GCSE

wjec cbac

C300UB0-1

A17-C300UB0-1

eduqas
Part of WJEC

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
HIGHER TIER

MONDAY, 6 NOVEMBER 2017

– MORNING

2 hours 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

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

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	2	
2.	3	
3.	5	
4.	5	
5.	5	
6.	10	
7.	5	
8.	3	
9.	7	
10.	3	
11.	6	
12.	6	
13.	9	
14.	5	
15.	6	
16.	9	
17.	6	
18.	4	
19.	4	
20.	12	
21.	5	
Total	120	

C300UB01
01

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. An amount of money is shared in the ratio 2 : 3 : 15.
The largest share is £330.
Calculate the smallest share. [2]

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Smallest share ....

(C300UB0-1) **Turn over.**

2. Seb wants to travel around the world in 7 years' time.
In total, he will need £4000.

Seb has just been given £3000.
He invests this in an account that pays 2·5% interest per annum.

How much extra money will Seb need in 7 years' time?
Give your answer correct to the nearest pound. [3]

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Extra money needed ....

3. The table shows the daily rainfall in Hightown during September 2017.

Rainfall, r mm	Number of days
$0 \leqslant r < 4$	4
$4 \leqslant r < 6$	14
$6 \leqslant r < 10$	10
$10 \leqslant r < 14$	2

(a) Calculate an estimate of the mean daily rainfall in Hightown for September 2017. [4]

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(b) The actual mean daily rainfall in Seabank during September 2017 was 5·9 mm. Explain how it is possible that the actual mean daily rainfall in Hightown and Seabank were both the same for September 2017. [1]

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(C300UB0-1) **Turn over.**

4. The score from the two spinners shown is 2 + 5 = 7.
The score is the sum of the two outcomes.
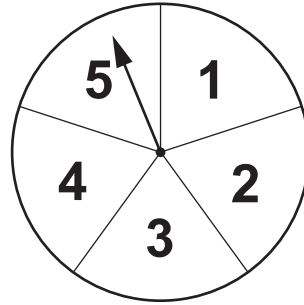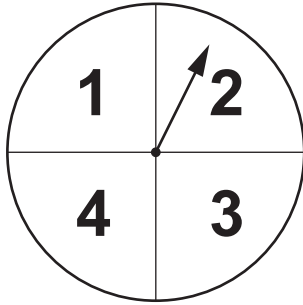
(a) What is the lowest possible score? [1]

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(b) Is it possible to get a score ⩾ 9?
Give a reason for your answer. [1]

Yes ☐   No ☐

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(c) Ryan says,

You can score 5 with these spinners by getting 1 + 4 or 2 + 3,

so the probability of scoring 5 is $\dfrac{2}{\text{the number of possible outcomes}}$

- Comment on Ryan's method.
- Find the probability of scoring 5.

Comment on Ryan's method: [3]

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Probability of scoring 5:

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Probability of scoring 5 is ....

5. *(a)* Solve $11x - 3 = 9x + 25$. [3]

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(b) Factorise $5x^2 + 10x$. [2]

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Turn over.

C300UB01
09

6. *(a)* The area of the trapezium shown below is $15\,cm^2$.
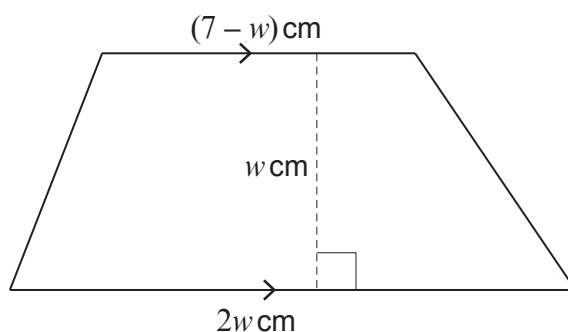

$(7 - w)\,cm$

$w\,cm$

$2w\,cm$

Diagram not drawn to scale

(i) Claire is trying to find a value for w to calculate the lengths of the parallel sides. She has started her work by using the formula for the area of the trapezium.

Claire then plans to
- collect like terms within the brackets, and
- multiply by 2 throughout.

Complete the next step in Claire's work in the box below. [1]

Area of the trapezium: $\dfrac{w \times (7 - w + 2w)}{2} = 15$

$w \times (\,..........\, + \,..........\,) = \,..........$

(ii) From your answer in *(a)*(i) show that $w^2 + 7w - 30 = 0$. You must show all your working. [1]

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(iii)   Factorise $w^2 + 7w - 30$ and hence solve $w^2 + 7w - 30 = 0$.
You must give both possible solutions to the equation.   [3]

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(iv)   Hence find the length of each of the parallel sides.   [1]

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(b)   The diagram below shows a different trapezium.

14·2 cm

3·3 cm

18·6 cm

y
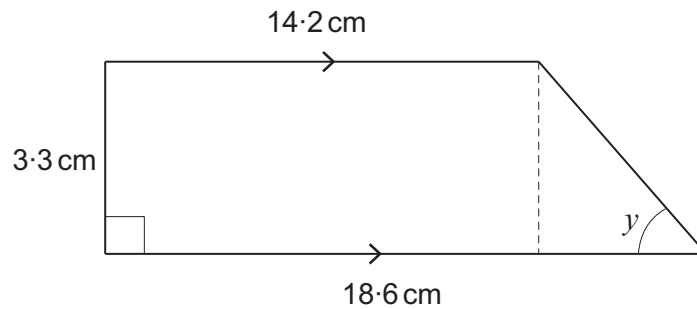
Diagram not drawn to scale

Calculate the size of the angle y.   [4]

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Turn over.

7. The table below gives the densities, in g/cm³, of aluminium, copper, iron and zinc.

Metal	Density g/cm³
Aluminium	2·70
Copper	8·96
Iron	7·87
Zinc	7·13

A metal sphere of radius 3·6 cm is placed on weighing scales.
The reading, in kg, shows:

1·538 kg

The sphere is made from a single metal.
Which metal is the sphere made from?
You must show all your working. [5]

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The sphere is made from ....

8. Each wheel on a truck has a diameter of 1·22 metres.
During April each wheel made $2 \cdot 4 \times 10^6$ revolutions.

How far did the truck travel in April?
Give your answer in kilometres. [3]

Distance travelled in April .... km

9. The diagram below shows triangle *ABC*.
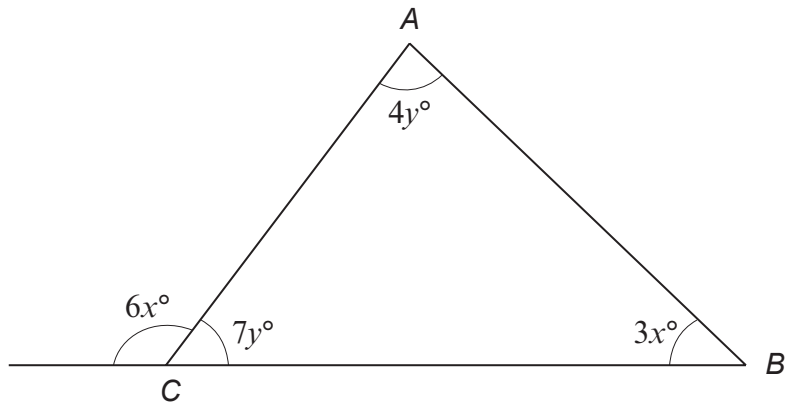
Diagram not drawn to scale

(a) Use the angles in the triangle to complete the following equation. [1]

$$3x + 11y = \text{...............................}$$

(b) Use the angles on the straight line at *C* to obtain a further equation.

Use the two equations to show that *ABC* is an isosceles triangle.
You must use an algebraic method. [6]

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(C300UB0-1)

Turn over.

10. *(a)* The equations of 5 lines are given below.
Which one represents a line that is parallel to $3x + y + 4 = 0$?
Circle your answer. [1]

$$3x - y - 4 = 0 \qquad\qquad y = 3x - 4$$

$$y = 3x + 4 \qquad\qquad y = 4 - 3x \qquad\qquad x + 3y + 4 = 0$$

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(b) A straight line has a gradient of 2 and passes through the point (0, 4).
Find the equation of this straight line.
Give your answer in the form $y = mx + c$. [2]

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$y = $ ....

11. A yacht set sail, at the start of its journey, on a bearing of 048°.
It sailed on this bearing for 3·8 km to Kew Rocks.
At Kew Rocks the yacht changed course and sailed to Dolphin Reach.

A triangle representing the yacht's journey is shown below.
Some angles are given.

North

Kew Rocks

3·8 km

North

54° Dolphin Reach

48°

Start
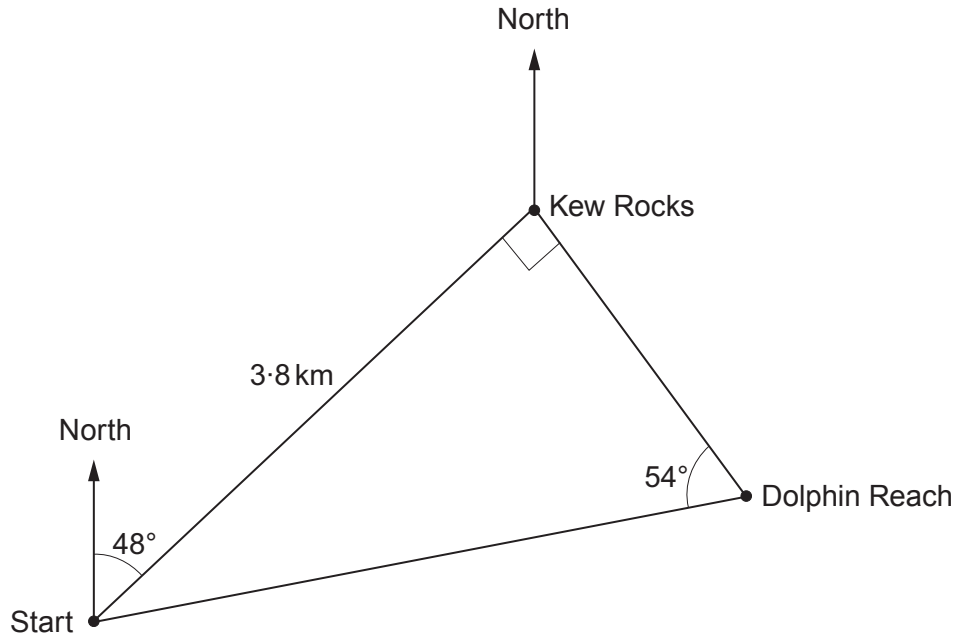
Diagram not drawn to scale

(a) Find the bearing on which the yacht sailed from Kew Rocks to Dolphin Reach. [2]

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Bearing of Dolphin Reach from Kew Rocks is .... °

(b) Calculate the distance the yacht would need to travel to go directly from Dolphin Reach back to the start.
Give your answer correct to 2 significant figures. [4]

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Distance is .... km, correct to 2 significant figures

12. The diagram shows the aerial view of a hotel swimming pool.

20 metres

12 metres
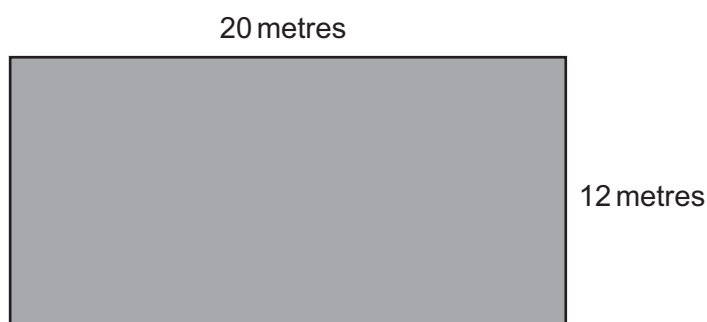
Diagram not drawn to scale

A poster at the swimming pool gives the following information.

Swimming pool length

Shallow end

20 metres

Deep end

1·4 metres

2·2 metres
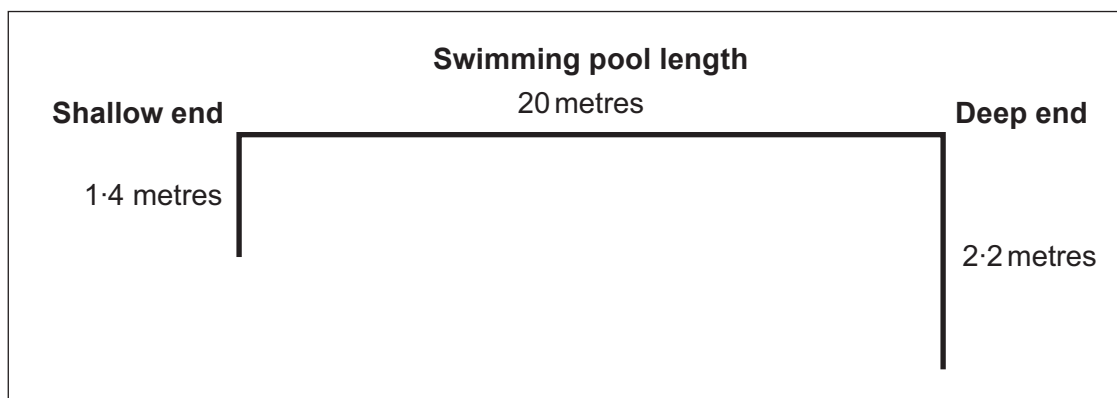
Diagram not drawn to scale

The swimming pool is filled to the top with water.

Calculate the possible volume of the water in the swimming pool. Give your answer in m^3.

- You must state any assumption you make in calculating the volume.
- Show how this assumption impacts on your solution.   [6]

Volume:

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Volume is .... m^3

Assumption:

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Impact of this assumption on your solution:

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13. Imran records details of his car journeys for 3 days.

Day	Average speed	Time
Monday	52 m.p.h.	3 hours 30 minutes
Tuesday	45 m.p.h	2 hours 20 minutes
Wednesday	44 m.p.h.	1 hour 45 minutes
		Total time: 7 hours 35 minutes

You are given the following information.
- His car's fuel consumption was 40 miles per gallon.
- 1 litre is approximately equal to 0·22 gallons.
- The cost of fuel is £1.25 per litre.

(a) Calculate the total cost of the fuel Imran used for the 3 days. [7]

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(b) Imran usually spends **a further** 7 hours 35 minutes travelling in his car during the week.

   (i)   Give an estimate for Imran's weekly fuel bill. [1]

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   (ii)   Why might this estimate be unrealistic? [1]

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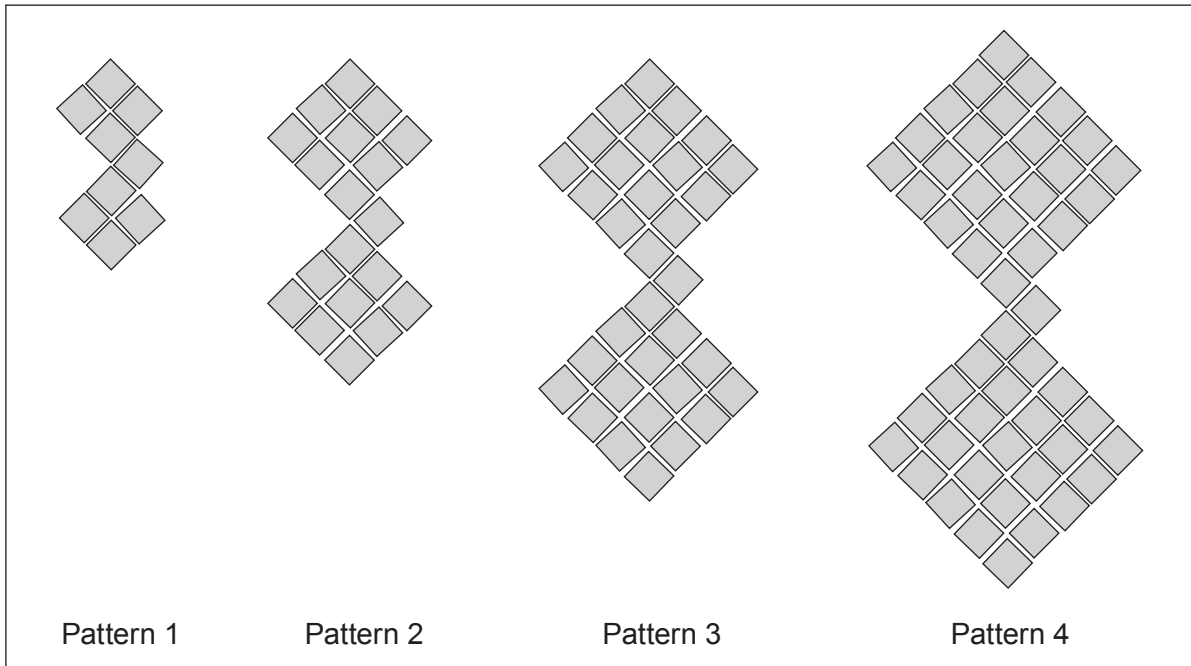..

14. Beth is making some designs using small square tiles.
She labels the patterns, as shown below.

Pattern 1   Pattern 2   Pattern 3   Pattern 4

(a) Beth has a further 75 small square tiles.
How many tiles will Beth have left after making Pattern 5? [2]

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(b) Write an expression for the number of small square tiles in Pattern n. [2]

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(c) Show that Beth cannot make a complete design using exactly 796 tiles. [1]

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15. At breakfast, the probability that Stefan has a bowl of cereal is 0·7.
The probability of Stefan having a slice of toast for breakfast is independent of him having a bowl of cereal.
The probability that Stefan has a bowl of cereal **and** a slice of toast is 0·28.
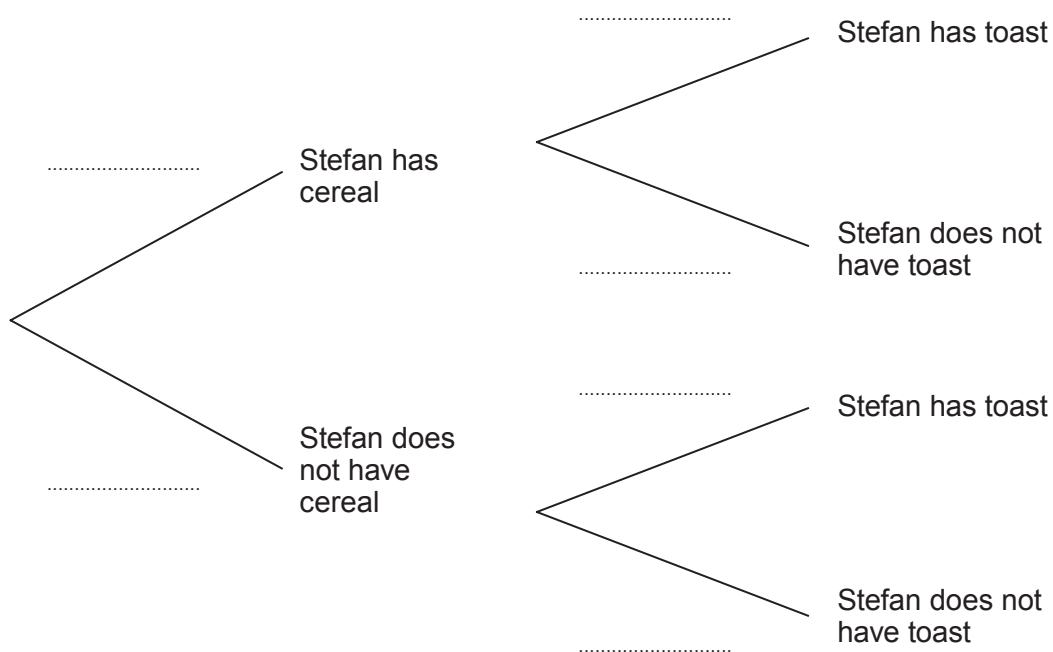
(a) Complete the tree diagram. [4]

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.... Stefan has toast

.... Stefan has cereal

.... Stefan does not have toast

.... Stefan does not have cereal

.... Stefan has toast

.... Stefan does not have toast

(b) Find the probability that Stefan has neither cereal nor toast for breakfast. [2]

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Examiner only

16. Shireen is trying to find the area of a field, *ABCDE*.
She has taken a few measurements and written them on a sketch, as shown below.
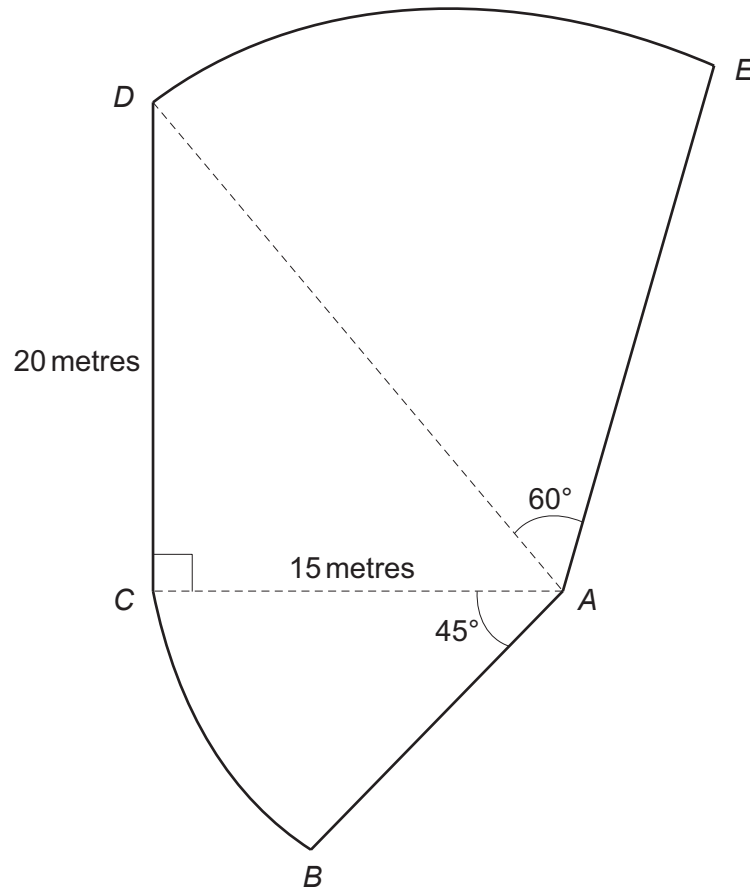
Diagram not drawn to scale

Shireen has indicated

- $D\hat{C}A = 90°$
- *DC* = 20 metres
- *CA* = 15 metres
- $E\hat{A}D = 60°$
- $B\hat{A}C = 45°$

She thinks that *DA* = *EA* and *CA* = *BA*.
Shireen knows that *BC* and *DE* are **not** straight lines.

Using the information Shireen has collected, calculate the area of the field.
You must state any assumption you make in deciding on your method. [9]

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Area of the field .... m^2

Assumption made:

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(C300UB0-1)   **Turn over.**
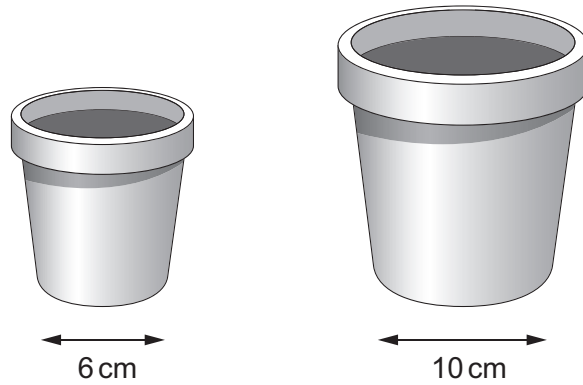
17. *(a)*

6 cm   10 cm

Diagram not drawn to scale

Two similar plant pots are shown.
When the smaller plant pot is full, it holds 0·4 litres of compost.
Calculate how many litres of compost the larger plant pot holds when it is full.   [2]

Larger plant pot holds .... litres

(b) Compost is sold in cylindrical cardboard drums.
A drum holds $30\,000\,\text{cm}^3$ of compost.
The height of the drum is four times its radius.

Calculate the radius of the drum.
You must show all your working. [4]

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Radius of the drum is .... cm

18. Use the formula method to solve $5(x^2 + 2x) = 73$. [4]

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19. *(a)* Show that $x = 8 - \dfrac{10}{x}$ is a rearrangement of $x^2 - 8x + 10 = 0$.

You must show each stage of your working. [1]

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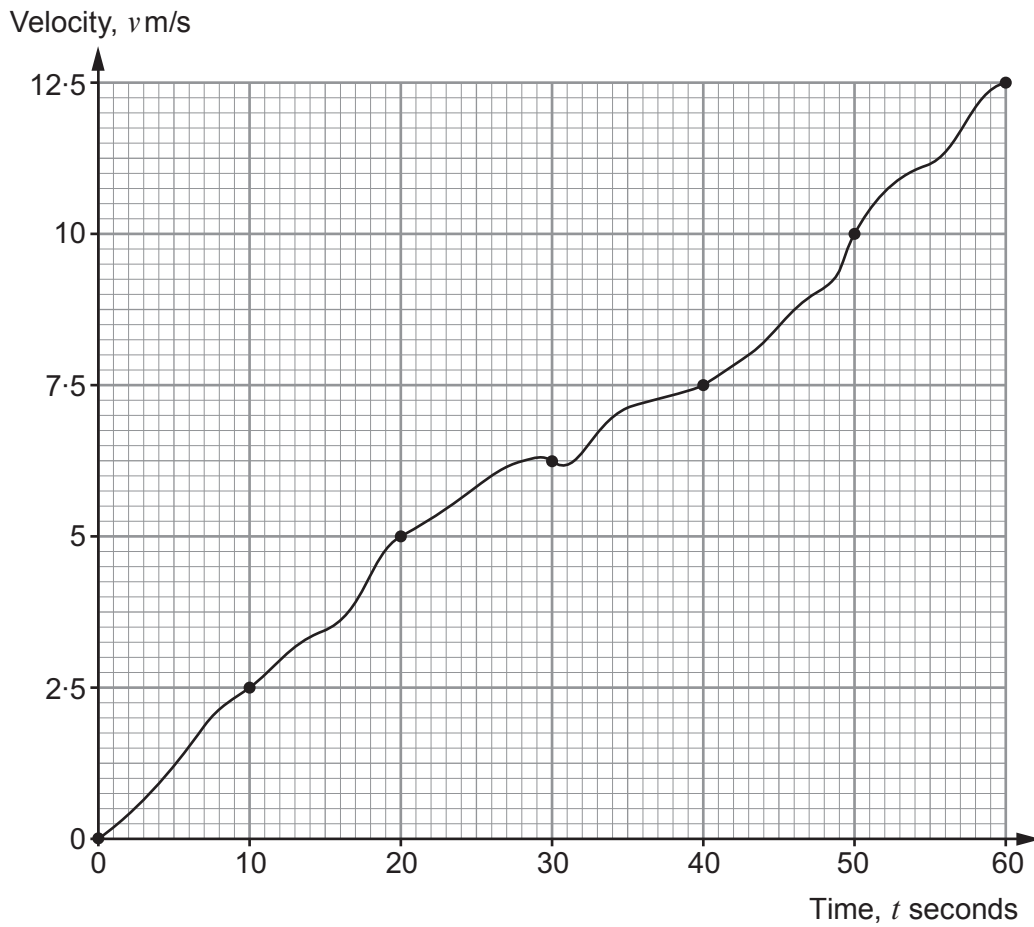
(b) Use the iteration formula

$$x_{n+1} = 8 - \frac{10}{x_n} \text{ and } x_1 = 5$$

to find a solution of $x^2 - 8x + 10 = 0$ correct to 2 decimal places.
You must give all your calculated values of x_{n+1}. [3]

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 Turn over.

20. The velocity-time graph below shows the first 60 seconds of a motorcyclist's journey.

The motorcycle accelerated from 0 to 12·5 m/s in 60 seconds.

(a) After how many seconds was the velocity of the motorcycle 27 **km/h**? [4]

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After .... seconds

(b) (i) Calculate an estimate for the acceleration at $t = 30$. [3]

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(ii) Tracey argues that this acceleration at $t = 30$ does not represent the typical acceleration of the motorcycle over the 60-second period.
Explain why Tracey's argument is correct. [1]

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(c) Over the same period, the velocity of another motorcycle is given by the equation $v = 5 + 0 \cdot 001t^2$.

Find the time for which the velocities of the two motorcycles were the same.
Give this time correct to the nearest second.
You must show all your working. [4]

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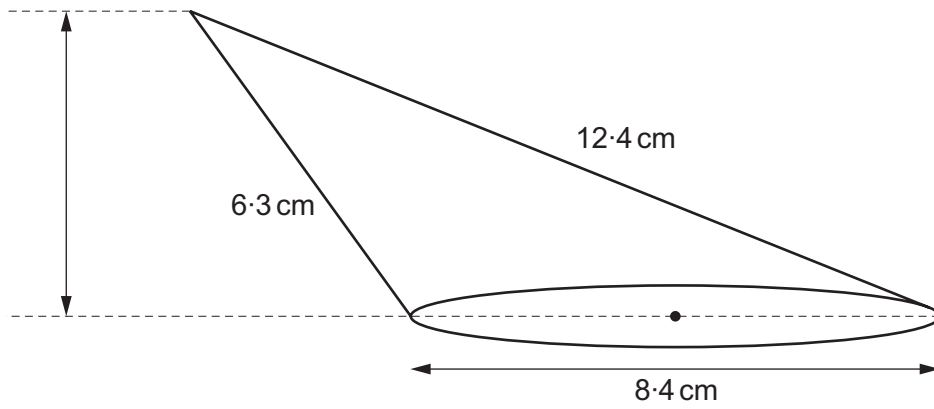**21.** The diagram shows a cone with a base diameter of 8·4 cm.

Diagram not drawn to scale

Calculate the perpendicular height of the cone. [5]

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END OF PAPER

For continuation only.

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