

Write your name here

Surname

Other Names

Mathematics

2022 Paper 1 (Non-Calculator) Foundation Tier

Time: 1 hour 30 minutes

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

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 not be used.**
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**



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.

Foundation Tier Formulae Sheet

Perimeter, area and volume

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

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

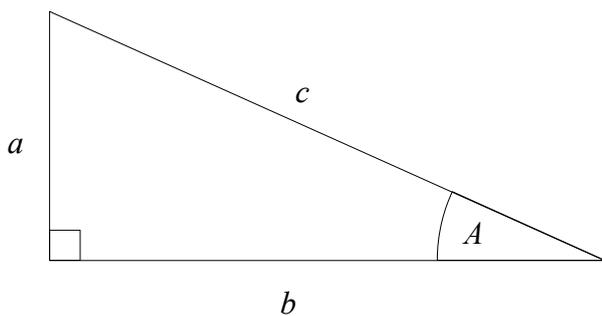
Volume of a prism = area of cross section \times length

Where r is the radius and d is the diameter:

$$\text{Circumference of a circle} = 2\pi r = \pi d$$

$$\text{Area of a circle} = \pi r^2$$

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:

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

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:

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

Probability

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

END OF EXAM AID

1 Write down the value of the 3 in the number 3091

3000

(Total for Question 1 is 1 mark)

2 Change 1.6 kilometres to metres.

1600

m

(Total for Question 2 is 1 mark)

3 Here are four numbers.

-7

-2

2

7

Write one of these numbers in each box to make a correct calculation.

$$\boxed{-7} + \boxed{2} = -5$$

OR $2 + -7$

(Total for Question 3 is 1 mark)

4 Write the following numbers in order of size.
Start with the smallest number.

0.3 $\frac{1}{3}$ 21% $\frac{1}{4}$ 0.205

0.333 0.21 0.25

0.205, 21%, $\frac{1}{4}$, 0.3, $\frac{1}{3}$

(Total for Question 4 is 2 marks)

5 Simplify $11c - 8d + 5c - d$

$$16c - 9d$$

(Total for Question 5 is 2 marks)

6 The first term in a sequence is 3.
The term to term rule is add 5.

3, 8, 13, 18, 23 ...

Is 97 a term in the sequence?
Give a reason for your answer.

No. All the terms end in 3 or 8.

(Total for Question 6 is 2 marks)

7 Liam goes to a Cafe.
He buys

3 coffees for £1.60 each
2 teas for £1.10 each
5 cakes for £2.15 each

Work out the total amount that Liam spends.

$$\begin{array}{r} 160 \\ \times 3 \\ \hline 480 \end{array}$$

$$\begin{array}{r} 110 \\ \times 2 \\ \hline 220 \end{array}$$

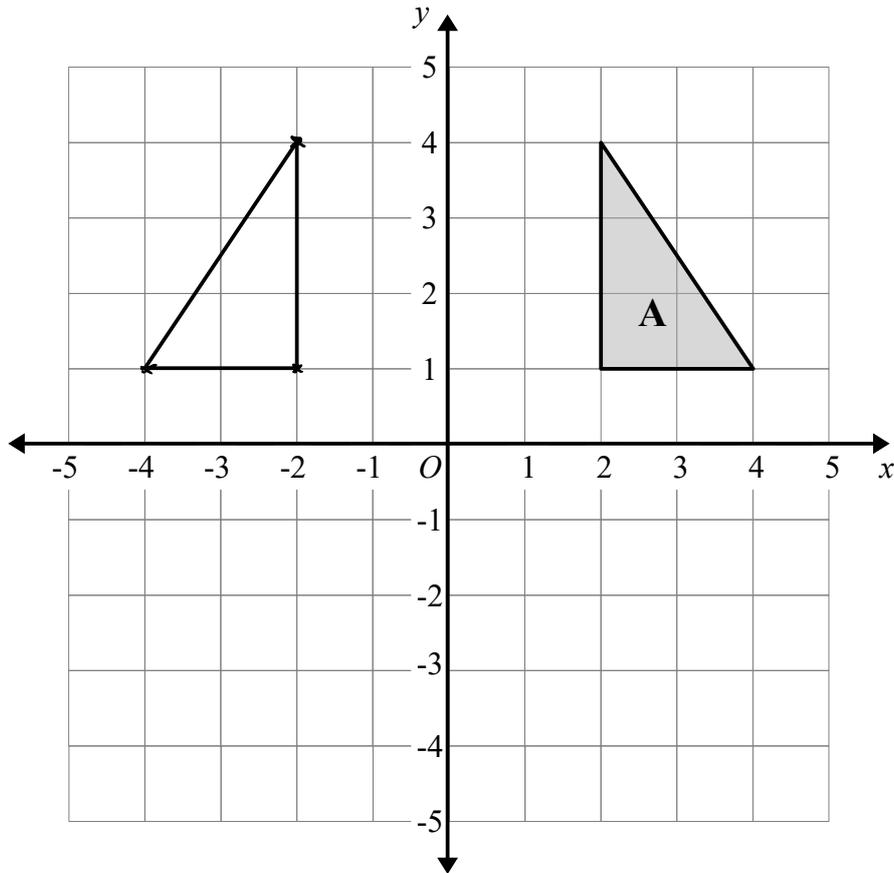
$$\begin{array}{r} 215 \\ \times 5 \\ \hline 1075 \end{array}$$

$$\begin{array}{r} 1075 \\ 480 \\ + 220 \\ \hline 1775 \end{array}$$

£17.75

(Total for Question 7 is 2 marks)

8



Reflect triangle A in the y-axis.

(Total for Question 8 is 2 marks)

9 There are only blue counters, red counters and yellow counters in a bag.

There are twice as many blue counters as yellow counters.

There are three times as many red counters as yellow counters.

Write down the ratio of blue counters to red counters to yellow counters.

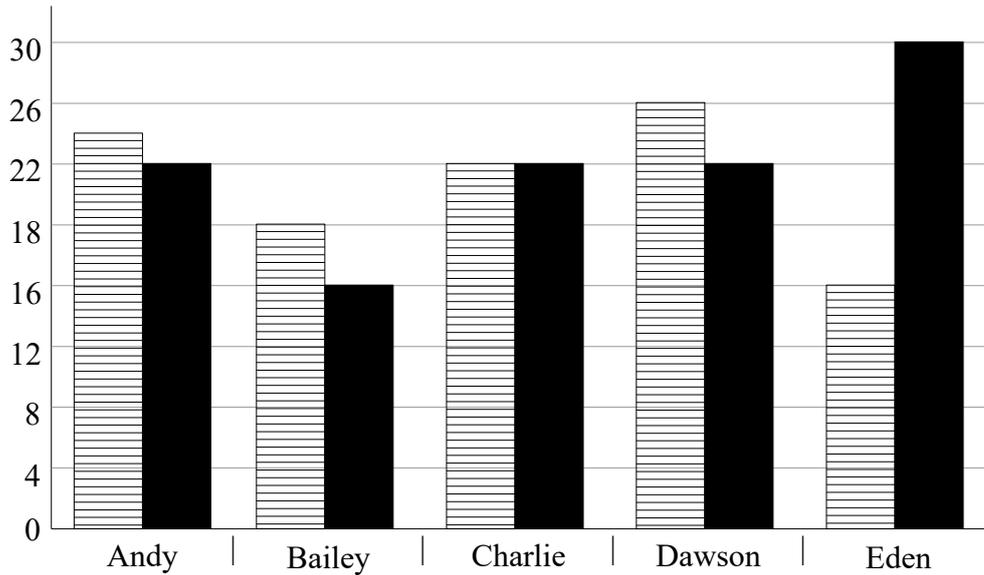
$$\begin{array}{ll} B : Y & R : Y \\ 2 : 1 & 3 : 1 \end{array}$$

$$\begin{array}{l} B : R : Y \\ 2 : 3 : 1 \end{array}$$

$$2 : 3 : 1$$

(Total for Question 9 is 2 marks)

10 (a) Here is a bar chart showing the scores of five students in their Maths and English tests.



Write down two things wrong with this graph

- 1 There is no key - we don't know which bar is Maths/English
- 2 The vertical axis is not linear - it goes up in 4s apart from 16 to 18.

(2)

OR/ There are no labels - no label for vertical axis

(b) The pictogram gives information about the number of chocolate bars sold by a shop last week.

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	

Key:	
	Represents 3 chocolate bars

(b) Write down one thing that is wrong with the pictogram.

Half a circle will be 1.5 chocolate bars - a shop cannot sell half a chocolate bar (on Thursday).

(1)

(Total for Question 10 is 3 marks)

- 11 Mr Sykes wants to buy a calculator for every student in year 11.
There are 104 students in year 11.
Each calculator costs £6.05

(a) Work out an estimate for the amount of money Mr Sykes will spend on calculators.

$$100 \times 6 = 600$$

£.....600.....

(2)

- (b) Is your answer to part (a) an underestimate or an overestimate?
Give a reason for your answer.

.....An underestimate, both numbers were rounded
down.....

(1)

(Total for Question 11 is 3 marks)

- 12 Last year Victoria paid £300 for her car insurance
This year she has to pay £348 for her car insurance.
Work out the percentage increase in her car insurance.

$$\frac{\text{change}}{\text{original}} \times 100$$

$$\frac{48}{300} \times 100$$

$$\frac{48}{3} = 16$$

.....16.....%

(Total for Question 12 is 3 marks)

13 $L = 9m + 2n$

Work out the value of L when $m = 3$ and $n = -6$

$$\begin{aligned} L &= 9(3) + 2(-6) \\ &= 27 - 12 \end{aligned}$$

15

(Total for Question 13 is 2 marks)

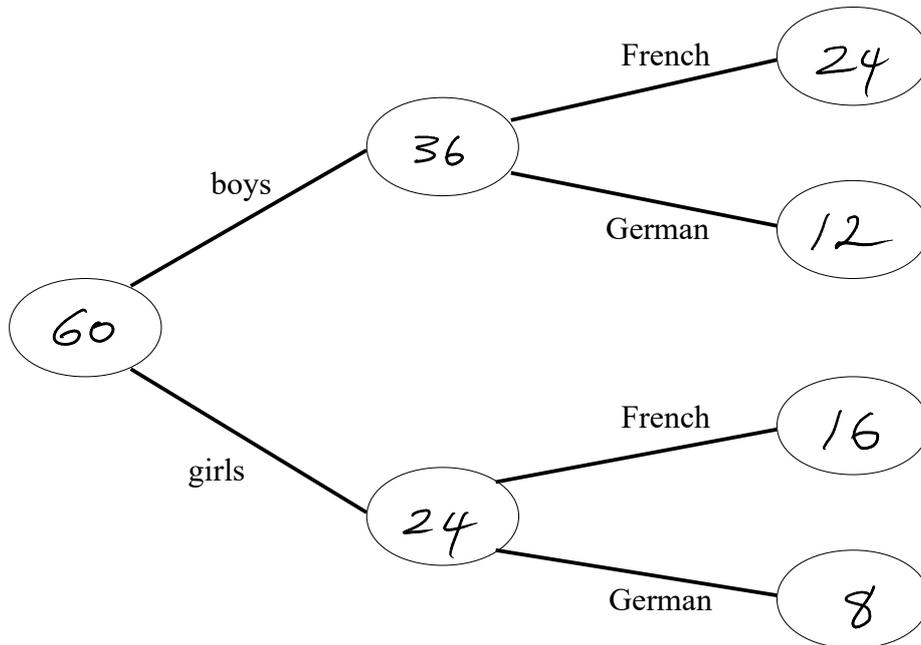
14 60 students study a language at a school.
Each student either studies French or German.

36 of the students are boys.

$\frac{2}{3}$ of the boys study French $\frac{1}{3}$ of 36 = $\frac{36}{3} = 12$ $\frac{2}{3}$ of 36 = 24

40 students study French

Use this information to complete the frequency tree.



(Total for Question 14 is 4 marks)

15 Here are the heights, in cm, of 15 plants.

~~35~~ ~~41~~ ~~47~~ ~~32~~ ~~45~~
~~40~~ ~~52~~ ~~33~~ ~~55~~ ~~41~~
~~29~~ ~~38~~ ~~42~~ ~~48~~ ~~38~~

Draw an ordered stem and leaf diagram to show this information.

2	9
3	2 3 5 8 8
4	0 1 1 2 5 7 8
5	2 5

Key: 2|9 = 29 cm

(Total for Question 15 is 3 marks)

16 Abbie runs a distance of 200 metres in 25 seconds.

(a) What is her average speed?

$$\text{Speed} = \frac{\text{distance}}{\text{time}} \quad \frac{200}{25}$$

..... 8 m/s
(2)

Bonnie runs at an average speed 4 metres per second for 240 seconds.

(b) How many metres does Bonnie run?

$$\begin{aligned} \text{distance} &= \text{speed} \times \text{time} \\ &= 4 \times 240 \end{aligned}$$

..... 960 m
(2)

(Total for Question 16 is 4 marks)

17 Frank needs 150 g of sugar to make 24 biscuits.

He also needs

three times as much flour as sugar $3 \times 150 = 450\text{g}$ Flour
 two times as much butter as sugar $2 \times 150 = 300\text{g}$ Butter

Frank is going to make 60 biscuits.

Work out the amount of each ingredient he needs.

	24 Biscuits	12 Biscuits	60 Biscuits
Sugar	150g	75g	375g
Flour	450g	225g	1125g
Butter	300g	150g	750g

butter7.50..... g

flour1.125..... g

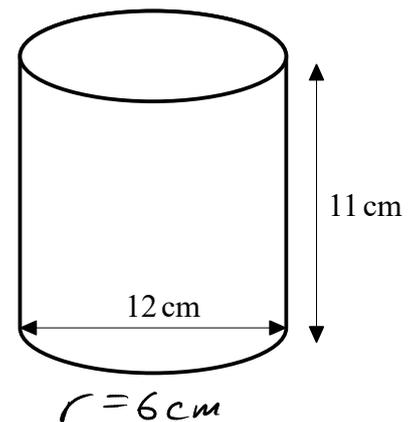
sugar3.75..... g

(Total for Question 17 is 3 marks)

18 A cylinder has a diameter of 12 cm and a height of 11 cm.

Work out the volume of the cylinder.
 Give your answer in terms of π .

$$\begin{aligned} \text{Volume} &= \pi r^2 \times h \\ &= \pi (6)^2 \times 11 \\ &= 36\pi \times 11 \end{aligned}$$

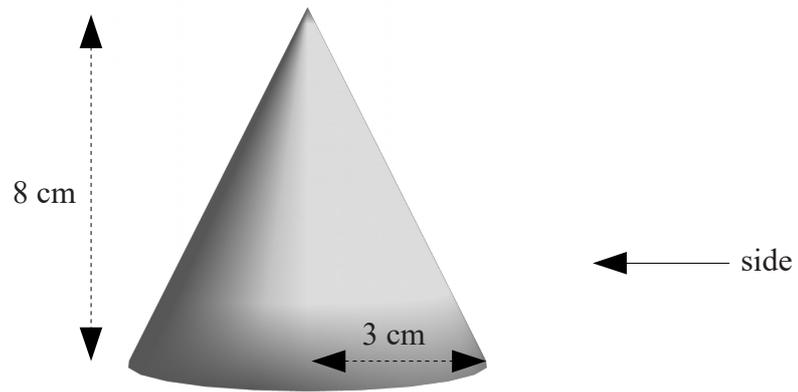


$$\begin{array}{r} 36 \\ \times 11 \\ \hline 36 \\ 360 \\ \hline 396 \end{array}$$

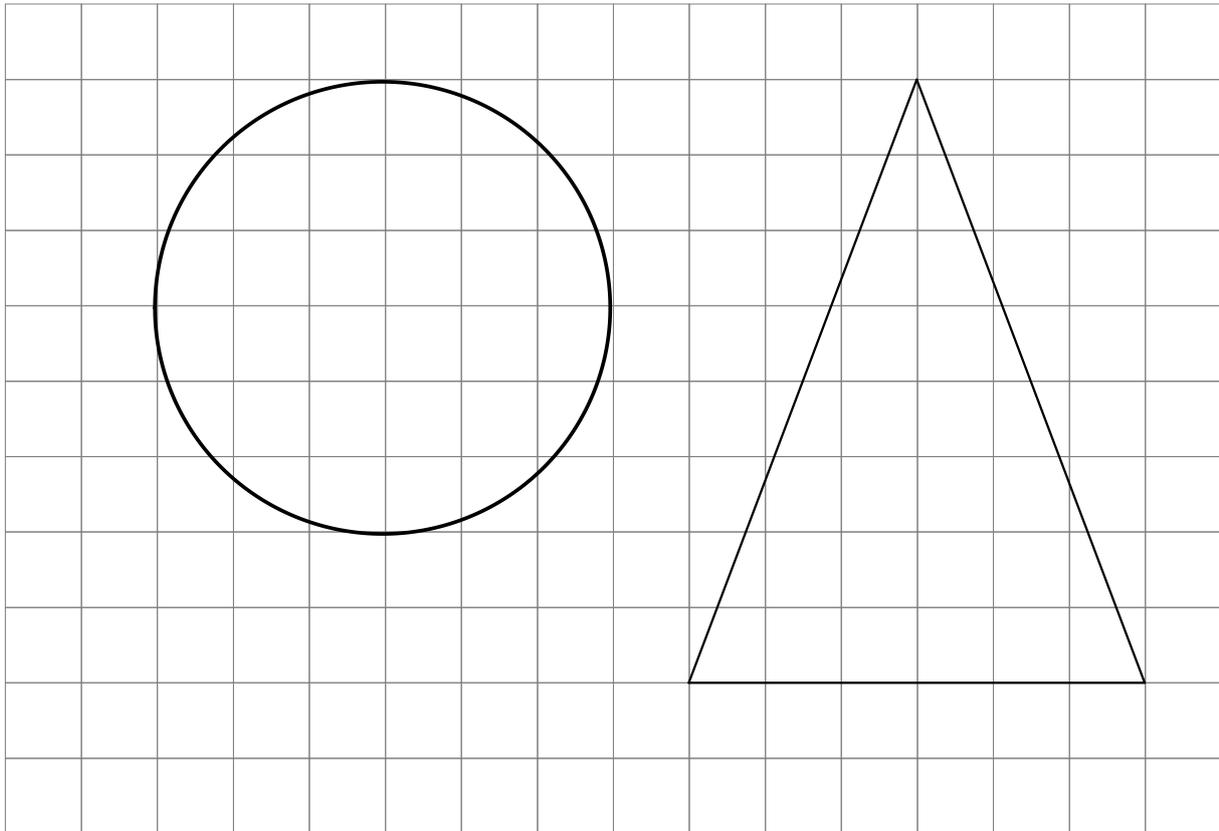
.....396 π cm³

(Total for Question 18 is 3 marks)

- 19 The diagram shows a cone with radius 3 cm and perpendicular height of 8 cm

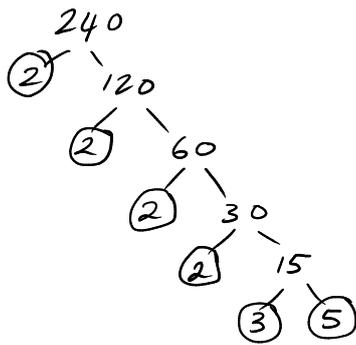


On the centimetre grid below, draw the plan and the side elevation of the cone.



(Total for Question 19 is 3 marks)

20 Write 240 as a product of its prime factors.



$$2 \times 2 \times 2 \times 2 \times 3 \times 5$$

(Total for Question 20 is 2 marks)

21 (a) Work out $\frac{5 \times 3}{5 \times 4} - \frac{7 \times 2}{10 \times 2}$

$$\frac{15}{20} - \frac{14}{20} = \frac{1}{20}$$

$$\frac{1}{20}$$

(2)

(b) Work out $2\frac{1}{3} \times \frac{3}{5}$

Give your answer as a mixed number in its simplest form.

$$2\frac{1}{3} = \frac{7}{3}$$

$$\frac{7}{3} \times \frac{3}{5} = \frac{7}{5} = 1\frac{2}{5}$$

$$1\frac{2}{5}$$

(2)

(Total for Question 21 is 4 marks)

22 In a bag there are only red counters, blue counters, green counters and yellow counters.

A counter is taken at random from the bag.

The table shows the probabilities that the counter will be green or will be yellow.

Colour	Red	Blue	Green	Yellow
Probability	$2x$ 0.3	x 0.15	0.35	0.20

The probability that the counter will be red is twice the probability that the counter will be blue.

There are 21 green counters in the bag.

$$0.35 + 0.2 = 0.55$$

Work out the number of red counters in the bag.

$$1 - 0.55 = 0.45$$

$$2x + x = 0.45$$

$$3x = 0.45$$

$$x = 0.15$$

$$[0.35 = 35\%]$$

$$35\% \text{ of total} = 21$$
$$\div 7 \qquad \qquad \div 7$$

$$5\% \text{ of total} = 3$$

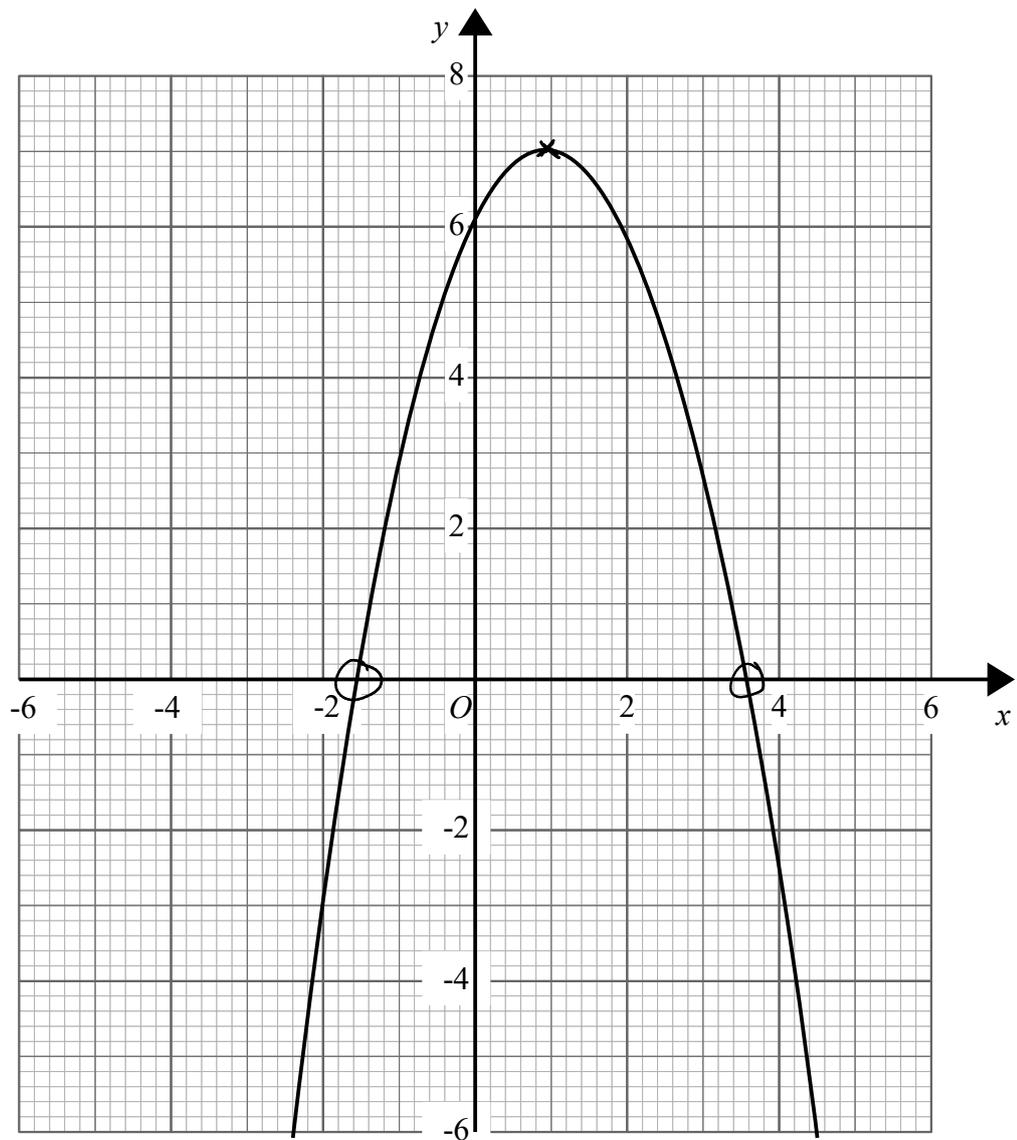
30% are red

$$3 \times 6 = \underline{\underline{18}}$$

18

(Total for Question 22 is 4 marks)

23 Here is the graph of $y = 2x + 6 - x^2$



(a) Write down the turning point of the graph $y = 2x + 6 - x^2$

(..... 1 , $\frac{7}{1}$ )

(b) Use the graph to find the roots of the equation $x^2 = 2x + 6$

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

..... $x = -1.6$ or $x = 3.6$
(2)

(Total for Question 23 is 3 marks)

24 $5 < 2y < 12$ where y is an integer.

(a) Write down all the possible values of y .

$$2.5 < y < 6$$

..... 3, 4 or 5

(b) Solve $4 > 19 - 3x$

(2)

$$3x + 4 > 19$$

$$3x > 15$$

$$x > 5$$

..... $x > 5$

(2)

(Total for Question 24 is 4 marks)

25 Dermot has 240 counters.
The counters are either red, or blue, or yellow or green.

15% of the counters are red.

$\frac{2}{5}$ of the counters are blue

The ratio of yellow counters to green counters is 3:1

Work out the number of yellow counters Dermot has.

$$\frac{240}{10} = 24$$

$$\frac{1}{5} \text{ of } 240 = \frac{240}{5} = \frac{480}{10}$$

$$10\% \text{ of } 240 = 24$$

$$= 48$$

$$\frac{24}{2} = 12$$

$$\frac{2}{5} \text{ of } 240 = 48 \times 2 = 96 \text{ (Blue)}$$

$$5\% \text{ of } 240 = 12$$

$$15\% \text{ of } 240 = 24 + 12 = 36 \text{ (Red)}$$

$$\begin{array}{r} 96 \\ + 36 \\ \hline 132 \end{array} \text{ (Red + Blue)}$$

$$240 - 132 = 108 \text{ (Yellow + Green)}$$

$$\frac{108}{4} = \frac{54}{2} = 27$$

$$\begin{array}{|c|c|c|} \hline 27 & 27 & 27 \\ \hline \end{array} \begin{array}{l} 4 \\ : \\ 27 \end{array}$$

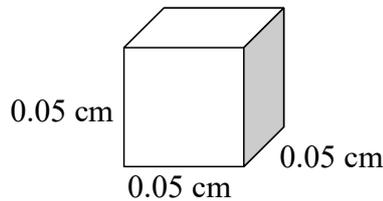
$$\begin{array}{r} 27 \\ \times 3 \\ \hline 81 \end{array}$$

$$81 : 27$$

..... 81

(Total for Question 25 is 4 marks)

26 Here is a cube.



Work out the volume of this cube.
Give your answer in standard form

$$0.05 = 5 \times 10^{-2}$$

$$5 \times 10^{-2} \times 5 \times 10^{-2} \times 5 \times 10^{-2}$$

$$125 \times 10^{-6}$$

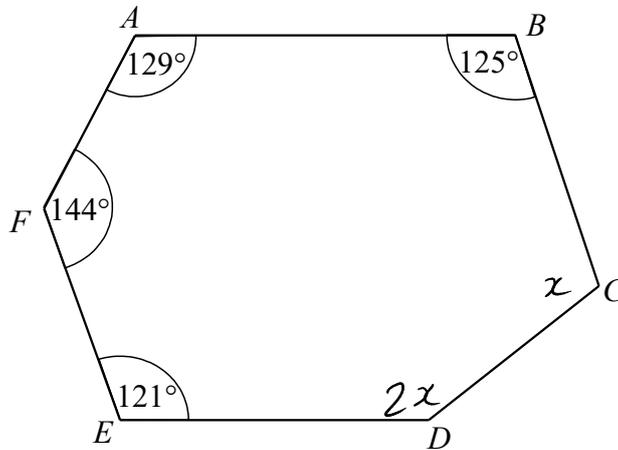
$$1.25 \times 10^2 \times 10^{-6}$$

$$1.25 \times 10^{-4}$$

..... 1.25×10^{-4} cm^3

(Total for Question 26 is 3 marks)

27



$$\begin{array}{r} 129 \\ 125 \\ 144 \\ 121 \\ \hline 519 \end{array}$$

ABCDEF is a hexagon.

Angle CDE = 2 × Angle BCD

Work out the size of angle CDE.

Angles in a hexagon = $(6-2) \times 180$
 $= 4 \times 180$
 $= \underline{\underline{720^\circ}}$

$$720 - 519 = 201$$

$$3x = 201 \quad \begin{array}{r} 067 \\ 3 \overline{)201} \end{array}$$

$$x = 67^\circ$$

$$2 \times 67 = \underline{\underline{134^\circ}}$$

..... 134 $^\circ$

(Total for Question 27 is 3 marks)

28 Liquid A has a density of 1.2 g/cm^3 —

150 cm^3 of Liquid A is mixed with some of Liquid B to make Liquid C.

Liquid C has a mass of 220 g and a density of 1.1 g/cm^3

Find the density of Liquid B.

$$\text{density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\begin{aligned} A// \text{ mass} &= \text{density} \times \text{volume} \\ &= 1.2 \times 150 \\ &= 12 \times 15 \\ &= 180 \text{ g} \end{aligned}$$

$$\begin{aligned} C// \text{ volume} &= \frac{\text{Mass}}{\text{density}} \\ &= \frac{220}{1.1} = \frac{2200}{11} = 200 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} B// \text{ Mass} &= \text{Mass of C} - \text{Mass of A} \\ &= 220 - 180 \\ &= 40 \text{ g} \end{aligned}$$

$$\begin{aligned} \text{Volume} &= \text{Volume of C} - \text{Volume of A} \\ &= 200 - 150 \\ &= 50 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Density} &= \frac{\text{Mass}}{\text{Volume}} \\ &= \frac{40}{50} = 0.8 \text{ g/cm}^3 \end{aligned}$$

.....0.8..... g/cm^3

(Total for Question 28 is 3 marks)

29 Write down the exact value of $\sin(45^\circ)$

$$\frac{\sqrt{2}}{2}$$

(Total for Question 29 is 1 mark)

30 (a) Factorise $x^2 - 3x - 18$

(b) Solve $x^2 - 3x - 18 = 0$

$$(x - 6)(x + 3)$$

(2)

$$x = 6 \text{ or } x = -3$$

(1)

(Total for Question 30 is 3 marks)