| A | Speed |
|---|-------|
|---|-------|

Examples:

- a) Jason drove 7 km in 4 minutes. Find Jason's speed in km/h.
- b) Rebekah drove 115 km at an average speed of 90 km/h. How long did the trip take?

Working:

a) First divide by 4 to get the distance covered in 1 minute, then multiply by 60 to get distance covered in 1 hour. 7 km in 4 min = $\frac{7}{4}$ km in 1 min = $60 \times \frac{7}{4}$ km in 1 hour.

Answer: 105 km/h

b) Every hour Rebekah drives 90 km, so 115 km is covered in $\frac{115}{90}$ hours.

 $\frac{115}{90}$ hours = $1\frac{5}{18}$ hours = 1 hour 17 min

An aircraft flies at a speed of 405 km/h.

How far does it fly in 25 minutes?

b) How long does it take to fly 108 km?

a) What is her average speed?

A cyclist covers a distance of 12 km in 25 minutes.

b) At this speed, what distance would she cover in 35 minutes?

Jacob drove 125 km at an average speed of 80 km/h and 75 km at 90 km/h. How long did the trip take? Give your answer in hours and minutes.

B Changing Units

Example:

An orca can reach a speed of 15 metres per second. Change that speed into km/h.

Working: 15 metres per second $= 60 \times 15$ metres per minute

 $= 60 \times 60 \times 15$ metres per hour

Answer: $54\,000\,\text{m/h} = 54\,\text{km/h}$

Car A goes at 80 km/h, car B goes at 20 m/s.

Which car goes faster?

- 2 It takes the driver of a car one second to react to whatever is happening on the road ahead.
- a) If his speed is 50 km/h, how many metres would the driver have covered in one second? Complete this working:

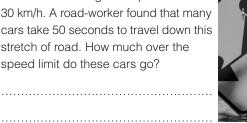
50 km/h = 50 000 metres in 60 minutes

= m/min = m/s

What if he was going 65 km/h? m/s

A cheetah can reach a speed of 95 km/h but can only keep that up for 22 sec. How far does the cheetah run in 22 sec at top speed?

Road works are in progress on a stretch of road 800 m long. The speed limit is 30 km/h. A road-worker found that many cars take 50 seconds to travel down this stretch of road. How much over the



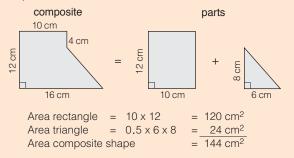


Area of Composite Shapes 1

A Pick Up the Pieces

A composite shape (also called a compound shape) is made up of various parts. The area of a composite shape is found by adding the areas of the parts.

Example:



Draw the pieces and work out the area of each composite shape.

1 8 cm

2 E5 0N

20 cm

.....

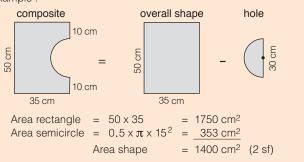
E 10: 1

3

B Holy Shapes

Sometimes composite shapes have holes in them. The area is found by subtracting the area of the hole from the overall area.

Example:



Draw the overall shape and the hole and work out the area of each composite shape.

40 cm 30 cm 40 cm

10 m 20 m 10 m

2

.....

15 cm 25 cm

.....

A Height

Example: The volume of a cone is 1 L, its radius is 6.5 cm. Calculate its height.

Working: $V = \frac{1}{3}\pi r^2 h$, here $V = 1000 \text{ cm}^3$

 $1000 = \frac{1}{3} \times \pi \times 6.5^2 \times h$

 $h = 1000 \times 3 \div \pi \div 6.5^2$

h = 23 cm (2 sf)



A cylinder has a volume of 2 L and its radius is 8 cm.
 Calculate the height of the cylinder.

| | |
|------|------|
| | |
| | |

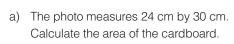
2

20 cm

1.2 L of cake mix is poured into this baking tin. In the oven the height of the cake increases by 60%. How high is the cake when it comes out of the oven?

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--|--|--|--|--|--|------|------|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |

3 A photo is mounted on a rectangular piece of cardboard. The area of the border around the photo is equal to the area of the photo itself.





b) The width of the cardboard is 36 cm. Calculate the height.

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|------|--|------|------|------|------|--|------|--|--|--|--|--|------|--|--|--|------|--|--|--|--|--|------|--|--|--|------|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

B Radius

Example: The surface area of a sphere is 500 cm².

Calculate the radius of the sphere.

Working: $S = 4\pi r^2$

$$500 = 4 \times \pi \times r^2$$

$$\mathbf{r}^2 = 500 \div 4 \div \pi = 39.788...$$

$$r = \sqrt{39.788.} \dots = 6.3 \text{ cm } (2 \text{ sf})$$

The area of a circle is 300 cm². Calculate its radius.

| | |
|------|------|
| | |

The circumference of a circle is 150 m. Calculate its area.

| | | | |
|------|------|------|------|
| | | | |
| | | | |

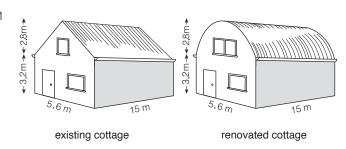
The volume of a cylinder is 240 cm³, its height is 6.0 cm. Calculate its radius.

A race course is 8.0 km long. The straight stretches are 2.2 km each. Calculate the width of the race course.

| | |
|------|--|
| | |
| | |
| | |

41 Mixed Problems 3

A New Roof



| a) | The pitched roof of this cottage is changed into a semi-circular |
|----|--|
| | roof. What is the percentage increase in the volume of the |
| | cottage? |
| | |
| | |
| | |
| | |

| b) | Calculate the area of the corrugated iron on the round roof. |
|----|--|
| | |
| | |
| | |
| | |
| | |

| 351 m | 295 m |
|-------|-------|
| 7 | |
| 324 m | |
| | 7 |

2

The diagram shows the dimensions of a flat section of forestry land. Trees have been planted at a rate of 400 trees per hectare. Estimate the number of trees on the plantation.

| | 3 | 32 | 4 | m | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|------|----|-----|-----|---------|---------|-----|----|-----|------|-----|--|-----|-----|--------|------|----|-----|------|-----|-----|-----|------|-----|-----|----|-------|-------|--|
| | | | ٠. | | | | | ٠. | ٠. | | ٠. | | ٠. | ٠. | ٠. | | ٠. | ٠. | | | | ٠. | | | | ٠. | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | • • | | | | | | ٠. | | | | ٠. | | | | | ٠. | | | | ٠. | | | | ٠. | | • • • | |
| | | | | | | | | | ٠. | | | | | ٠. | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | • • | • • | • • | • • | • • | • | • • | • • | • • | | • • | • • | | • • | • | • • | | • • | • • | • • | | • • | • • | • | • | | |

B Making a Tube

An open ended tube is made from a piece of cardboard measuring 45 cm by 65 cm. There will be an overlap of 1 cm where the ends meet.

Two different tubes can be made. Give the length and diameter of the tube with the largest volume.





| | | |
|--|------|------|------|------|------|------|------|------|------|------|------|------|--|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Indicate what |
|--------------------|
| measurements |
| you would take |
| and what formulas |
| you would use to |
| find the volume of |
| |

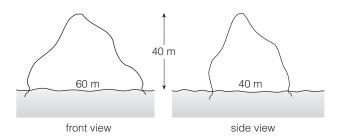
| (шиннининининини | |
|------------------|--|
| Pencils | |

| ind t his p | | | | | | | | | | | | | | | | |
|----------------|------|------|------|------|------|------|------|----|----|------|--------|------|------|------|--------|-------|
| | | ٠. | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | ٠. | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | ٠. | ٠. | | ٠. | | | | ٠. | ٠ |

45 Modelling 3

A The Tip of the Iceberg

- Only $\frac{1}{8}$ of the volume of an iceberg is visible above the water. The crew of a yacht encounters an iceberg. They make a sketch of the front view and side view and estimated height of the berg and the diameters at the waterline.
- Approximate the volume of the visible part of the iceberg.
 Clearly explain the chosen model and the calculations.



| | | | |
|------|------|------|--|
| | | | |
| | | | |
| | | | |

The submerged part of the iceberg could be modelled with a cylinder shape. Show how you can estimate the depth of the iceberg below the waterline.

