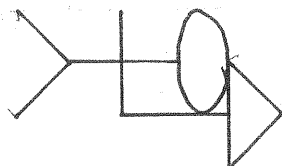
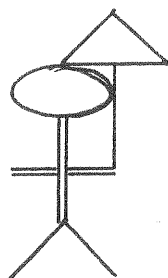


## Rotation

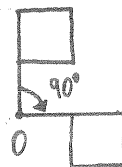
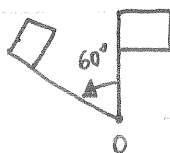
When an object is rotated every point of the object is moved around a centre point by a fixed angle.



centre •

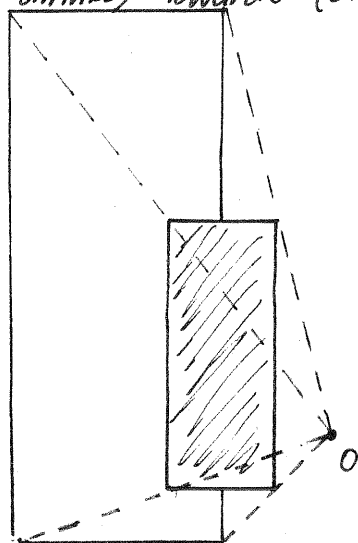
This object has been rotated through an angle of  $270^\circ$  (a positive rotation is specified anti-clockwise) or  $90^\circ$  clockwise about the point labelled centre.

Example: This flag has been rotated about point O.



## Enlargement

An enlargement requires both a centre and a scale factor. The entire plane expands (or shrinks) towards (or from) the centre of enlargement.



The scale factor is the ratio of any length of the image to the corresponding length of the object.

The scale factor is also the ratio of the image distance to the centre and the corresponding distance of the object to the centre.

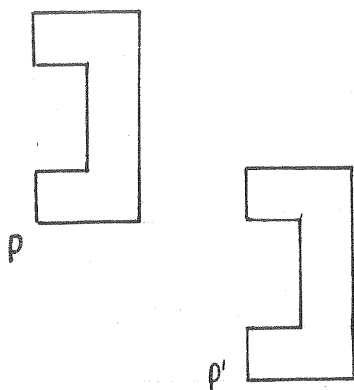
$$\text{Scale factor} = \frac{\text{distance to image}}{\text{distance to object}}$$

$$\text{or Scale factor} = \frac{\text{part of the image}}{\text{corresponding part of object}}$$

$$\text{Scale factor} = 2$$

## Translation

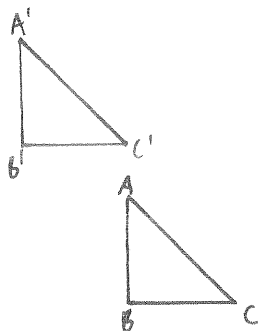
A translation is a slide. Each point moves the same amount in the same direction.  
There are no invariant points.



## Vectors

We can describe translations using vectors.  
e.g. translate the shape by the vector

$$\begin{pmatrix} -2 \\ 3 \end{pmatrix} \leftarrow \begin{array}{l} x \text{ direction (back 2)} \\ y \text{ direction (up 3)} \end{array}$$



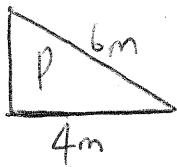
## Scale Factor for Length

If  $k$  is the scale factor for an enlargement each length on the image is  $k$  times as long as the corresponding length on the original.

$$k = \frac{\text{length on image}}{\text{length on object}}$$

Example:  $P'$  is an enlargement of  $P$

- a) what is the scale factor
- b) find  $x$



a)  $k = \frac{\text{new}}{\text{old}}$

$$k = \frac{3}{4}$$

b)  $x = 6 \times \frac{3}{4}$

$$x = 4 \frac{1}{2} m$$

## Scale Factor for Area & Volume

If  $k$  is the scale factor for length, then  $k^2$  is the scale factor for area and  $k^3$  is the scale factor for volume.

Examples 1) The area of a triangle is  $6m^2$  find the area of the image under an enlargement of  $k = 3$ .

Solution

$$k = 3$$

$$k^2 = 9$$

$$\text{Area} = 6 \times 9$$

$$\text{Area} = 54 \text{ m}^2$$

2)



$$h = 10 \text{ m}$$

The can shown has a height of 10cm and a capacity of 300ml.

We want to design a can having the same shape but whose capacity is 360.

Calculate the height of the new can correct to 1 decimal place.

$$300 k^3 = 3600$$

$$k^3 = \frac{3600}{300}$$

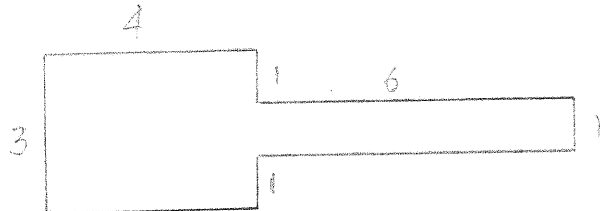
$$= 12$$

$$k = 2.289428485$$

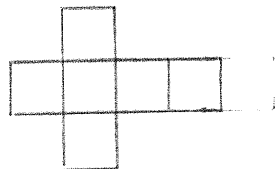
$$h = 10k$$

$$h = 22.9 \text{ cm (1 d.p.)}$$

## Nets



This diagram shows the outline of a piece of cardboard. You could cut out this cardboard shape and fold it into a box. Copy the diagram, then add five dashed lines to show where folds would need to go to make the edges of the box.



This is the basic net for a cube

## Plain Views

### Top Views

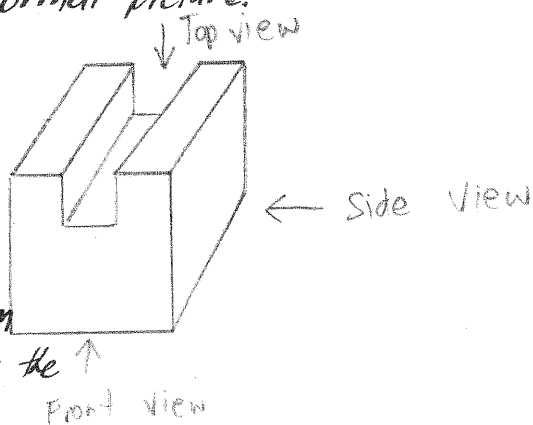
A top view is a view of a 3-D object taken directly above it. In this way the view becomes a normal picture and not a 3D view.

### Front View

Front view is a view facing a 3-D object at exactly  $90^\circ$ . In this way the view becomes a normal picture.

### Side View

A side view is a view of a 3D object at exactly  $90^\circ$  from either left or right from the front face. In this way the view becomes a normal picture



## Sections

When a solid shape is cut, the two-dimensional figure on the exposed surface is called a section.

e.g. when a carrot is sliced at right angles to its length, the exposed surface is approximately circular. But when sliced on another angle, the section is more like an ellipse.

