AQA

Practice Paper A

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname Answers

Forename(s)

Candidate signature Thankyou JP AAY DAB MG

GCSE Mathematics

H

Higher Paper 3 Calculator

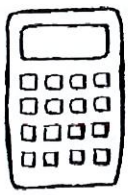
Summer 2019

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to the answer book.

Advice

- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
3	
4 - 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
22 – 23	
24 – 25	
26 – 27	
TOTAL	

Teacher	Class

8300/MissB/3H

Practice Paper Overview

Q	Topic	Mark	Total
1	Angles in Polygons	1	
2	Algebraic Factors	1	
3	Factorise and Solve	1	
4	Congruence	2	
5	Percentage Change	2	
6	Scatter Graph	4	
7	Quadratic Graph	7	
8	Compound Interest	5	
9	Product of Prime Factors	3	
10	Sine Rule MCQ	1	
11	Pie Chart	4	
12	Angles on Parallel Lines	3	
13	Form and Solve Inequalities	3	
14	Reverse Averages	3	
15	Direct Proportion	2	
16	Combined Transformations	4	
17	Algebraic Ratio	4	
18	Circle Theorem MCQ	1	
19	Perpendicular Lines	3	
20	Probability Problem	4	
21	Quadratic Formula	5	
22	Iteration	3	
23	Rearranging Equations	3	
24	3D Pythagoras	4	
25	Cosine Rule	3	
26	Algebraic Fractions	4	
	Total		**80**

Answer **all** questions in the spaces provided.

Do not write outside the box

1 A shape has an interior angle of 120^o.

How many sides does the shape have?

Ext = 180 - 120 = 60°

$n = \frac{360}{60} = 6$ sides

[1 mark]

2 | 3 | 6 | 15

2 Circle the Highest Common Factor (HCF) of $12xy^3$ and $18x^3y^9$

$6xy^3$

[1 mark]

$2xy^3$ | $3x^3y^9$ | $3x^3y$ | $6xy^3$ | $6x^3y^9$ | $36xy^9$

3 Circle the solutions to $x^2 - 5x - 24 = 0$

$(x - 8)(x + 3) = 0$

[1 mark]

$x = -6$ and $x = 4$ | $x = -4$ and $x = 6$

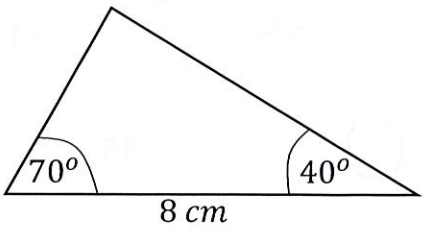
$x = -3$ and $x = 8$ | $x = -8$ and $x = 3$

Do not write outside the box

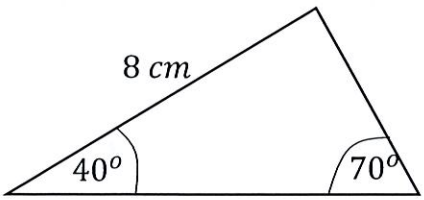
4 Here are four triangles

Not drawn accurately

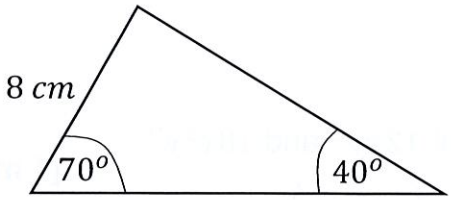
A



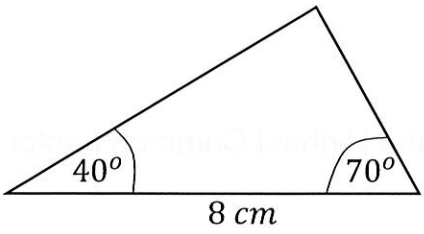
B



C



D



4 (a) Which two triangles are congruent? Circle your answers.

[1 mark]

A B C D

4 (b) Circle the reason for your answer to part (a).

[1 mark]

SSS ASA SAS RHS

2

Do not write outside the box

5 Paul buys a laptop from PC World for £529.

A year later it is worth £444.36.

Calculate the percentage decrease in the price.

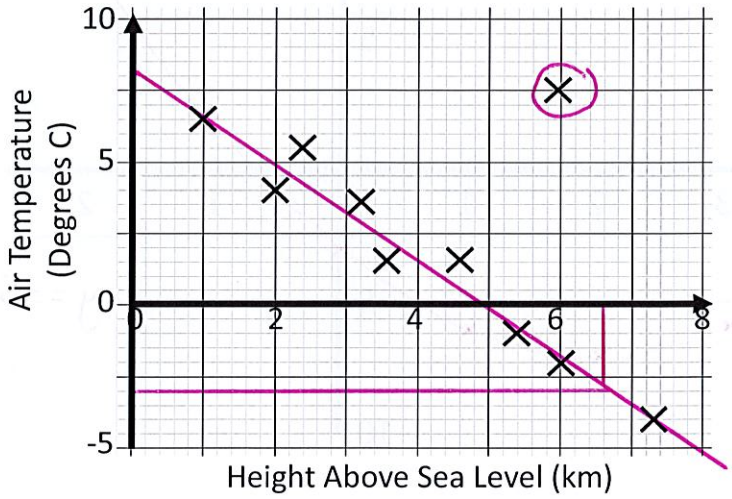
change / original × 100

[2 marks]

$\frac{84.64}{529} \times 100 = 16\%$

Answer 16% decrease

6 Below is a scatter graph showing the air temperature and the height above sea level.



6 (a) Describe the correlation between the air temperature and the height above sea level. **[1 mark]**

As height above sea level ~~decreases~~ increases,

Air temperature decreases. Negative correlation.

6 (b) Circle and write down the coordinates of the outlier. **[1 mark]**

Answer (6, 7.5)

6 (c) Find an estimate of the height above sea level when the air temperature is -3^oC. **[2 marks]**

Answer 6.6 ± 0.2

6

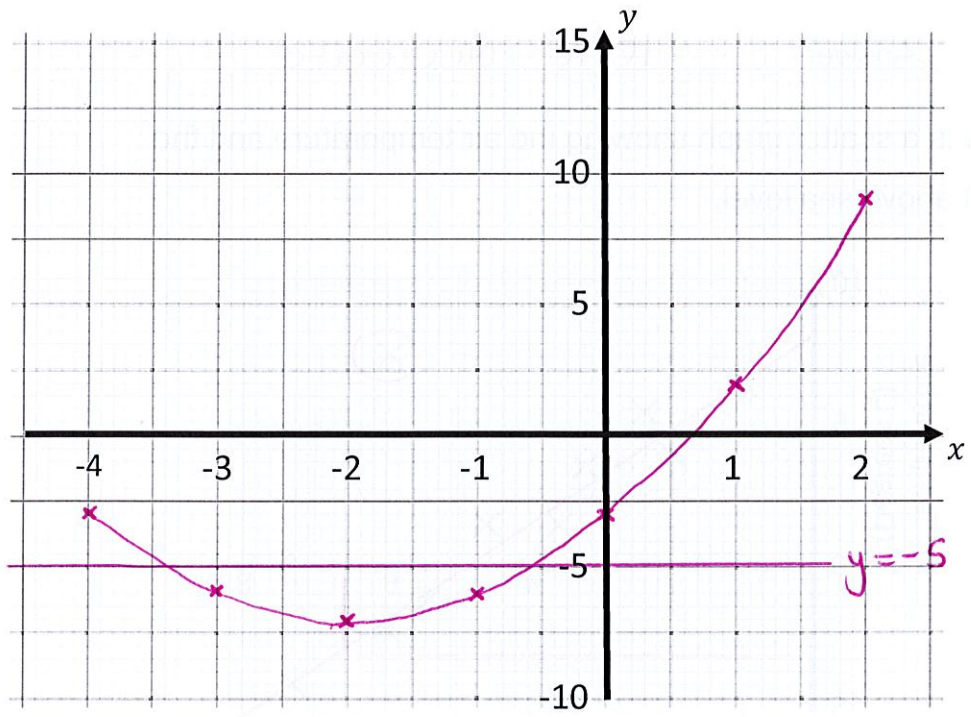
Do not write outside the box

7 (a) Complete the table of values for $y = x^2 + 4x - 3$. **[2 marks]**

x	-4	-3	-2	-1	0	1	2
y	-3	-6	-7	-6	-3	2	9

7 (b) On the gird, draw the graph of $y = x^2 + 4x - 3$.

[2 marks]



7 (c) Circle the coordinates of the turning point of the curve.

[1 mark]

$(0, -3)$ $(-2, -7)$ $(-2, 1)$ $(2, -7)$ $(4, -3)$

7 (d) Use the graph to find approximate solutions to $x^2 + 4x - 3 = -5$

[2 marks]

$x =$ -3.84 $x =$ -0.6

Do not write outside the box

8 The value of a new house £V is given by

$$V = 160\,000 \times 1.014^t$$

where t is the age of house in complete years.

8 (a) Write down the value of V when $t = 0$.

[1 mark]

$V = 160000 \times 1.014^0$

Answer £160000

8 (b) What is the value of V after 3 years?

[2 marks]

$160\,000 \times 1.014^3$

Answer £166 814.52

8 (c) After how many complete years will the house's value rise above £180 000?

[2 marks]

4 years £169149.92

5 years £171518.02

6 years £173919.27

7 years £176354.14

8 years £178823.10

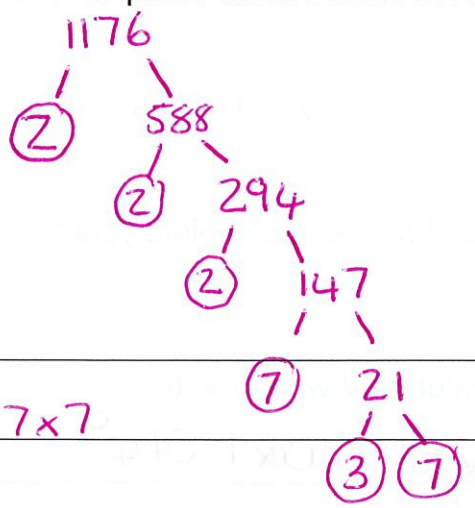
9 years £181326.62

Answer 9 years

5

Do not write outside the box

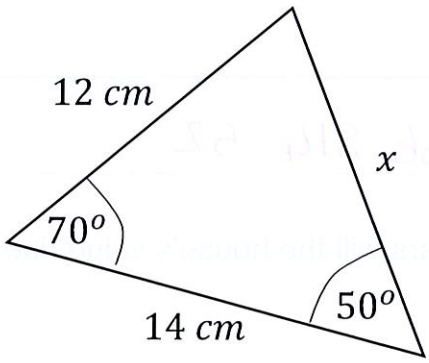
9 Express 1176 as a product of its prime factors in index form. **[3 marks]**



$2 \times 2 \times 2 \times 3 \times 7 \times 7$

Answer $2^3 \times 3 \times 7^2$

10 Which equations gives the missing length, x, of this triangle?



Circle your answer. **[1 mark]**

$\frac{x}{\sin(50)} = \frac{12}{\sin(70)}$ $\quad$ $\frac{x}{\sin(50)} = \frac{12}{\sin(14)}$

$\frac{x}{\sin(70)} = \frac{12}{\sin(50)}$ $\quad$ $\frac{x}{\sin(70)} = \frac{14}{\sin(70)}$

Do not write outside the box

11 The pie chart shows some information about the medals the United States received at the Rio Olympics in 2016.

United States
Medal Results

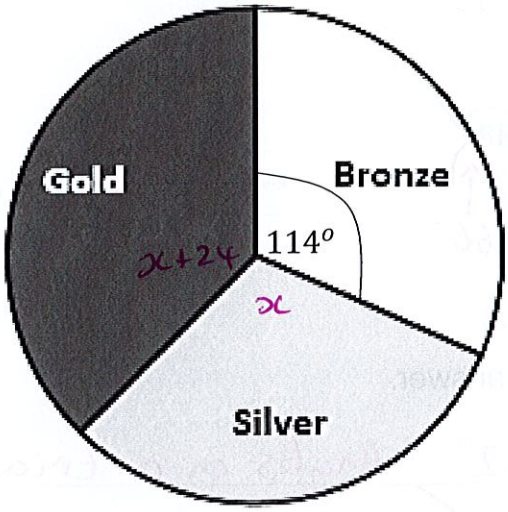


Diagram not drawn accurately

The angle for gold would be 24^o more than the angle for Silver.

There were 120 medals in total.

Work out the number of silver medals.

[4 marks]

$2x + 24 = 360 - 114$

$2x + 24 = 246$.

$2x = 222$

$x = 111°$

$\frac{360}{120} = 3°$ per medal.

silver medals $= \frac{111}{3} = 37$ medals

Answer 37 medals.

4

Do not write outside the box

12 AB and CD are parallel to each other.

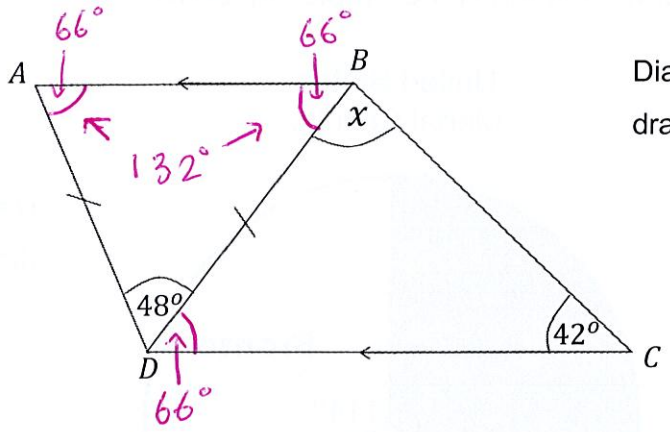


Diagram not drawn accurately

Find the size of angle x.

Give reasons for your answer. **[3 marks]**

$180° - 48° = 132°$ - Angles in a triangle

$132° \div 2 = 66°$ - Base angles in isosceles equal

$\angle BDC = 66°$ - Alternate angles equal (Z)

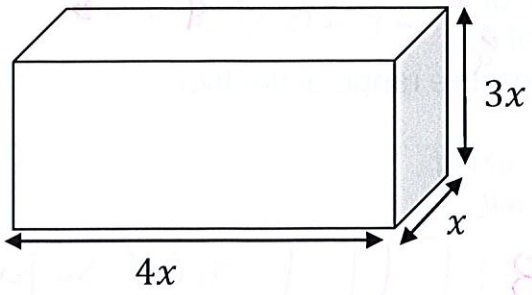
$x + 66 + 42 = 180$ - Angles in a triangle

$x = 72°$

Answer $72°$

Do not write outside the box

13 Here is a cuboid.



All measurements are in centimetres.

x is an integer.

The total volume of the cuboid is less than $1200\ cm^3$

Show that $x \leq 5$ **[3 marks]**

$x < 5$, not ≤ 5

Area cross-section $= x \times 3x = 3x^2$

Volume = Area x length $= 3x^2 \times 4x = 12x^3$ ✓

$12x^3 < 1200$

$\div 12 \quad \div 12$

$x^3 < 100$

$\sqrt[3]{} \quad \sqrt[3]{}$

$x < 4.64$ ✓, but x has to be an integer

so $x < 5$ ✓

Answer _____

3

Do not write outside the box

14 Five integers have

a mode of 7 ← at least 2 7s

a median of 9 ← 8 in the middle

a mean of 8. ← 5 lots of 8 = 45 in total

What is the greatest possible range of the five integers?

You must show your working.

[3 marks]

both 7s must go below a ✓ middle

7 7 8 ☐ ☐ Total so far = 22, so 23 left

makethis small ↑ ↑ makethis big

smallest possible → 8 + 14 = 23 ✓

7 7 8 8 14 → range = 14 − 7

Answer 7 ✓

15 y is directly proportional to the square of x.

x / x^2	2 / 4	3 / 9	b / ?
y	a	36 ↓×4	100

Work out the value of a and b.

[2 marks]

$x^2 \times 4 = y$, so

$a = 4 \times 4 = 16$

$b^2 = 100 \div 4 = 25$

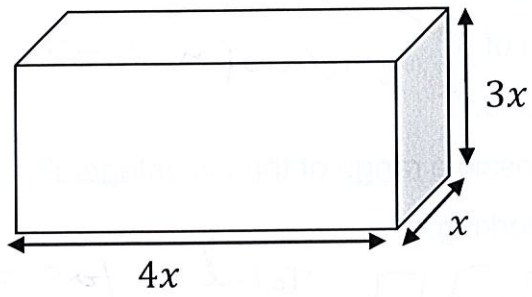
$b = 5$

$a =$ 16 $\quad b =$ 5

5

Do not write outside the box

13 Here is a cuboid.



All measurements are in centimetres.

x is an integer.

The total volume of the cuboid is less than $1200\ cm^3$

Show that $x < 5$ **[3 marks]**

Answer _____

3

Do not write outside the box

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a mode of 7 ← at least 2 7s

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7 7 8 ☐ ☐ Total so far = 22, so 23 left

small as possible ↑ big as possible ↑

9 + 14 = 23

7 7 8 9 14 → range = 14 − 7

Answer 7 ✓

15 y is directly proportional to the square of x.

x x^2	2 4	3 9	b b^2
y	a	36 ↙×4	100

Work out the value of a and b.

[2 marks]

$x^2 \times 4 = y$, so

$a = 4 \times 4 = 16$

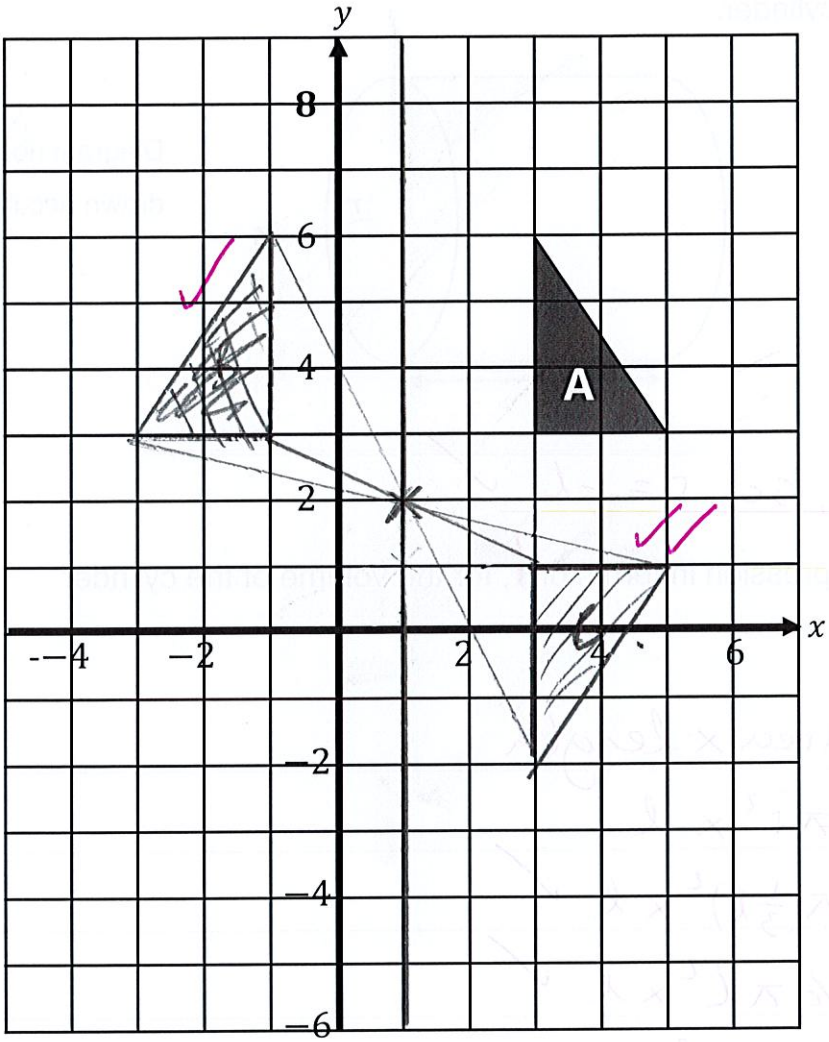
$b^2 = 100 \div 4 = 25$

$b = 5$

$a =$ 16 $\quad b =$ 5

Do not write outside the box

16



Triangle **A** is drawn on a coordinate grid.

The triangle **A** is reflected in the line $x = 1$ and

then enlarged by a scale factor of -1 from the centre $(1, 2)$ to give triangle **B**.

Describe fully the single transformation which maps triangle **A** onto triangle **B**.

[4 mark]

Reflection in line y=2

4

17 Below is a cylinder. **[1 mark]**

Do not write outside the box

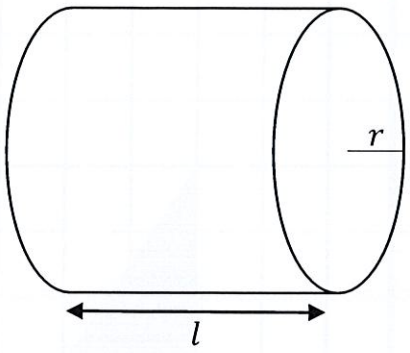


Diagram not drawn accurately

$r : l = 1 : 3$, so $r = \frac{1}{3}l$ ✓

Write an expression in terms of l, for the volume of the cylinder.

[4 marks]

$V = \text{Area} \times \text{length}$

$= \pi r^2 \times l$

$= \pi(\frac{1}{3}l)^2 \times l$ ✓

$= \frac{1}{9}\pi l^2 \times l$ ✓

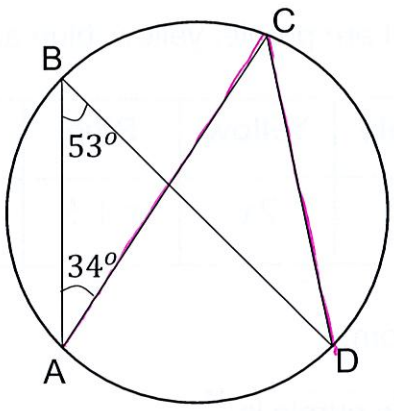
$= \frac{1}{9}\pi l^3$

Answer $\frac{1}{9}\pi l^3$ ✓

4

Do not write outside the box

18



Not drawn accurately

Circle the size of angle ACD. = 53° ← Both subtended from A and D
ABD = 53° ←

[1 mark]

34^o 53^o 68^o 106^o 146^o

19 Write down the equation of the line that is perpendicular to $y = \frac{x}{2} + 5$ and passes through $(7, 1)$.

[3 marks]

gradient = $\frac{1}{2}$, so perpendicular gradient = -2

new eqn: $y = -2x + c$

sub in (7, 1) $1 = -2 \times 7 + c$

$1 = -14 + c$

$15 = c$

Answer $y = -2x + 15$

Do not write outside the box

20 A bag contains counters that are purple, yellow, blue and white.

Counter	Purple	Yellow	Blue	White
Probability	22	$2x$	$x + 5$	$3x + 7$

A counter is chosen at random.

The probability the counter is purple is $\frac{11}{50}$.

Work out the probability it is white.

[4 marks]

$\frac{22}{\text{Total}} = \frac{11}{50}$, so total counters = 100

$22 + 2x + x + 5 + 3x + 7 = 100$ ✓

$6x + 34 = 100$

$6x = 66$

$x = 11$ ✓, so white $= 3 \times 11 + 7 = 40$ ✓

Answer $\frac{40}{100} = \frac{2}{5}$ ✓

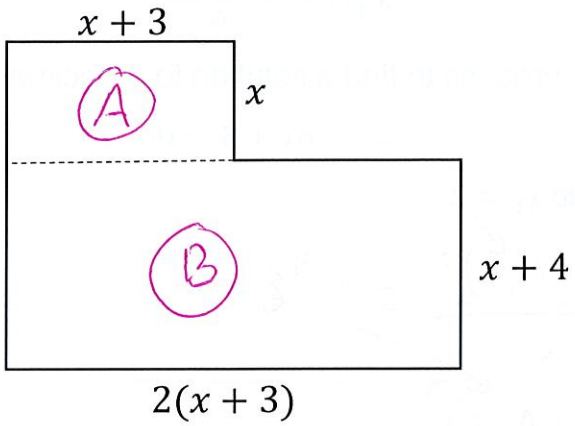
4

Do not write outside the box

21 The diagram below shows a 6-sided shape.

All the corners are right angles.

All the measurements are given in centimetres.



The area of the shape is $40\ cm^2$.

21 (a) Show that $3x^2 + 17x - 16 = 0$ **[2 marks]**

$A = x^2 + 3x$ $\quad B = 2(x+3)(x+4) = 2x^2 + 14x + 24$

Total Area $= 3x^2 + 17x + 24 = 40$

$-40 \quad -40$

$3x^2 + 17x - 16 = 0$

21 (b) Solve the equation

$$3x^2 + 17x - 16 = 0$$ **[3 marks]**

Give your solutions correct to 3 significant figures.

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $\quad a = 3 \quad b = 17 \quad c = -16$

$\frac{-17 \pm \sqrt{17^2 - 4 \times 3 \times -16}}{2 \times 3} = \frac{-17 \pm \sqrt{289 + 192}}{6}$

$= \frac{-17 \pm \sqrt{481}}{6}$

$= 0.822$ or -6.49

$x = 0.822$ $\quad x = -6.49$

Do not write outside the box

22 An approximate solution to the equation $x^3 - 6x + 3 = 0$ is found using this iterative process.

$$x_{n+1} = \frac{(3 - x_n^3)}{6}$$

Use this iterative process to find a solution to 3 decimal places of

$$x^3 - 6x + 3 = 0$$

Start with the value $x_1 = 2$

[3 marks]

$x_2 = \frac{3-(2)^3}{6} = -5/6$

$x_3 = \frac{3-(Ans)^3}{6}$

$x_6, x_7, x_8 = 0.481$, so

Answer 0.481

23 Rearrange

$$y = \frac{wx - 5}{w - 4x}$$

to make x the subject. $\times w-4x$ $\times w-4x$

[3 marks]

$y(w-4x) = wx-5$

$yw - 4xy = wx - 5$

$yw + 5 = wx + 4xy$

$yw + 5 = x(w+4y)$

$\div(w+4y)$ $\div(w+4y)$

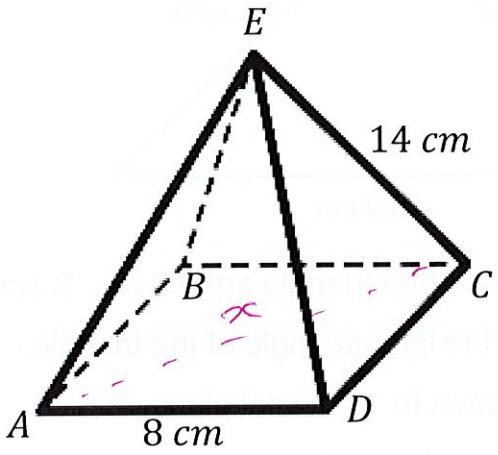
Answer $x = \frac{yw+5}{w+4y}$

6

Do not write outside the box

24 ABCDE is a square-based pyramid.

The apex of the pyramid, E, is directly over the centre of the base.



Calculate the volume of the pyramid.

Give your answer correct to 1 decimal place. **[4 marks]**

Volume = $\frac{1}{3}$ × area of base × height

Area of base = $8 \times 8 = 64 cm^2$

Height: Use Pythag twice $\quad x = \sqrt{8^2+8^2}$

$= 8\sqrt{2}$ ✓

$h^2 + (4\sqrt{2})^2 = 14^2$ $\quad$ height $= \sqrt{14^2-(4\sqrt{2})^2}$

$= 2\sqrt{41}$ ✓

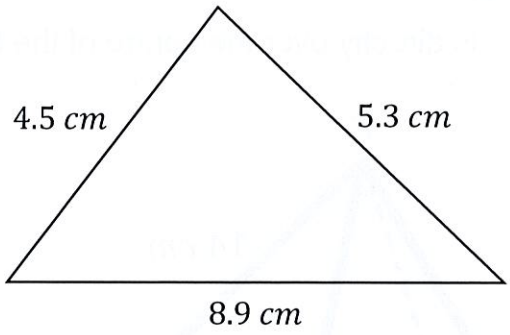
Volume $= \frac{1}{3} \times 64 \times 2\sqrt{41}$ ✓

Answer 273.2 ✓

4

Do not write outside the box

25



The lengths of the sides of a triangle are 4.5 cm, 5.3 cm and 8.9 cm.

Calculate the size of the largest angle of the triangle.

Give your answer correct to 1 decimal place. **[3 marks]**

$c^2 = a^2 + b^2 - 2ab\cos C$

$8.9^2 = 4.5^2 + 5.3^2 - 2 \times 4.5 \times 5.3 \times \cos C$ ✓

$\cos C = -\frac{343}{530}$ ✓

Answer 130.3 ✓

26 Simplify fully

$$\frac{x^2 + 7x + 12}{4x - 2} \div \frac{x + 4}{2}$$

[4 marks]

✓ ✓

$\frac{2(x^2+7x+12)}{(4x-2)(x+4)} = \frac{2(x+3)(x+4)}{2(2x-1)(x+4)}$

Answer $\frac{x+3}{2x-1}$ ✓

End of Questions

7