GCSE   MATHEMATICS

S21-C300

With Calculator Assessment Resource C

Foundation Tier

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

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

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:
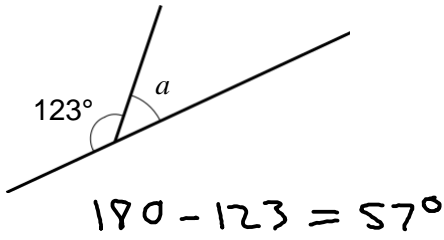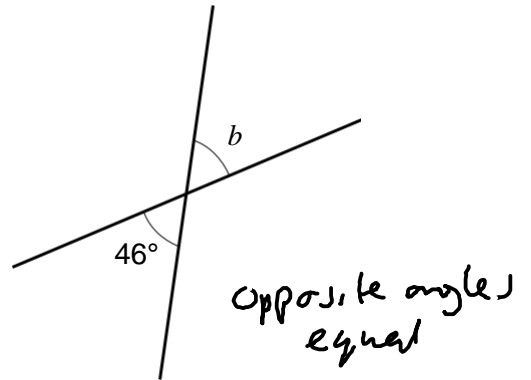
$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

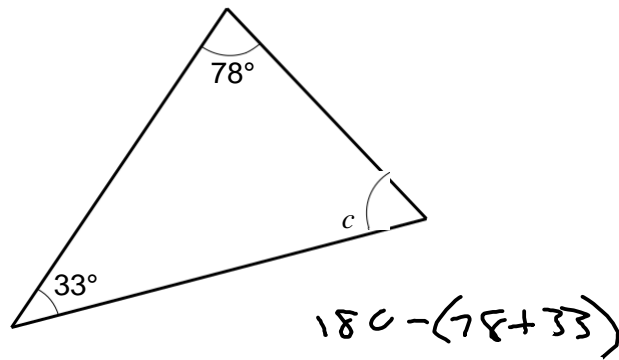**1.** *(a)* Find the size of each of the angles marked *a*, *b* and *c*. [4]

123°   *a*

$180 - 123 = 57°$

a = ...57.... °

b

46°

Opposite angles
equal

b = ...46.... °

78°

c

33°

$180 - (78 + 33)$

c = ...69.... °

Diagrams not drawn to scale

(b) Points *A* and *B* are on the circumference of a circle with centre *O*. Points *A*, *O* and *B* lie on a straight line.
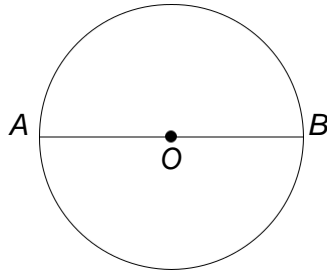
Circle the special name for the straight line *AB*. [1]

circumference   (diameter)   tangent   radius   arc

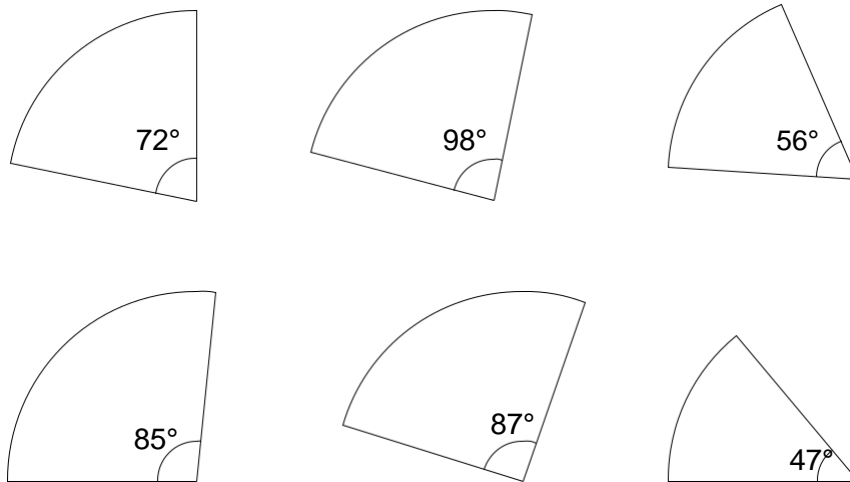*(c)* Six slices of pizza are shown in the diagram below.

Diagram not drawn to scale

Five of the slices make one whole pizza.
One of the slices in the bottom row is from a different pizza.

Which slice is from the different pizza?
You must show all your working. [3]

The different pizza slice is either 85° or 87°
          top line   bottom line
360 − (72 + 98 + 56 + 47) = 87°
So 87° is part of this pizza.
This leaves 85° slice from the different pizza.

2. *(a)* Verity is arranging these 6 identical tiles into different shapes.
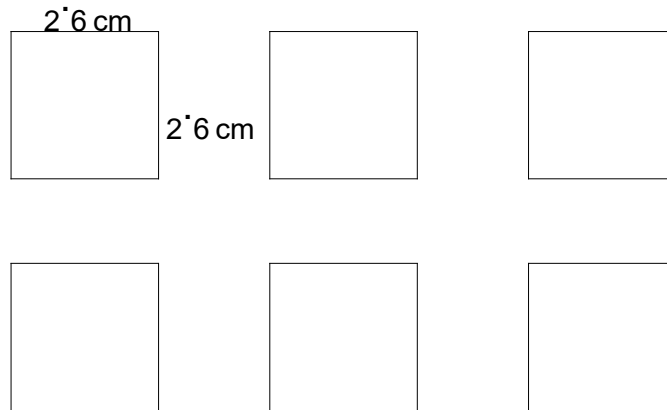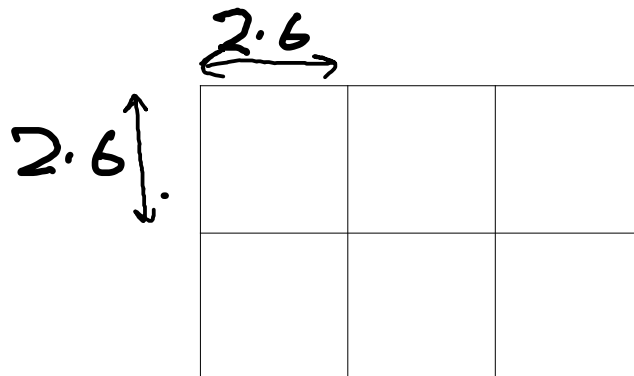
2˙6 cm

2˙6 cm

Diagram not drawn to scale

Each tile is a square with sides of length 2·6 cm.

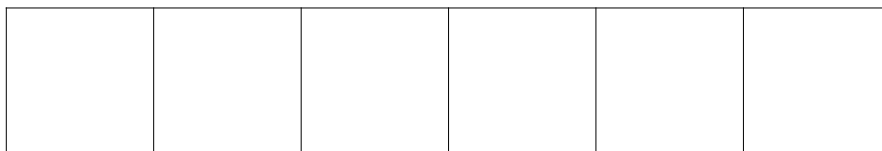Verity makes these two shapes by placing tiles side by side:

Shape 1

2.6

2.6

Shape 2

Diagram not drawn to scale

Calculate the perimeter of each shape. [3]

Perimeter of shape 1 .... 10 sides ×2·6 = 26cm ....

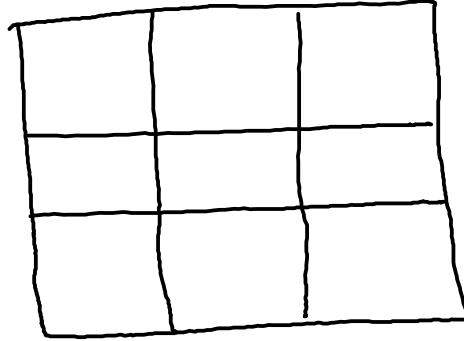Perimeter of shape 2 ..... 14 sides × 2·6 = 36·4cm

(b) Maddie has 9 of the same square tiles.
Maddie arranges her 9 tiles to make a shape that has the smallest possible **perimeter**.

(i) Sketch Maddie's shape. [1]

(ii) Calculate the **area** of Maddie's shape. [2]

length of width and length both are $3 \times 2.6 = 7.8$

$7.8 \times 7.8 = 60.84 \, cm^2$

Area = ... 60.84 .... cm^2

3. *(a)* James is looking at this set of numbers.

0·45   0·4   0·0005   1·25   0·99

He says,

"They are all probabilities because they are decimals."

Is James correct?   [1]

Yes ☐   No ☑

Give the reason for your answer.

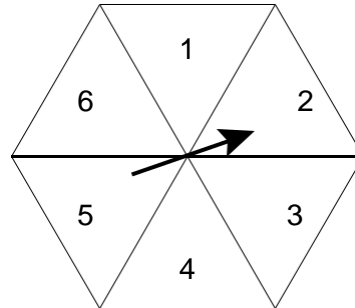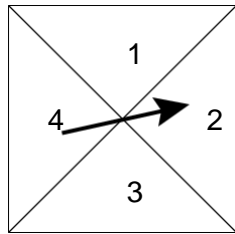1.25 is larger than 1 and probabilities are less than or equal to one. So not all are probabilities.

(b) James rolled a fair 6-sided dice 24 times.
How many times would you expect James to roll a six?   [1]

1/6 × 24 = 4 times

(c) The diagrams show a fair 4-sided spinner and a fair 6-sided spinner.

Which spinner has the greater chance of landing on a 2?   [1]

4-sided spinner ☑   6-sided spinner ☐

Show how you decide.

4 side spinner 2 chance ⟹ 1/4

6 sided spinner 2 chance → 1/6

1/4 > 1/6

(d) Jago is using a spinner.

The spinner can only land on one of the colours; purple, red, blue, orange or yellow.

The probabilities of yellow and purple occurring on any spin of the spinner are shown in the table below.

Colour	Purple	Red	Blue	Orange	Yellow
Probability	0˙33	0.14	0.14	0.14	0˙25

The probabilities of the spinner landing on red, blue and orange are all **equal**.

Complete the table. [3]
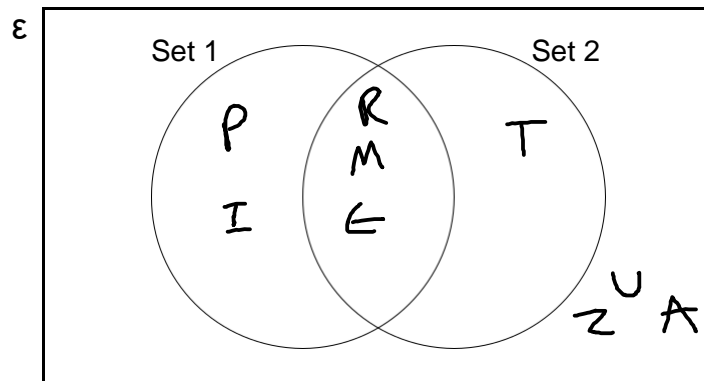
$$1 - (0.33 + 0.25) = 0.42$$

$$\frac{0.42}{3} = 0.14$$

4. The universal set (Ɛ), contains the letters from the word TRAPEZIUM.

    Set 1 contains the letters of the word PRIME.

    Set 2 contains the letters of the word TERM.

    (a) Show the information in the Venn diagram below.   [2]

    (b) A letter is chosen at random from the word TRAPEZIUM.

    What is the probability that the letter chosen is in both of the words PRIME and TERM?
                                                                                      [2]

    $3/9 = 1/3$

5. *(a)* The usual time taken to complete a journey is 3 hours.

How long should the same journey take when the speed is doubled? [1]

$3/2 = 1.5$ hours

(b) A cyclist rides a distance of 36 km at an average speed of 16 km/h.

Calculate the time taken to complete this ride. Give your answer in hours and minutes. [2]

$$\text{Time} = \frac{\text{Distance}}{\text{speed}}$$

$36/16 = \text{time} = 2.25$ hours

$= 2$ hours 15 minutes

(c) Sidney the snail slides a distance of 180 m in 24 hours.

Calculate Sidney's average speed in **cm per hour**. [3]

$$\text{speed} = \frac{\text{Distance}}{\text{time}} \qquad \text{speed} = \frac{180 \times 100}{24}$$

$= 750 \, cm/hr$

6.

12·3 cm

8·4 cm

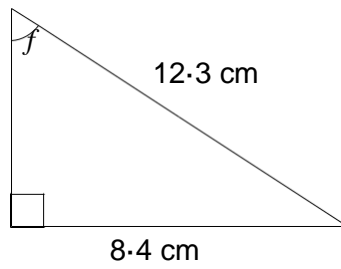*Diagram not drawn to scale*

Calculate the size of angle f. [3]

$$\sin t = \frac{8.4}{12.3}$$

$$f = 43.077781\ldots$$

$$= 43.1°$$

7. A car travels at an average speed of 45 mph for 40 minutes.
The next part of the car's journey takes 25 minutes at an average speed of 60 mph.

Show that the average speed of the entire journey is just over 50 mph. [5]

Distance = speed × time

speed = Distance/time

First part distance = $45 \times 2/3 = 30$ miles

Second part distance = $60 \times 5/12 = 25$ miles

Total distance = $30 + 25 = 55$ miles

Total time hours = $2/3 + 5/12 = 13/12$ hours

Average speed → $\dfrac{55}{13/12} = 660/13$ mph

= 50.76923077 mph
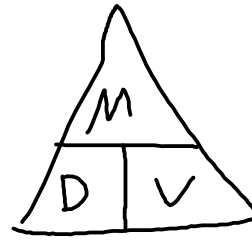
which is just over 50 mph by 0.76923077

8. The density of glass in a bottle is 2˙4 g/cm^3.

The volume of glass used to make the bottle is 13˙4 cm^3.

Calculate the mass of the glass bottle.

Give your answer in grams. [2]

MASS = Density × Volume

2.4 × 13.4 = 32.16 grams

Mass 32.16 g