50$	18	45	45 × 18 = 810
$50 < s \leqslant 60$	2	55	55 × 2 = 110
$60 < s \leqslant 70$	2	65	65 × 2 = 130

(a) How many cars were travelling at more than 40 mph?

18 + 2 + 2 = 22

Answer 22 [1]

(b) Which class interval contains the median speed?

median: 25th/26th, 12 + 16 = 28

Answer $30 < s \leq 40$ [1]

(c) Calculate an estimate for the mean speed of the cars on the road.

$\Sigma fx = 300 + 560 + 810 + 110 + 130 = 1910$

$\Sigma f = 50$

Mean = 1910 ÷ 50 = 38.2

Answer 38.2 mph [4]

[Turn over

24 A child's height increased from 84 cm to 91 cm.

Calculate the percentage increase.

$91 - 84 = 7$ cm

$\frac{7}{84} \times 100 = 8.3333...$

$= 8.33$

Answer 8.33 % [3]

25 ABCD is a square of side 6 cm.

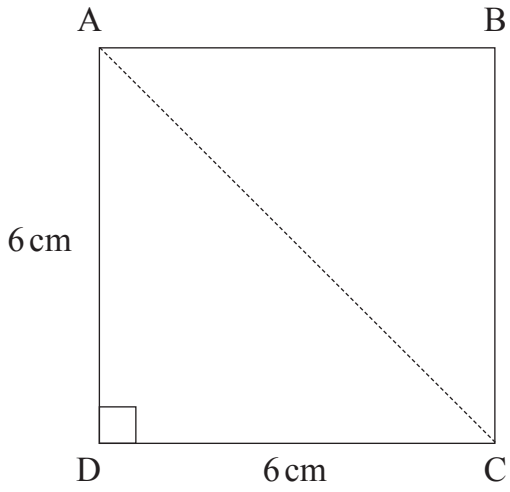


diagram not drawn accurately

How much longer is AC than AD?

You must show all your working.

$AC^2 = 6^2 + 6^2$

$AC^2 = 36 + 36 = 72$

$AC = \sqrt{72} = 8.485281...$

$AC - AD = 8.485... - 6$

$= 2.485... = 2.49$ cm

Answer 2.49 cm [4]

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