Candidate surname	Other names

Maths Planner

AQA

2024 Predicted Paper

Mathematics

PAPER 1 (Non-Calculator)

Higher Tier

Time 1 hour 30 minutes

WORKED WRITTEN SOLUTIONS

Total Marks

80

Q	Topic(s)	Marks
1	Percentage Multipliers	/ 1
2	Ratio 1:n	/ 1
3	Equations of Linear Graphs	/ 1
4	Reciprocals / Simplifying Fractions	/ 2
5	Splitting Ratio	/ 3
6	Calculating with Approximations	/ 3
7	Simplifying Expressions	/ 1
8	Linear Inequalities / Number Lines	/ 3
9	Plans & Elevations / Circumference	/ 4
10	Laws of Indices	/ 4
11	Column Vectors	/ 5
12	Standard Form	/ 4
13	Calculating with Speed	/ 4

Q	Topic(s)	Marks
14	Area of Quadrilaterals	/ 4
15	Sequences	/ 3
16	Frequency Tables w/ Grouped Data	/ 2
17	Constructions	/ 3
18	Cumulative Frequency Graphs / %'s	/ 3
19	Probability Trees / Expected Outcomes	/ 5
20	Venn Diagram	/ 4
21	Inequality Regions	/ 1
22	Harder Indices / Recurring Decimals	/ 4
23	Quadratic Graphs	/ 4
24	Exact Trig Values / Shaded Areas	/ 5
25	Equation of Circle / Quad. Simultaneous	/ 6

Answers all questions in the spaces provided.

Do not write outside the box

1 Write the percentage multiplier used to **decrease** by 12%

100% − 12% = 88%

[1 mark]

Answer 0.88

2 The ratio $x : y = 2 : 3$

If $x : y = 1 : n$

Write down the value of n

x : y
÷2 (2 : 3) ÷2
1 : 3/2

[1 mark]

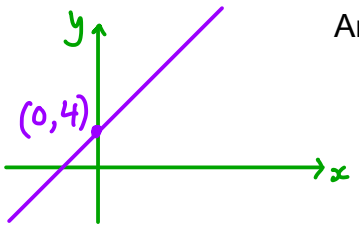
Answer $\frac{3}{2}$ or 1.5

3 A straight line has the equation $y = 4 + 5x$

Write down the coordinates of the y-intercept

[1 mark]

y = mx + c



Answer (0,4)

Do not write outside the box

4 Write down the reciprocal of 0.8
Give your answer in its simplest form.

[2 marks]

$0.8 = \frac{8}{10}$ $\therefore$ $\frac{10}{8} = \frac{5}{4}$

Answer $\frac{5}{4}$

5 Divide 42 in the ratio 5 : 7

[3 marks]

$5 + 7 = 12$ PARTS

1 PART $= 42 \div 12$

$\frac{42}{12} = \frac{21}{6} = \frac{7}{2} = 3.5$

$35 \times 5 = 175$ $35 \times 7 = 245$

Answer 17.5 and 24.5

Do not write outside the box

6 $\dfrac{4.85 \times 0.429}{0.0501}$

Keertan works out that the answer to this calculation is 0.04
Use approximations to decide if he is correct.

[3 marks]

$\dfrac{4.85 \times 0.429}{0.0501} \approx \dfrac{5 \times 0.4}{0.05} = \dfrac{2}{0.05} = \dfrac{200}{5} = 40$

(×100 applied to numerator and denominator)

$5 \overline{)200}$ → 040

Keertan is incorrect, his place value is out.

7 Simplify $8x - 2(x + 3)$

MINUS!

$= 8x - 2x - 6$

$= 6x - 6$

Circle your answer.

[1 mark]

$10x - 6$ $\quad$ $6x - 6$ $\quad$ $10x + 6$ $\quad$ $6x + 3$

Do not write outside the box

8 (a) Solve $5 < 4n - 3 \leq 25$ **[2 marks]**

+3 +3

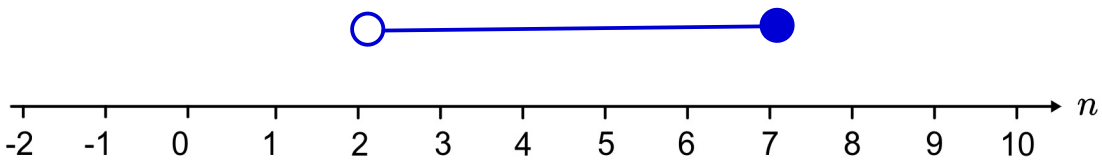
$8 < 4n \leq 28$

÷4 ÷4

$2 < n \leq 7$

Answer 2 $< n \leq$ 7

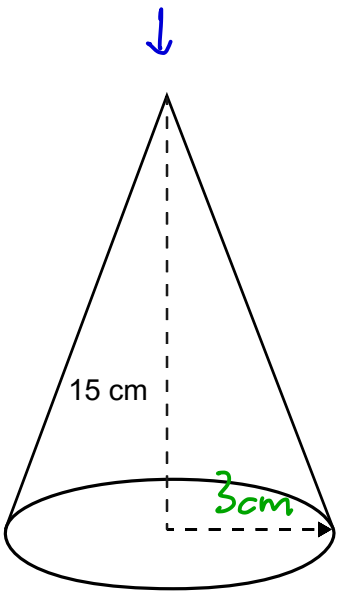
8 (b) Represent the inequality for n on the number line below. **[1 mark]**



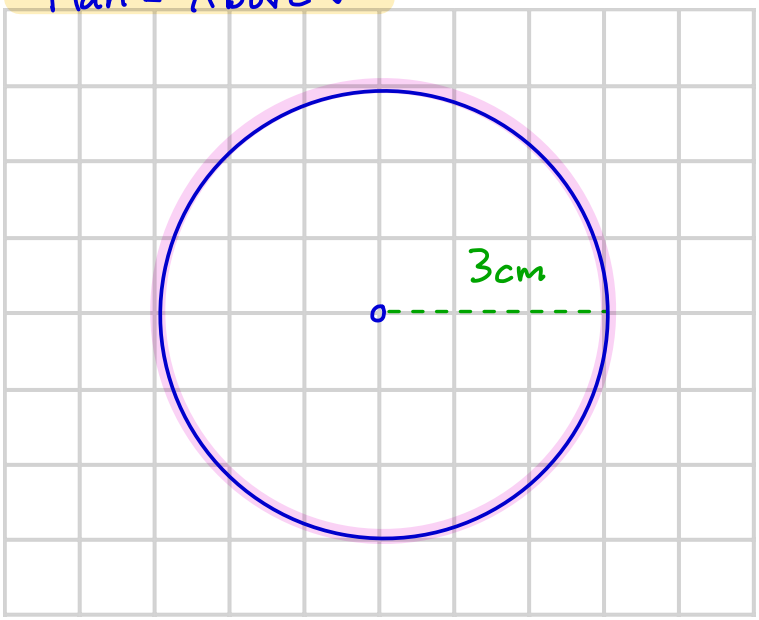
Do not write outside the box

9 (a) Draw a plan view of this cone on the centimetre grid.

[2 marks]



Plan = Above ↓



height : radius $= 5 : 1$

×3 (5 : 1) ×3
15 : 3

9 (b) Calculate the circumference of the cone's base, in centimetres.
Give your answer in terms of π

[2 marks]

$C = 2\pi r = \pi d$

$C = \pi \times 6$

$= 6\pi$

Radius = 3 cm

Diameter = 3 × 2
= 6 cm

Answer 6π

Do not write outside the box

10 **(a)** Simplify $(2b^3)^3$

NB: $(a^n)^m = a^{n \times m}$

[2 marks]

$(2b^3)^3 = 2^3 b^9$

$= 8b^9$

Answer $8b^9$

LHS = RHS

10 **(b)** $(4 \times 2^3)^5 = 2^x$

Find the value of x

[2 marks]

$\therefore$ LHS $= (2^2 \times 2^3)^5$

$2^2 = 4$

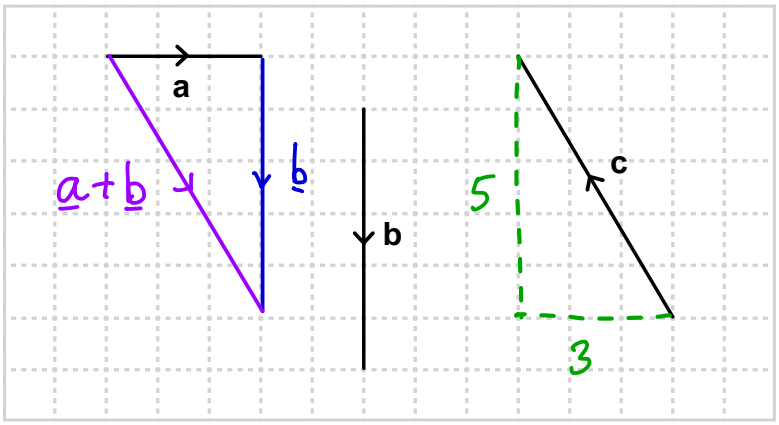
$= (2^5)^5$

$= 2^{25}$

Answer $x = 25$

Do not write outside the box

11 The diagram shows the vectors **a**, **b** and **c**.



11 (a) What is **c** as a column vector?

[2 marks]

Answer $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$

11 (b) Work out **a** + **b** as a column vector.

[2 marks]

$\begin{pmatrix} 3 \\ 0 \end{pmatrix} + \begin{pmatrix} 0 \\ -5 \end{pmatrix} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$

Answer $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$

11 (c) What mathematical word describes the relationship of the resultant vector **a** + **b** and vector **c**?

[1 mark]

They are parallel

Do not write outside the box

12 (a) Tick the **correct** box for this statement.

[1 mark]

	False	True
$5.2 \times 10^{-3} = 0.00052$	✓	

12 (b) Joanne is asked to write an answer to a question in standard form.

She writes 23.1×10^{-4}

The teacher marks it incorrect, explain why.

[1 mark]

Standard Form must be between 1-10 ... 23.1 is not.

12 (c) Work out $4 \times 5.1 \times 10^3$

Give your answer in standard form

[2 marks]

51
× 4
204

$4 \times 5.1 \times 10^3 = 20.4 \times 10^3$

$= 2.04 \times 10^4$

Answer 2.04×10^4

Do not write outside the box

13 Road works were being carried out between two motorway junctions **32 km apart**. Due to the road works, the speed limit was reduced from **80 mph** to **50 mph**.

Average speed check cameras were installed to fine anyone exceeding the speed limit.

5 miles = 8 km

A car took **20 minutes** to travel between the two junctions.

Will the driver receive a speeding fine? You must fully justify your answer.

[4 marks]

5 miles = 8 km

×4 ↓ ×4

20 miles = 32 km

20 mins → "mph"

1 hour = 60 mins

÷3 ↓ ÷3

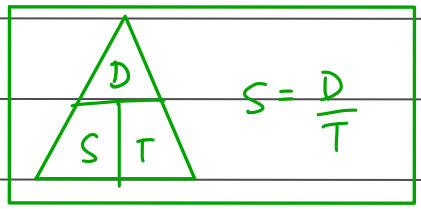
$\frac{1}{3}$ hour = 20 mins

KCF

$\therefore S = \frac{D}{T} = \frac{20}{1} \div \frac{1}{3}$

$= \frac{20}{1} \times \frac{3}{1}$

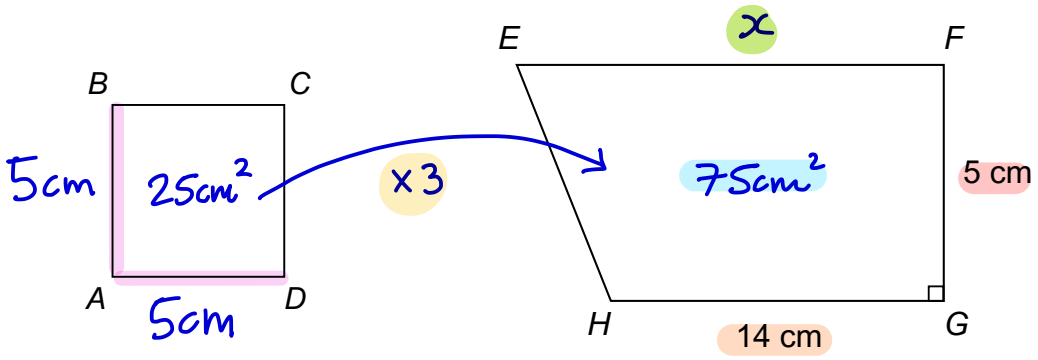
= 60 mph Yes 60 mph > 50 mph



Yes ☑ No ☐

Do not write outside the box

14 *ABCD* is a square.
EFGH is a trapezium.



ABCD has a perimeter of 200 mm 200m = 20cm

x3 The area of the square is **one third** the area of the trapezium.

Work out the size of length *EF*. = x

[4 marks]

Square side length = $\frac{20}{4}$ = 5 cm

Square Area = 5 × 5 = 25cm²

EFGH is a trapezium

$A = \frac{1}{2}(a+b)h \Rightarrow 75 = \frac{1}{2} \times (x+14) \times 5$

$150 = (x+14) \times 5$

$\frac{150}{5} = x + 14$

$30 = x + 14$

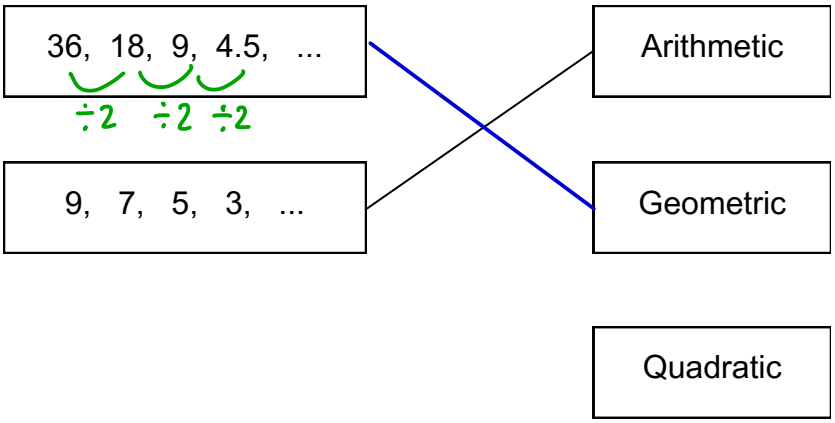
$16 = x$

Answer 16 cm

Do not write outside the box

15 (a) Match the sequence on the left with the correct type on the right.
One has been done for you.

[1 mark]



15 (b) Complete the **first two missing terms** in this sequence.

[2 marks]

$\sqrt{2}$, 2, $2\sqrt{2}$, 4, $4\sqrt{2}$, ...

÷√2 ÷√2 ×√2 ×√2

$\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

Do not write outside the box

16 The table below gives information about the time taken for a group of runners to complete a 5 km park run.

Time (t minutes)	Frequency
$20 < t \leq 22$	2
$22 < t \leq 24$	4
$24 < t \leq 28$	3
$28 < t \leq 32$	7
$32 < t \leq 36$	4

6
9
16 ← median
20

Tick **one box** for each statement.

[2 marks]

	Cannot be true	**Might be true**	**Definitely true**
The range of the running times is 16 minutes	☑	☐	☐
The median running time was 31 minutes	☐	☑	☐

Fastest time ≠ 20

$\frac{20+1}{2} = 10.5^{th}$ runner.

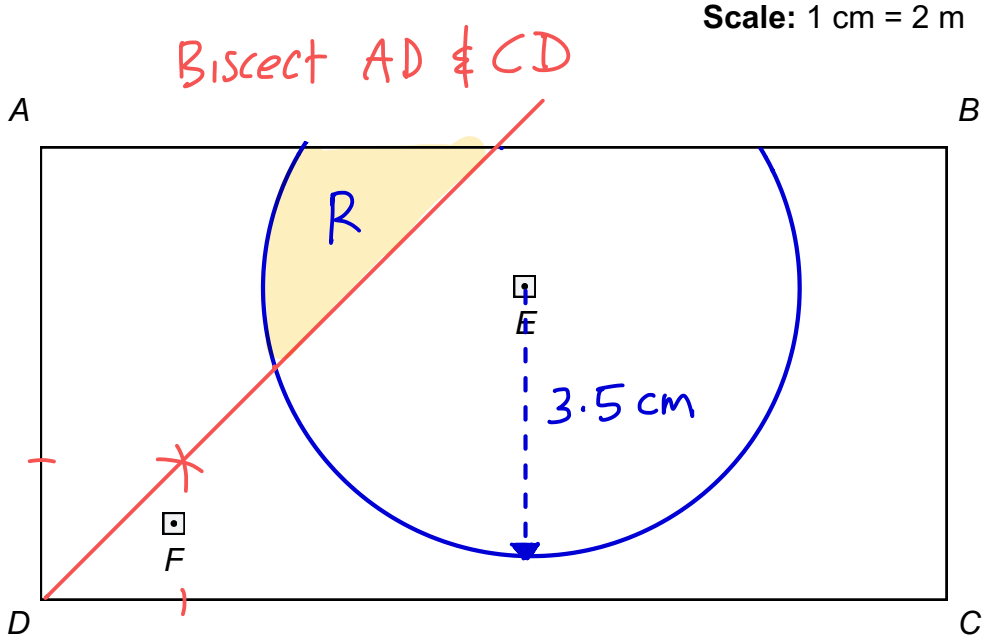
Do not write outside the box

17 Use a ruler and compasses in this question.

ABCD represents a car park.

Object *E* and *F* represent parking meters.

Scale: 1 cm = 2 m



A car enters the car park.
It parks closer to *AD* than to *CD,* and within **7 m** of the parking meter *E*.

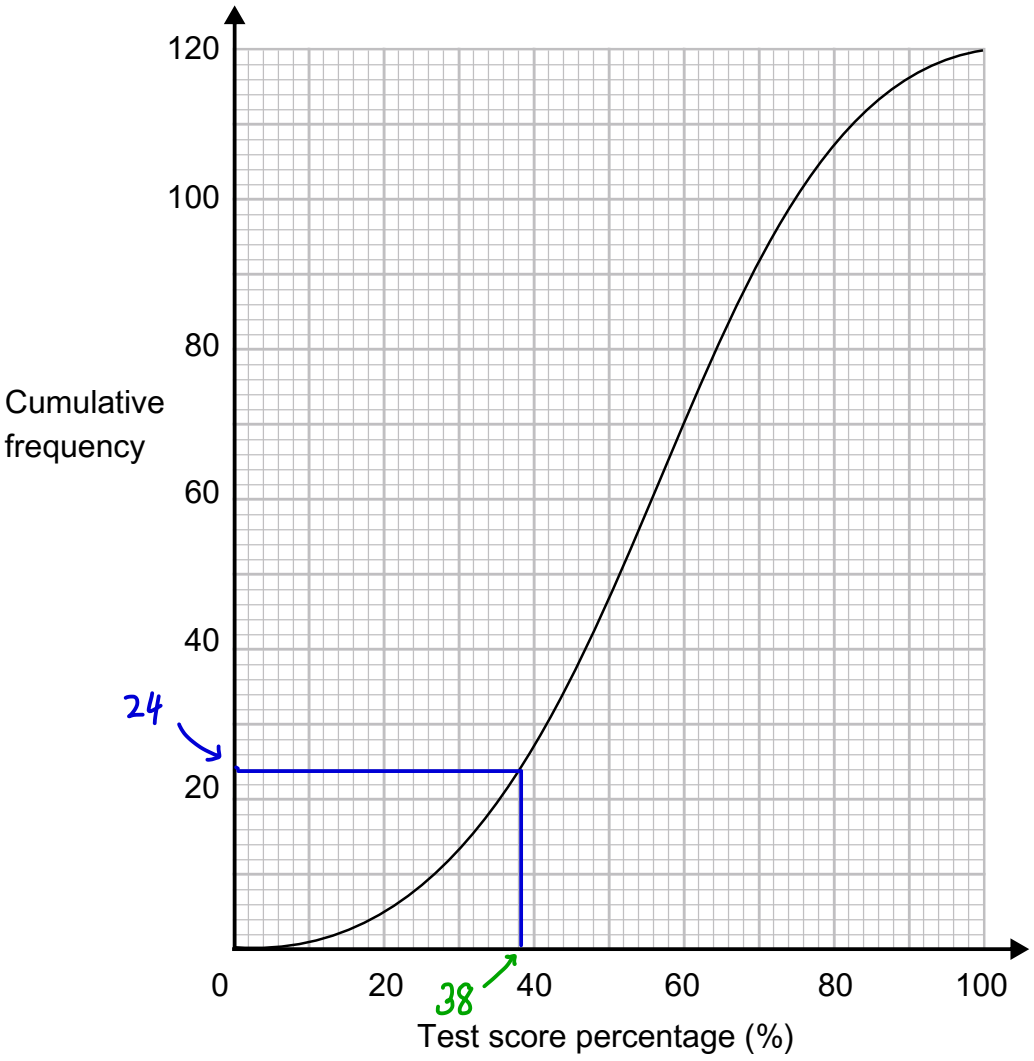
Label the region, **R**, where the car could have parked.
Show all your construction lines.

[3 marks]

x3.5 (1cm = 2m
3.5cm = 7m) x3.5

Do not write outside the box

18 The cumulative frequency graph gives information about the test score percentages of a year group.



Students needed to achieve at least 38% in order to pass the test.

Work out an estimate for the percentage of students that failed the test.

[3 marks]

$\frac{24}{120} = \frac{2}{10} = \frac{20}{100}$

×10

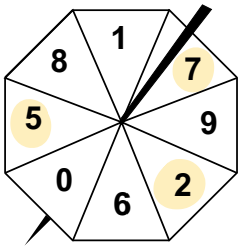
Answer 20 %

Do not write outside the box

19 Here is a fair 8-sided spinner and dice.

Primes: 2, 7, 5

$P(\text{Prime}) = \frac{3}{8}$



Spinner

Dice

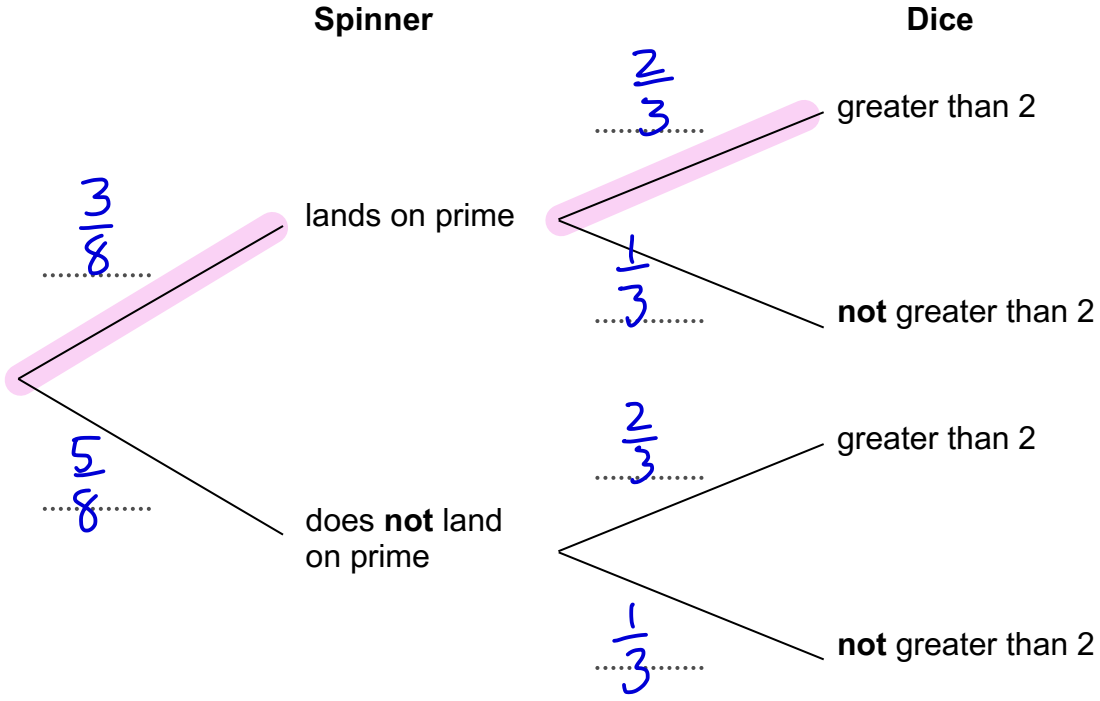
1 2 3 4 5 6

$P(>2) = \frac{4}{6} = \frac{2}{3}$

Sophie spins the spinner and then rolls the dice.

19 (a) Complete the probability tree diagram.

[2 marks]



(b) Sophie is going to do this 200 times.

Work out how many times she should expect the spinner to land on a prime and the dice to be greater than 2.

[3 marks]

$P(\text{prime}, >2) = \frac{3}{8} \times \frac{2}{3} = \frac{6}{24} = \frac{1}{4}$

$\therefore$ Expected outcome $= 200 \times \frac{1}{4}$

$= 50$ times

Answer _____

Do not write outside the box

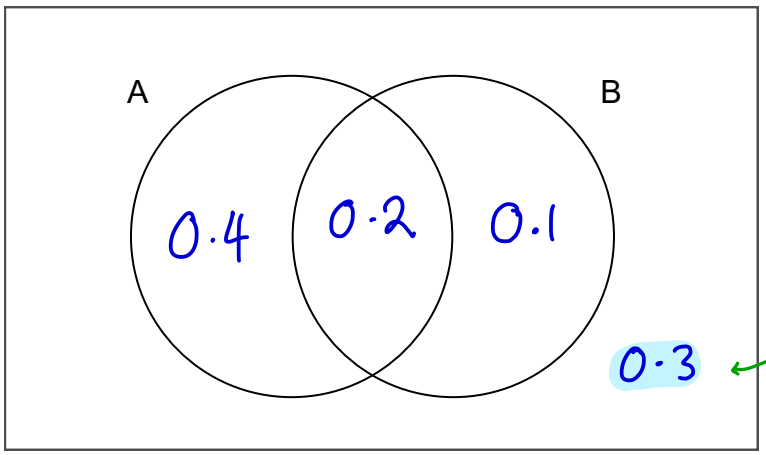
20 $P(A') = 0.4$ $P(A) = 1 - 0.4 = 0.6$

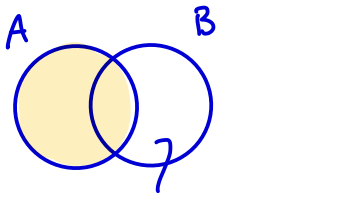
$P(B) = 0.3$

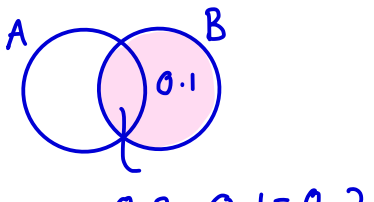
$P(A \cup B) = 0.7$

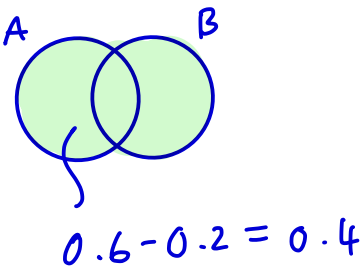
20 (a) Complete the Venn diagram.

[3 marks]







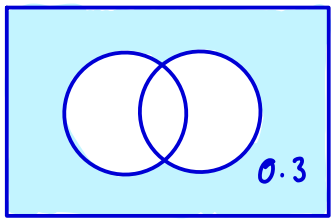


20 (b) Find $P(A \cup B)'$

[1 mark]

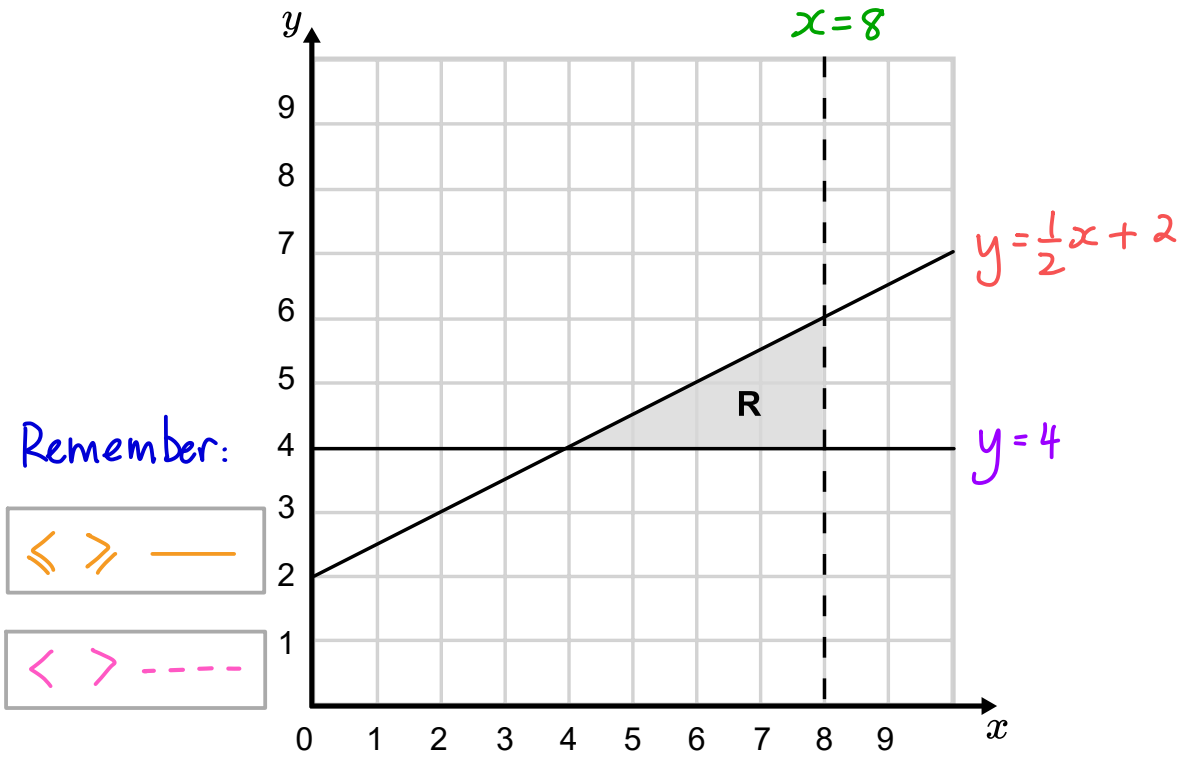
Answer 0.3

$P(A \cup B)' =$



Do not write outside the box

21 The shaded region **R** is bounded by three inequalities.



Tick the **correct set** of inequalities for the region **R.**

[1 mark]

Set A ☑

$x < 8$

$y \geq 4$

$y \leq 2 + \frac{1}{2}x$

Set B ☐

$x > 4$

$y \leq 8$

$y > \frac{1}{2}x + 2$

Set C ☐

$x < 8$

$y \geq 4$

$y \geq 2x + 2$

Do not write outside the box

22 Work out $\left(\frac{27}{8}\right)^{-\frac{2}{3}} \div 0.6\dot{1}$

$a^{\frac{n}{m}} = \left(\sqrt[m]{a}\right)^n \qquad a^{-n} = \frac{1}{a^n}$

[4 marks]

$\left(\frac{27}{8}\right)^{-\frac{2}{3}} = \left(\frac{8}{27}\right)^{\frac{2}{3}}$

$= \left(\sqrt[3]{\frac{8}{27}}\right)^2$

$= \frac{2^2}{3^2}$

$= \frac{4}{9}$

$x = 0.61111\ldots$

① $10x = 6.11111\ldots$

② $100x = 61.1111\ldots$

② − ①:

$90x = 55$

$x = \frac{55}{90}$

$x = \frac{11}{18}$

$\therefore \frac{4}{9} \div \frac{11}{18}$ 'KCF'

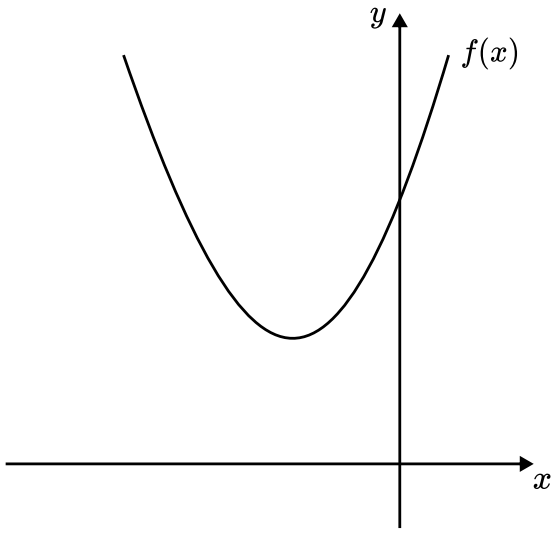
$= \frac{4}{9} \times \frac{18^2}{11}$ $= \frac{4}{1} \times \frac{2}{11}$

$= \frac{8}{11}$

Answer 8/11

Do not write outside the box

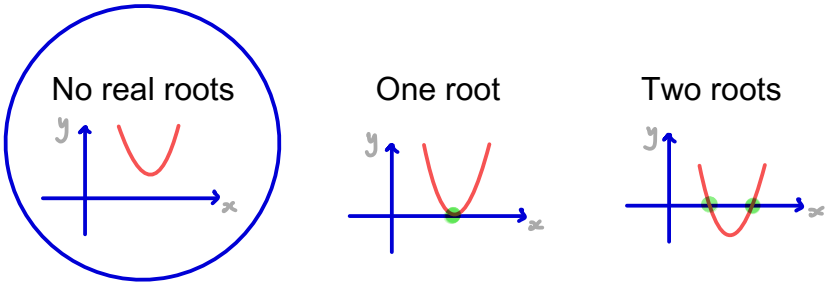
23 The graph shows the graph $f(x)$



23 (a) How many roots does $f(x)$ have?

Circle your answer.

[1 mark]



23 (b) Given $f(x) = x^2 + px + q$ and the turning point is (-1, 4)

Work out the integer values of p and q

[3 marks]

If T.P is $(-1, 4) \Rightarrow f(x) = (x+1)^2 + 4$

$= x^2 + 2x + 1 + 4$

$(x+1)(x+1)$ $= x^2 + 2x + 5$

$= x^2 + x + x + 1$

$= x^2 + 2x + 1$

Answer $p = 2, \ q = 5$

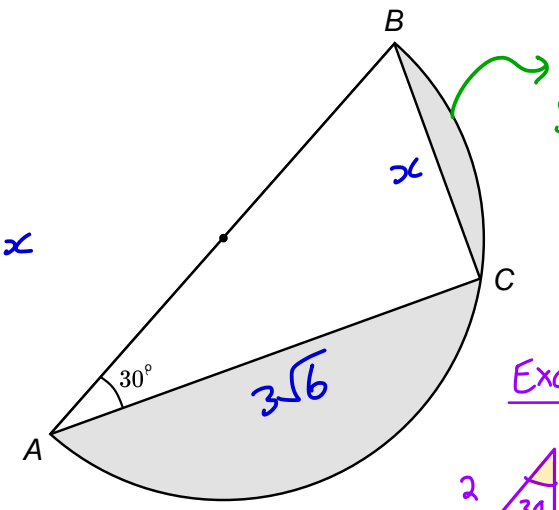
Do not write outside the box

24 Shown is a semi-circle, where *AB* is the diameter.

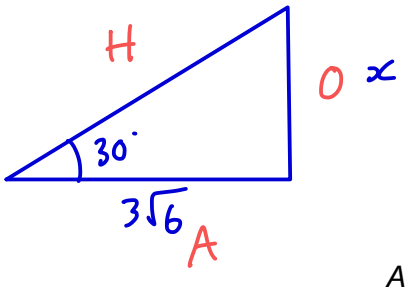
$\angle BAC = 30^\circ$

$AC = 3\sqrt{6}$ cm

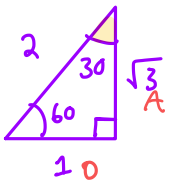
Diagram not drawn to scale



Shaded Area = $A_{\text{semicircle}} - A_{\triangle}$



Exact Trig Values



$\tan(30) = \frac{O}{A}$

$= \frac{1}{\sqrt{3}}$

Work out the exact area of the shaded region.

Give your answer in the form $a\pi - b\sqrt{3}$

[5 marks]

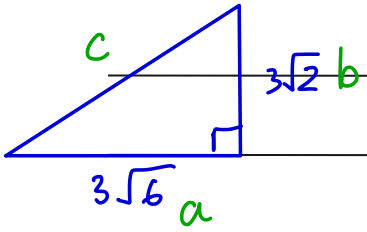
$\tan(30) = \frac{O}{A}$

$\tan(30) = \frac{x}{3\sqrt{6}}$

$\frac{1}{\sqrt{3}} = \frac{x}{3\sqrt{6}}$

$\frac{3\sqrt{6}}{\sqrt{3}} = x$

$3\sqrt{2} = x$



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

$(3\sqrt{6})^2 + (3\sqrt{2})^2 = c^2$

$9 \times 6 + 9 \times 2 = c^2$

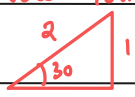
$54 + 18 = c^2$

$c = \sqrt{72}$

$c = \sqrt{36} \times \sqrt{2}$

$c = 6\sqrt{2}$

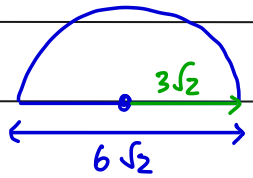
Note: You could use fact



H:O = 2:1

$3\sqrt{2} \times 2 = 6\sqrt{2}$

Instead of pythagoras!



$A_{\text{semicircle}} = \frac{\pi \times r^2}{2}$

$= \frac{\pi \times (3\sqrt{2})^2}{2}$

$= \frac{\pi \times 9 \times 2}{2}$

$= 9\pi$

$A_{\triangle} = \frac{3\sqrt{6} \times 3\sqrt{2}}{2}$

$= \frac{9\sqrt{12}}{2}$

$= \frac{9 \times 2 \times \sqrt{3}}{2}$

$= 9\sqrt{3}$

Answer $9\pi - 9\sqrt{3}$

Do not write outside the box

25 Circle $\mathbf{C_1}$ has the equation $x^2 + y^2 + 11 = 36$

25 (a) Work out the radius of the circle $\mathbf{C_1}$ **[1 mark]**

$x^2+y^2 = 25$

$\Rightarrow r^2 = 25$

$r = 5$

Equation of circle:

$x^2+y^2=r^2$

Answer 5

$f(x-1)$

25 (b) Circle $\mathbf{C_1}$ is translated 1 unit to the right to form circle $\mathbf{C_2}$

The line **L** has the equation $y + x = 2$

Find the points of interception between circle $\mathbf{C_2}$ and line **L**. **[5 marks]**

C_1: $f(x) = x^2 + y^2 = 25$

C_2: $f(x-1) = (x-1)^2 + y^2 = 25$

L: $y = 2 - x$

Sub L into C_2:

$(x-1)^2 + (2-x)^2 = 25$

$(x-1)(x-1) + (2-x)(2-x) = 25$

$x^2 - 2x + 1 + 4 - 4x + x^2 = 25$

$2x^2 - 6x + 5 = 25$

$2x^2 - 6x - 20 = 0$

$x^2 - 3x - 10 = 0$

$(x-5)(x+2) = 0$

$x - 5 = 0$ $\quad$ $x + 2 = 0$

$\boxed{x = 5}$ $\quad$ $\boxed{x = -2}$

$y = 2 - x$

At $x = 5$:

$y = 2 - 5 = -3$

At $x = -2$

$y = 2 - (-2) = 4$

Answer $(5, -3)$ and $(-2, 4)$

END OF QUESTIONS