



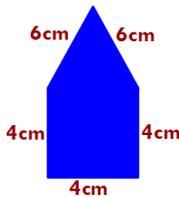
## 'How To' Guide – Using scale factors to enlarge images



**Enlargement** – To enlarge a shape means to change its size. This means it can get bigger or smaller. The **scale factor** is the number that the dimensions of the shape are multiplied by to change its size. A scale factor of greater than 1 will increase the shape's size. A positive scale factor of less than one (usually a fraction) will decrease the shape's size.

### Example

Enlarge the following shape by a scale factor of 3.



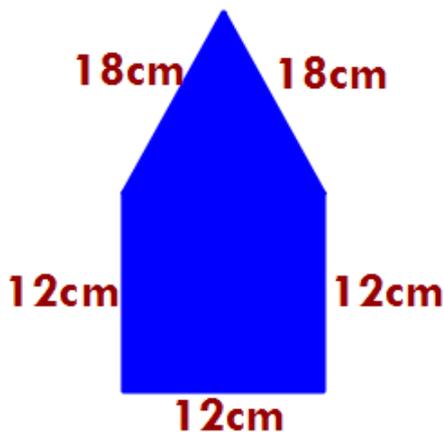
### Answer

Multiply **every** dimension by the **same** scale factor:

$$4\text{cm} \times 3 = 12\text{cm}$$

$$6\text{cm} \times 3 = 18\text{cm}$$

Draw the new shape with these new lengths.



### How we teach it

- Make sure a pencil and ruler are used if doing it by hand.
- You need to make sure you know the length of every side of the shape you wish to enlarge. If you don't know, measure them with a ruler.
- We then multiply each of these measurements by the scale factor.  
E.g. If we were enlarging by a scale factor of 2, we would double every measurement. The shape would then be double its original size.  
E.g. If we were enlarging by a scale factor of 5, we would multiply every measurement by 5. The shape would then be 5 times its original size.  
E.g. If we were enlarging by a scale factor of  $\frac{1}{3}$ , we would divide every measurement by 3. The shape would then be a third of its original size.
- We then draw the shape exactly like the original (same basic shape and orientation), but use our new measurements.
- The old shape and new shape are said to be **similar**.
- The size of the shape has changed, but it stays **in proportion**.

### Additional info

- Every dimension (side or length) of the shape needs to be multiplied by the same number (scale factor). If this doesn't happen, the shape will become **distorted** and will no longer look like the original.
- The best example of this would be to use a photograph. If you double the width but multiply the height by 5, the proportions of the content will change and it will no longer be a reproduction of the original image.

### Common mistakes

- Not multiplying every dimension by the same number, leading to a distorted image of the original shape or picture.
- Not measuring the original shape accurately to begin with, leading to errors in creating the enlargement.
- Not drawing the new image in the same orientation as the original (turning it).



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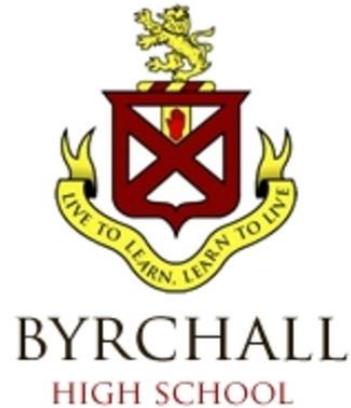


The following are two more examples of using a scale factor.

**Question** - Enlarge the following image by a scale factor of 2.



We would measure every side and then double then lengths. This one was done using the 'size' toolbar on Microsoft Word.



**Question** - Enlarge the following image by a scale factor of  $\frac{1}{3}$ .

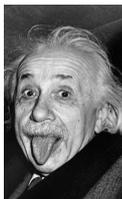


We would divide each length by 3, so this would make this particular shape smaller than the original as shown.



The following is an example of what happens when an enlargement is done incorrectly.

**Question** - Enlarge the following image by a scale factor of 4.



The width has been multiplied by 4, but the height has only been multiplied by 2, leaving the image distorted.

