4H

**Pearson Edexcel
International GCSE**

EDEXCEL
IGCSE

MATHEMATICS A
SOLUTIONS

JANUARY 2016

4MA0/4H

Disclaimer

(a) Work out the value of $\dfrac{\sqrt{4.6}}{8.1 - 3.7}$

Give your answer as a decimal.
Write down all the figures on your calculator display.

A2

0.48744569

(2)

(b) Write your answer to part (a) correct to 3 significant figures.

A1

0.487

(1)

$D = 3e^2 + 4e$

Work out the value of D when $e = -5$

$$D = 3(-5)^2 + 4(-5) \quad \text{(m1)}$$

$D =$ ....55........ (A1)

Here are 8 cards.

There is a number on each of six cards.
Two cards are blank.

(3) (1) (5) (5) (2) (3) ( ) ( )
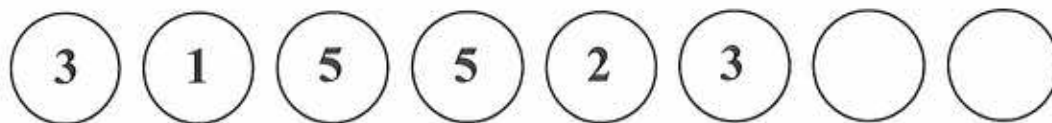
Uzma wants the mean of the numbers on the 8 cards to be 4
She wants the range of the numbers on the 8 cards to be 9

Find the numbers that she should write on the two blank cards.

TOTAL NEEDS TO BE $8 \times 4 = 32$ (B1)

CURRENT TOTAL IS $3 + 1 + 5 + \ldots = 19$ (B1)

∴ LAST TWO MUST ADD TO $32 - 19 = 13$

RANGE MUST BE 9.
CURRENT LOWEST IS 1   (A1) [BOTH]
∴ HIGHEST MUST BE 10 ⟶ ___10___ and ___3___

Karen has a spinner.

When the spinner is spun once, the probability that it will land on yellow is $\frac{2}{5}$
Karen spins the spinner 30 times.

Work out an estimate for the number of times the spinner lands on yellow.

$$\frac{2}{5} \times 30 \quad \text{(M1)}$$

12 (A1)

CORRESPONDING

Diagram **NOT** accurately drawn

40°

x 30°
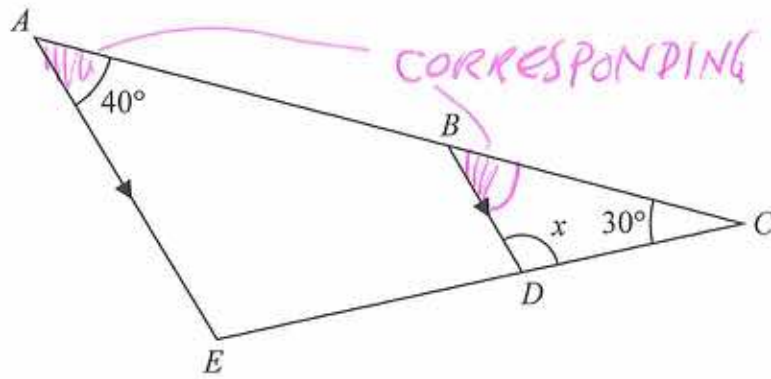
ABC and *EDC* are straight lines.
AE is parallel to *BD*.
Angle *EAC* = 40°
Angle *ACE* = 30°

Work out the size of angle *x*.
Give reasons for your answer.

$\angle$ BDA = 40° BECAUSE IT CORRESPONDS
         TO ANGLE EAB   (B1)

$\therefore$ x = 180 − (40 + 30) (m1)

       = $\underline{\underline{110°}}$

                           (A1)

x =   110°   °

B is the point with coordinates (1, 4)
C is the point with coordinates (6, 9)

Find the coordinates of the midpoint of *BC*.

$$\left(\frac{1+6}{2}, \frac{4+9}{2} \right) \quad \text{(m1)}$$

$$\text{(A1) [BOTH]}$$

(3·5   ,   6·5   )

A clothes shop has a sale.

In the sale, normal prices are reduced by 12%
The normal price of a shirt is £30

(a) Work out the sale price of the shirt.

$$30 \times 0.88$$ ⓑ①

ⓜ①

REMEMBER
THE ZERO

£ 26.40 Ⓐ①

(3)

The price of a coat is reduced by £9 in the sale.

(b) Work out the normal price of the coat.

$$0.12 \times \text{NORMAL} = 9$$

$$\text{NORMAL} = \frac{9}{0.12}$$ ⓜ①

ⓑ①

Ⓐ①

£ 75

(3)

A box contains toy cars.
Each car is red or blue or black or silver.

Emily takes at random a car from the box.
The table shows the probabilities that Emily takes a red car or a blue car or a black car.

Colour of car	Probability
red	0.20
blue	0.05
black	0.15
silver	

(a) Work out the probability that Emily takes a silver car.

$$1 - (0.20 + 0.05 + 0.15)$$ (mi)

(A1)

0.6

(2)

Emily puts the car back into the box.
There are 6 blue cars in the box.

(b) Work out the total number of cars in the box.

$$\frac{6}{TOTAL} = 0.05$$

$$\Rightarrow TOTAL = \frac{6}{0.05}$$ (mi)

(A1)

120

(2)

(a) Expand $x(x + 2)$

$x^2 + 2x$ (A1)

(1)

(b) Solve the inequality $4x - 7 > 3$

$$4x > 10 \quad \text{(M1)}$$

$$x > \frac{10}{4}$$

$$x > 2 \cdot 5 \quad \text{(A1)}$$

(2)

(c) Solve $\dfrac{3 - 5m}{4} = 8$

Show clear algebraic working.

$$3 - 5m = 32 \quad \text{(M1)} \ [\text{NO FRACTION}]$$

$$-5m = 29 \quad \text{(M1)} \ [\text{m-TERM ISOLATED}]$$

$$m = \frac{29}{-5}$$

$m = $ $-5 \cdot 8$ (A1)

(3)

The lengths of the sides of a triangle are in the ratios 2 : 6 : ⑦

The length of the longest side of the triangle is 24.5 cm.

R LONGEST

Work out the perimeter of the triangle.

$$\frac{24.5}{7} = 3.5 \quad (\text{EACH PART})$$

(m1)

$$\therefore \text{ TOTAL } = 3.5 \times 15$$

(m1)

(A1)

52.5 ....cm

Solve the simultaneous equations

EXACTLY THE SAME

$$5x + y = 17 \longrightarrow \text{①}$$
$$x + y = 3 \longrightarrow \text{②}$$

⎫ SUBTRACT

Show clear algebraic working.

$$4x = 14 \quad \text{(M1)}$$

$$x = \frac{14}{4}$$

$$= 3.5 \quad \text{(A1)}$$

SUBSTITUTE INTO ①

$$5(3.5) + y = 17$$

$$y = 17 - 5(3.5)$$

$$= -0.5 \quad \text{(A1)}$$

$$x = \underline{3.5}$$

$$y = \underline{-0.5}$$

Find an equation of the line that is parallel to the line $y = 4 - 2x$ and passes through the point $(3, 7)$

GRADIENT $= -2$. (B1)

$\therefore \quad y - 7 = -2(x - 3)$

$\Rightarrow y = -2(x - 3) + 7$ $\Big\}$ (m1) [ANY]

$y = -2x + 6 + 7$

$y = -2x + 13$ (A1)

Here is a regular 10-sided polygon.

Diagram **NOT** accurately drawn

$x°$
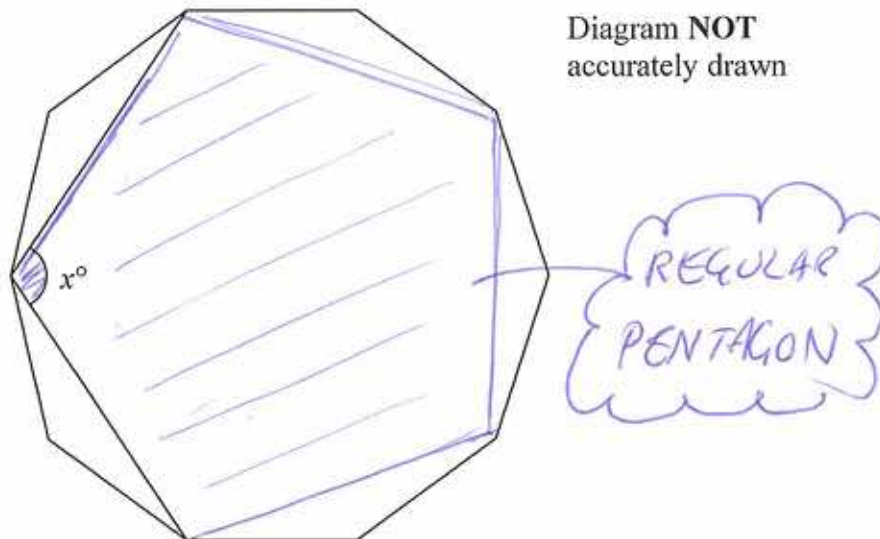
REGULAR PENTAGON

Work out the value of x.
Show your working clearly.

x IS THE INTERIOR ANGLE OF A REGULAR PENTAGON. (M1)

SUM $= (n-2) \times 180$ (M1)

$= 3 \times 180$

$= 540$

∴ EACH ANGLE $= \dfrac{540}{5}$ (M1)

$= 108°$ (A1)

ALTERNATIVE METHODS ARE FINE

$x =$ ....

A ⟶ B

Diagram **NOT**
accurately drawn

SIMILAR
TRIANGLES

4 cm   5 cm

C

10 cm

D ⟶ E

18 cm
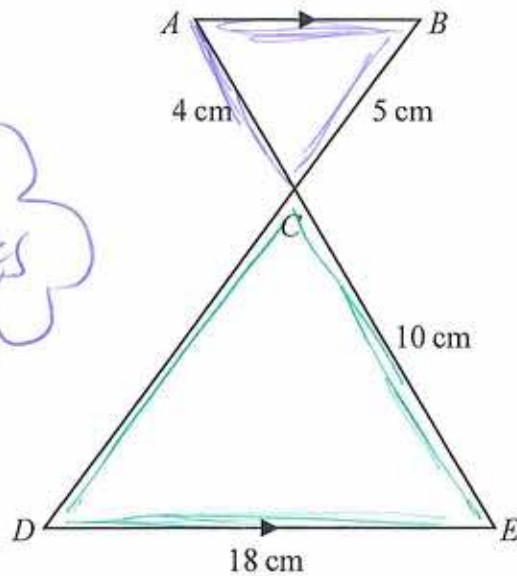
ACE and *BCD* are straight lines.
AB is parallel to *DE*.

SCALE FACTOR $= \dfrac{10}{4}$ = 2·5

(a) Calculate the length of *CD*.

$$5 \times 2 \cdot 5$$
(m1)

12·5 (A1) .... cm

(2)

(b) Calculate the length of *AB*.

$$\dfrac{18}{2 \cdot 5} \;\; \text{(m1)}$$

7·2 (A1) .... cm

(2)

The area of triangle *ABC* = *T* cm²

(c) Find the area of triangle *CDE* in terms of *T*.

$$T \times 2 \cdot 5^{2}$$

6·25 T (B1) .... cm²

(1)

The cumulative frequency table shows information about the heights of 60 men.

Height (h cm)	Cumulative frequency
$140 < h \leqslant 150$	10
$140 < h \leqslant 160$	35
$140 < h \leqslant 170$	52
$140 < h \leqslant 180$	58
$140 < h \leqslant 190$	60

(a) On the grid, draw a cumulative frequency graph for the table.
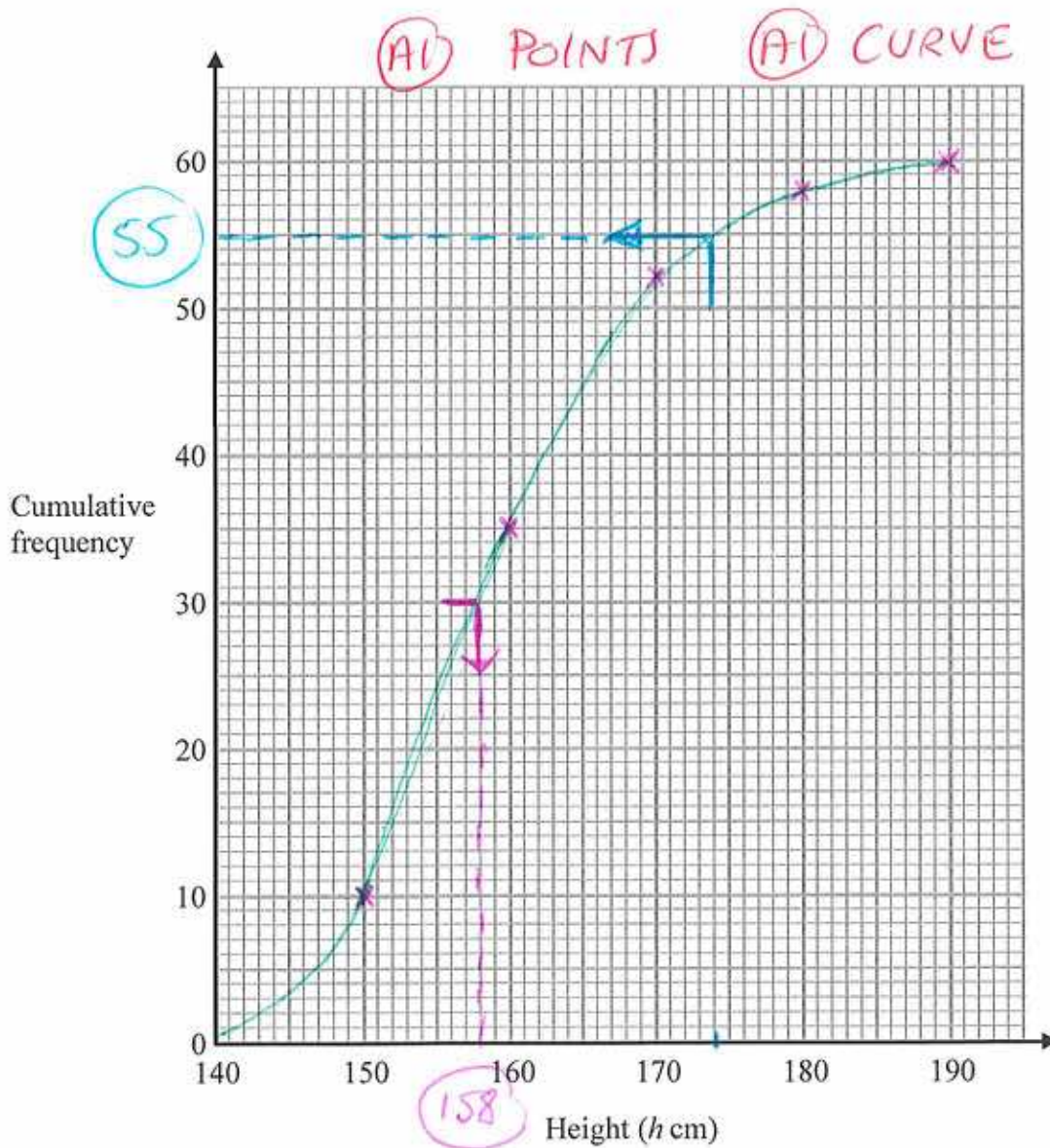
(2)

(b) Use your graph to find an estimate for the median height of the 60 men.

$$\frac{60}{2} = 30\text{TH VALUE}$$

(m)

[157-159]   (A) 158 .... cm

(2)

(c) Use your graph to find an estimate for the number of the men who are taller than 174cm.

$$60 - 55 \text{ (m)}$$

(A)

.... 5 ....

(2)

The curve C has equation $y = 3x^2 - 12x + 8$

(a) Find $\dfrac{dy}{dx}$

$$6x - 12$$

$$\frac{dy}{dx} = \underline{6x - 12} \quad \text{Ⓐ①} \ \text{Ⓐ①}$$

(2)

(b) Find the coordinates of the point on C where the gradient of the curve is 18

$$6x - 12 = 18 \quad \text{Ⓜ①}$$
$$6x = 30$$
$$x = \underline{\underline{5}} \quad \text{Ⓐ①}$$

$\dfrac{dy}{dx} = 18$

$$\therefore \quad y = 3(5)^2 - 12(5) + 8$$
$$= \underline{\underline{23}} \quad \text{Ⓐ①}$$

$(\underline{\quad 5 \quad}, \underline{\quad 23 \quad})$

(3)

(a) Simplify $\left(\dfrac{8e^6}{f^{12}}\right)^{\frac{1}{3}}$

$$\dfrac{8^{\frac{1}{3}} \times e^{6 \times \frac{1}{3}}}{f^{12 \times \frac{1}{3}}}$$

(B2)

$$\dfrac{2e^2}{f^4}$$

(2)

(b) Factorise fully $2y^2 - 72$

$$2(y^2 - 36) \quad \text{(m1)}$$

$$2 \times (y - 6)(y + 6)$$

(A1)

$$2(y - 6)(y + 6)$$

(2)

(c) Simplify $\dfrac{2p^2 - p - 15}{p^2 - 3p}$

$$= \dfrac{(2p + 5)(p - 3)}{p(p - 3)}$$

(B1) [FACTORISING]

(B1) [FACTORISING]

$$= \dfrac{2p + 5}{p}$$

(A1)

$$\dfrac{2p + 5}{p}$$

(3)

y is directly proportional to $\sqrt{x}$
When $x = 49$, $y = 4$

(a) Find a formula for y in terms of x.

$$y = k \times \sqrt{x} \quad \text{(m1)}$$

$$\Rightarrow 4 = k \times \sqrt{49}$$
$$\Rightarrow k = \frac{4}{\sqrt{49}}$$

(m1) [EITHER]

$$= \frac{4}{7}$$

(A1)

$$y = \frac{4}{7}\sqrt{x}$$

(3)

(b) Calculate the value of x when $y = 12$

$$y = \frac{4}{7}\sqrt{x}$$

$$12 = \frac{4}{7}\sqrt{x} \quad \text{(m1)}$$

$$x = 21^2$$

$$\sqrt{x} = 12 \times \frac{7}{4}$$

$$\sqrt{x} = 21$$

$$x = \underline{441} \quad \text{(A1)}$$

(2)
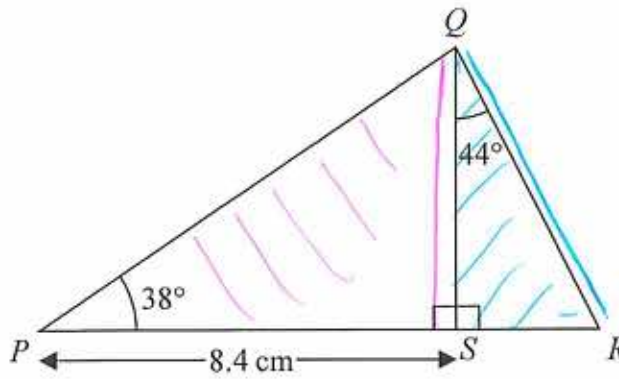
Q

Diagram **NOT** accurately drawn

44°

38°

P ◄——— 8.4 cm ———► S   R

PSR is a straight line.

Angle $PSQ = 90°$
$PS = 8.4$ cm
Angle $QPS = 38°$
Angle $SQR = 44°$

Work out the length of *QR*.
Give your answer correct to 3 significant figures.
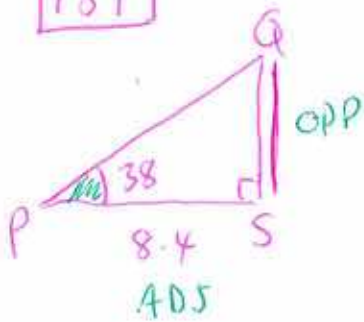
1ST

Q

OPP

38

P   8.4   S

ADJ

SOH   CAH   **TOA**

$TAN 38 = \dfrac{OPP}{ADJ}$

$TAN 38 = \dfrac{OPP}{8.4}$ (m)

$OPP = 8.4 \, TAN \, 38$
$= 6.56279$ (m)

2ND

Q

44   HYP

S

R

ADJ

6.56279

SOH   **CAH**   TOA

$COS \, 44 = \dfrac{ADJ}{HYP}$

$COS \, 44 = \dfrac{6.56279}{QR}$ (m)

$QR = \dfrac{6.56279}{COS \, 44}$
$= 9.12336...$

9.12 (A1) ....cm

NOTE!

15 cm

8 cm

7 cm

C

Diagram **NOT** accurately drawn

D

P

10 cm

x

A

B
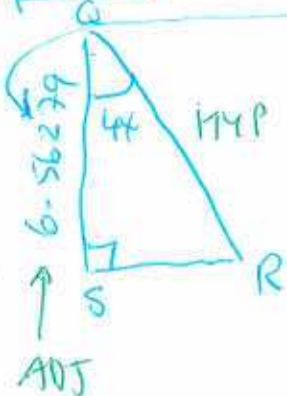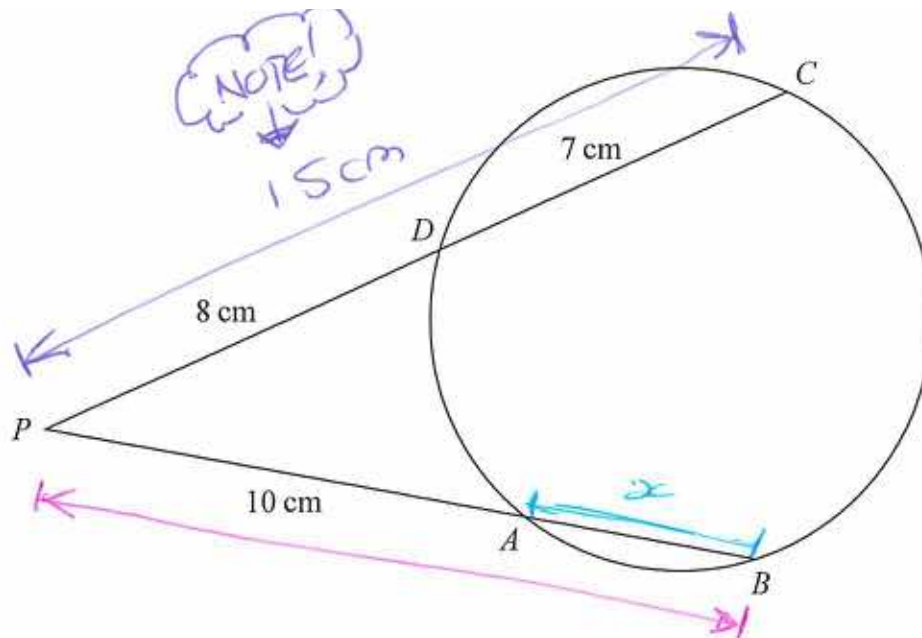
A, B, C and D are points on a circle.

PAB and PDC are straight lines.
$PA = 10$ cm, $PD = 8$ cm and $DC = 7$ cm.

Calculate the length of AB.

GET THIS RIGHT!!

1ST

$$AP \times BP = DP \times CP$$

$$10 \times BP = 8 \times 15 \quad \text{(m1)}$$

$$BP = \frac{8 \times 15}{10}$$

$$= 12 \quad \text{(m1)}$$

$$\therefore \quad AB = 12 - 10$$

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

Diagram **NOT** accurately drawn

4.8 cm

123°

6.4 cm

B

A

x

C
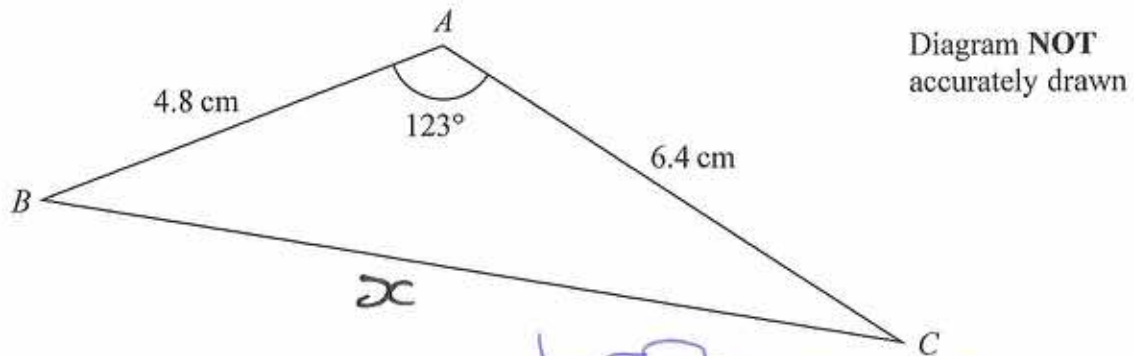
Calculate the length of BC.
Give your answer correct to 3 significant figures.

USE
$a^2 = b^2 + c^2 - 2bc \cos A$

$$x^2 = 4 \cdot 8^2 + 6 \cdot 4^2 - 2 \times 4 \cdot 8 \times 6 \cdot 4 \cos 123$$

M1

$$= 97 \cdot 46 \ldots$$ A1

$$x = \sqrt{97 \cdot 46 \ldots}$$

$$= 9 \cdot 8723 \ldots$$

$$= 9 \cdot 87 \text{ cm}$$ A1

Solve the equation $\dfrac{6}{x-2} - \dfrac{6}{x+1} = 1$

Show clear algebraic working.

$$\frac{6(x+1) - 6(x-2)}{(x-2)(x+1)} = 1 \quad \text{(m1) [SINGLE DENOM.]}$$

$$\Rightarrow \frac{6x+6 - 6x+12}{(x-2)(x+1)} = 1$$

$$\Rightarrow \frac{18}{(x-2)(x+1)} = 1$$

$$\Rightarrow 18 = (x-2)(x+1) \quad \text{(m1) [NO DENOMINATOR]}$$

$$18 = x^2 + x - 2x - 2$$

$$18 = x^2 - x - 2$$

$$\Rightarrow x^2 - x - 20 = 0 \quad \text{(m1) [QUADRATIC]}$$

$$(x+4)(x-5) = 0 \quad \text{(m1) [FACTORS OR FORMULA USE]}$$

$$x = -4 \qquad x = 5 \quad \text{(A1) [BOTH]}$$

The diagram shows a solid cylinder.
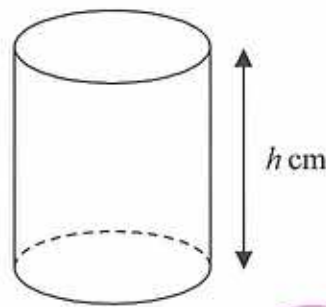
Diagram **NOT** accurately drawn

h cm

The cylinder has radius $4\sqrt{3}$ cm and height h cm.
The total surface area of the cylinder is $56\pi\sqrt{6}$ cm² → $2\pi r h + 2\pi r^2$

Find the exact value of h.
Give your answer in the form $a\sqrt{2} + b\sqrt{3}$, where a and b are integers.
Show your working clearly.

$$2\pi r h + 2\pi r^2 = 56\pi\sqrt{6} \quad \text{(m1)} \; [\text{EQUATION}]$$

$$2rh + 2r^2 = 56\sqrt{6} \quad \text{(m1)}$$

$$2\times(4\sqrt{3})h + 2(4\sqrt{3})^2 = 56\sqrt{6}$$

$$8\sqrt{3}h + 2(16\times3) = 56\sqrt{6} \quad \Big\} \text{(m1)}$$

$$8\sqrt{3}h + 96 = 56\sqrt{6}$$

$$8\sqrt{3}h = 56\sqrt{6} - 96$$

$$h = \frac{56\sqrt{6} - 96}{8\sqrt{3}} \quad \text{(m1)}$$

I USED A CALCULATOR

$$= 7\sqrt{2} - 4\sqrt{3} \quad \text{(A1)}$$

The diagram shows sector OAB of a circle, centre O

Diagram NOT accurately drawn

$$A = \frac{50}{360} \times \pi r^2$$

$$ARC = \frac{50}{360} \times 2\pi r$$

Angle $AOB = 50°$
Sector OAB has area 20π cm²

Calculate the perimeter of sector OAB.
Give your answer correct to 3 significant figures.

[1st]

$$AREA = 20\pi$$

so $\quad \frac{50}{360} \times \pi r^2 = 20\pi \quad$ (m1)

$\Rightarrow \quad \frac{50}{360} \times r^2 = 20$

$\Rightarrow \quad r^2 = \frac{20 \times 360}{50}$

$\quad r = \sqrt{\frac{20 \times 360}{50}}$ (A1)

$\quad = \underline{12 \text{ cm}}$ (A1)

[2nd]

$$PERIMETER = \frac{50}{360} \times 2\pi r + \boxed{2r}$$

$= \frac{50}{360} \times 2\pi \times 12 + \frac{2 \times 12}{\uparrow}$

    (m1)   (B1)

$= 34.4719\ldots$ (A1)

$= \underline{\underline{34.5 \text{ cm}}}$

$y = 16 \times 10^{8k}$ where k is an integer.

Find an expression, in terms of k, for $y^{\frac{5}{4}}$

Give your answer in standard form.

$$\left(16 \times 10^{8k}\right)^{\frac{5}{4}} = 16^{\frac{5}{4}} \times 10^{8k \times \frac{5}{4}}$$

$$= \left(\sqrt[4]{16}\right)^{5} \times 10^{10k} \quad \text{B1}$$

$$= 2^{5} \times 10^{10k}$$

$$= 32 \times 10^{10k}$$

$$\text{B1} \quad = 3.2 \times 10^{10k+1} \quad \text{A1}$$