Edu-H | Summer '25 | 2

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Answer **all** questions.

1. (a) Solve $3(4x - 2) = 7 - 8x$. [3]

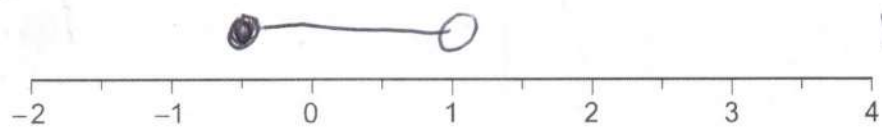
$12x - 6 = 7 - 8x$ ✓

$20x = 13$ ✓

$x = \frac{13}{20}$ ✓ OE

(b) Represent the solution to the inequality $-2 \leqslant 4n < 4$ on the number line below. [2]

$-\frac{1}{2} \leqslant n < 1$ ✓



✓

(c) Factorise $2x^2 - 14x$. [2]

$2x(x - 7)$ ✓✓

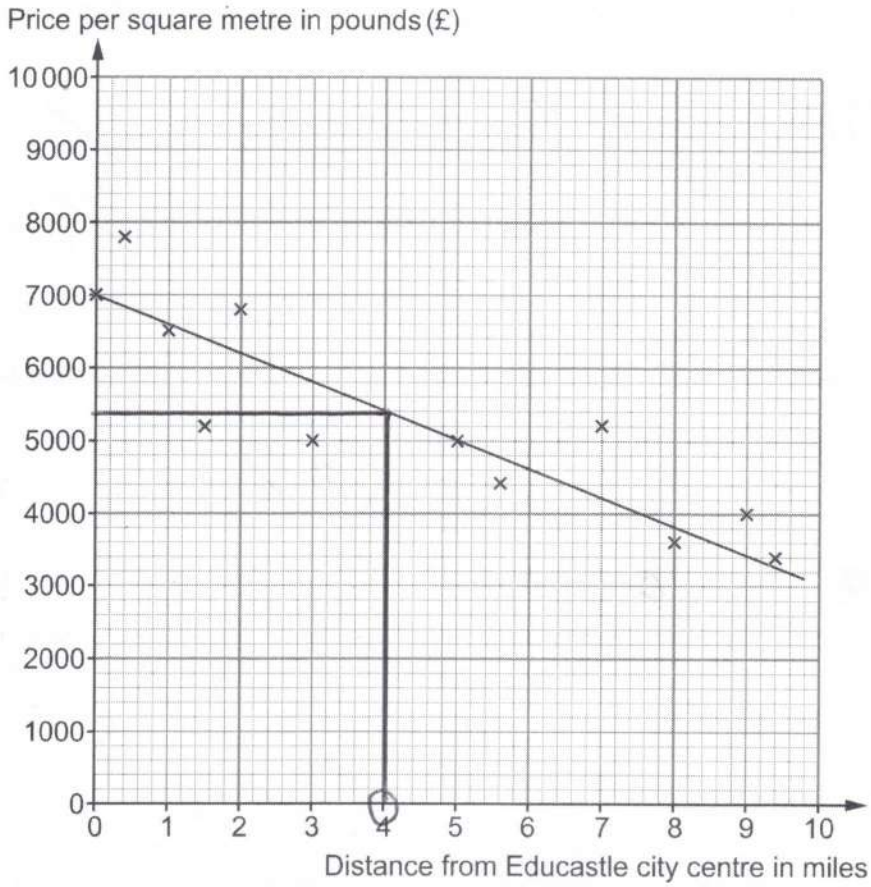
C300UB01 03

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2. When selling an apartment, the selling price can be calculated using the price per square metre of floor area.

The scatter diagram shows the price per square metre of 12 apartments and their distance from Educastle city centre.
It also shows the line of best fit for the data.



(a) Describe the relationship between the price per square metre of an apartment and its distance from Educastle city centre. [1]

Further from the city centre the lower the cost ✓OE

(b) Use the line of best fit to estimate the price per square metre of an apartment that is 4 miles from Educastle city centre. [1]

5400 ✓

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(c) Ellie says,

"All apartments 6 miles from Educastle city centre cost £4600 per square metre."

Is Ellie's statement correct?

Yes ☐ No ☑

Give the reason for your answer. [1]

Line of best fit not necessarily true for all apartments ✓

(d) The table below shows information about the house prices of 35 houses on a street outside Educastle city centre.

mp(x)	Price, p, thousand pounds		Frequency	fx
125	$100 < p \leqslant 150$	X	8	1000
175	$150 < p \leqslant 200$	X	12	2100
225	$200 < p \leqslant 250$	X	9	2025
275	$250 < p \leqslant 300$	X	5	1375
325	$300 < p \leqslant 350$	X	1	325

✓ ✓

Calculate an estimate for the mean house price on the street. [4]

✓ $\frac{6825}{35} = £195000$ ✓

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3. The diagram shows a square inside a circle.
Each corner of the square lies on the circumference of the circle.
The length of each side of the square is 13 cm.

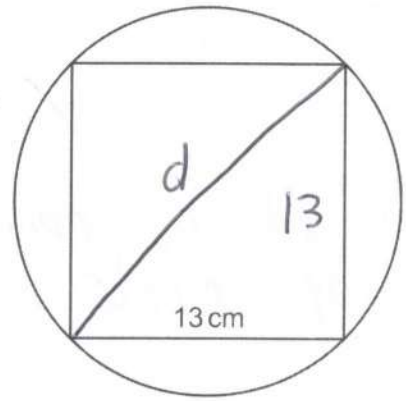


Diagram not drawn to scale

Calculate the area of the circle.
Give your answer correct to 1 decimal place.
You must show all your working. [5]

$d = \sqrt{13^2 + 13^2} = \sqrt{338}$ ✓✓

$A = \pi \times \left(\frac{\sqrt{338}}{2}\right)^2$ ✓✓

$= 265.464\ldots$

✓

Area of the circle = 265.5 cm^2

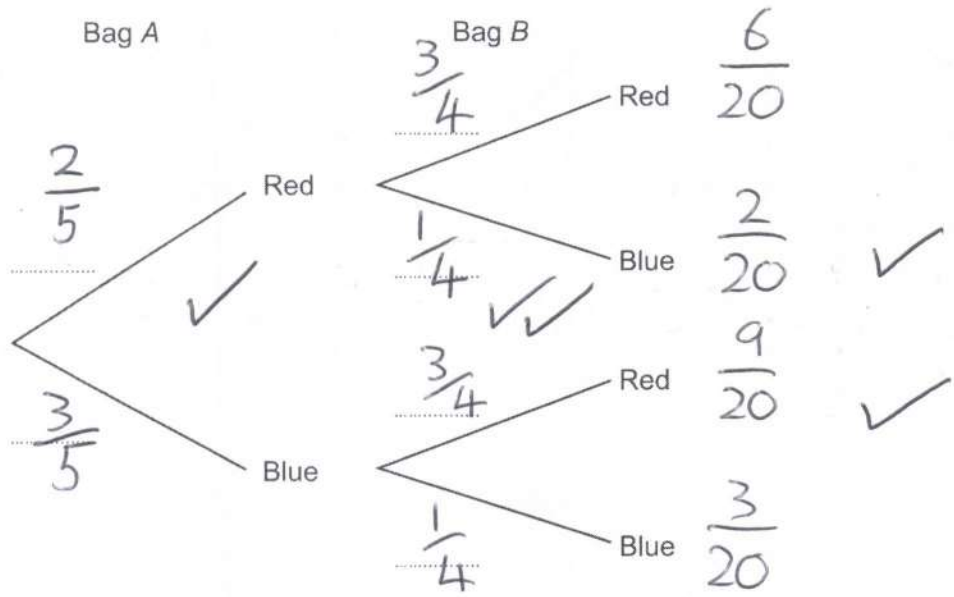
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4. Yasmin has two bags, Bag *A* and Bag *B*.
Each bag contains some red counters and some blue counters.

Bag *A* contains 2 red counters and 3 blue counters.
In Bag *B* the number of red counters is three times the number of blue counters.
3 1
Yasmin randomly chooses one counter from Bag *A* and then one counter from Bag *B*.

(a) Complete the probability tree diagram. [3]



(b) Calculate the probability that Yasmin chooses at least one blue counter. [3]

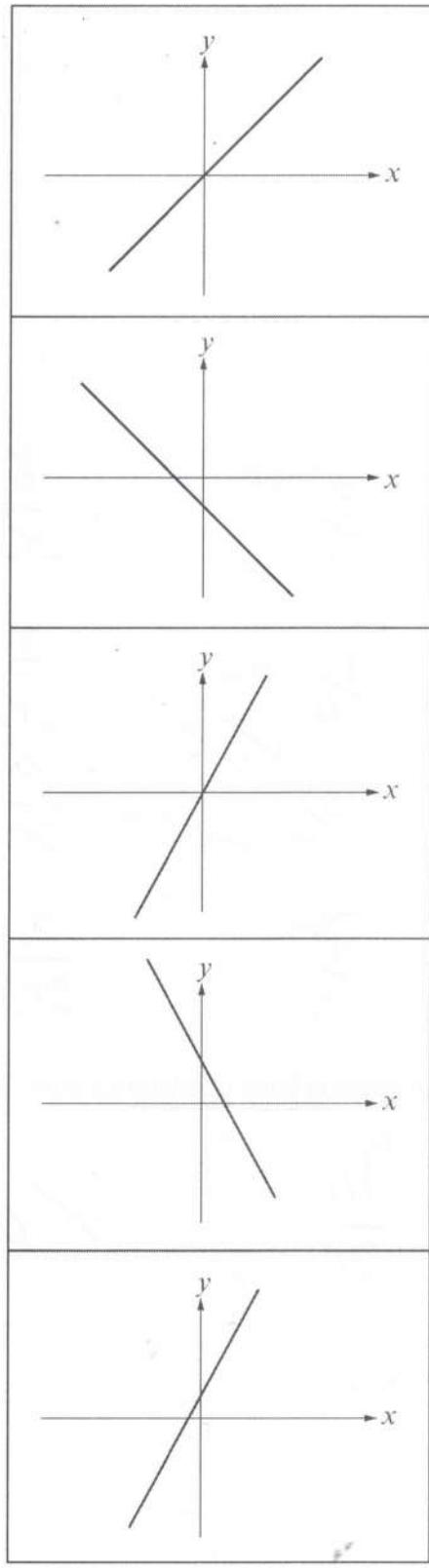
$\frac{2+9+3}{20} = \frac{14}{20}$ OE

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5. (a) Five straight-line graphs and their equations are shown below.
Draw a line to connect each graph to its equation.
One has been completed for you. [2]



$y = 2x + 1$

$y = x$

$y = -x - 1$

$y = 2x$

$y = -2x + 1$

✓2
✓All

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(b) Circle the equation of the straight line that is parallel to $y = 3x + 5$. [1]

$3y = x + 5$ $\quad y = -3x$ $\quad (2y = 6x + 8)$ $\quad y = \frac{1}{3}x + 5$ $\quad y + 3x = 7$

$y = \frac{x}{3} + \frac{5}{3}$ ✗ $\quad y = 3x + 4$ ✗ $\quad y = -3x + 7$ ✗

✗

(c) Make y the subject of the following formula. [2]

$\frac{y}{a} + b = x$

$\frac{y}{a} = x - b$

$y = a(x - b)$

OR

$y + ab = ax$ ✓

$y = ax - ab$ ✓ etc

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6. (a)

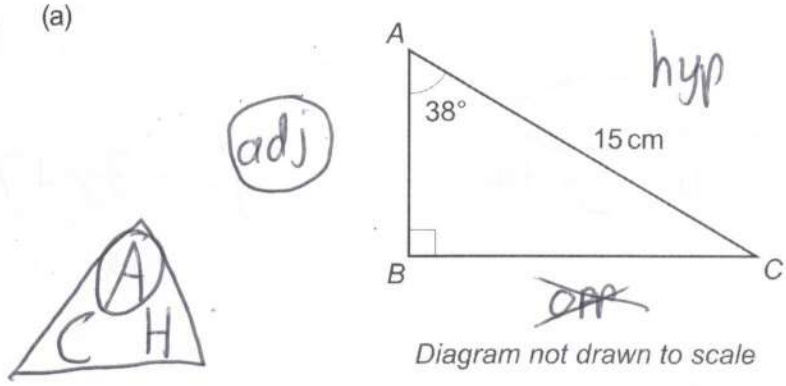


Diagram not drawn to scale

Calculate the length of *AB*. [3]

$AB = \cos 38 \times 15$ ✓✓

$= 11.8...$ ✓etc

(b)

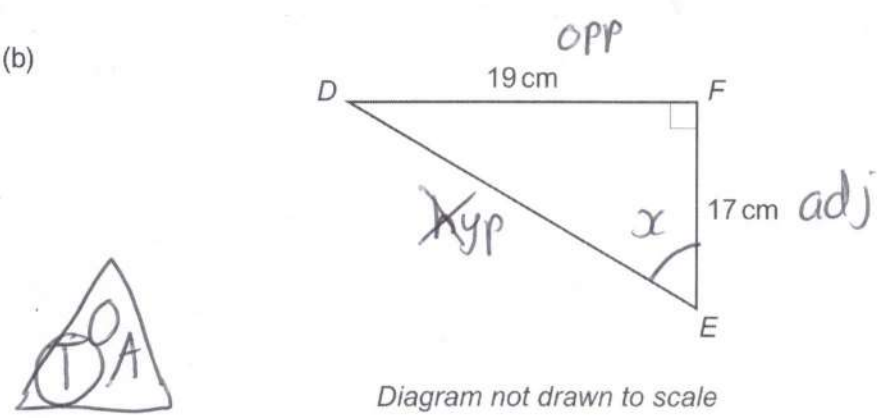


Diagram not drawn to scale

Calculate the size of $D\hat{E}F$. [3]

$x = \tan^{-1}\left(\frac{19}{17}\right) = 48.2$ ✓etc

✓ ✓

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7. Greg has been saving 10p and 20p coins in a money jar.

The ratio of the number of 10p coins to the number of 20p coins in Greg's money jar is 2:7.

Greg gives all the 20p coins to his children, Rona and Jamie, in the ratio 3:4.
The 20p coins that Rona was given have a total value of £3.60.

What was the total value of the coins in Greg's money jar? [6]
You must show all your working.

(10) (20) R J
2 7 3 4

£3.60 £4.80 ✓

£8.40 ✓

£8.40
= 42 coins ✓
2x6 = 12 coins ✓
= £1.20 ✓

8.4 + 1.2

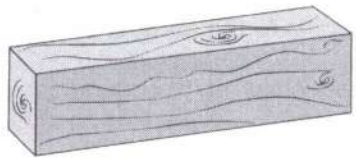
The total value of the coins in Greg's money jar was £9.60 ✓

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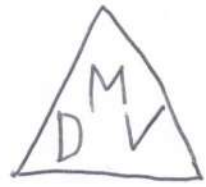
8. A wooden block is shown below.



Zachary saws off a small block that is 30% of the original wooden block.



Diagrams not drawn to scale



The mass of Zachary's small block is 5·4 kg.
The density of the wood is 0·75 g/cm^3.

(a) Calculate the volume of the **original** wooden block. [5]

$V = \frac{M}{D} = \frac{5.4 \times 1000}{0.75}$ ✓ ✓

30% = 7200 cm^3

10% = 2400 ✓

100% = 24000 cm^3 ✓ ✓

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(b) Zachary converts the volume of the wooden block from cubic centimetres (cm^3) to cubic inches (in^3).
He uses the conversion 2·5 cm ≈ 1 inch.

Zachary says,

"To convert the volume from cm^3 into in^3 I must divide the volume by 2·5."

Explain why Zachary's method is incorrect. [1]

Needs to divide by 2.5^3 ✓ etc

9. (a) Circle the expression that is equivalent to $\left(b\times10^{x}\right)\div\left(c\times10^{-y}\right)$. [1]

$bc\times10^{x-y}$ ✗ $\frac{b}{c}\times10^{x-y}$ ✗ (circled) $\frac{b}{c}\times10^{x+y}$ ✓ $\frac{b}{c}\times10^{\frac{x}{-y}}$ ✗ $(b-c)\times10^{x+y}$ ✗

(b) Circle the expression that is equivalent to $\left(\sqrt{a}\right)^5$. $= a^{5/2}$ [1]

a^5 $5\sqrt{a}$ $\frac{1}{a^5}$ (circled) $a^2\sqrt{a}$ ✓ $a^4\sqrt{a}$

$5a^{\frac{1}{2}}$ a^{-5} $a^{\frac{9}{2}}$

(c) Circle the expression that is equivalent to $\left(\frac{f}{g}\right)^{-\frac{1}{3}}$. [1]

(circled) $\sqrt[3]{\frac{g}{f}}$ ✓ $\sqrt[3]{\frac{f}{g}}$ ✗ $\frac{g}{\sqrt[3]{f}}$ ✗ $\frac{f}{\sqrt[3]{g}}$ ✗ $\left(\frac{f}{g}\right)^3$ ✗

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10. *ABC* is a triangle.
The lines *AC* and *DE* are parallel.
D is a point on the line *AB* such that *AD* : *DB* is in the ratio 5 : 2.
The length of *AC* is 23·8 cm.

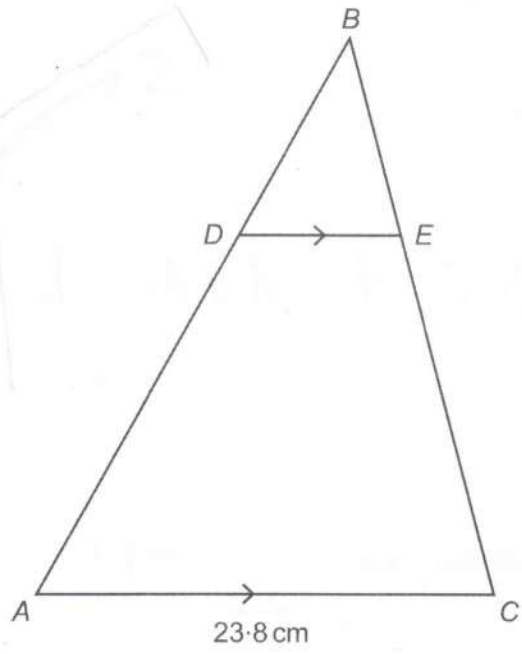


Diagram not drawn to scale

Calculate the length of *DE*. [2]

23·8 ÷ 7 × 2 ✓

= 6·8 ✓

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11. Prove that $(n + 4)^2 - (n - 1)^2$ is a multiple of 5 for all integer values of n. [3]

You must use an algebraic method (not trial and improvement).

$= n^2 + 16 + 8n - n^2 - 1 + 2n$ ✓✓

$= 10n + 15$

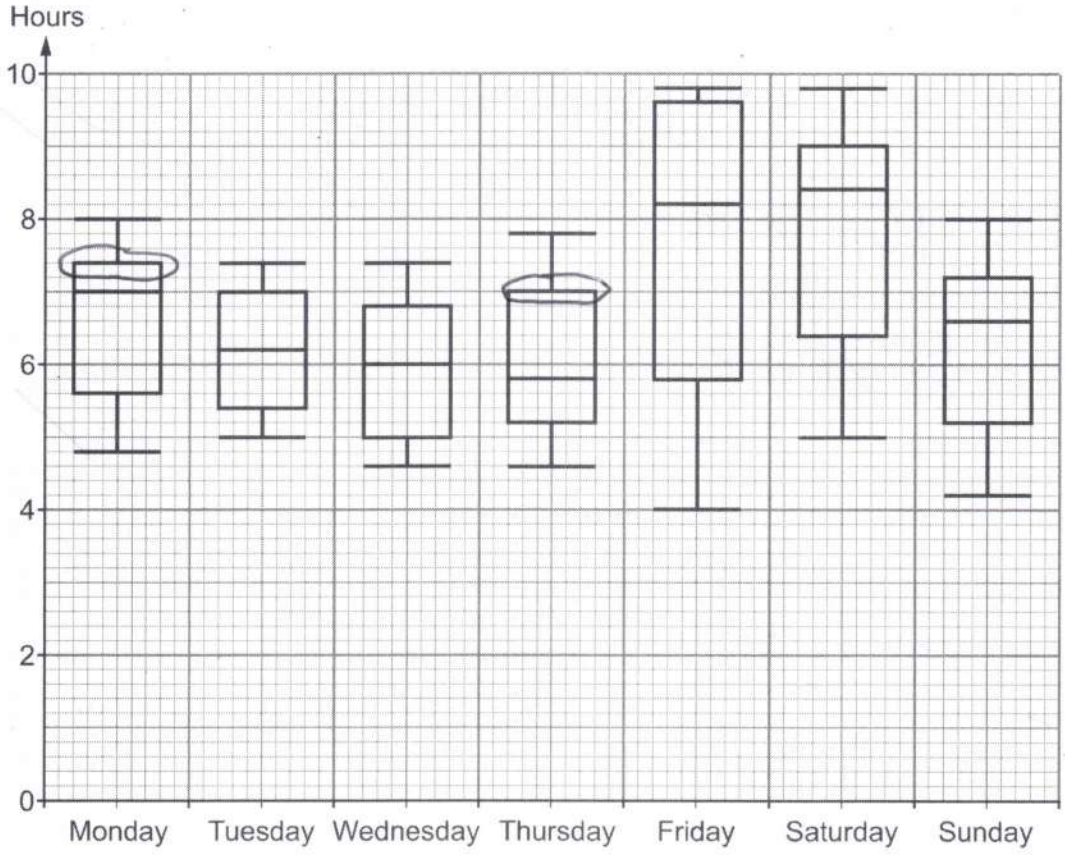
$= 5(2n + 3)$ ✓

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12. Isaias recorded the number of hours of sleep he had each night last year.
The box plots below show the results.



(a) On which day was the median number of hours of sleep the greatest? [1]

Saturday ✓

(b) Calculate the range of the number of hours of sleep on Fridays. [1]

9.8 − 4 = 5.8 hrs ✓etc

(c) Complete the following sentence.
On 25% of Mondays Isaias slept longer than
7 hours 24 minutes. ✓ [1]

7.4 hrs = 7 + 0.4 × 60

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(d) Isaias recorded the number of hours of sleep he had on the 52 Thursdays last year. On how many Thursdays last year did Isaias sleep for 7 hours or less? [2]

$\frac{75}{100} \times 52 = 39$ ✓ ✓

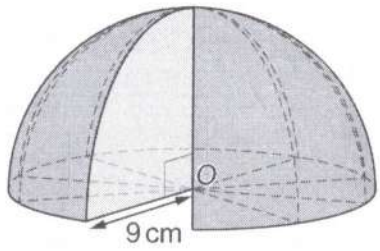
(e) Which day of the week is Isaias's sleep pattern the most consistent? Give a reason for your answer. [1]

Tuesday, range (and/or) IQR were smallest ✓

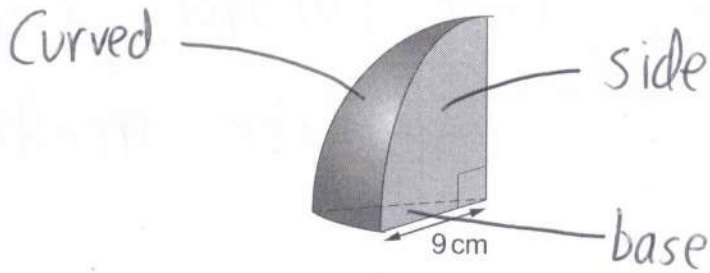
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13. A hemisphere, centre *O*, with radius 9 cm is cut into 10 equal pieces.
One piece has been removed.



The removed piece is shown below.



Diagrams not drawn to scale

Calculate the total surface area of the removed piece.
You must show all your working. [5]

Curved SA $= \frac{1}{2} \times \frac{1}{10} \times 4 \times \pi \times 9^2$ ✓✓

2 Sides $= 2 \times \frac{1}{4} \times \pi \times 9^2$ ✓

Base $= \frac{1}{10} \times \pi \times 9^2$ ✓

Total $= \frac{324\pi}{5}$ or 203.6 ✓etc

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14. Simplify $\frac{x^2+x-12}{3x+12}$. [4]

$$= \frac{(x+4)(x-3)}{3(x+4)} \quad \checkmark\checkmark\checkmark$$

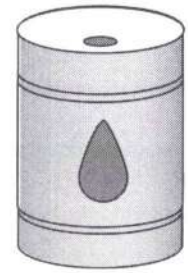
$$= \frac{x-3}{3} \quad \checkmark \text{etc}$$

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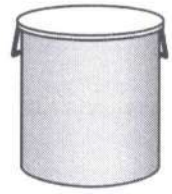
15. Paint is stored in large tanks.
The volume of paint in each tank is 1500 litres, **correct to the nearest 20 litres**.

± 10



The paint from the tank is poured into tins.
Each tin has a capacity of 10 litres, **correct to the nearest 0·1 litre**.

± 0.05



Calculate the maximum number of tins that can be filled using paint from one of the tanks. [4]

$1500 < \begin{matrix} 1510 \\ 1490 \end{matrix}$ $\quad 10 < \begin{matrix} 10.05 \\ 9.95 \end{matrix}$ ✓

max = $\frac{1500\uparrow}{10\downarrow}$ ✓

✓ $= \frac{1510}{9.95}$ $= 151.7\ldots$

$= 151$ ✓

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16. The diagram below shows points *A*, *B* and *C* on the circumference of a circle with centre *O*. The line *DAE* is a tangent to the circle.

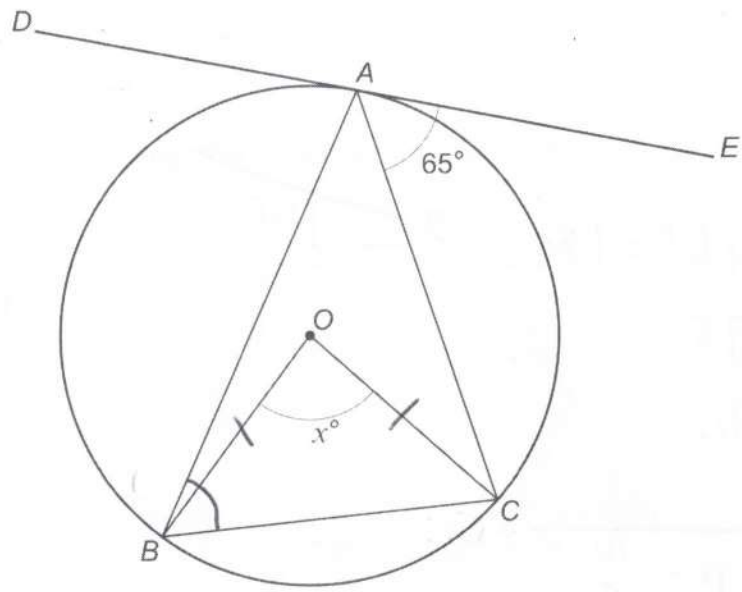


Diagram not drawn to scale

Show that $A\hat{B}O = \left(\frac{1}{2}x - 25\right)^{\circ}$.

Give a reason for each step of your answer. [4]

$\angle BAC = \frac{1}{2}x$ (angle at centre is twice angle on circumference) ✓etc

$\angle ABC = 65^{\circ}$ (alternate segment theorem) ✓

$\angle OBC = \frac{180 - x}{2} = 90 - \frac{x}{2}$ (base angles of an isosceles triangle are equal) ✓

$\angle ABO = \angle ABC - \angle OBC$

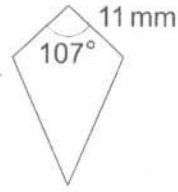
$= 65 - \left(90 - \frac{x}{2}\right) = -25 + \frac{x}{2}$ ✓

as req^{d}

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17. A kite is shown.



A logo is created by arranging 8 of these kites inside an **octagon**.

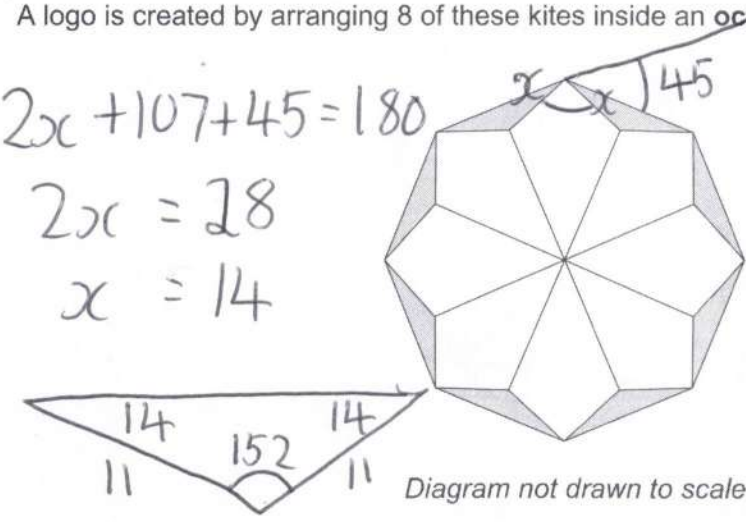


Diagram not drawn to scale

Calculate the area of one shaded triangle.
Hence, calculate the total area of the shaded region of the logo. [6]

1 triangle $= \frac{1}{2} \times 11 \times 11 \times \sin 152$ ✓

$= 28.14...$ ✓

Shaded $= 8 \times 28.14...$

$= 227.2...$ ✓

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18. Rohan invests money in a compound interest account with interest paid annually.
The interest rate stays the same for the period of the investment.
In 4 years, his investment has increased in value from £7800 to £8950.70.

How much will his investment be worth after a further 3 years?
Give your answer correct to the nearest pound. [5]

$7800 \times x^4 = 8950.7$ ✓

$x = \sqrt[4]{\frac{8950.7}{7800}}$ ✓

$x = 1.035...$ ✓

$8950.7 \times 1.035...^3$ ✓
$= 9923.8...$

After a further 3 years, Rohan's investment is worth £9924 to the nearest pound. ✓

19. y is directly proportional to the square root of x.
$y = 0.14$ when $x = 0.49$.

(a) Find the formula for y in terms of x. [3]

$y = k \times \sqrt{x}$ ✓
$0.14 = k \times \sqrt{0.49}$ ✓

$k = \frac{0.14}{0.7} = 0.2$ $\quad y = 0.2\sqrt{x}$ ✓

(b) Calculate the value of y when $x = 5.29$. [1]

$y = 0.2 \times \sqrt{5.29} = 0.46$ ✓

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20. A large pyramid is shown below.
The base of the large pyramid is a square with sides of length 40 cm.

A small pyramid is **removed** from the top of the large pyramid.
The base of the small pyramid is a square with sides of length 16 cm.

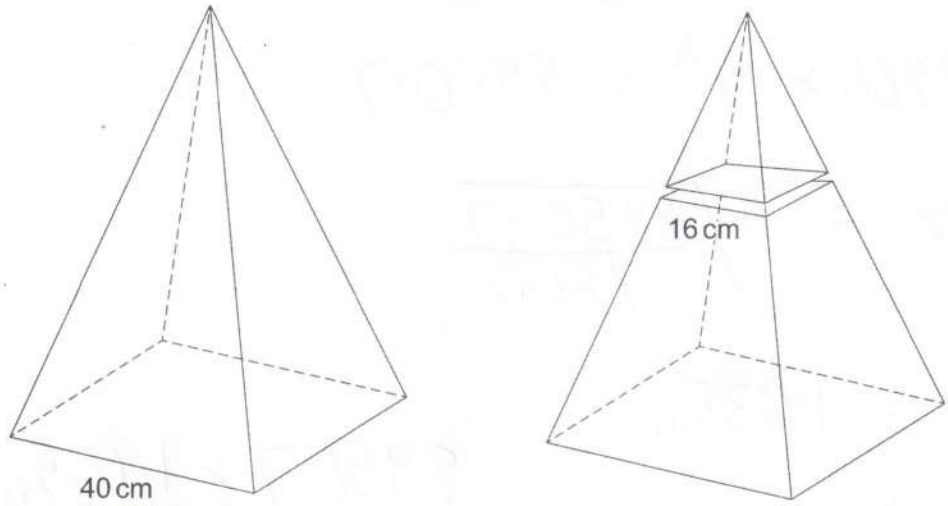


Diagram not drawn to scale

What percentage of the large pyramid's volume has been removed? [3]

Vol scale factor = $\left(\frac{16}{40}\right)^3$ ✓

× 100 ✓

= 6·4% ✓

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21. A boat makes the following journey from Port *A* to Port *C*.

- It sails 30 km on a bearing of 108° from Port *A* to Port *B*.
- It then sails 42 km on a bearing of 065° from Port *B* to Port *C*.

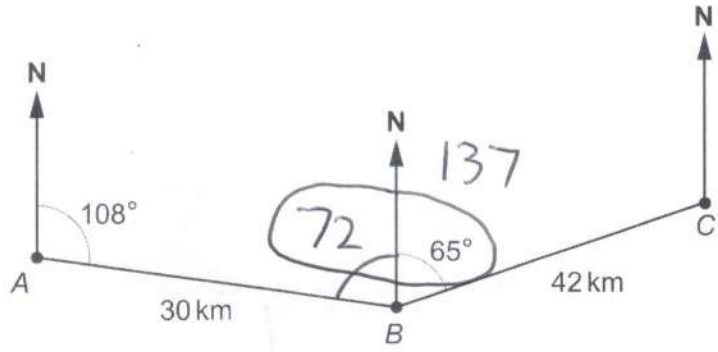


Diagram not drawn to scale

On its return journey, the boat travels directly from Port *C* to Port *A*.
This journey takes 1 hour and 45 minutes. $= 1.75$ hr

Calculate the average speed of the boat on its return journey. [6]

$AC^2 = 30^2 + 42^2 - 2 \times 30 \times 42 \times \cos 137$

$AC = \sqrt{4507.0\ldots}$

$= 67.1\ldots$ km

$S = \frac{D}{T} = \frac{67.1\ldots}{1.75} = 38.36\ldots$

The average speed of the boat is 38.4 km/h

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22. The diagram below shows Circle *A* and Circle *B*.
Circle *A* has its centre at the origin.
Circle *B* has its centre at (7,0) and passes through the origin.
Circle *A* and Circle *B* touch at the same point on the x axis.

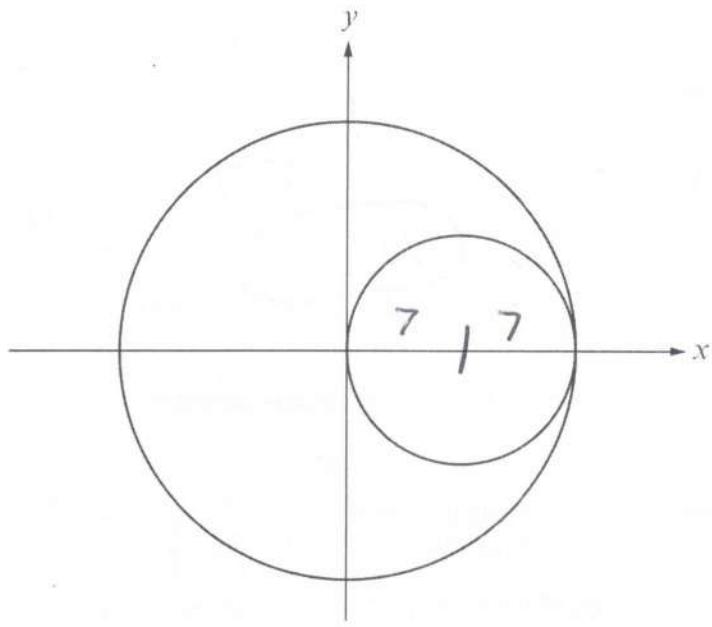


Diagram not drawn to scale

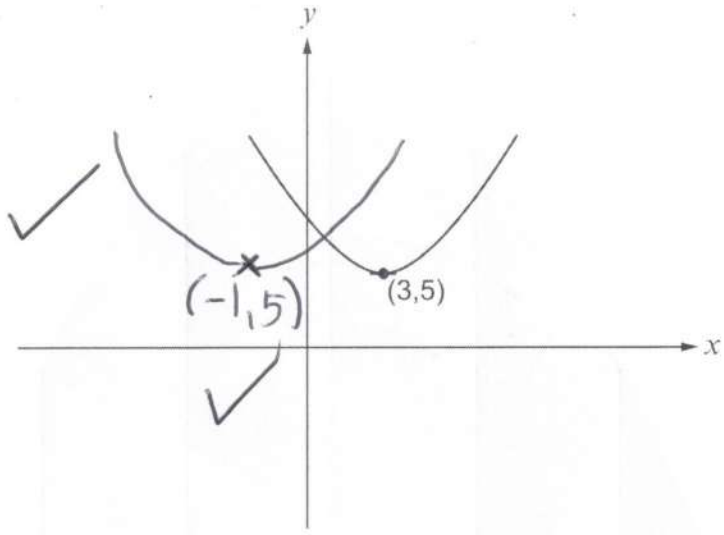
Write down the equation of Circle *A*. [2]

$x^2 + y^2 = 14^2$

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23. The diagram shows a sketch of $y = f(x)$.
It has a stationary point at (3,5).



On the same diagram, sketch $y = f(x+4)$.
Mark clearly the coordinates of the stationary point. [-4, 0] [2]

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Use **five** vertical strips of equal width to calculate an estimate for the area of the shaded region. [5]
You must show all your working.

$A = \left(\frac{3+8}{2}\right) = 5.5$

$B = \left(\frac{8+11}{2}\right) = 9.5$

$C = \left(\frac{11+12}{2}\right) = 11.5$

$D = \left(\frac{12+11}{2}\right) = 11.5$

$E = \left(\frac{11+8}{2}\right) = 9.5$

$= 47.5$ ✓✓✓

Unshaded Trapezium $= \frac{1}{2}(3+8) \times 5 = 27.5$ ✓

Shaded $= 47.5 - 27.5 = 20$ ✓

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25. A tank containing 1000 litres of water was emptied in two stages.
During the first stage, 400 litres were emptied out of the tank at a constant rate.
This took x minutes.
During the second stage, the remaining water was emptied out at a different constant rate.
This took $x - 26$ minutes.

During the second stage, the rate of flow of the water from the tank was 17 litres per minute faster than the rate of flow during the first stage.

(a) Show that $17x^2 - 642x - 10400 = 0$. [5]

S1 rate $= \frac{400}{x}$ S2 rate $= \frac{600}{x-26}$ ✓

so $\frac{400}{x} + 17 = \frac{600}{x-26}$ ✓

$400(x-26) + 17x(x-26) = 600x$ ✓

$400x - 10400 + 17x^2 - 442x = 600x$ ✓

$17x^2 - 42x - 10400 = 600x$

$17x^2 - 642x - 10400 = 0$ ✓

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(b) By solving $17x^2 - 642x - 10400 = 0$, find the value of x.
You must show all your working. [3]

$$x = \frac{642 \pm \sqrt{(-642)^2 - 4 \times 17 \times (-10400)}}{34}$$

$x = 50$ $(x = -12{\cdot}2 \ldots \text{reject})$

END OF PAPER

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