Candidate surname	Other names

Maths Planner

Edexcel

2024 Predicted Paper

Mathematics

PAPER 1 (Non-Calculator)

Higher Tier

Time 1 hour 30 minutes

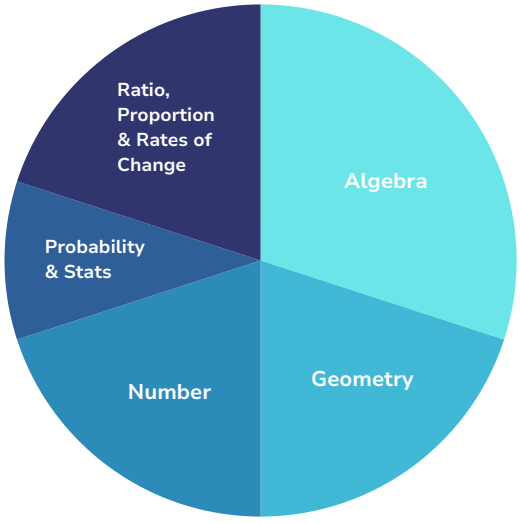
WORKED WRITTEN SOLUTIONS

Total Marks

80

Q	Topic(s)	Marks
1	Estimation	/ 3
2	Product of Prime Factors / HCF	/ 3
3	Ordering Fractions / Averages	/ 4
4	Expanding Brackets / Laws of Indices	/ 4
5	Angles in Polygons	/ 5
6	Converting Standard Form	/ 2
7	Calculating with Speed	/ 4
8	Area of Quadrilaterals	/ 4
9	Averages with Grouped Frequency	/ 4
10	Transformations	/ 3
11	Applied Ratio	/ 4
12	Quadratic Graphs	/ 6
13	Cumulative Frequency Graphs	/ 3

Q	Topic(s)	Marks
14	Probability Tree Diagrams	/ 5
15	Linear Graphs	/ 5
16	Direct & Inverse Proportion	/ 5
17	Area of Circles / Exact Trig Values / Surds	/ 5
18	Volume of Cones	/ 5
19	Simplifying Algebraic Fractions	/ 3
20	Equation of a Circle	/ 3



Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in you working.

1 $\dfrac{4.85 \times 0.429}{0.0501}$

Keertan works out that the answer to this calculation is 0.42
Use estimation to decide if he is correct or incorrect.

$$\frac{4.85 \times 0.429}{0.0501} \approx \frac{5 \times 0.4}{0.05} = \frac{2}{0.05} \overset{\times 100}{=} \frac{200}{5} = 40$$

$5 \overline{)200} = 040$

Keertan is incorrect, his place value is out.

(Total marks for Question 1 is 3 marks)

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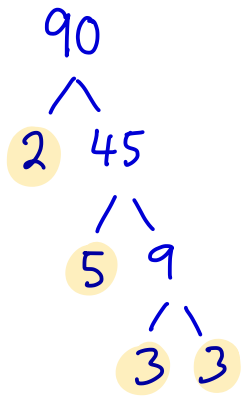
2 (a) Express 90 as the product of its prime factors.
Give your answer in index form.



$90 = 2 \times 3 \times 3 \times 5$

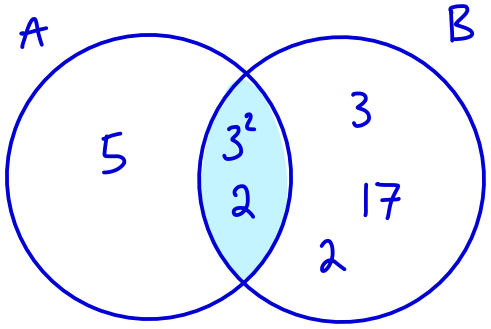
$= 2 \times 3^2 \times 5$

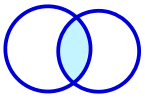
.....

(2)

$A = 2 \times 3^2 \times 5$ $B = 2^2 \times 3^3 \times 17$

(b) Write down the highest common factor (HCF) of A and B.



HCF = 

$= 3^2 \times 2$

$= 18$

.....

(1)

(Total marks for Question 2 is 3 marks)

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3 Here are some mixed numbers and fractions.

$$2\tfrac{1}{6} = 1\tfrac{7}{6} \qquad 2\tfrac{1}{4} \qquad 2\tfrac{2}{3} \qquad \tfrac{25}{12} = 2\tfrac{1}{12}$$

3 2 1 4

(a) Sort them into descending order.

$2\frac{2}{3}$ $2\frac{1}{4}$ $2\frac{1}{6}$ $2\frac{1}{12}$

.....

(2)

(b) Find their range.

Biggest - smallest

$= 2\frac{2}{3} - 2\frac{1}{12}$

$= \frac{2}{3} - \frac{1}{12}$

$= \frac{8}{12} - \frac{1}{12}$

$\frac{7}{12}$

.....

(2)

(Total marks for Question 3 is 4 marks)

---

4 (a) Expand and simplify $(x^2 + 3)(x^2 + 5)$

$(x^2+3)(x^2+5) = x^4 + 5x^2 + 3x^2 + 15$

$= x^4 + 8x^2 + 15$

.....

(2)

LHS = RHS

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

(b) Find the value of x

$2^2 = 4$ $\therefore$ LHS $= (2^2 \times 2^3)^5$

$= (2^5)^5$

$= 2^{25}$

$x =$ 25

.....

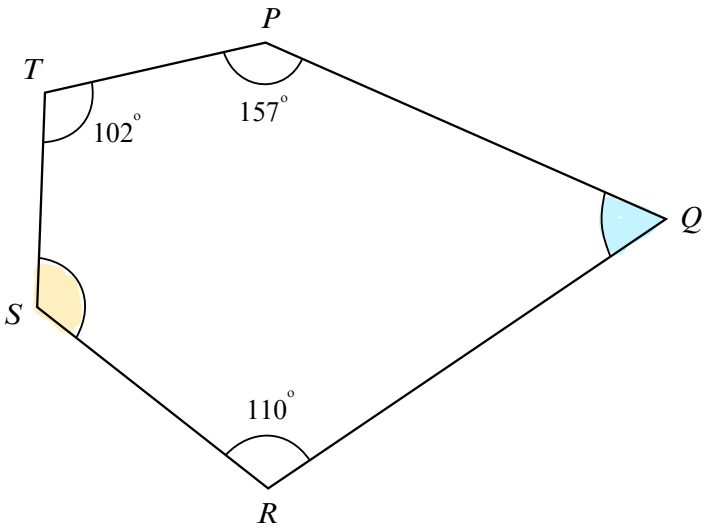
(2)

(Total marks for Question 4 is 4 marks)

1H24

5 Shown below is an irregular polygon.

Diagram not drawn to scale



(a) What makes this polygon irregular?

All angles and sides are different.

"Regular" polygons have equal angles & sides.

Angles $\frac{PQR}{RST} = \frac{1}{2} \Rightarrow$ PQR : RST
1 : 2

(1)

(b) Find the size of angle RST

Sum of interiors $= (n-2) \times 180$
$= (5-2) \times 180$
$= 3 \times 180$
$= 540°$

102
157
+110
369°

$540 - 369 = 171°$

$3\overline{)171}$ → 057

∴ PQR : RST TOTAL
1 : 2 3
×57 [57 : 114 171] ×57

114 °

(4)

(Total marks for Question 5 is 5 marks)

6 (a) Write 8104000 in standard form

8.104×10^6

(1)

(b) Write 6.1×10^{-4} as an ordinary number.

6.1

0.00061

(1)

(Total marks for Question 6 is 2 marks)

---

7 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.

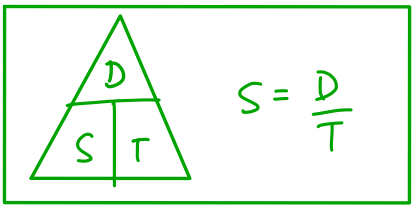
Average speed check cameras were installed to fine anyone exceeding the speed limit. A car took 20 minutes to travel between the two junctions.

5 miles = 8 km

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

5 miles = 8 km ×4

20 miles = 32 km ×4



20 mins ▶ "mph"

1 hour = 60 mins ÷3

$\frac{1}{3}$ hour = 20 mins ÷3

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

(Total marks for Question 7 is 4 marks)

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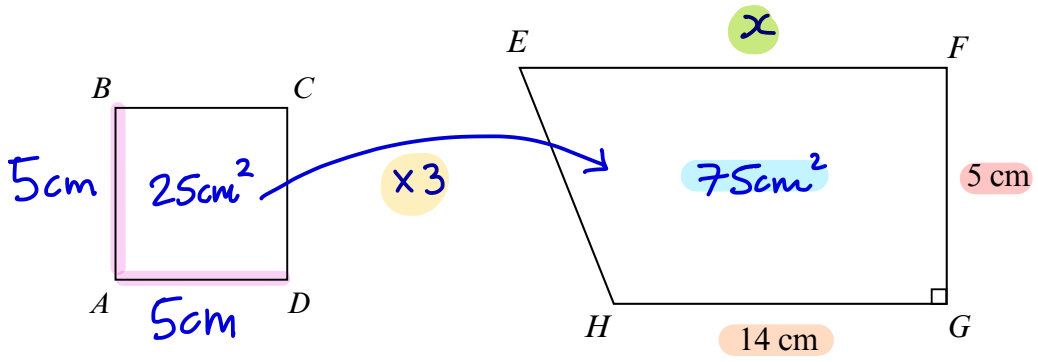
8 *ABCD* is a square.
EFGH is a trapezium.



ABCD has a perimeter of 200 mm.

×3 The area of the square is one third the area of the trapezium.

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

200m = 20cm

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

Square Area = 5×5 = 25cm²

EFGH is a trapezium

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

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

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

$30 = x + 14$

$16 = x$

16 ..... cm

(Total marks for Question 8 is 4 marks)

9 The table below gives information about the time taken for a group of 20 runners to complete a 5 km park run.

Time (t minutes)	Frequency (F)	midpoint (x)	estimated time (Fx)
$20 < t \leq 22$	2	21	42
$22 < t \leq 24$	4	23	92
$24 < t \leq 28$	3	26	78
$28 < t \leq 32$	7	30	210
$32 < t \leq 36$	4	34	136
	20		558

(a) Find the modal class.

most common interval = largest frequency

$28 < t \leq 32$

.....

(1)

(b) Work out an estimate for the mean time for the group.

$$\text{mean} = \frac{\Sigma fx}{\Sigma x} = \frac{558}{20} = \frac{279}{10} = 27.9$$

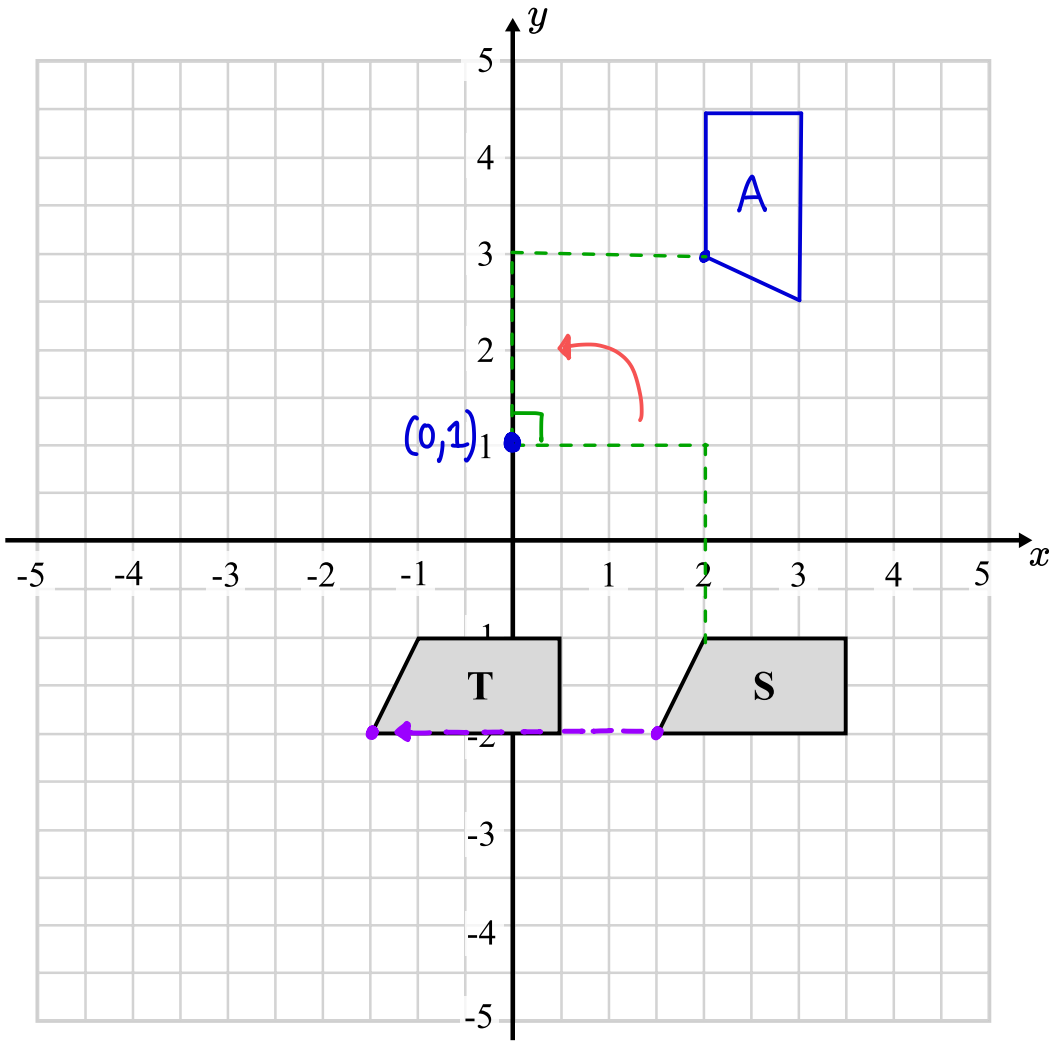
27.9 ..... minutes

(3)

(Total marks for Question 9 is 4 marks)

1H24

10



(a) Rotate trapezium **S** 90° anti-clockwise about the point (0, 1)
Label the new trapezium **A**.

(1)

(b) Write down the single transformation that maps trapezium **S** on to **T**.

Translation by vector $\begin{pmatrix} -3 \\ 0 \end{pmatrix}$

.....

.....

(2)

(Total marks for Question 10 is 3 marks)

1H24

11 A fitness class is held on different days each week, either in the morning or in the evening.

The ratio of men to women that attend is 3 : 5
30 more women attend the class than men.

$\frac{2}{3}$ of the women attend a morning class

Of the women who attend morning classes, 46% less men attend an evening class.

100% − 46% = 54%

Write the ratio of men to women who attend a morning class as 1 : n

+ 2 PARTS

M : W
3 : 5
×15 (45 : 75) ×15

2 PARTS = 30 people
1 PART = 15 people

$\frac{2}{3}$ of 75 = 50 women attend morning class

54% of 50 :
50% = 25
×4 (1% = 0·5) ×4
4% = 2

27 men attend an evening class

men attending morning class = 45 − 27 = 18

$M_m : W_m = 1 : n$

18 : 50

$1 : \frac{50}{18}$

$1 : \frac{50}{18}$ or $1 : \frac{25}{9}$

(Total marks for Question 11 is 4 marks)

12 (a) Complete the table of values for $y = x^2 + 3x - 1$

x	-4	-3	-2	-1	0	1
y	3	-1	-3	-3	-1	3

$(-4)^2+3(-4)-1$
$= 16-12-1$
$= 3$

$(-2)^2+3(-2)-1$
$= 4-6-1$
$= -3$

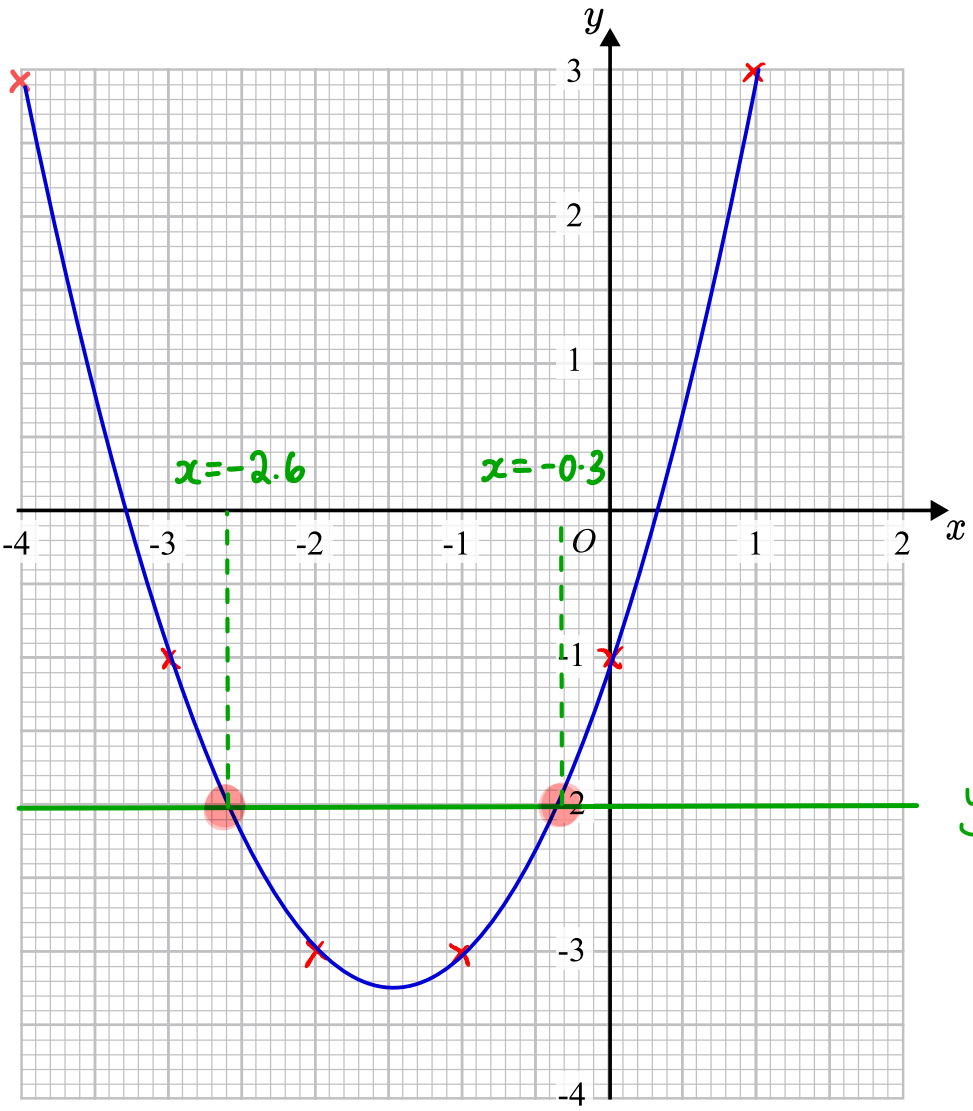
$(-1)^2+3(-1)-1$
$= 1-3-1$
$= -3$

$(0)^2+3(0)-1$
$= -1$

(2)

(b) On the grid, draw the graph of $y = x^2 + 3x - 1$ for x values from -4 to 1

(2)



y=-2

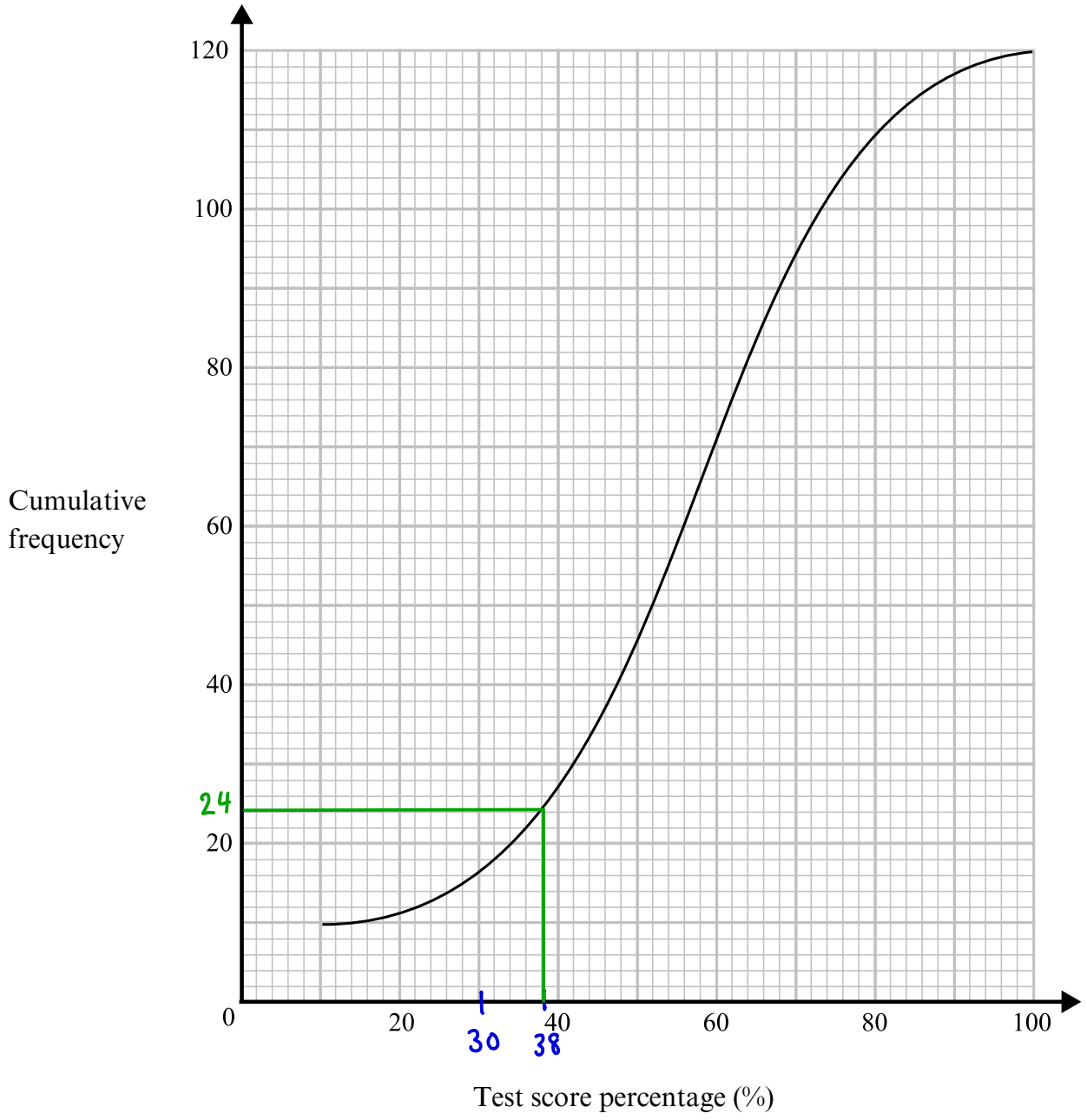
(c) Use your graph to find estimates of the solutions of the equation $x^2 + 3x - 1 = -2$

$x = -0.3$, $x = -2.6$

(2)

(Total marks for Question 12 is 6 marks)

13 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.

24 students failed % failed = $\frac{24}{120} = \frac{2}{10} = 20\%$

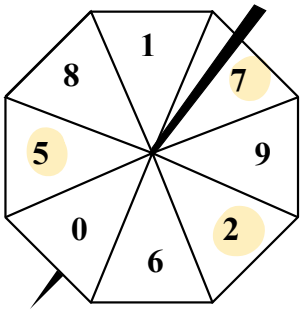
20 %

(Total marks for Question 13 is 3 marks)

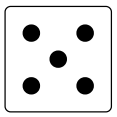
14 Here is a fair 8-sided spinner and dice.

Primes: 2, 7, 5

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



Spinner



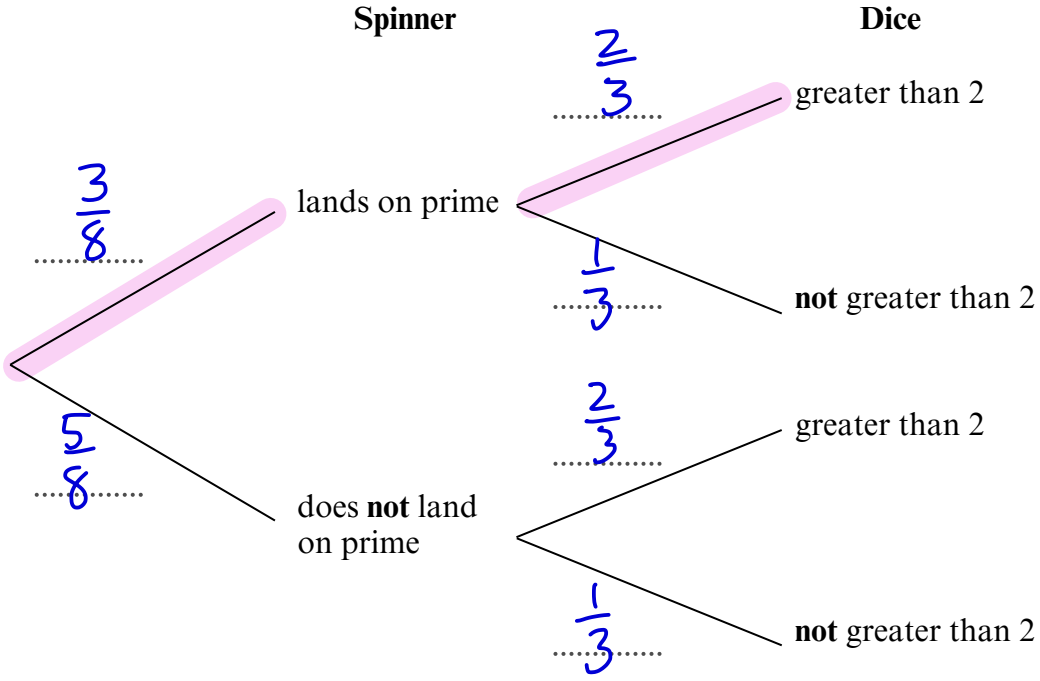
Dice

1 2 3 4 5 6

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

Karl spins spinner and then rolls the dice.

(a) Complete the probability tree diagram.



(2)

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

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

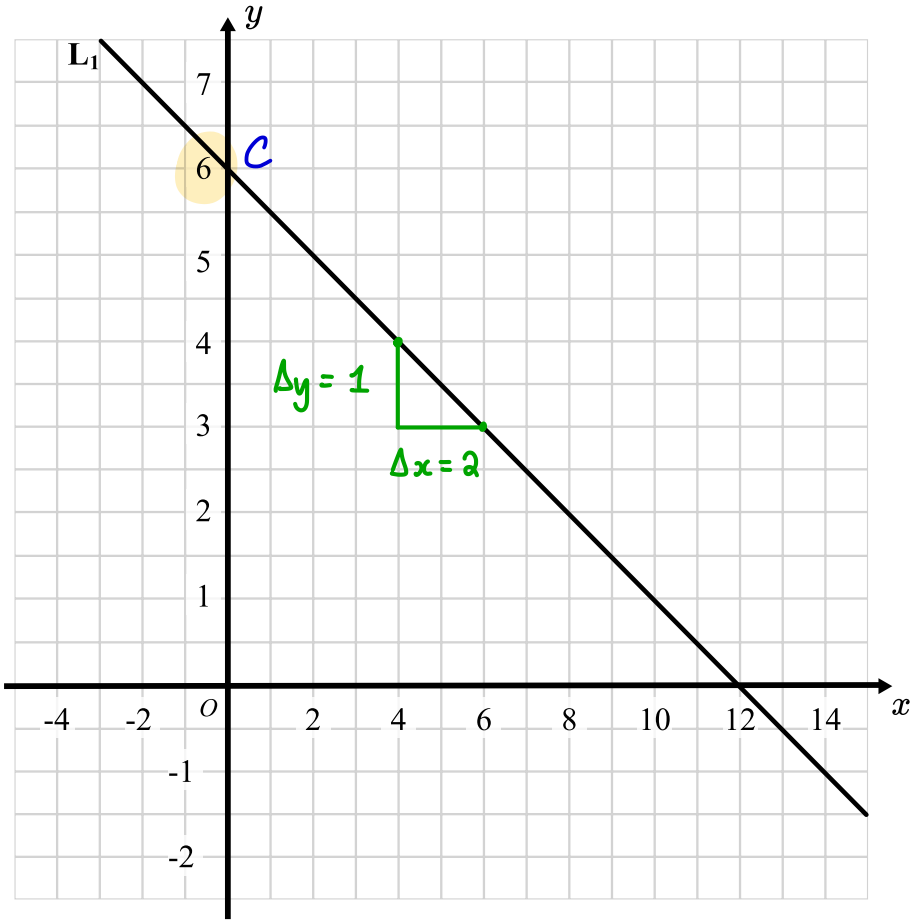
$P(\text{prime}, >2) = \frac{3}{8} \times \frac{2}{3} = \frac{6}{24} = \frac{1}{4}$

$\therefore$ Expected outcome $= 200 \times \frac{1}{4} =$ 50 times

(3)

(Total marks for Question 14 is 5 marks)

15 The line $\mathbf{L_1}$ is shown on the grid.



(a) Find the gradient of the line $\mathbf{L_1}$

$m = \frac{\Delta y}{\Delta x} = -\frac{1}{2}$

$-\frac{1}{2}$

(2)

(b) Write down the equation of the line $\mathbf{L_1}$ in the form $y = mx + c$

$y = mx + c$

$y = -\frac{1}{2}x + 6$

(1)

(c) The line L_2 is perpendicular to L_1, and passes through the point (0, -1)
Write down the equation for the line L_2 in the form $y = mx + c$

$\uparrow (0, c)$

perpendicular lines :

$m_1 \times m_2 = -1$

$-\frac{1}{2} \times m_2 = -1$

$m_2 = 2$

$y = mx + c$

$y = 2x - 1$

$y = 2x - 1$

(2)

(Total marks for Question 15 is 5 marks)

16 a is inversely proportional to b

(a) Complete the table of values.

$a = \frac{30}{b}$

$a = \frac{k}{b}$

$2 = \frac{k}{15}$

$30 = k$

$90 = \frac{30}{b}$

$b = \frac{30}{90}$

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

a	7.5	2	90
b	4	15	$\frac{1}{3}$

$a = \frac{30}{4} = 7.5$

(2)

(b) b is directly proportional to $\sqrt{c}$

When $c = 16$, $b = 10$

Find a formula for c in terms of a.

from part (a) $a = \frac{30}{b}$

$b \propto \sqrt{c}$

$b = k\sqrt{c}$ "General Equation"

when $c = 16$, $b = 10$

$10 = k \times \sqrt{16}$

$10 = 4k$

$\frac{5}{2} = k$

② $b = \frac{5}{2}\sqrt{c}$ "Specific equation"

$\therefore$ c in terms of a

$a = \frac{30}{b}$

$b = \frac{30}{a}$ ①

Sub ① into ②

$\frac{30}{a} = \frac{5}{2}\sqrt{c}$

$\frac{60}{a} = 5\sqrt{c}$

$\frac{12}{a} = \sqrt{c}$

$c = \frac{144}{a^2}$

(3)

(Total marks for Question 16 is 5 marks)

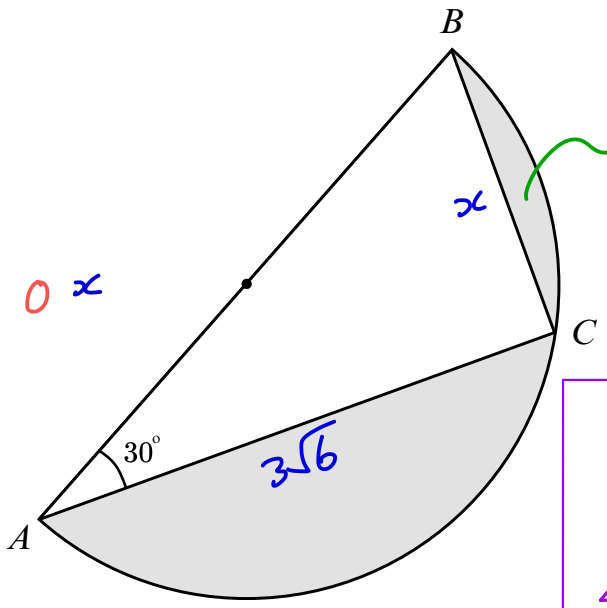
1H24

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

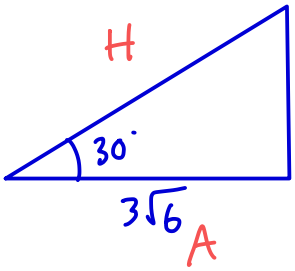
$\angle BAC = 30^\circ$

$AC = 3\sqrt{6}$ cm

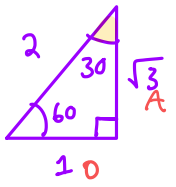
Diagram not drawn to scale



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



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 $a\pi - b\sqrt{3}$

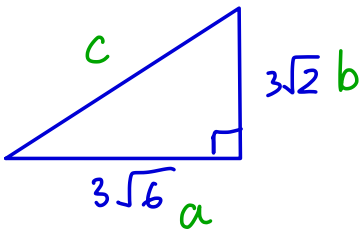
$\tan(30) = \frac{O}{A}$

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

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

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

$3\sqrt{2} = x$



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

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

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

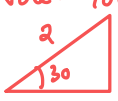
$54 + 18 = c^2$

$c = \sqrt{72}$

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

$c = 6\sqrt{2}$

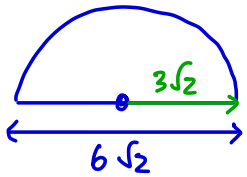
Note: You could use fact



H:O = 2:1

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

Instead of pythagoras!



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

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

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

$= 9\pi$

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

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

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

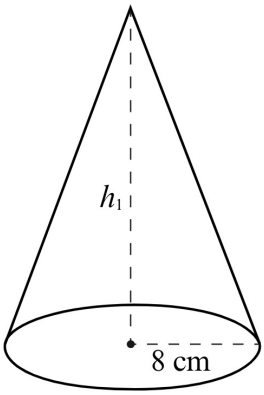
$= 9\sqrt{3}$

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

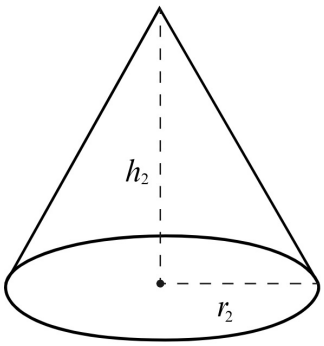
..... cm^2

(Total marks for Question 17 is 5 marks)

18

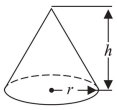


Cone **A**



Cone **B**

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



Cone **A** has a radius of 8 cm and a volume of 384π

Cone **A** is enlarged to make Cone **B**.

The radius of Cone **B** is $\frac{1}{4}$ larger than the radius of cone **A**.

h_2 is $\frac{1}{3}$ smaller than h_1

Work out the fractional increase in volume from Cone **A** to Cone **B**.
Give your answer in its simplest form.

$\frac{1}{3} \times \pi \times 8^2 \times h_1 = 384\pi$

$\frac{64h}{3} = 384$

$h_1 = 384 \div \frac{64}{3}$

$h_1 = 384 \times \frac{3}{64}$

$h_1 = 18$

$\times 1\frac{1}{4} = \frac{5}{4}$

$\therefore r_1 \times \frac{5}{4} = r_2$

$8 \times \frac{5}{4} = r_2$

$r_2 = 10$

$\times \frac{2}{3}$

$\therefore h_1 \times \frac{2}{3} = h_2$

$18 \times \frac{2}{3} = h_2$

$h_2 = 12$

$V_B = \frac{1}{3} \times \pi \times 10^2 \times 12$

$= \frac{1}{3}\pi \times 100 \times 12$

$= \frac{1200\pi}{3} = 400\pi$

$\therefore V_A = 384\pi \quad V_B = 400\pi$

$400\pi - 384\pi = 16\pi$

$\Rightarrow \frac{16\pi}{384\pi} = \frac{8}{192} = \frac{4}{96} = \frac{1}{24}$

Increased by $\frac{1}{24}$

(Total marks for Question 18 is 5 marks)

1H24

19 Simplify fully $\dfrac{16y^2 - 25}{12y^2 + 10 - 23y}$

a b c

$12y^2 - 23y + 10$

$ac = 120$

factors: $15 \times 8 = 120$

$15 + 8 = 23$

$\therefore -15 \times -8 = 120$

$-15 + (-8) = -23$

$12y^2 - 15y \mid -8y + 10$

$3y(4y - 5) \mid -2(4y - 5)$

$(4y - 5)(3y - 2)$

DOTS

$x^2 - y^2 = (x - y)(x + y)$

$\therefore 16y^2 - 25 = (4y - 5)(4y + 5)$

$$\frac{(4y - 5)(4y + 5)}{(4y - 5)(3y - 2)}$$

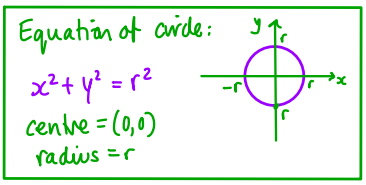
$$= \frac{4y + 5}{3y - 2}$$

$\dfrac{4y + 5}{3y - 2}$

(Total marks for Question 19 is 3 marks)

20 The equation of a circle is given by $x^2 + y^2 - 4 = 32$

(a) Write down the radius of the circle.



$x^2 + y^2 = 36$

$r^2 = 36$

$r = \sqrt{36}$

$r =$ 6 **(1)**

(b) Calculate whether the point (2, 3) lies **inside**, **outside** or **on** the circle.
You must show workings and justify your answer.

(2)

$(2)^2 + (3)^2 = 36$

$4 + 9 < 36$

$13 < 36 \quad \therefore$ inside circle.

(Total marks for Question 20 is 3 marks)

TOTAL FOR PAPER IS 80 MARKS