• Percentages (Compound/Appreciation/Depreciation)

1. Ian's annual salary is £28 400. His boss tells him that his salary will increase by 2·3% per annum.

   What will Ian's annual salary be after 3 years?

   Give your answer to the nearest pound.

2. 250 milligrams of a drug are given to a patient at 12 noon.

   The amount of the drug in the bloodstream decreases by 20% every hour.

   How many milligrams of the drug are in the bloodstream at 3pm?

3. In 1999, a house was valued at £90 000 and the contents were valued at £60 000.

   The value of the house **appreciates** by 5% each year.

   The value of the contents **depreciates** by 8% each year.

   What will be the **total** value of the house **and** the contents in 2002?

• The Quadratic Formula

1. Solve the equation

$$2x^2 + 3x - 7 = 0.$$

   Give your answers **correct to 1 decimal place**.

2. Solve the equation

$$2x^2 - 6x - 5 = 0,$$

giving the roots correct to one decimal place.

3. Solve the equation

$$x^2 + 2x = 9.$$

Give your answers correct to 3 significant figures.

- ## Standard Deviation/Box Plots/SIQR

1. Fiona checks out the price of a litre of milk in several shops.
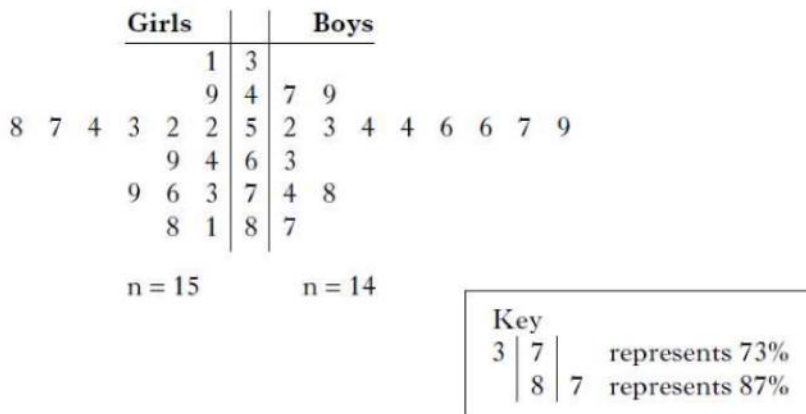   The prices in pence are:

   49   44   41   52   47   43.

   (a) Find the mean price of a litre of milk.

   (b) Find the standard deviation of the prices.

   (c) Fiona also checks out the price of a kilogram of sugar in the same shops and finds that the standard deviation of the prices is 2·6.

   Make one valid comparison between the two sets of prices.

2. The price, in pence per litre, of petrol at 10 city garages is shown below.
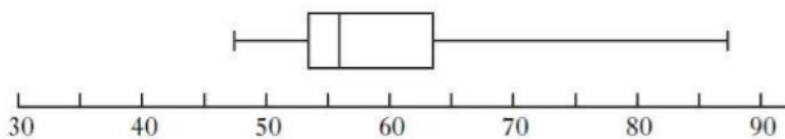
84·2	84·4	85·1	83·9	81·0
84·2	85·6	85·2	84·9	84·8

(a) Calculate the mean and standard deviation of these prices.

(b) In 10 rural garages, the petrol prices had a mean of 88·8 and a standard deviation of 2·4.

 How do the rural prices compare with the city prices?

3. This back-to-back stem and leaf diagram shows the results for a class in a recent mathematics examination.

```
        Girls   |   |  Boys
            1 | 3 |
            9 | 4 | 7  9
8 7 4 3 2 2 | 5 | 2  3  4  4  6  6  7  9
        9 4 | 6 | 3
      9 6 3 | 7 | 4  8
        8 1 | 8 | 7

        n = 15        n = 14
```

Key
3 | 7   represents 73%
  | 8 | 7 represents 87%

(a) A boxplot is drawn to represent one set of data.

 Does the boxplot above represent the girls' data or the boys' data?
 Give a reason for your answer.

(b) For the **other** set of data, find:
   (i) the median;
   (ii) the lower quartile;
   (iii) the upper quartile.

(c) Use the answers found in part (b) to construct a second boxplot.

(d) Make an appropriate comment about the distribution of data in the two sets.

- ## Standard Form

1. A spider weighs approximately $19 \cdot 06 \times 10^{-5}$ kilograms.

   A humming bird is 18 times heavier.

   Calculate the weight of the humming bird.

   Give your answer **in scientific notation**.

2. Radio signals travel at a speed of 3×10^8 metres per second.

   A radio signal from Earth to a space probe takes 8 hours.

   What is the distance from Earth to the probe?

   Give your answer **in scientific notation**.

3. $$E = mc^2.$$

   Find the value of E when $m = 3 \cdot 6 \times 10^{-2}$ and $c = 3 \times 10^8$.

   Give your answer **in scientific notation**.

- ## Similarity

1. Two perfume bottles are mathematically similar in shape.
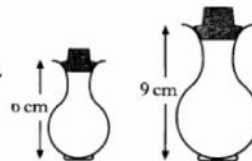
   The smaller one is 6 centimetres high and holds 30 millilitres of perfume.

   The larger one is 9 centimetres high.

   What volume of perfume will the larger one hold?

2. Two Christmas decorations are mathematically similar similar in shape.
   The larger decoration has an area of 128 cm^2.

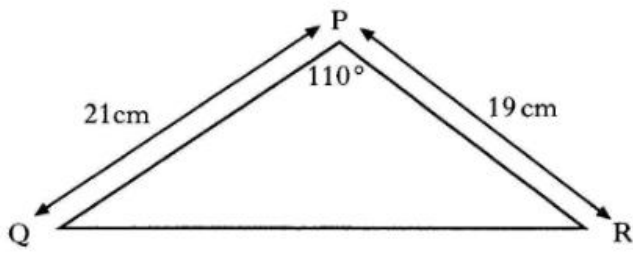   Calculate the area of the smaller decoration.
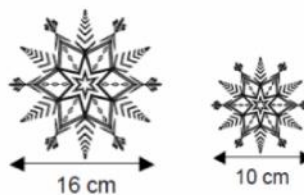
3. . The foot of window cleaner's ladder is 2 metres from the base of a wall and rests against a block of flats a further 5 metres away.
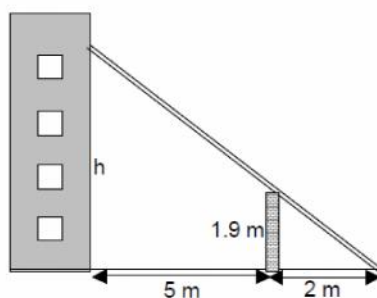
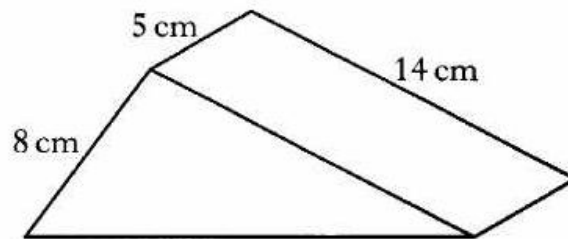   Calculate h, how far up the block of flats the ladder reaches.
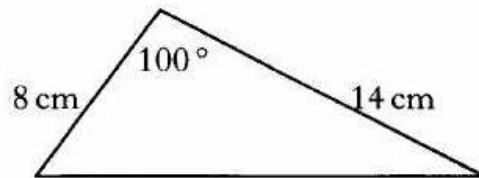
• Area of a Triangle

1.

Calculate the area of triangle PQR.

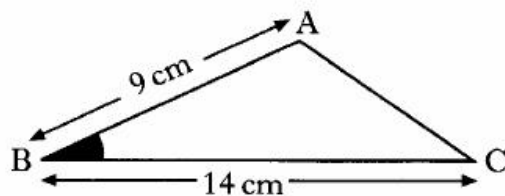**2.** A metal door-stop is prism shaped, as shown.

The uniform cross-section is shown below.

Find the volume of metal required to make the door-stop.
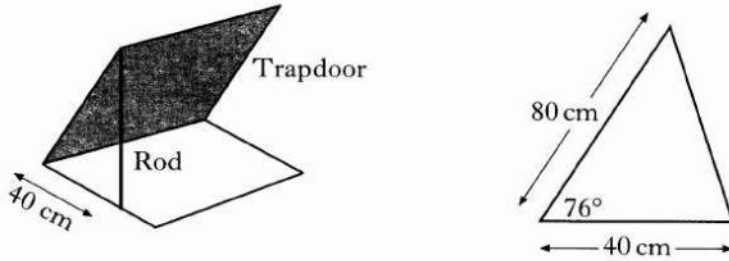
3. The area of triangle ABC is 38 square centimetres.

AB is 9 centimetres and BC is 14 centimetres.

Calculate the size of the acute angle ABC.

1. A square trapdoor of side 80 centimetres is held open by a rod as shown.

The rod is attached to a corner of the trapdoor and placed 40 centimetres along the edge of the opening.

The angle between the trapdoor and the opening is 76°.

Calculate the length of the rod to **2 significant figures**.

2. A helicopter, at point H, hovers between two aircraft carriers at points A and B which are 1500 metres apart.
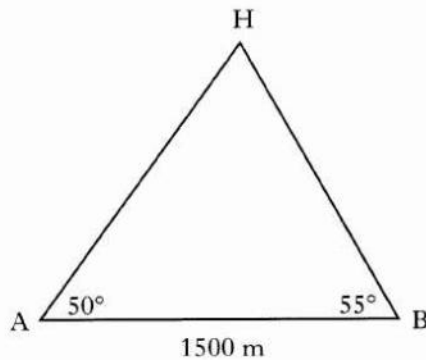
From carrier A, the angle of elevation of the helicopter is 50°.

From carrier B, the angle of elevation of the helicopter is 55°.

Calculate the distance from the helicopter to the nearer carrier.

3. Two yachts leave from harbour H.

Yacht A sails on a bearing of 072° for 30 kilometres and stops.

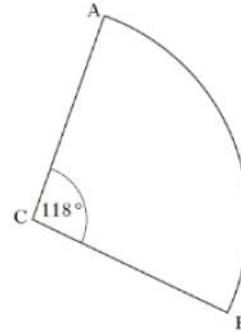Yacht B sails on a bearing of 140° for 50 kilometres and stops.
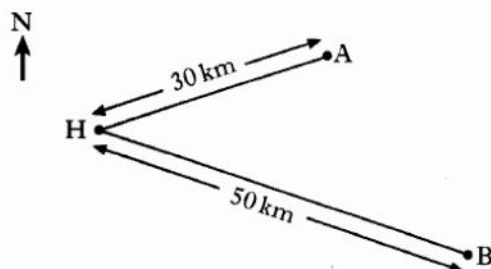
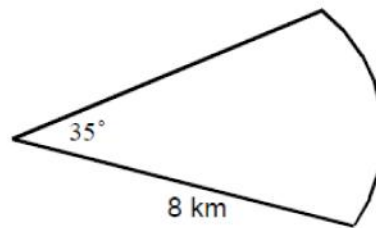How far apart are the two yachts when they have both stopped?

- Arc Length/Area of Sector

1. The diagram below shows a sector of a circle, centre C.

   The radius of the circle is 10·5 centimetres and angle ACB is 118°.
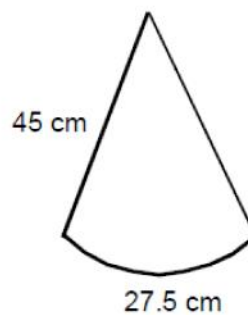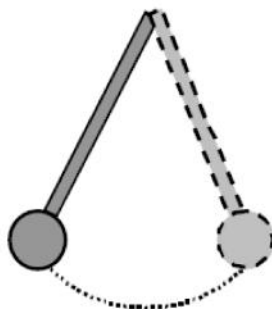   Calculate the length of arc AB.

2. The beam from a lighthouse reaches a distance of 8 kilometres and spreads to an angle of 35°.

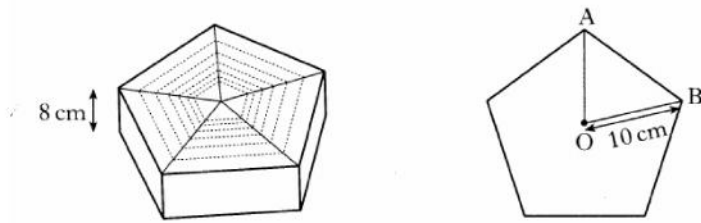   Calculate the area covered by the beam from the lighthouse.

3. A pendulum is 45 centimetres long. When the pendulum swings it travels along the arc of a circle and covers a distance of 27.5 centimetres.

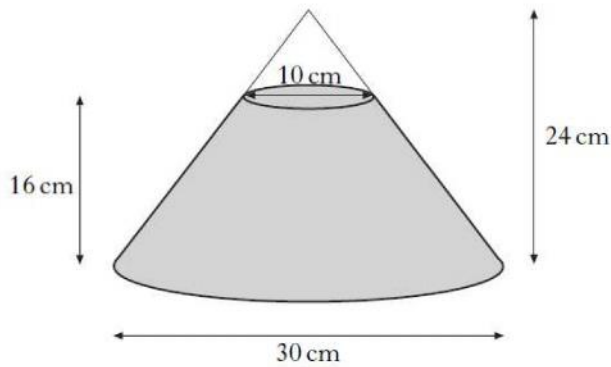   Calculate the size of the angle through which the pendulum travels.

1. A gift box, 8 centimetres high, is prism shaped.

The uniform cross-section is a regular pentagon.

Each vertex of the pentagon is 10 centimetres from the centre O.

Calculate the volume of the box.

2. A glass ornament in the shape of a cone is partly filled with coloured water.

The cone is 24 centimetres high and has a base of diameter 30 centimetres.

The water is 16 centimetres deep and measures 10 centimetres across the top.

What is the volume of the water?

Give your answer correct to 2 significant figures.

3. A feeding trough, 4 metres long, is prism-shaped.

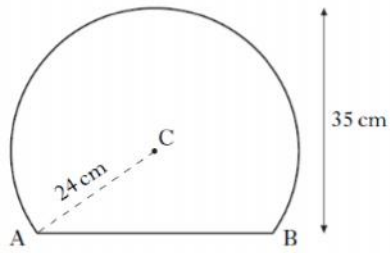The uniform cross-section is made up of a rectangle and semi-circle as shown below.
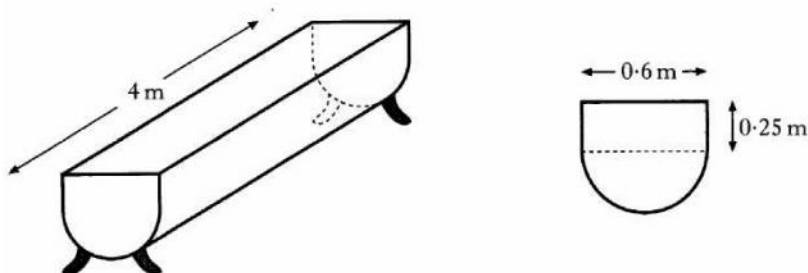
Find the volume of the trough, **correct to 2 significant figures**.

1. A mirror is shaped like part of a circle.

   The radius of the circle, centre C, is 24 centimetres.
   The height of the mirror is 35 centimetres.

2. A sheep shelter is part of a cylinder as shown in Figure 1.

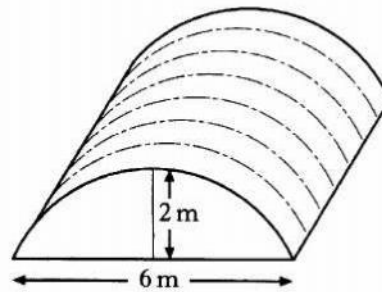   It is 6 metres wide and 2 metres high.

   Figure 1

   The cross-section of the shelter is a segment of a circle with centre O, as shown in Figure 2.

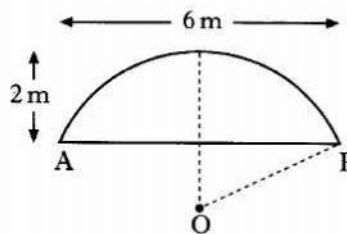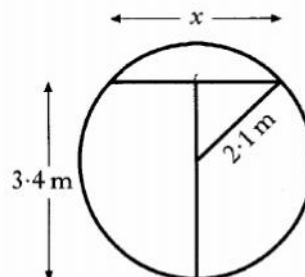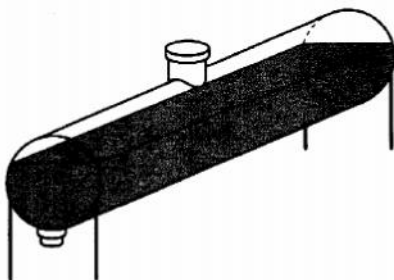   OB is the radius of the circle.

   Figure 2

3. An oil tank has a circular cross-section of radius 2·1 metres.

   It is filled to a depth of 3·4 metres.

   (a) Calculate x, the width in metres of the oil surface.

   (b) What other depth of oil would give the same surface width?