

CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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4024/21

May/June 2020

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Blank pages are indicated.

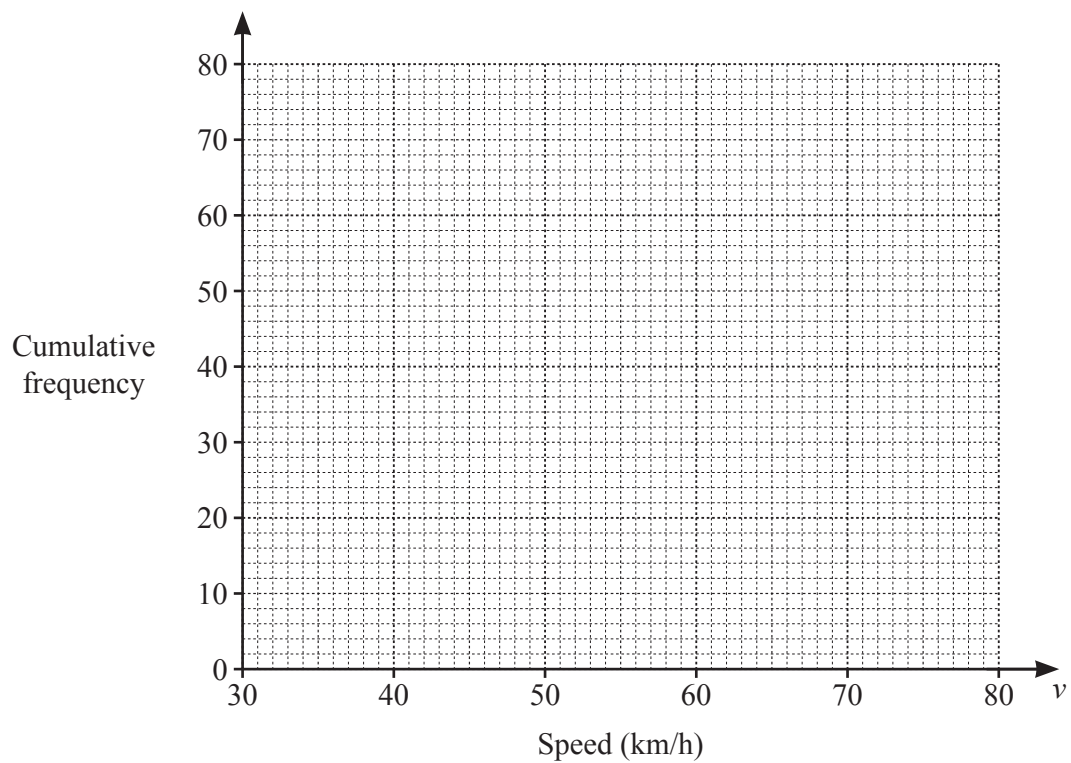
- 1 The speeds, v km/h, of 80 vehicles travelling along a road were recorded. The results are shown in the table.

Speed (v km/h)	Frequency
$30 < v \leq 40$	10
$40 < v \leq 50$	18
$50 < v \leq 60$	27
$60 < v \leq 70$	19
$70 < v \leq 80$	6

- (a) Calculate an estimate of the mean speed of the vehicles.

..... km/h [3]

- (b) Draw the cumulative frequency diagram.



[3]

(c) Use your cumulative frequency diagram to find an estimate for

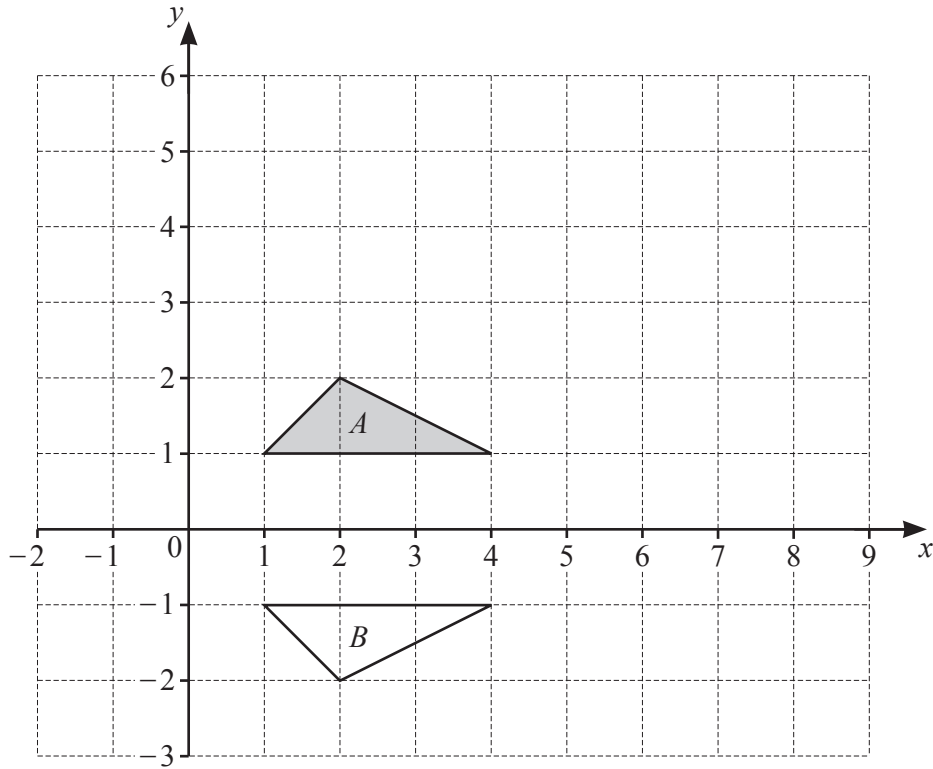
(i) the median,

..... km/h [1]

(ii) the interquartile range.

..... km/h [2]

2



- (a) Describe fully the **single** transformation that maps triangle A onto triangle B .

..... [2]

- (b) Triangle A is mapped onto triangle C by a rotation 90° anticlockwise about $(1, 1)$.

Draw triangle C . [2]

- (c) Triangle A is mapped onto triangle D by the **single** transformation P .

The matrix representing P is $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$.

Describe fully the **single** transformation P .

..... [3]

- 3 (a) Rearrange $m = 4n - 3$ to make n the subject.

$$n = \dots\dots\dots [2]$$

- (b) Solve these simultaneous equations.
Show your working.

$$\begin{aligned} 10x + 7y &= -3 \\ 5x - y &= 3 \end{aligned}$$

$$x = \dots\dots\dots$$

$$y = \dots\dots\dots [3]$$

- (c) Solve the equation $5x^2 + 3x - 1 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$$x = \dots\dots\dots \text{ or } x = \dots\dots\dots [3]$$

- 4 Anton invests \$6000 in an account for 5 years.
The account has a compound interest rate of 2.5% per year.
At the end of 5 years, he spends \$4200 of this money on a family holiday to Malaysia.

(a) How much money is left in the account?

\$ [3]

- (b) Anton changes \$800 into Malaysian Ringgits (MYR) for his trip.
The exchange rate is \$1 = 3.16 MYR.
He spends 2250 MYR and then changes the remaining money back into dollars (\$).
The exchange rate on his return is \$1 = 3.27 MYR.

How many dollars does he receive on his return?
Give your answer correct to the nearest dollar.

\$ [3]

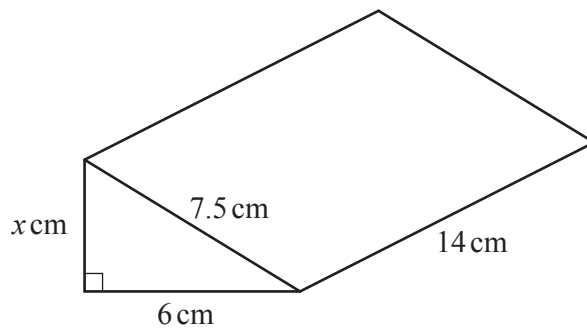
- (c) Anton invests \$1500 in another account.
The account has a compound interest rate of $p\%$ per year.
At the end of 3 years, there is \$1598.85 in the account.

Calculate p .

Give your answer correct to 2 decimal places.

$p = \dots\dots\dots$ [3]

- 5 A company makes and packages chocolate bars.



This box contains a chocolate bar.
The box is in the shape of a triangular prism.

- (a) Show that $x = 4.5$.

[2]

- (b) These boxes are packed into cartons.
Each carton is a cuboid with internal dimensions 30 cm by 28 cm by h cm.
80 boxes fill one carton exactly.

- (i) Calculate the value of h .

$h = \dots\dots\dots$ [3]

- (ii) One day, the company packs 37 500 of these boxes into cartons.

How many complete cartons are packed that day?

$\dots\dots\dots$ [2]

(c) The company sells the chocolate bars to shops for \$0.70 each bar.

(i) The company makes 40% profit on each bar it sells.

Work out the cost to the company of producing each bar.

\$ [2]

(ii) A shop buys one carton of chocolate bars.

- They sell $\frac{3}{5}$ of the bars at a profit of 30% .
- They sell each of the remaining bars at \$0.84 .

Calculate the overall percentage profit made by the shop from selling all 80 bars.

..... % [5]

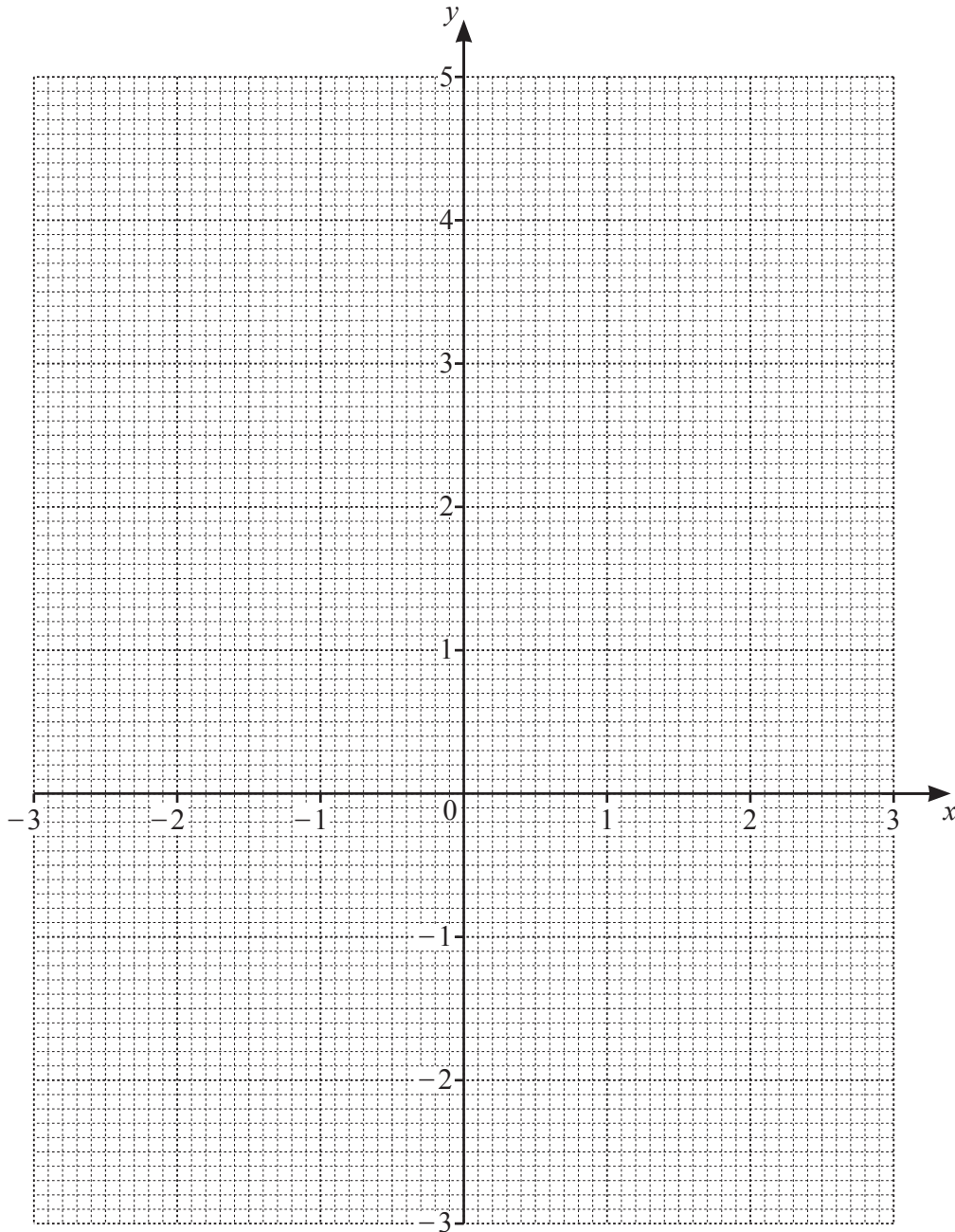
- 6 (a) The table shows some values for $y = \frac{x^3}{4} - x + 1$.

x	-3	-2	-1	0	1	2	3
y	-2.75	1	1.75	1	0.25	1	

- (i) Complete the table.

[1]

- (ii) Draw the graph of $y = \frac{x^3}{4} - x + 1$ for $-3 \leq x \leq 3$.



[3]

(iii) (a) On the same grid, draw the graph of $y = \frac{1}{3}x + 1$. [2]

(b) Use your graph to find all the values of x where $y = \frac{1}{3}x + 1$ crosses $y = \frac{x^3}{4} - x + 1$.

..... [2]

(c) The values of x where $y = \frac{1}{3}x + 1$ crosses $y = \frac{x^3}{4} - x + 1$ are the solutions of the equation $Ax^3 = Bx$.

Given that A and B are integers, find A and B .

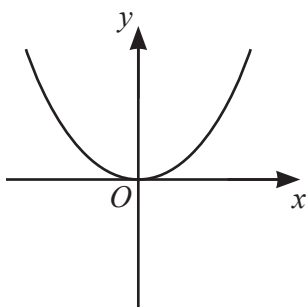
$A = \dots\dots\dots B = \dots\dots\dots$ [2]

(b) Here are four equations.

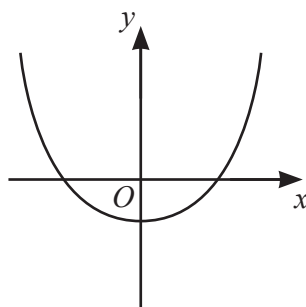
$$y = x^2 - 2x \quad y = 2x^2 - 2 \quad y = x^2 + 2x \quad y = 2x^2$$

The graphs of three of these equations are sketched below.

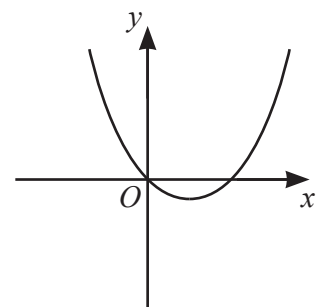
Write the correct equation below each graph.



.....



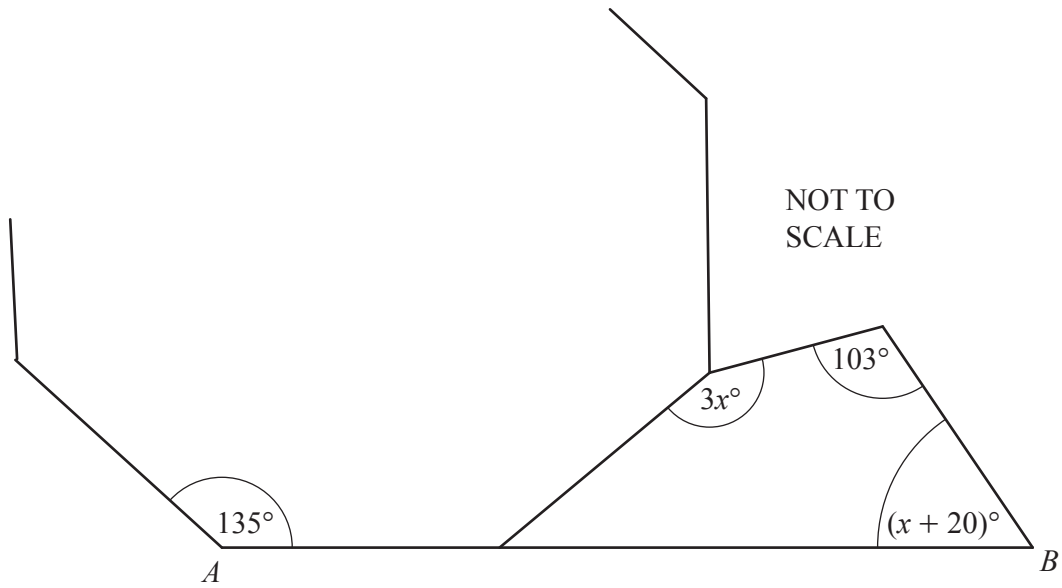
.....



.....

[2]

7 (a)

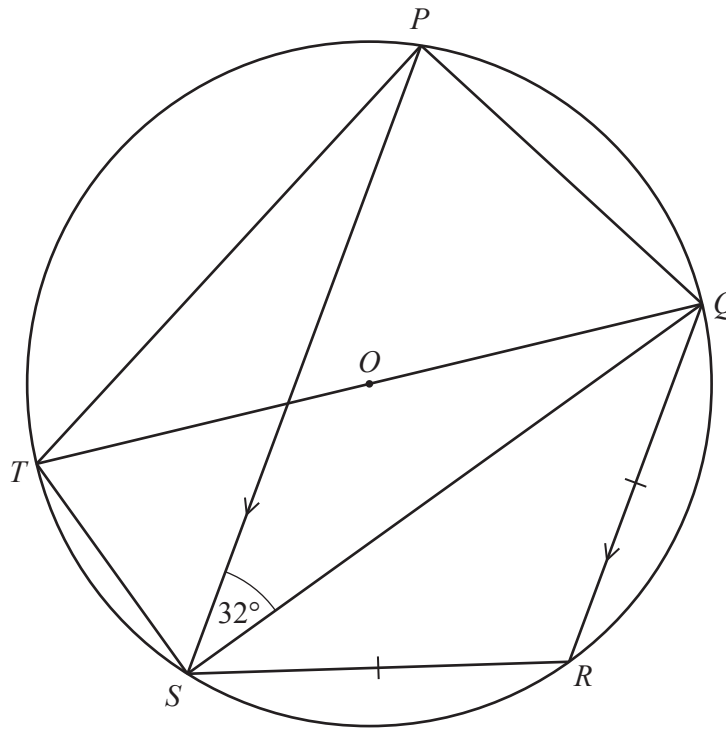


The diagram shows a quadrilateral and part of a regular octagon.
 AB is a straight line.

Form an equation in x and solve it to find x .

$x = \dots\dots\dots [3]$

(b)

NOT TO
SCALE

P, Q, R, S and T are points on the circumference of a circle, centre O .
 $\angle PSQ = 32^\circ$ and O lies on TQ .
 PS is parallel to QR and $QR = RS$.

- (i) Find $\angle PQT$.
 Give a reason for each step of your working.

.....

.....

.....

$$\angle PQT = \dots\dots\dots [3]$$

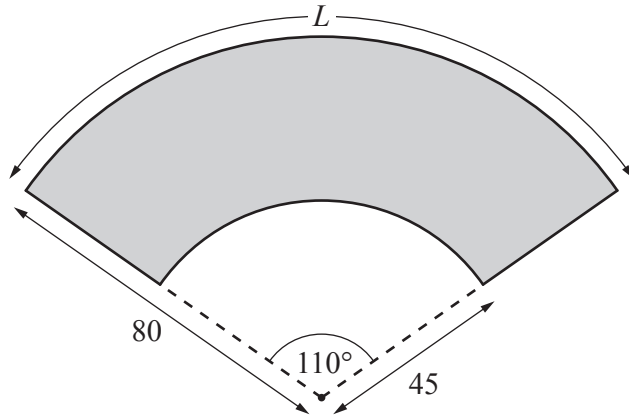
- (ii) Find $\angle QRS$.

$$\angle QRS = \dots\dots\dots [2]$$

- (iii) Find $\angle TQS$.

$$\angle TQS = \dots\dots\dots [1]$$

8 (a)

NOT TO
SCALE

A display notice is made by removing a sector of a circle from a larger sector.
Both sectors have an angle of 110° .
The radii of the sectors are 80 cm and 45 cm.

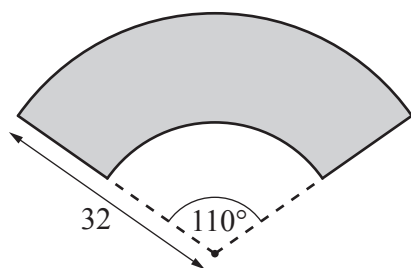
(i) Calculate arc length L .

$L = \dots\dots\dots$ cm [2]

(ii) Calculate the area of this display notice.

$\dots\dots\dots$ cm^2 [3]

(b)

NOT TO
SCALE

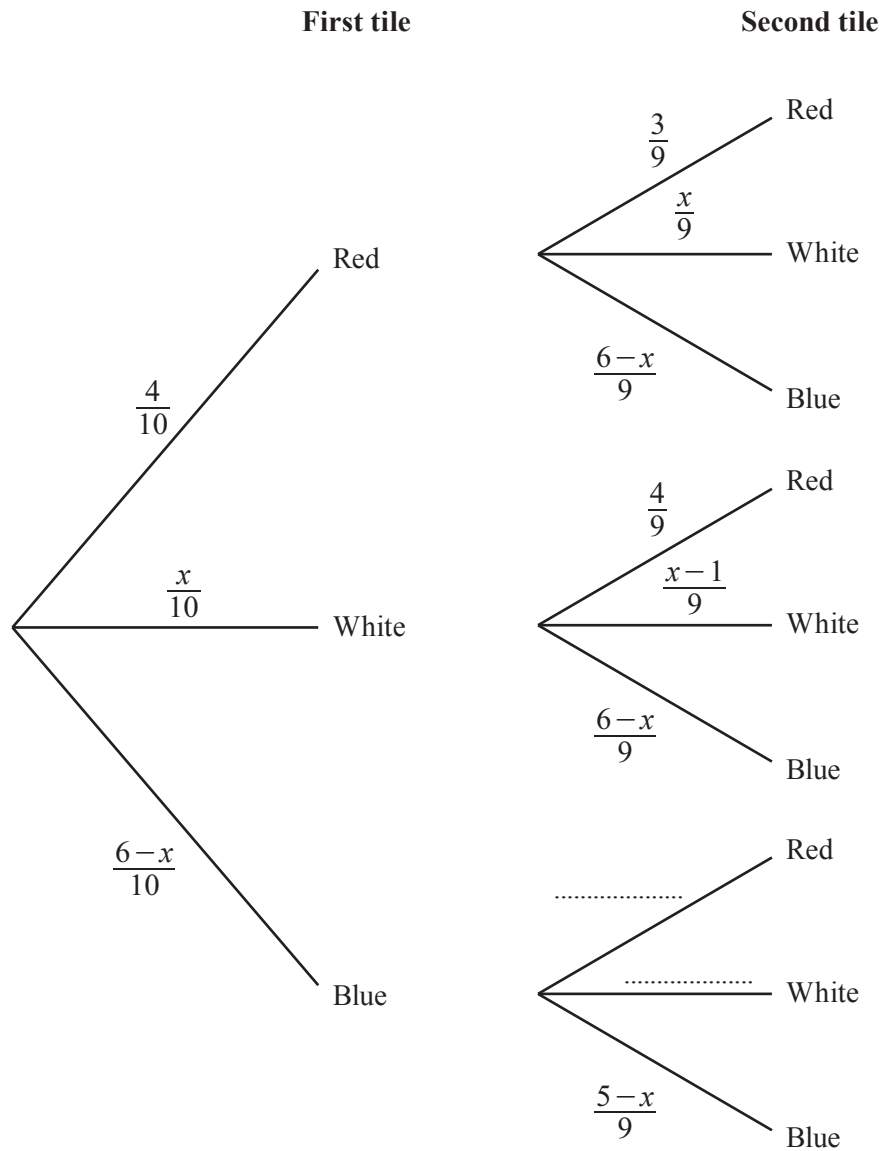
This diagram shows a display notice mathematically similar to the one in **part (a)**.
The radius of the larger sector is 32 cm.

Calculate the area of this display notice.

..... cm² [2]

- 9 A bag contains 10 tiles.
There are 4 red tiles, x white tiles and the rest are blue.
Two tiles are taken at random, without replacement, from the bag.

(a) Complete the tree diagram.



[2]

(b) Calculate the probability that both the tiles are red.

..... [1]

- (c) (i) Show that the probability that the tiles are both the same colour is $\frac{x^2 - 6x + 21}{45}$.

[4]

- (ii) The probability the tiles are both the same colour is $\frac{16}{45}$.

Show that $x^2 - 6x + 5 = 0$.

[1]

- (iii) Solve $x^2 - 6x + 5 = 0$.

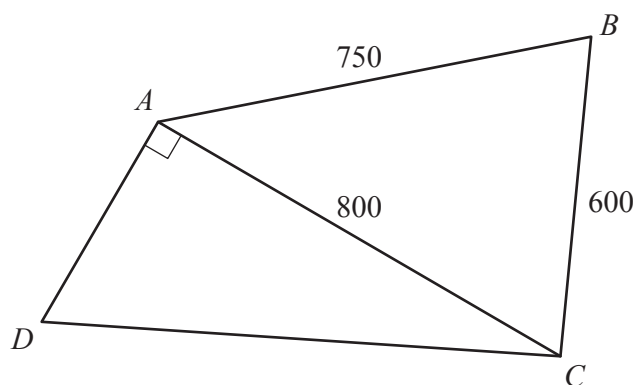
$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

- (iv) There are more red tiles than white tiles in the bag.

Find the probability that the first tile taken from the bag is blue.

$\dots\dots\dots$ [2]

10

NOT TO
SCALE

$ABCD$ is a field with $AB = 750$ m and $BC = 600$ m.
Inside the field is a straight path, AC , of length 800 m and $\hat{DAC} = 90^\circ$.

- (a) Show that $\hat{ACB} = 62.9^\circ$, correct to 1 decimal place.

[3]

- (b) The area of the field is $375\,000 \text{ m}^2$.

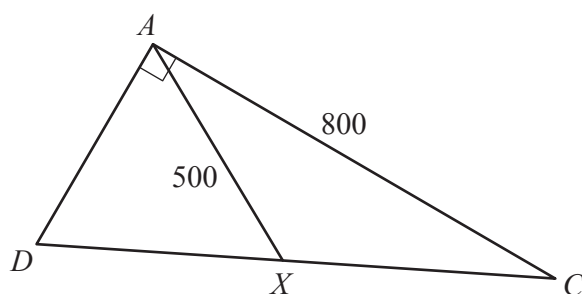
Calculate AD .

$AD = \dots\dots\dots \text{ m}$ [4]

(c) Calculate $\hat{ACD}$.

$\hat{ACD} = \dots\dots\dots$ [2]

(d) X is a point on DC and $AX = 500$ m.



NOT TO
SCALE

Calculate the obtuse angle $\hat{AXC}$.

$\hat{AXC} = \dots\dots\dots$ [4]

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