Write your name here

Surname	Other Names

Mathematics

June 2025 Practice Paper 3 (Calculator)
Higher Tier

Time: 1 hour 30 minutes

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- **Calculators may be used**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Higher Tier Formulae Sheet

Perimeter, area and volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium = $\frac{1}{2}(a + b)\, h$

Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

Area of a circle = πr^2

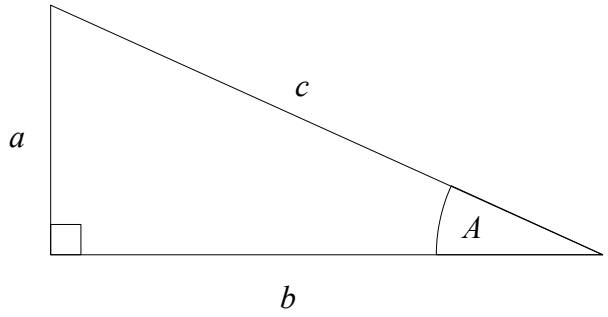
Quadratic formula

The solution of $ax^2 + bx + c = 0$

where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pythagoras' Theorem and Trigonometry

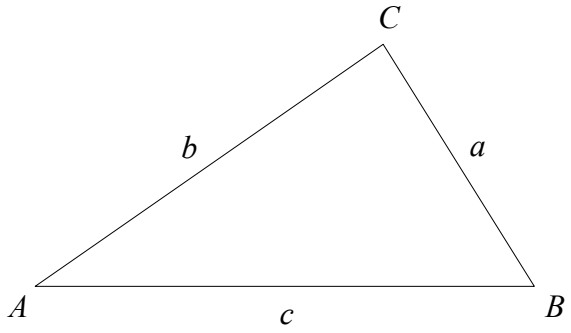


In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$



In any triangle ABC where a, b and c are the length of the sides:

sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

Total accrued = $P\left(1 + \frac{r}{100}\right)^n$

Probability

Where P (A) is the probability of outcome A and P (B) is the probability of outcome B:

P (A or B) = P (A) + P (B) – P (A and B)

P (A and B) = P (A given B) P(B)

END OF EXAM AID

1 The height of a building is 310 metres, correct to the nearest metre.

Complete the error interval for the height of the building.

..... m ≤ length < ..... m

(Total for Question 1 is 2 marks)

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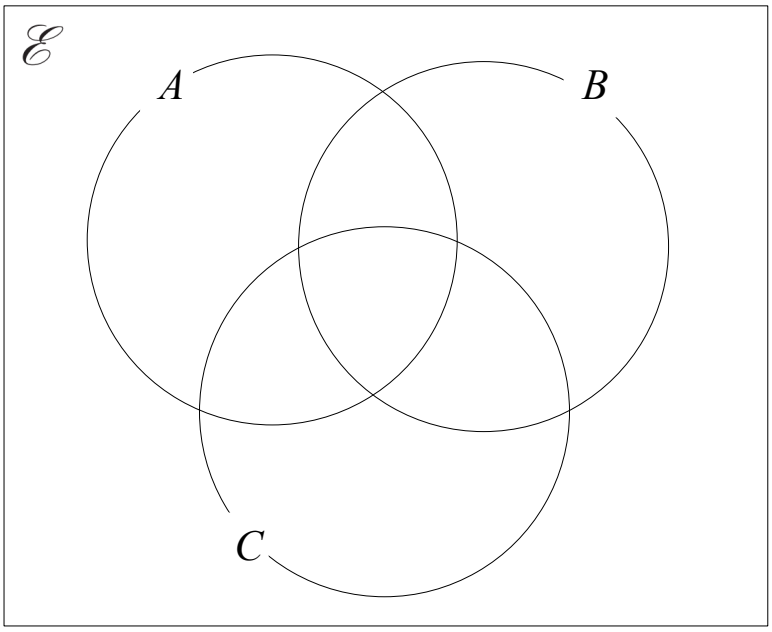
2 $\mathscr{E}$ = {odd numbers less than 30}
A = {1, 5, 7, 23, 29}
B = {7, 11, 15, 29}
C = {7, 15, 17, 19, 25, 27}

(a) Complete the Venn diagram to represent this information.



(2)

A number is chosen at random from $\mathscr{E}$.

(b) Find the probability that the number is a member of $(A \cap B)$.

.....

(2)

(Total for Question 2 is 3 marks)

3 Use your calculator to work out $\sqrt{\dfrac{\tan 20^\circ + \sin 25^\circ}{\tan 25^\circ - \sin 20^\circ}}$

(a) Write down all the figures on your calculator display.

.....

(2)

(b) Write your answer to part (a) correct to 2 decimal places.

.....

(1)

(Total for Question 3 is 3 marks)

4

Potatoes
1.25 kg
£1.45

London

Potatoes
2 kg
€3.49

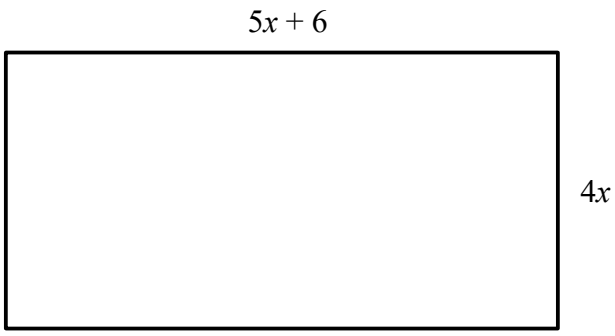
Dublin

In London, 1.25 kg of potatoes cost £1.45
In Dublin, 2 kg of potatoes cost €3.49

The exchange rate is £1 = €1.19
In which city are potatoes better value for money, in London or in Dublin?
You must show how you get your answer.

(Total for Question 4 is 3 marks)

5 Here is a rectangle.



All measurements are in centimetres.

The perimeter of the rectangle is 57 cm.

Find the area of the rectangle.

.....cm^2

(Total for Question 5 is 4 marks)

6 Change a speed of 900 km per hour to metres per second.

..... metres per second

(Total for Question 6 is 2 marks)

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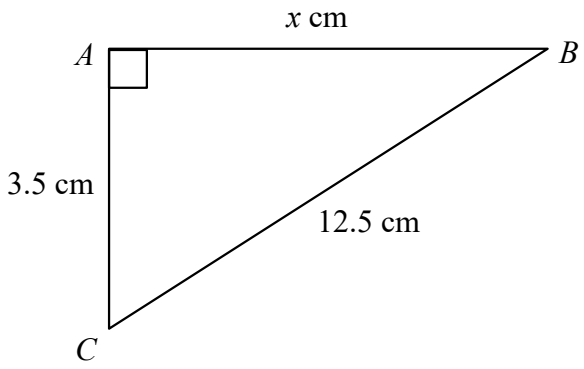
7 Here is a right-angled triangle.



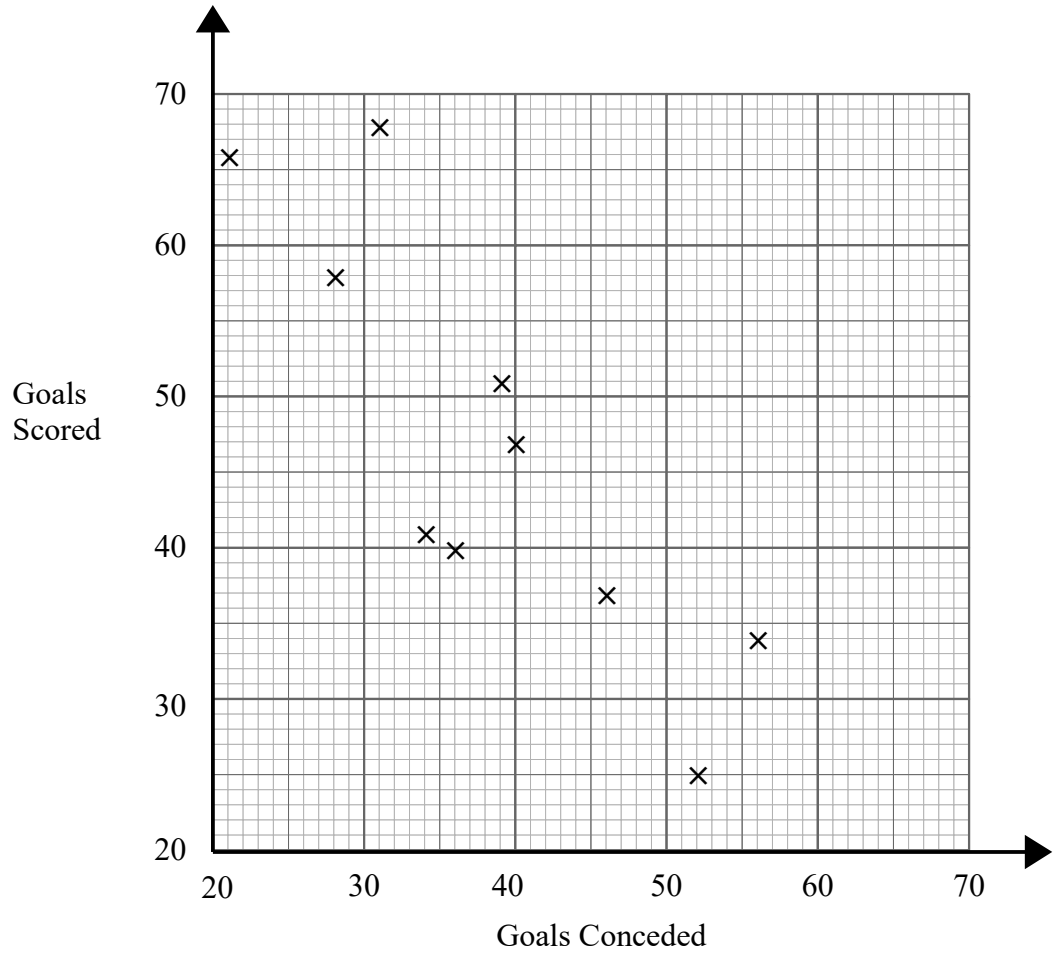
Work out the value of x.

$x =$ .....

(Total for Question 7 is 2 marks)

8 Gary recorded how many goals 10 football teams scored.
He also recorded how many goals they conceded

The information is shown on the scatter graph.



(a) What type of correlation does the scatter graph show?

.....

(1)

(b) Another team have scored 44 goals.

Estimate the number of goals this team has conceded.

.....

(2)

(Total for Question 8 is 3 marks)

9 Adam is measuring the heights in cm of his tomato plants.

Height (cm)	Frequency
$140 < h \leqslant 150$	7
$150 < h \leqslant 160$	10
$160 < h \leqslant 170$	15
$170 < h \leqslant 180$	19
$180 < h \leqslant 200$	9

(a) Estimate the mean height.
Give your answer correct to 1 decimal place.

..... cm

(3)

(b) Explain why your answer to part (a) is an estimate.

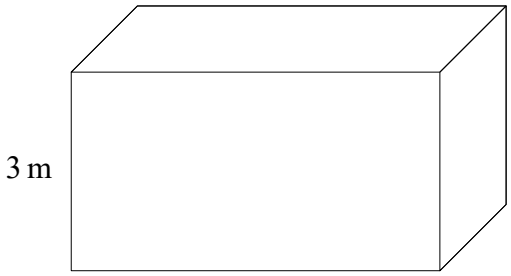
.....

.....

(1)

(Total for Question 9 is 4 marks)

10 The diagram shows a cuboid.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The cuboid has height 3 m
The volume of the cuboid is 21 m^3
The pressure on the floor due to the cuboid is 25 newtons/m^2

Work out the force exerted by the cuboid on the floor.

..... newtons

(Total for Question 10 is 3 marks)

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11 Water flows through each of the hoses that fill a swimming pool at the same rate.

It takes 3 of the hoses 6 hours to fill the swimming pool.

Work out how many hours it would take 2 of the hoses to fill $\frac{3}{4}$ of the swimming pool.

..... hours

(Total for Question 11 is 3 marks)

12 Simplify fully $\left(\frac{16x^4}{9y^{10}}\right)^{-\frac{1}{2}}$

.....

(Total for Question 12 is 3 marks)

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13 Omar buys a car for £12500

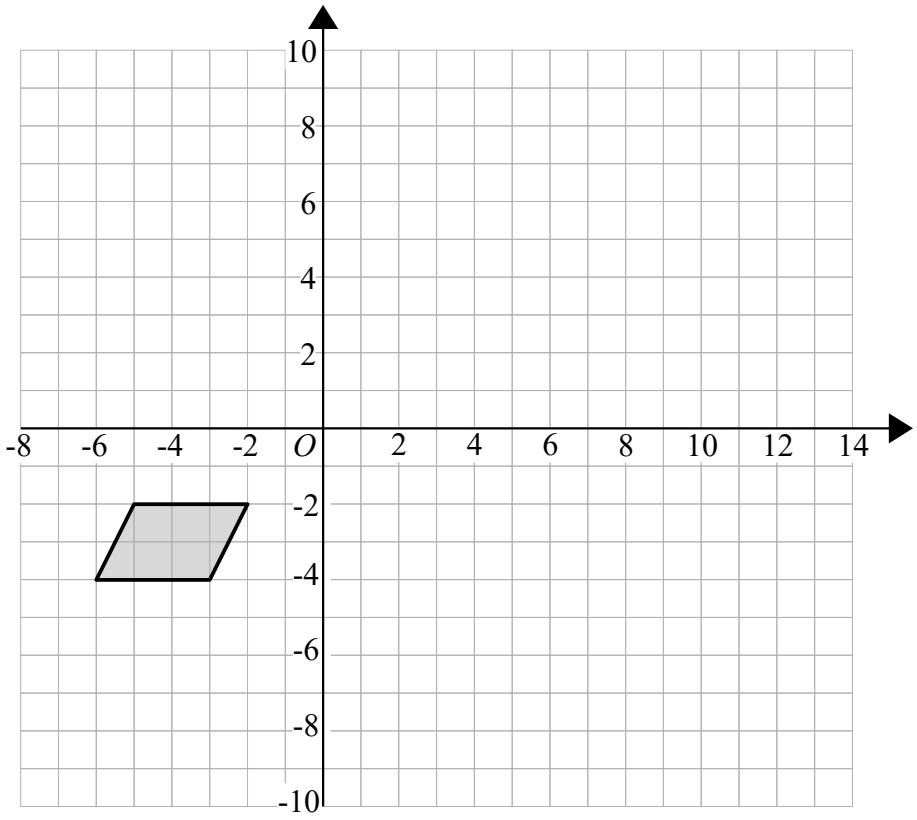
The value of the car depreciates by x% each year.
At the end of 3 years the value of the car is £6968

Work out the value of x.

$x =$ .....

(Total for Question 13 is 3 marks)

14



Enlarge the shaded shape by scale factor –2 with centre of enlargement (0, 0)

(Total for Question 14 is 2 marks)

15 Make x the subject of the formula $a = \dfrac{x + 4}{x + 2}$

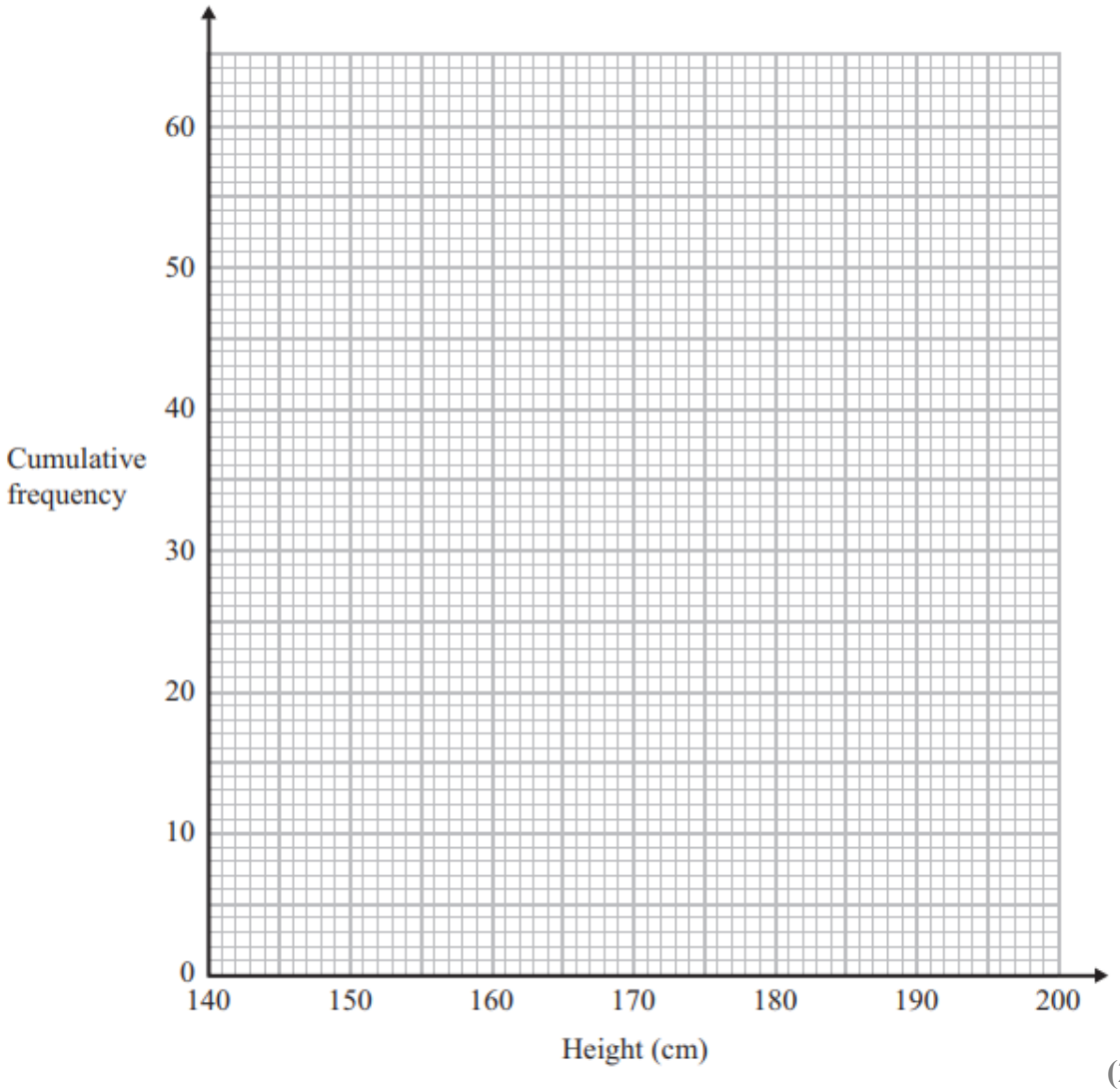
.....

(Total for Question 15 is 3 marks)

16 The cumulative frequency table shows the height, in cm, of some tomato plants.

Height	Cumulative Frequency
$140 < h \leqslant 150$	7
$140 < h \leqslant 160$	17
$140 < h \leqslant 170$	32
$140 < h \leqslant 180$	51
$140 < h \leqslant 190$	57
$140 < h \leqslant 200$	60

(a) On the grid, plot a cumulative frequency graph for this information.



(2)

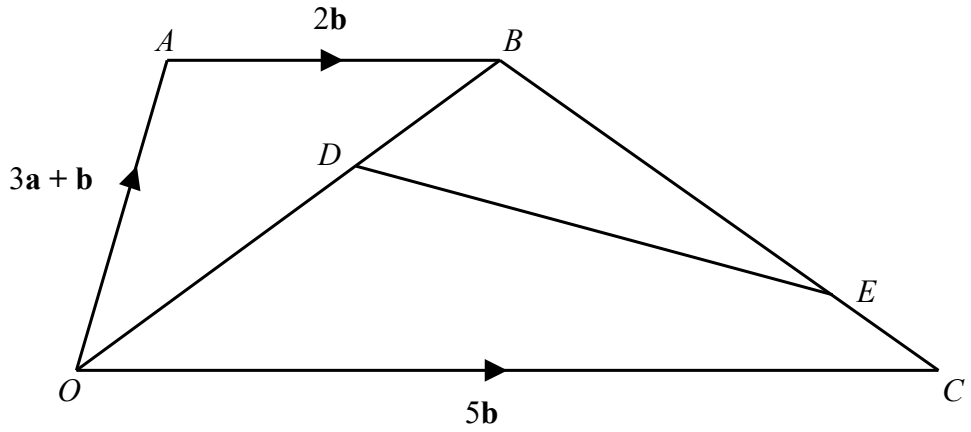
(b) Use the graph to find an estimate for the median height of the plants.

.....cm

(1)

(Total for Question 16 is 3 marks)

17 O*ABC* is a trapezium



$\overrightarrow{OA} = 3\mathbf{a} + \mathbf{b}$ $\overrightarrow{OC} = 5\mathbf{b}$ $\overrightarrow{AB} = 2\mathbf{b}$

D is the point on *OB* such that *OD* : *DB* = 3 : 2
E is the point on *BC* such that *BE* : *EC* = 4 : 1

Work out the vector $\overrightarrow{DE}$ in terms of **a** and **b**.
Give your answer in its simplest form.

.....

(Total for Question 17 is 4 marks)

18 (a) Write $\dfrac{x^3 - 4x}{3x - 6} \div \dfrac{x^2 - x}{5}$ in the form $\dfrac{ax + b}{cx + d}$ where a, b, c and d are integers.

.....

(3)

(b) Express $\dfrac{3}{x - 1} + \dfrac{2x}{x - 2} - 2$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 18 is 6 marks)

19 The curve C has equation $y = 2x^2 - 8x + 5$

Find the coordinates of the turning point on C.

(..... , ...)

(Total for Question 19 is 3 marks)

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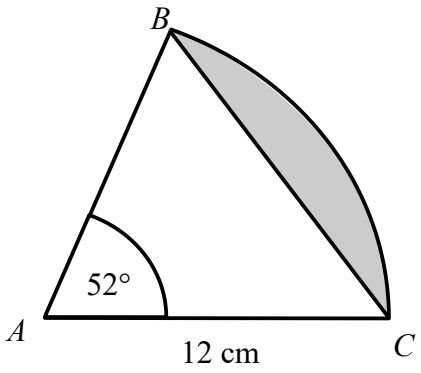
20 *BAC* is a sector of a circle, centre *A*.
AC is 12 cm.

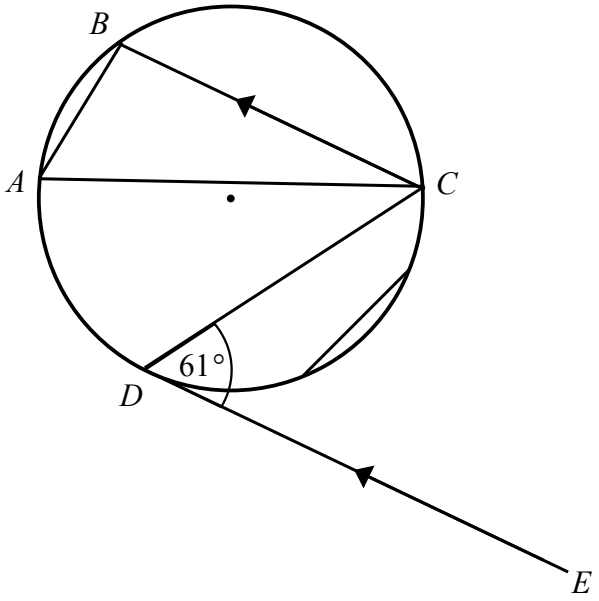


Find the area of the shaded segment.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 20 is 4 marks)

21



A, B, C and *D* are points on the circumference of a circle.

DE is a tangent at *D* to the circle.
BC is parallel to *DE*.
Angle *CDE* = 61°

Work out the size of angle *BAC*.
Write down any circle theorems that you use.

°

.....

(Total for Question 21 is 4 marks)

22 Here are the first 5 terms of a quadratic sequence.

19 15 9 1 -9

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 22 is 2 marks)

23 There are only 2 red counters and n blue counters in a bag.

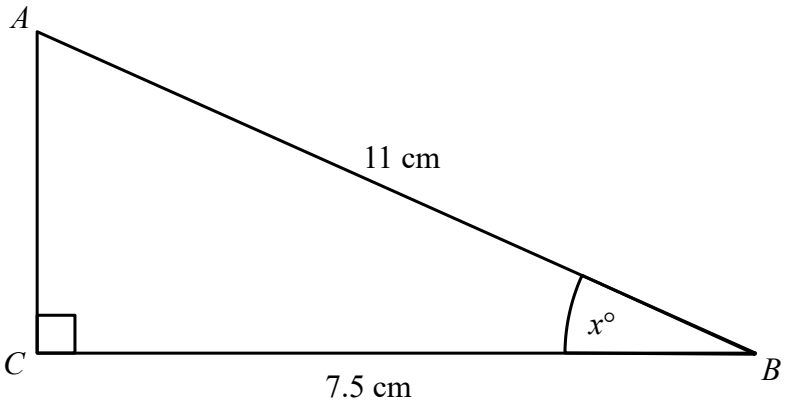
Sabrina takes 2 counters at random from the bag.

Find an expression, in terms of n, for the probability that both the counters are red.

.....

(Total for Question 23 is 2 marks)

24 The diagram shows right-angled triangle ABC



AB = 11 cm correct to the nearest cm.
BC = 7.5 cm correct to one decimal place.

Calculate the lower bound for the size of the angle marked x.
You must show all your working.

.....°

(Total for Question 24 is 3 marks)

25 **L** is the straight line with equation $y = 2x - 1$

C is the graph with equation $y^2 = 10x^2 - 11x - 2$

Using algebra, find the coordinates of the points of intersection of **L** and **C**.
You must show all your working.

(..... , ...)

(..... , ...)

(Total for Question 25 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS