3H

EDEXCEL IGCSE

Pearson Edexcel International GCSE

MATHEMATICS A

SOLUTIONS

MAY 2012 | **4MA0/3H**

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The methods used in these solutions, where relevant, are methods which have been successfully used with students. The method shown for a particular question is not always the only method and We do not claim that the method we have used is necessarily the most efficient or 'best' method. We will, from time to time, update a solution to show a different method if We feel that it is a good idea to do so.

Sometimes a method used in these solutions might be unfamiliar to You. If You are able to use a different method to obtain the correct answer then We would usually recommend that You keep using your existing method and not change to the method that We have used here. However, the choice of method is always up to You and We believe that it is often useful if You know more than one method to solve a particular type of problem.

Within these solutions We have indicated where marks **might** be awarded for each question. We have used B marks, M marks and A marks in a similar, but **not identical**, way that the exam board uses these marks within their mark schemes. We have done this for simplicity and convenience. We have sometimes interchanged B marks, M marks and A marks and We have sometimes awarded the marks in different ways to the exam board.

B1 – This is an unconditional accuracy mark (the specific number, word or phrase must be seen. This type of mark cannot be given as a result of 'follow through').

M1 – This is a method mark. We have indicated where method marks might be awarded for the method that is shown. If You use a different method, then the same number of method marks would be awarded but We are not able to indicate for what the marks would be awarded for Your particular method. When appropriate, You should seek clarity and download the relevant examiner mark scheme from the exam board's web site

A1 – These are accuracy marks. Accuracy marks are typically awarded after method marks. If the correct answer is obtained, then You should normally (but not always) expect to be awarded all of the method marks (provided that You have shown Your method) and all of the accuracy marks.

(a) The length of an Airbus A300 aeroplane is 54 m.
The ratio of the length of this aeroplane to its wingspan is 6 : 5

Work out the wingspan of the aeroplane.

L : W
6 : 5
54 : ?

$\frac{54}{6} = 9$ (B1)

ONE PART

WIDTH = 5 × 9

45 (A1)

..... m

(2)

(b) A model is made of the Airbus A300 aeroplane.
The length of the model is 36 cm.
The length of the real aeroplane is 54 m.

Find the ratio of the length of the model to the length of the real aeroplane.
Give your ratio in the form 1 : *n*

M : R

36cm : 54m

= 36cm : 5400cm (M1)

= 36 : 5400

= 1 : 150 (÷ 36)

(A2)

1 : 150

(3)

$A = 2x^2 + kx$

(a) $x = -3$
$k = 4$

Work out the value of A.

$A = 2 \times (-3)^2 + 4 \times -3$ M1

$= 2 \times 9 - 12$

$= 18 - 12$

$= 6$

$A =$ 6 A1

(2)

(b) $A = 38$
$x = 4$

Work out the value of k.

$38 = 2 \times 4^2 + k \times 4$ M1

$38 = 2 \times 16 + 4k$

$38 = 32 + 4k$

$4k = 38 - 32$

$4k = 6$ M1

$k = \frac{6}{4}$

$= \frac{3}{2}$ $(= 1.5)$

$k =$ 1.5 A1

(3)

(a) Write $2^3 \times 2^6$ as a single power of 2

2^9 A1

(1)

(b) Write $\frac{3^9}{3^4}$ as a single power of 3

3^5 A1

(1)

(c) $\frac{5^n}{5^4 \times 5^6} = 5^3$

Find the value of n.

$\frac{5^n}{5^{10}} = 5^3 \Rightarrow n - 10 = 3$

$n = 13$

M1

(EITHER)

$n =$ 13 A1

(2)

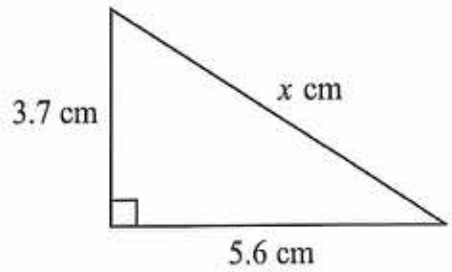


Diagram **NOT** accurately drawn

Work out the value of x.
Give your answer correct to 3 significant figures.

$x^2 = 3.7^2 + 5.6^2$ (M1)

$= 45.05$

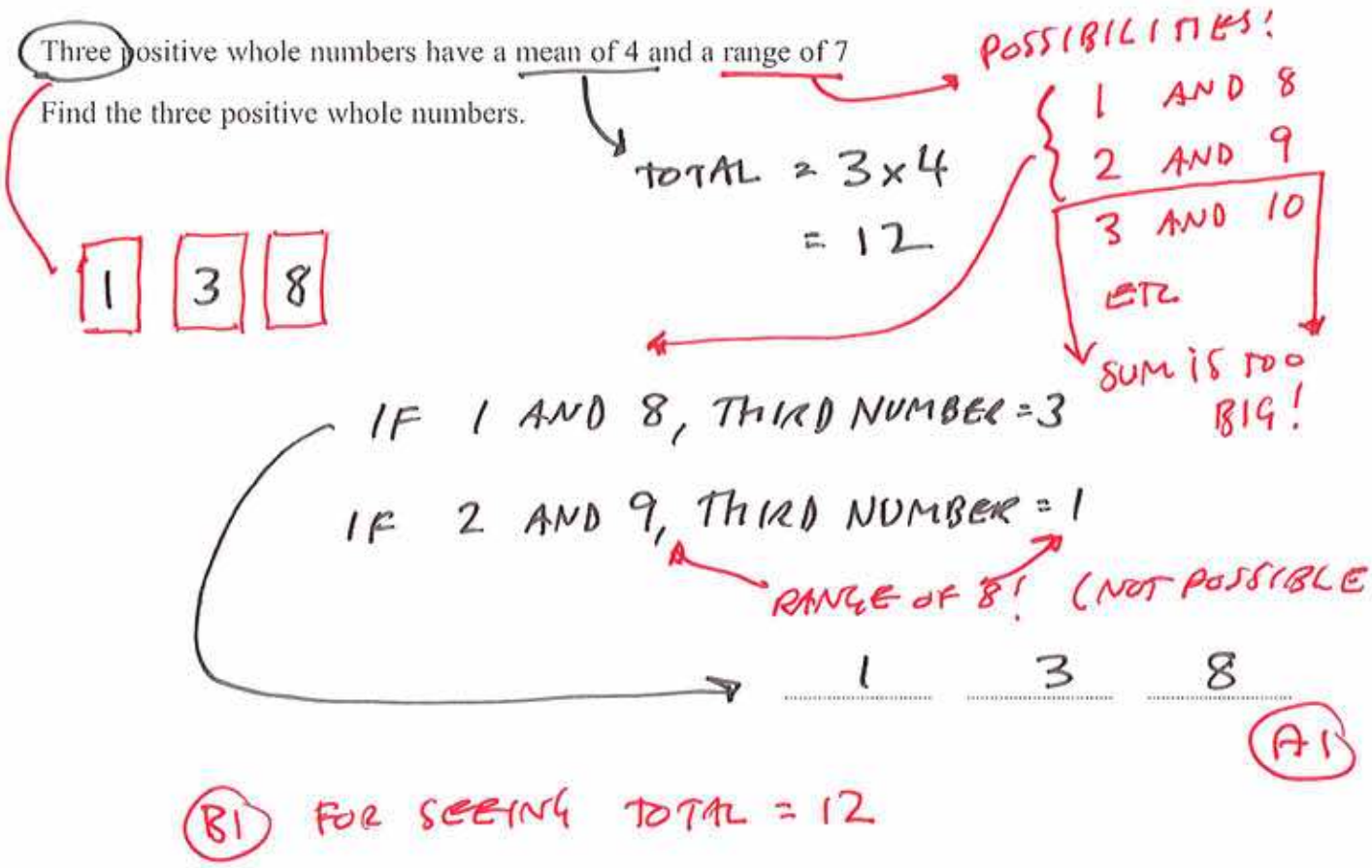
$x = \sqrt{45.05}$ (M1)

$= 6.71192...$

$= 6.71$ cm (A1)

Three positive whole numbers have a mean of 4 and a range of 7

Find the three positive whole numbers.



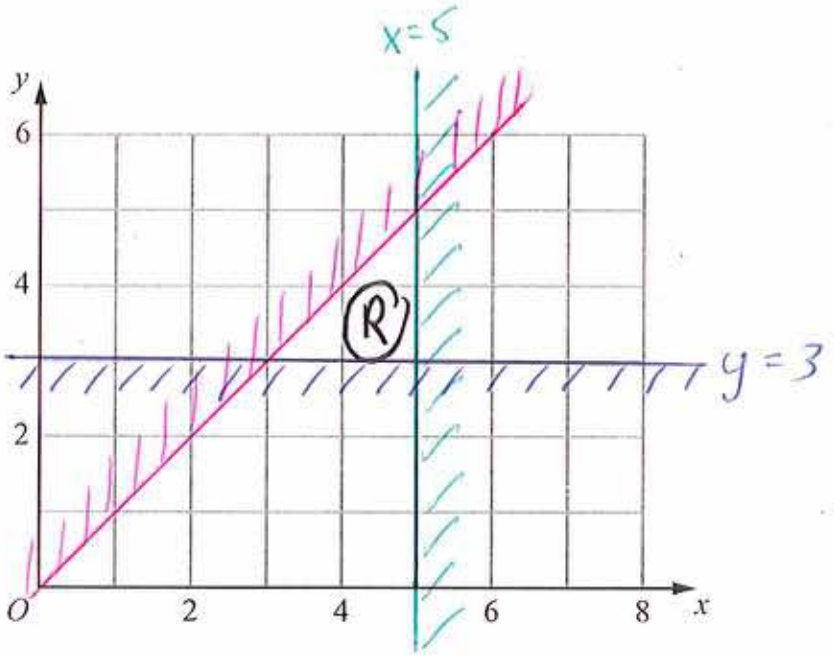
Show, by shading on the grid, the region defined by all three of the inequalities

$x \leqslant 5$

$y \geqslant 3$

$y \leqslant x$

Label your region **R**.



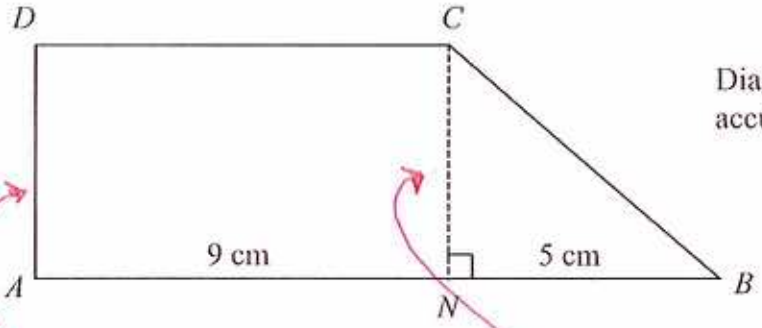
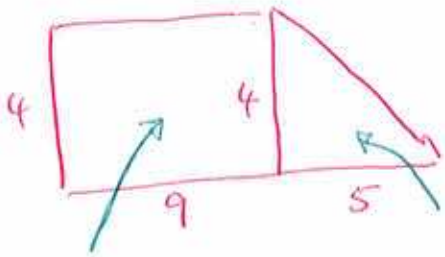


Diagram **NOT** accurately drawn

The shape *ABCD* is made from a rectangle *ANCD* and the right-angled triangle *NBC*.
ANB is a straight line.
AN = 9 cm.
NB = 5 cm.
The area of rectangle *ANCD* is 36 cm²

[AD = 4] B1

Work out the area of shape *ABCD*.



36 A1

$\frac{4 \times 5}{2} = 10$ A1

TOTAL = 36 + 10
= 46

46 A1 cm²

On 9th May, 2009, there were 3440 people in the world with swine flu.
Of these people, 1639 were in the USA.

(a) Express 1639 as a percentage of 3440
Give your answer correct to 1 decimal place.

M1 $\frac{1639}{3440} \times 100 = 47.6453...$

47.6 A1 %

(2)

The 3440 people who had swine flu on 9th May was an increase of 37.6% on the number of people who had swine flu on 8th May.

→ 1.376

(b) Calculate the number of people who had swine flu on 8th May.

BACKWARDS / REVERSE PERCENTAGE

$\frac{3440}{1.376}$ M1

B1

2500 A1

(3)

(a) Solve $3(2x - 1) = 6$

Show clear algebraic working.

$6x - 3 = 6$ M1

$6x = 9$ M1

$\Rightarrow x = \frac{9}{6}$

$x =$ 1·5 A1

(3)

(b) Solve $\frac{2y+1}{3} = \frac{y-2}{4}$

Show clear algebraic working.

$4(2y+1) = 3(y-2)$

$\Rightarrow 8y + 4 = 3y - 6$ M1 M1

$\Rightarrow 8y - 3y = -6 - 4$

$5y = -10$ M1

$y = \frac{-10}{5}$

$y =$ −2 A1

(4)

The table shows information about the number of peas in each of 25 pods.

Number of peas	1	2	3	4	5	6
Number of pods	3	6	5	8	2	1

f x d c 3 12 15 32 10 6

(a) Work out the mean number of peas in the 25 pods. M1

MEAN = TOTAL PEAS / NUMBER OF PODS

$= \frac{78}{25}$ M1

$= 3.12$ A1

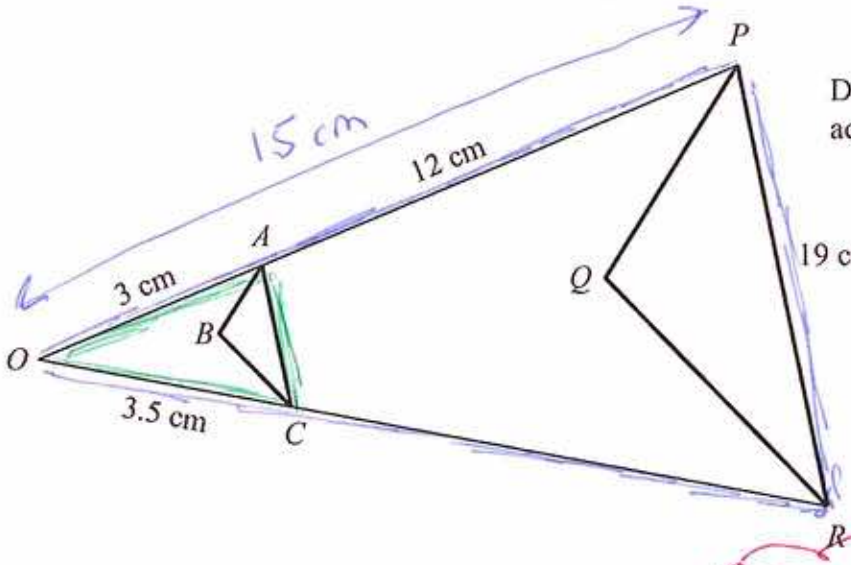


Diagram **NOT** accurately drawn

GREEN AND BLUE TRIANGLES ARE SIMILAR!

SCALE FACTOR = 15/3 = 5

Triangle PQR is an enlargement, centre O, of triangle ABC.
OAP and OCR are straight lines.
$OA = 3$ cm.
$AP = 12$ cm.
$OC = 3.5$ cm.
$PR = 19$ cm.

(a) Work out the length of CR.

$OC = 3.5 \times 5$ (M1)
$= 17.5$
$CR = 17.5 - 3.5$
$= 14$ (A1)

14 cm
(2)

(b) Work out the length of AC.

$AC = \frac{19}{5}$ (M1)
(M1)

3.8 (A1) cm
(3)

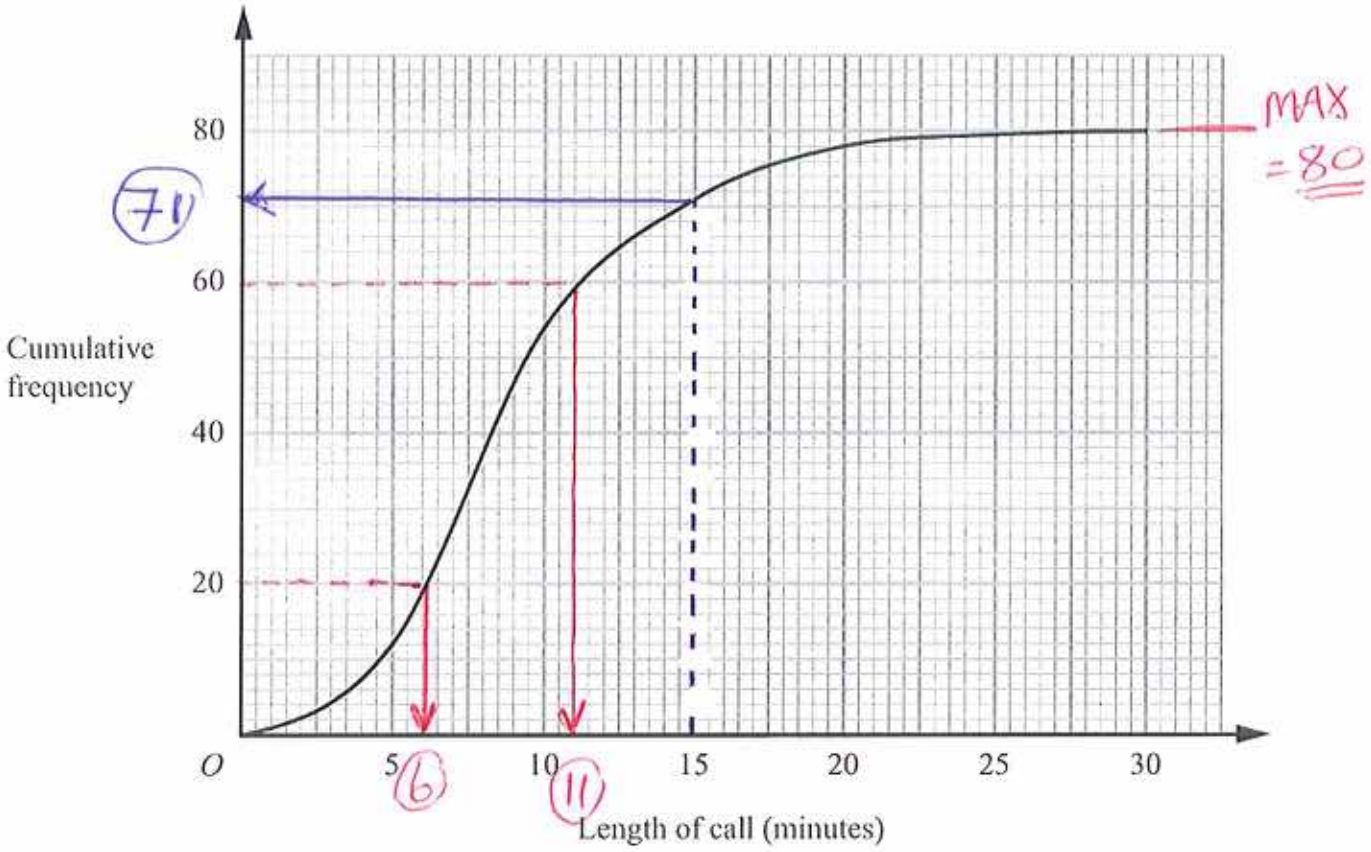
The area of triangle ABC is 2 cm^2

(c) Work out the area of triangle PQR.

2×5^2 (M1)
(M1)
AREAS!

50 (A1) cm^2

The cumulative frequency graph gives information about the lengths, in minutes, of 80 telephone calls.



(a) Find an estimate for the number of calls which were longer than 15 minutes.

80 − 71 (M1)

9 (A1)

(2)

(ACCEPT 9 → 10)

(b) Find an estimate for the interquartile range of the lengths of the 80 calls.

$Q_1 = \frac{80}{4} = 20$TH $= 6$

$Q_3 = 3 \times \frac{80}{4} = 60$TH $= 11$

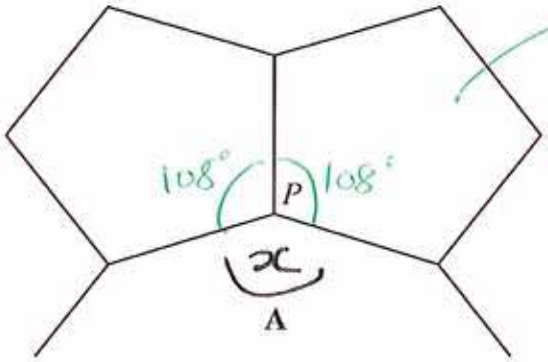
(M1)

$Q_3 - Q_1 = 11 - 6$

5 (A1) minutes

(2)

(ACCEPT 4·5 → 5·5)



PENTAGON
[INTERIOR ANGLE = 108°]

Diagram **NOT** accurately drawn

The diagram shows two congruent regular pentagons and part of a regular n-sided polygon **A**.
Two sides of each of the regular pentagons and two sides of **A** meet at the point P.

Calculate the value of n.
Show your working clearly.

ANGLE x $= 360 - 2 \times 108$ (B1)

$= 144°$ (M1)

EXTERIOR ANGLE OF A $= 180 - 144$

$= 36°$ (M1)

NUMBER OF SIDES $= \frac{360}{36}$ (M1)

$= 10$

$n =$ 10 (A1)

(a) The equation of a line **L** is $2x - 3y = 6$
Find the gradient of **L**.

$2x - 3y = 6$

$-3y = -2x + 6$

$y = \frac{-2x+6}{-3}$ } M1 (EITHER)

$= \frac{-2}{-3}x + \frac{6}{-3}$

$= \frac{2}{3}x - 2$ B1

$\frac{2}{3}$ A1

(3)

(b) Find the equation of the line which is parallel to **L** and passes through the point (6, 9).

$m = \frac{2}{3}$

$y = mx + c$

$y = \frac{2}{3}x + c \quad (x = 6, y = 9)$

$\Rightarrow 9 = \frac{2}{3} \times 6 + c$ M1

$9 = 4 + c$

$c = 9 - 4$

$= 5$

$y = \frac{2}{3}x + 5$ A1

(2)

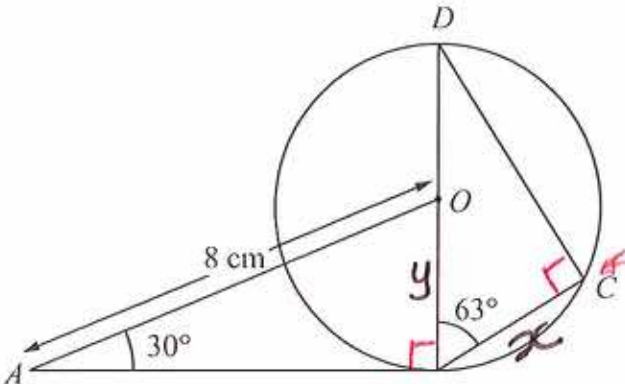


Diagram **NOT** accurately drawn

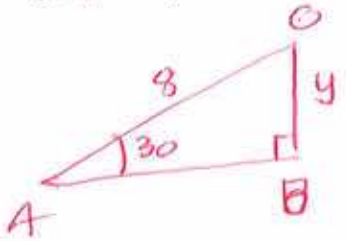
ANGLE FROM DIAMETER = 90°

TANGENT WITH RADIUS = 90°

B, C and D are points on a circle, centre O.
BOD is a diameter of the circle.
AB is the tangent to the circle at B.
$AO = 8$ cm. Angle $BAO = 30°$ Angle $CBD = 63°$

Calculate the length of BC. (x)
Give your answer correct to 3 significant figures.

USING TRIANGLE AOB!



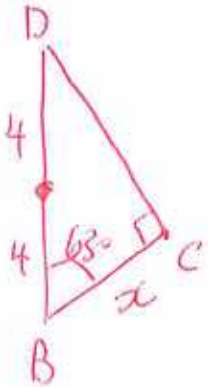
$\sin 30 = \frac{y}{8}$

$\Rightarrow y = 8 \times \sin 30$

$= 4$

THIS IS RADIUS OF THE CIRCLE!

USING TRIANGLE BCD:



$\cos 63° = \frac{x}{8}$

$\Rightarrow x = 8 \cos 63$

$= 3.6319...$

$= 3.63$ cm

The population of India increased by 20% between 1989 and 1999. → × 1·20
The population of India increased by a further 17% between 1999 and 2009. → × 1·17

Calculate the percentage by which the population of India increased between 1989 and 2009.

1·20 × 1·17 (M1)

(B1) EITHER

= 1·404

= 40·4% (A1)

(a) Simplify $(3a^2b)^4$

$3^4 \times a^{2\times4} \times b^4$

A1 A1

$81a^8b^4$

(2)

(b) Simplify $(9c^8)^{\frac{1}{2}}$

$9^{\frac{1}{2}} \times c^{8\times\frac{1}{2}} = \sqrt{9} \times c^4$

A1 A1

$3c^4$

(2)

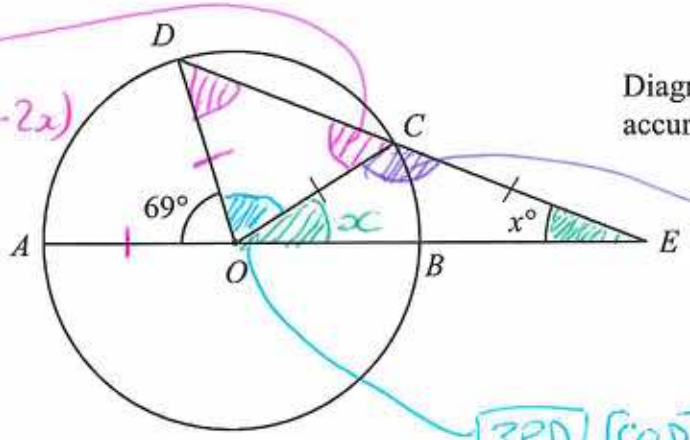


Diagram **NOT** accurately drawn

A, *B*, *C* and *D* are points on a circle, centre *O*.
AOBE and *DCE* are straight lines.
CO = *CE*.
Angle *AOD* = 69°
Angle *CEO* = *x*°

Calculate the value of *x*.
Show your working clearly.

2ND
$180-(180-2x)$
$=2x$ M1

1ST [OCE]
$180-2x$ M1

3RD [COD]
$180-4x$ M1

4TH [COD - AGAIN!]
$COD = 180-(69+x)$
$= 111-x$ M1

TWO EXPRESSIONS FOR THE SAME ANGLE
YIPEE!

$111-x = 180-4x$ M1
$4x-x = 180-111$
$3x = 69$
$x = 23°$ A1

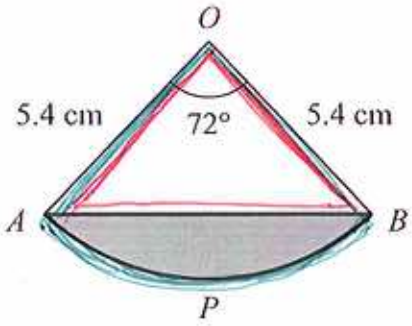


Diagram **NOT** accurately drawn

The diagram shows a sector $OAPB$ of a circle, centre O.
AB is a chord of the circle.
$OA = OB = 5.4$ cm.
Angle $AOB = 72°$

Calculate the area of the shaded segment APB.
Give your answer correct to 3 significant figures.

SECTOR

$$A = \frac{72}{360} \times \pi \times 5.4^2 \quad \text{(M1)}$$

$$= 18.3217... \quad \text{(A1)}$$

TRIANGLE

$$A = \frac{1}{2} \times 5.4^2 \times \sin 72 \quad \text{(M1)}$$

$$= 13.866... \quad \text{(A1)}$$

$$\text{SHADED AREA} = 18.3217... - 13.866...$$

$$= 4.45529...$$

$$= \underline{4.46}\ \text{cm}^2 \quad \text{(A1)}$$

Correct to 2 decimal places, the volume of a solid cube is 42.88 cm³

Calculate the lower bound for the surface area of the cube.

SMALLEST

$V = 42.88 \pm 0.005$

SMALLEST SIDE LENGTH = $\sqrt[3]{42.875}$ B1

LOWER BOUND!

$= 3.5$ A1

SURFACE AREA = 6×3.5^2 M1

$= 73.5 \text{ cm}^2$ A1

..... cm²

Solve the simultaneous equations

BOTH ARE $y =$ { $y = 2x^2$ —— (1) ; $y = 20 - 3x$ —— (2)

Show clear algebraic working.

MATCH EQUATIONS

(1) = (2)

$2x^2 = 20 - 3x$ (M1)

$2x^2 + 3x - 20 = 0$ (A1)

$(2x - 5)(x + 4) = 0$ (M1)

$2x - 5 = 0$

$x_1 = 2.5$

$x + 4 = 0$

$x_2 = -4$ (A1) BOTH

SUBSTITUTE INTO (1)

$y_1 = 2 \times 2.5^2$

$= 12.5$

$y_2 = 2 \times (-4)^2$

$= 32$ (A1) BOTH