

Level 3 AON

Scale Drawings

After completing this unit you should be able to:

- Convert length, area and volume measurements from a scale drawing back to the original and vice versa
- Choose a suitable scale for a map or plan

If you think you already know this go straight to the PRACTICE QUESTIONS

Scale Drawings

A scale drawing is an exact replica of something, but reduced in size. Maps and plans are examples of scale drawings.

To convert

from the scale drawing back to the original (and vice versa) we need to use the scale to get a conversion factor.

Method

- 1) Find the conversion factor – the distance represented by one unit on the map or plan
- 2) Multiply by it AND divide by it
- 3) Choose the common sense answer

Three Important Examples

- 1) A map has a scale of **2cm** to **5km**. The distance between two electricity pylons on the map is **3.5cm**. What is the distance on the ground?
 1. **2cm** represent **5km**, so **1cm** represents $\frac{5}{2} = 2.5\text{km}$
 2. 3.5×2.5 ($= 3 \times 2.5 + 0.5 \times 2.5$) $= 7.5 + 1.25$
 $= 8.75\text{km}$ (sensible)
 $3.5 \div 2.5 = 1.4$ something km (highly unlikely so we won't bother to calculate it)
 3. So plainly the answer is that the distance between the pylons is 8.75km.
- 2) A plan of a house is drawn to a scale **1:50**. Find the length of a wall which is **4cm** on the plan.
 1. **1** unit on the plan represents **50** *of the same units* on the house.
 2. $4\text{cm} \times 50 = 200\text{cm} = 2\text{m}$ (a sensible length for a wall).
 $4\text{cm} \div 50 = 0.08\text{cm}$ (not sensible).
 3. So clearly the length of the wall is 2m.
- 3) A map has a scale of **1cm** to **20km**. Find the distance on the map between two towns which are **110km** apart.
 1. **1cm** represents **20km**.
 2. $110 \times 20 = 2200\text{cm} = 2.2\text{km}$ (crazy – the map would have to be huge!)
 $110 \div 20 = 5.5\text{cm}$ (sensible).
 3. Clearly, the distance on the map would be 5.5cm.

Choosing Suitable Scales

To make a map or plan we need to decide on a suitable scale which

- i) is easy to use (has simple numbers) and
- ii) will let us fit the whole thing onto the size of plan we have available.

Example

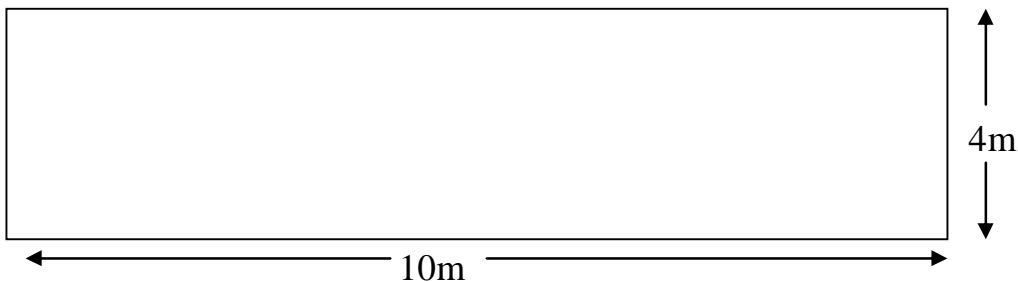
A rectangular garden, 10m long and 4m wide is to be landscaped. In order to decide on the landscaping it is desirable to draw a plan to scale. Determine a suitable scale and then draw a plan to that scale.

- i) A scale of 1cm representing 1m would be simple to use
- ii) The plan would then be 10cm by 4cm which would be easy to fit on a sheet of paper.

Now Try These

1. On a world atlas the British Isles is drawn to a scale of 4cm to 60km. Two towns are 90km apart. What is this distance on the map?
2. A Michelin route-planning map is drawn to a scale of 1:1000000. The length of the road on the map between two towns is 7.8cm. What is the actual distance between these towns?
3. A plan of a garden is drawn to a scale of 1:100. If the garden is 30m by 25m what would its dimensions be on the plan?

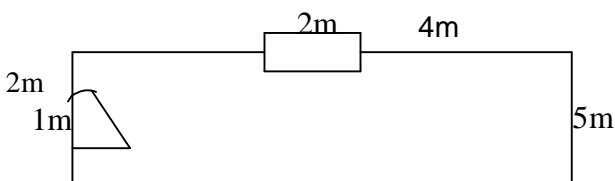
The plan of the garden would look like this:



Now Try These

Hint: Graph paper would help.

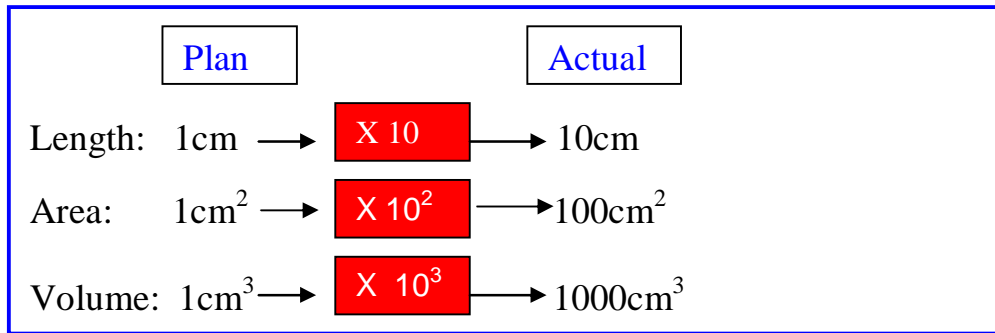
1. The drawing shows a sketch of a room with a door and a window. Decide on a suitable scale and draw a plan to scale.



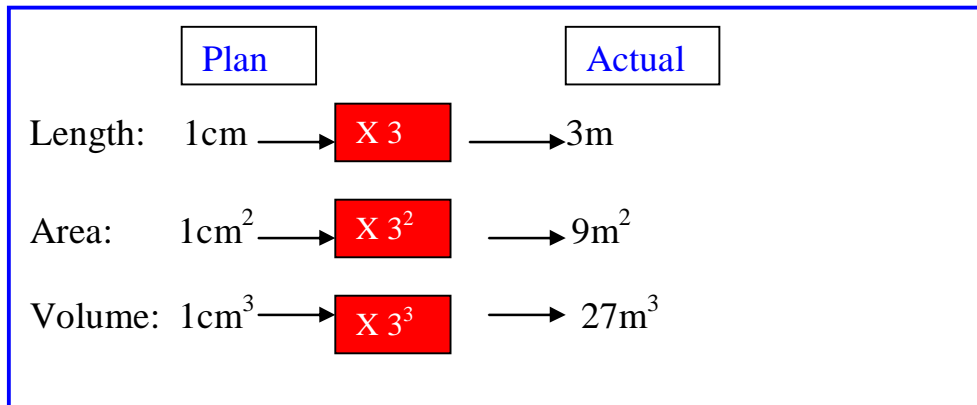
2. A patio, 5m by 4m, is to be laid in a garden. The patio slabs are 1m by $\frac{1}{2}$ m. Draw a plan of the patio to a suitable scale and show the patio slabs on it.

What About Scaled Areas and Volumes?

1) A scale of 1:10 means

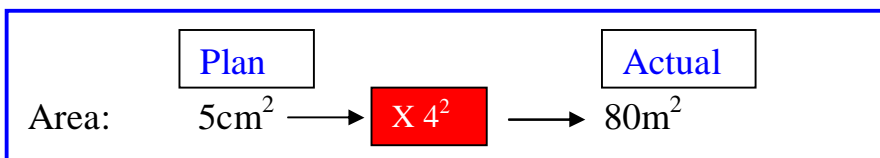


2) A scale of 1cm to 3m means

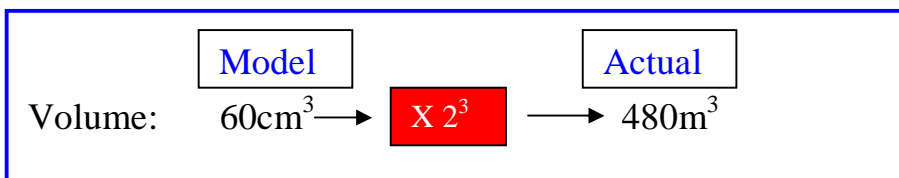


Example:

1) The area of a garden on a scale drawing is 5cm². What is the area of the real garden if the scale is 1cm to 4m.



2) The volume of a room on a model is 60cm³. If the model is made to scale of 1cm to 2m what is the actual volume of the room?



Now Try These

1. What is the actual area of a garden which is 12cm² on a plan drawn to a scale of 1cm to 3m.
2. The scale model of an aeroplane has an interior volume of 40cm³. The model's scale is 1cm to 5m. What is the interior volume of the real phone?

EXAM PRACTICE (Scale Drawings)

NB : Always remember to show units : £, mm, cm², m³ etc.

1. A local shop sells glass cut to any size. The recommended safety thicknesses and the cost depend on the area of glass sold. This information is given in the table below.

Area of Glass m ²	Safety Thickness mm	Cost per m ² £
Up to 1	3	9.50
1 up 2.5	4	18.50
2.5 up to 9	6	28.50
9 up to 22	12	98.00

Sadia has a scale drawing of a house to a scale of 1 : 80. The measurements on the scale drawing for the pane of glass in one window are 29mm by 21 mm.

(i) What is the recommended safety thickness for the pane of glass for this window?

(ii) What is the cost of the pane of glass?

2. Ahmed is looking at a scale model of the new Sports Hall planned for his college. The model is cuboid and is 1.2m long, 60cm wide and 250mm high.

(i) What are the dimensions of the Sports Hall in metres if the scale of the model is 1 : 50?

(ii) What is the volume of the hall?

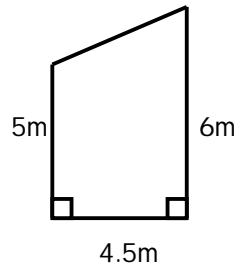
3. A garage is in the shape of a cuboid. Its ground dimensions are 3.5m by 2m and its height is 2.5m

(i) What is the volume of the garage?

(ii) What would be the area of the base of a scale model made to a scale of 1 : 25? Show the units of your answer.

(iii) What would be the volume in cm³ of a model made to a scale of 1cm to 0.5m?

4. Use a sheet of graph paper to produce a scale drawing of a room whose dimensions are as follows :



The scale should be 2cm to 1m.

ANSWERS

1.

(i) 6mm

(ii) £111.08

2.

(i) 60m x 30m x 12.5m

(ii) 22500m³

3.

(i) 17.5m³

(ii) 112cm² or 0.0112m²

(iii) 140cm³