Boat Plans

Technical Drawings & Elevations

Keys Terms:

Elevations, Scale, Plan, Isometric drawing

Boat Plans: Objectives

- Recognise why narrowboats have distinct design features.
- Understand how 2D technical drawings are used to represent 3D shapes.
- Learn how to use plans and elevations to gather mathematical information.

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The narrowboats on our canals have **many** design similarities.

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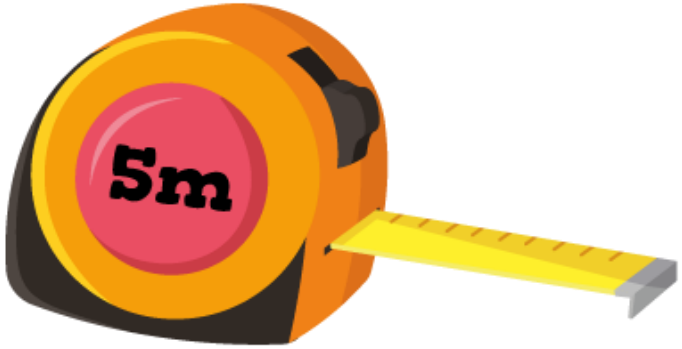
What characteristics of canals might influence the **measurements** of a boat?

List as many ideas as you can think of.



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Here are some factors to consider

- **Depth of water** – canals are shallow
- **Width of the canal** – canals are narrow
- **Length of locks** – a boat needs to fit into a lock
- **Speed limits** – the hull is designed for stability not speed
- **Height and width of bridges** – bridges and tunnels are small
- **Purpose of boat** – most narrowboats need to carry a lot of weight

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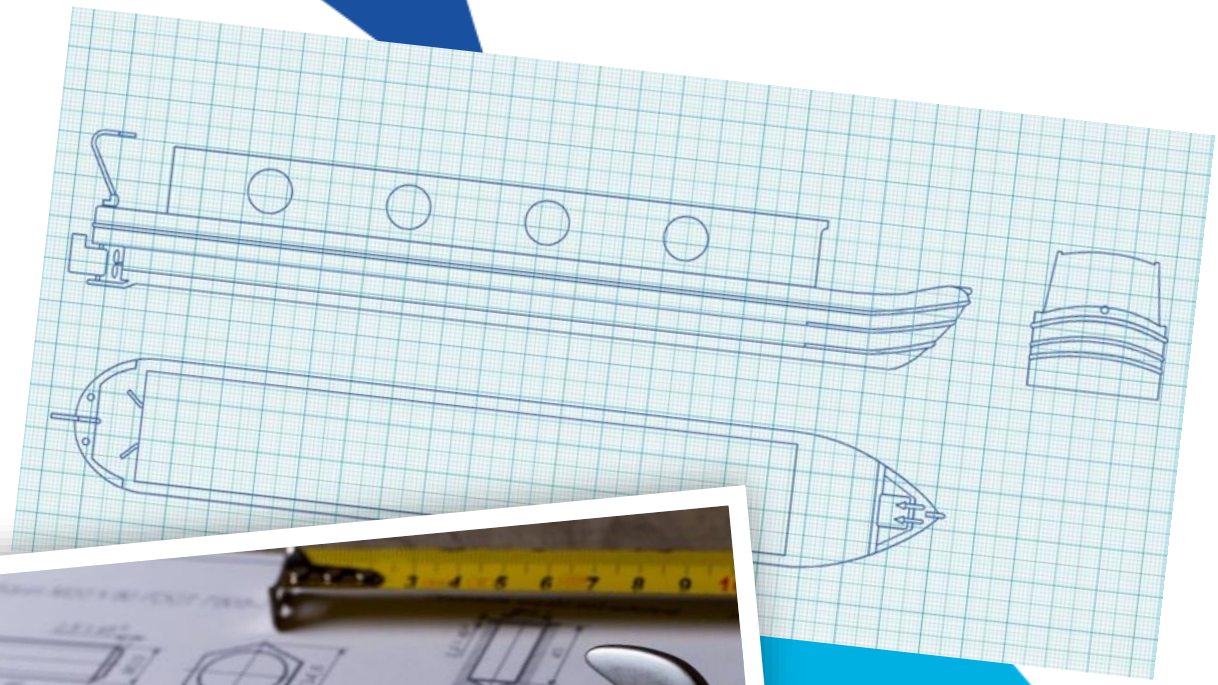

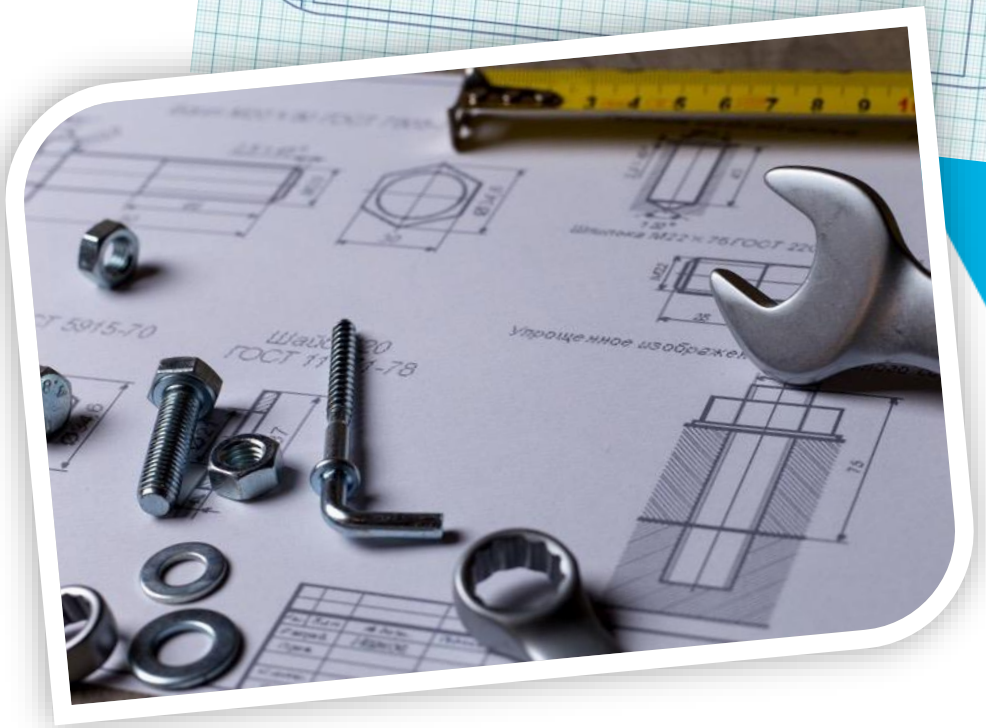

Engineers and designers use technical drawings to enable builders and carpenters to construct the boats and structures.

Technical drawings contain ELEVATIONS and PLANS.

Let's take a closer look.

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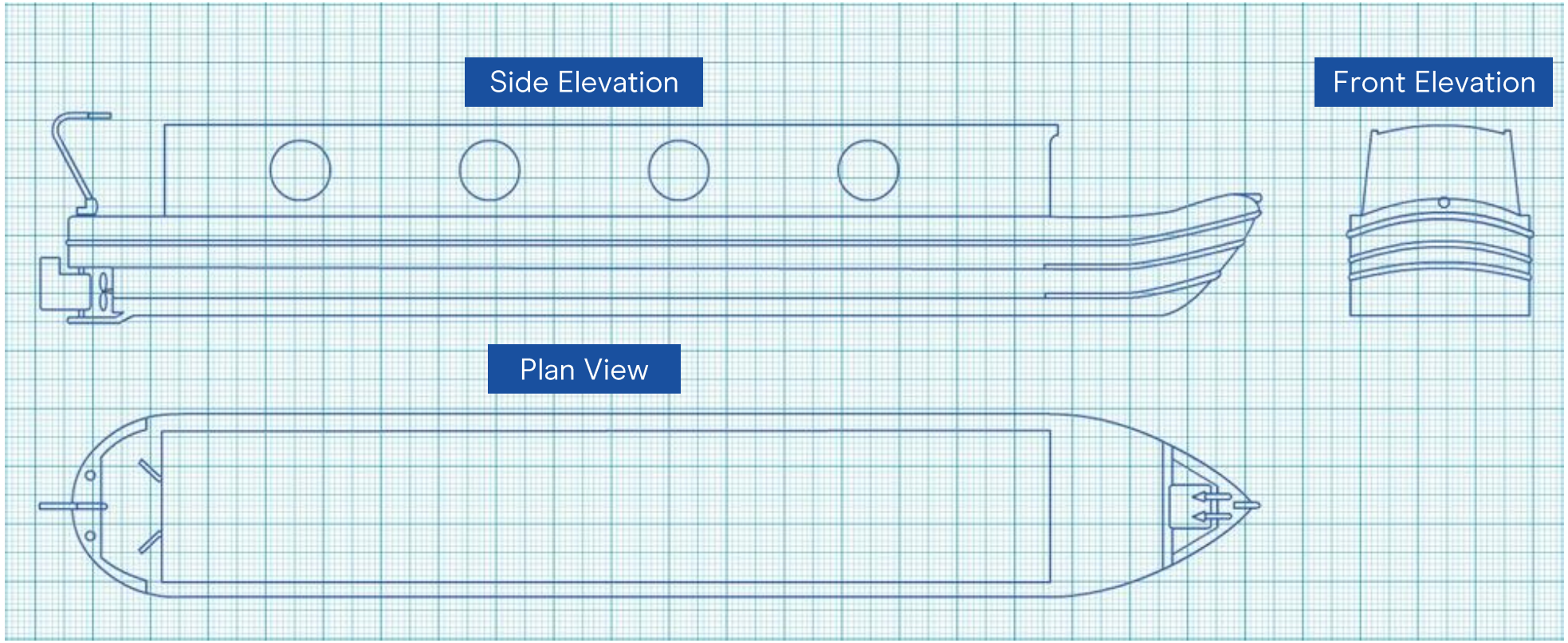
An ELEVATION is a scale drawing of a 3D object as seen from the front or the side.

A PLAN is a scale drawing of a 3D object as seen from above.



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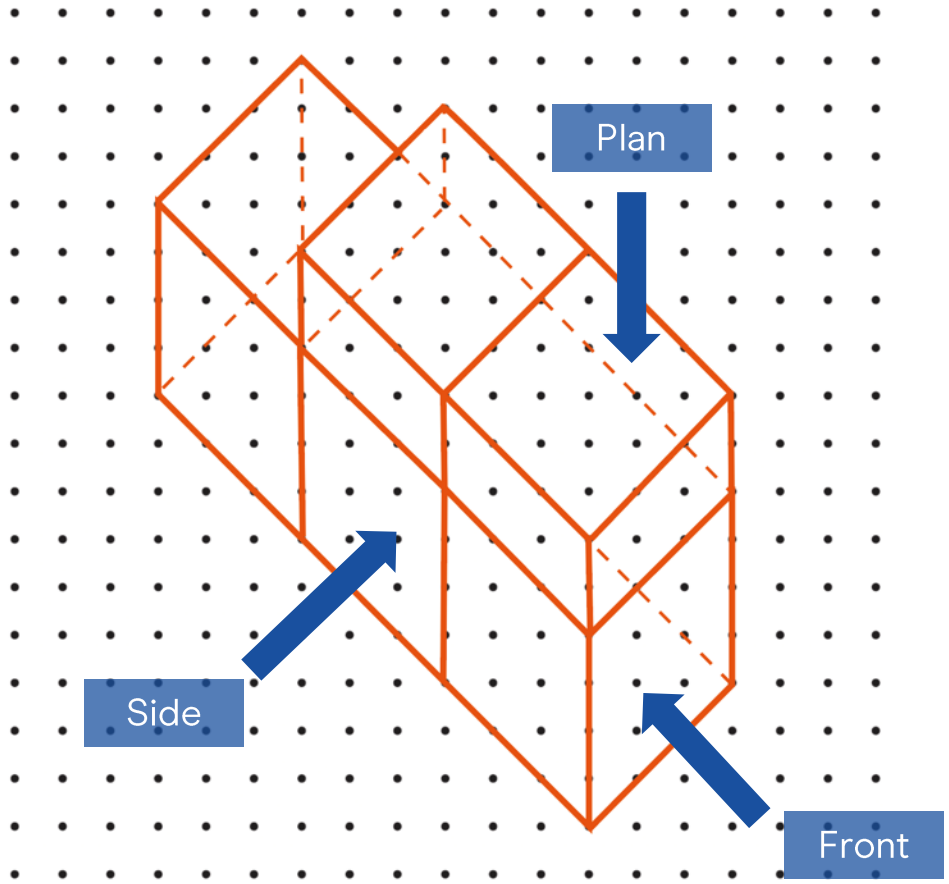
Here's a simpler example:

This 3D shape has been drawn on an isometric grid.

What would the **PLAN VIEW** look like?

What would the **FRONT** and **SIDE ELEVATIONS** look like?



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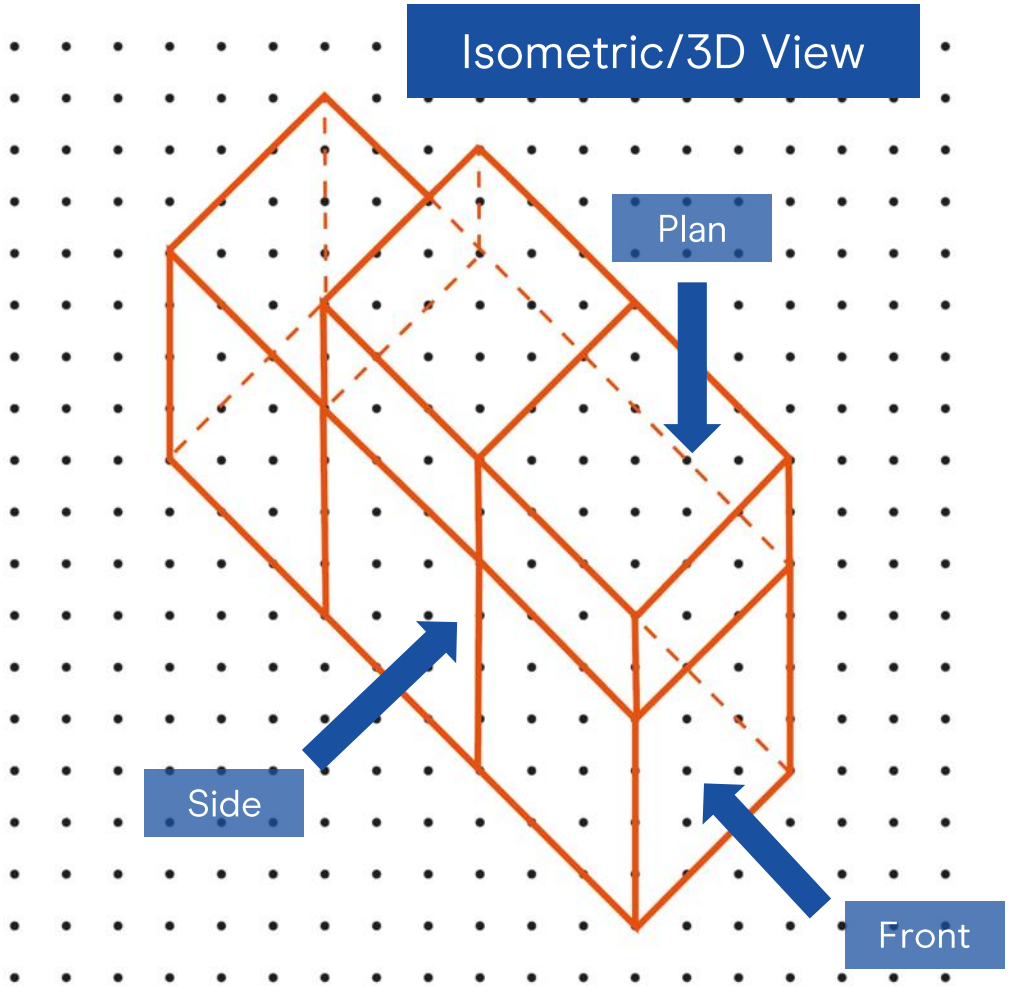

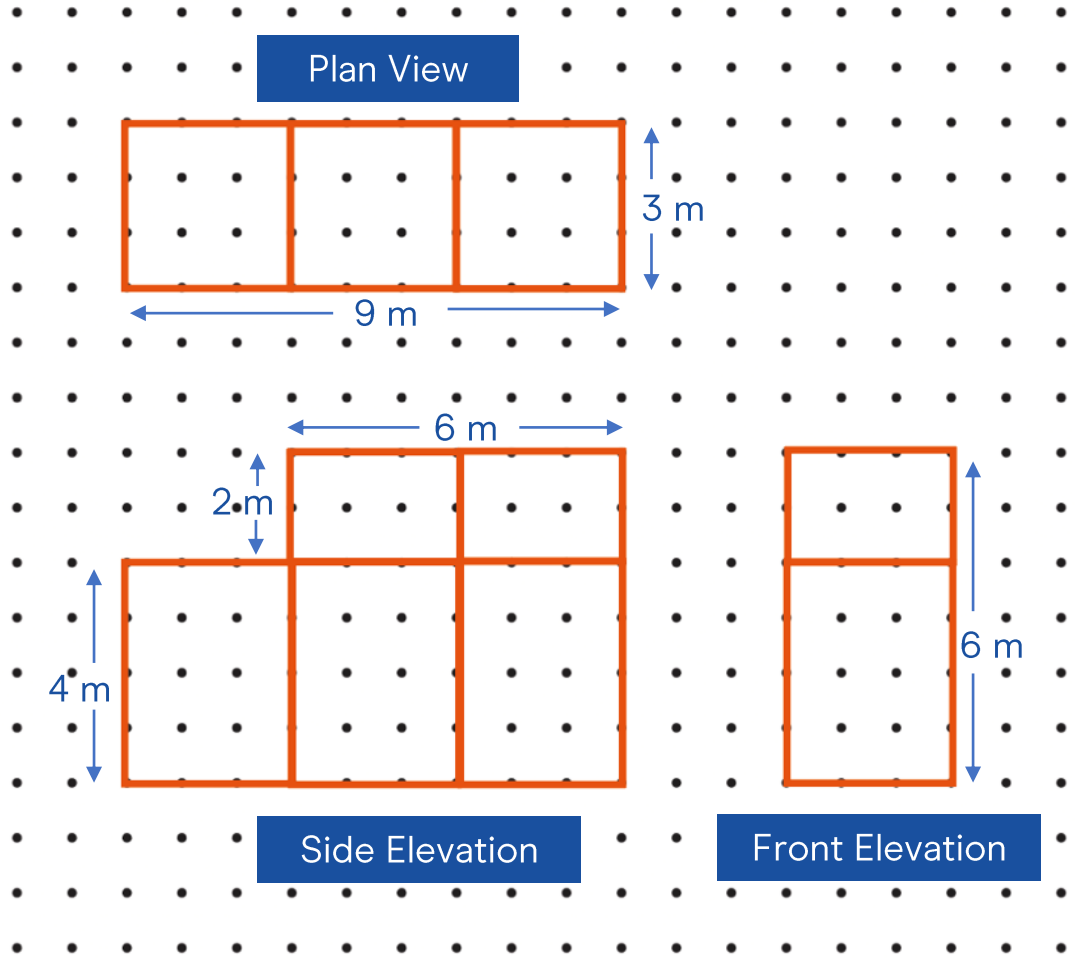

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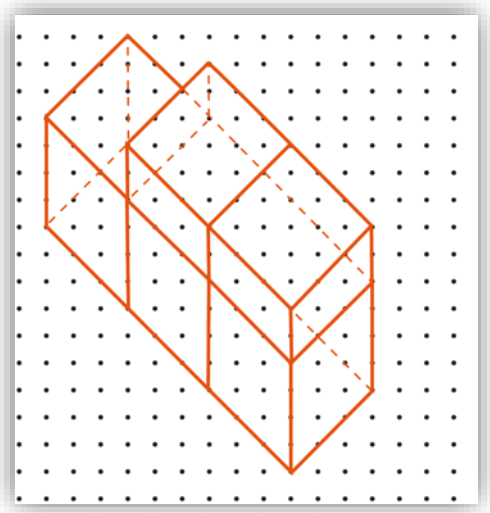
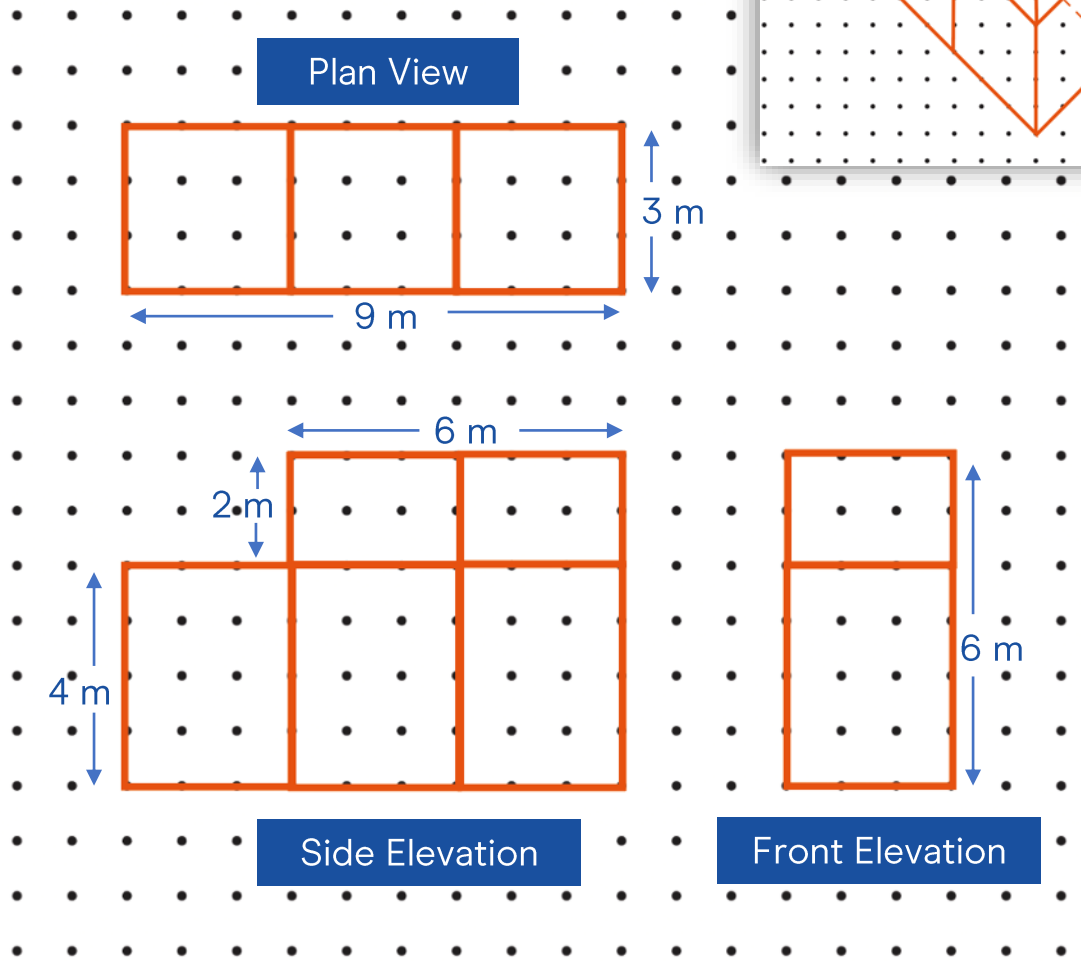


Plans and elevations help us to understand the dimensions of an object.

1. Work out the **SURFACE AREA** of the side elevation.

2. Work out the **VOLUME** of the entire object.



Break the object into two rectangular/cuboid shapes then add them back together!

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Surface Area Answer:

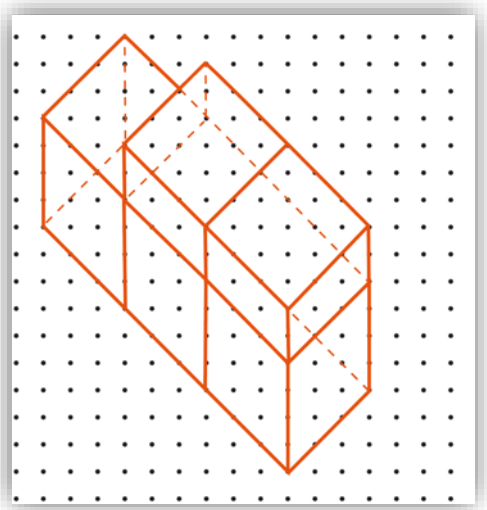
SURFACE AREA of the side elevation:

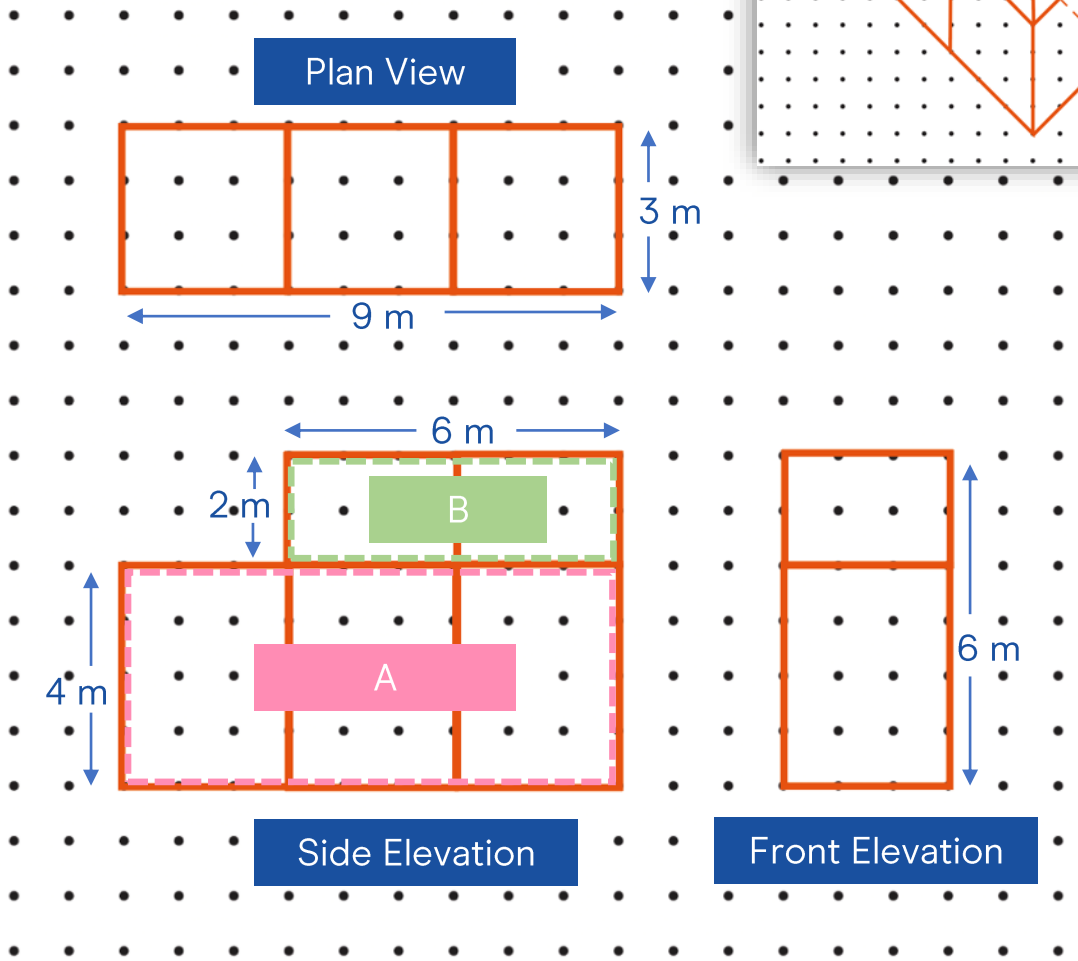
A 9m x 4m = 36^2m

B 6m x 2m = 12^2m

A + B = Surface area

36m + 12m = 48^2m





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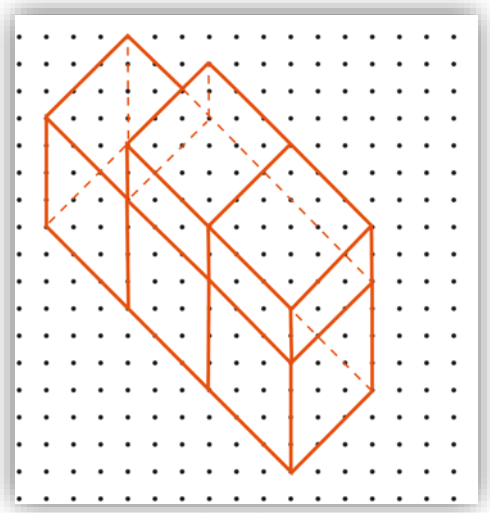
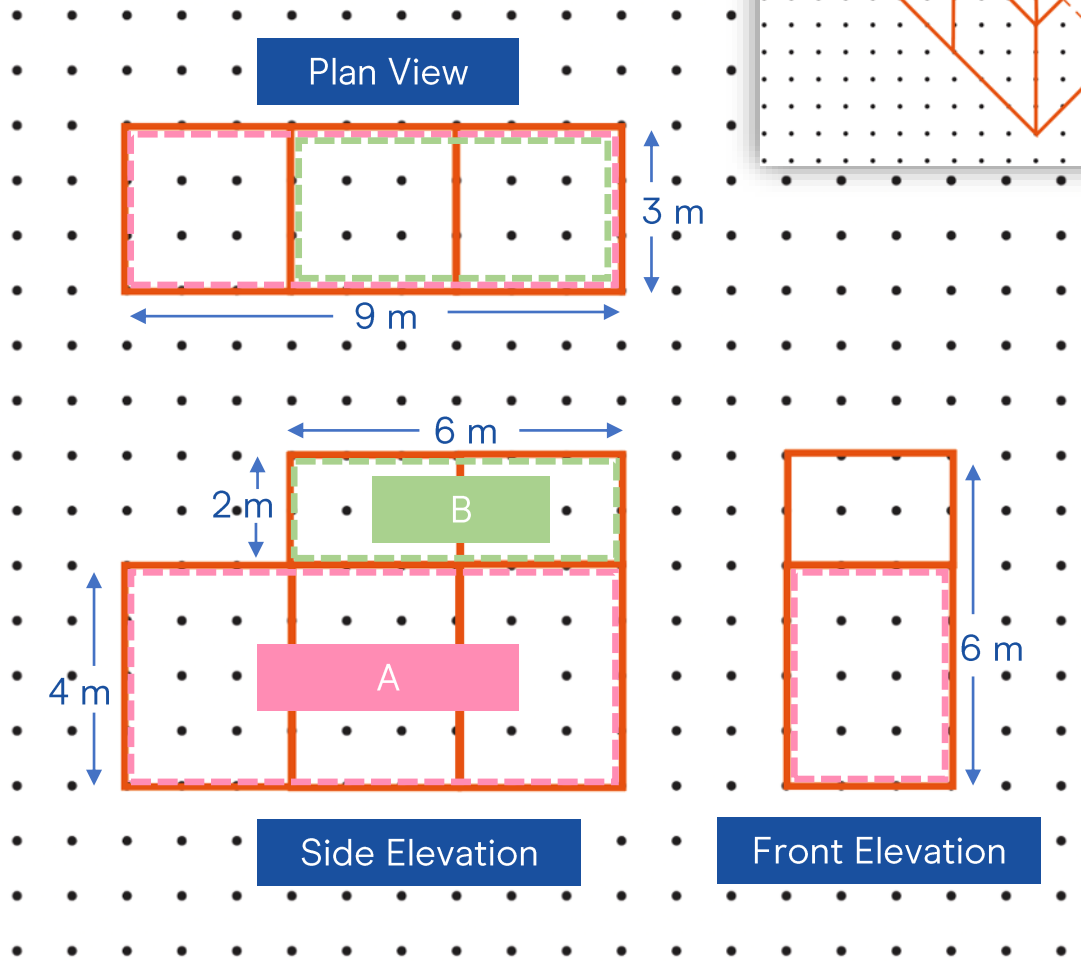
Volume Answer:



VOLUME of whole object:

A $9m \times 3m \times 4m = 108^3m$

B $6m \times 3m \times 2m = 36^3m$



A + B = Total volume

108^3m + 36^3m = 144^3m

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Here's another example:

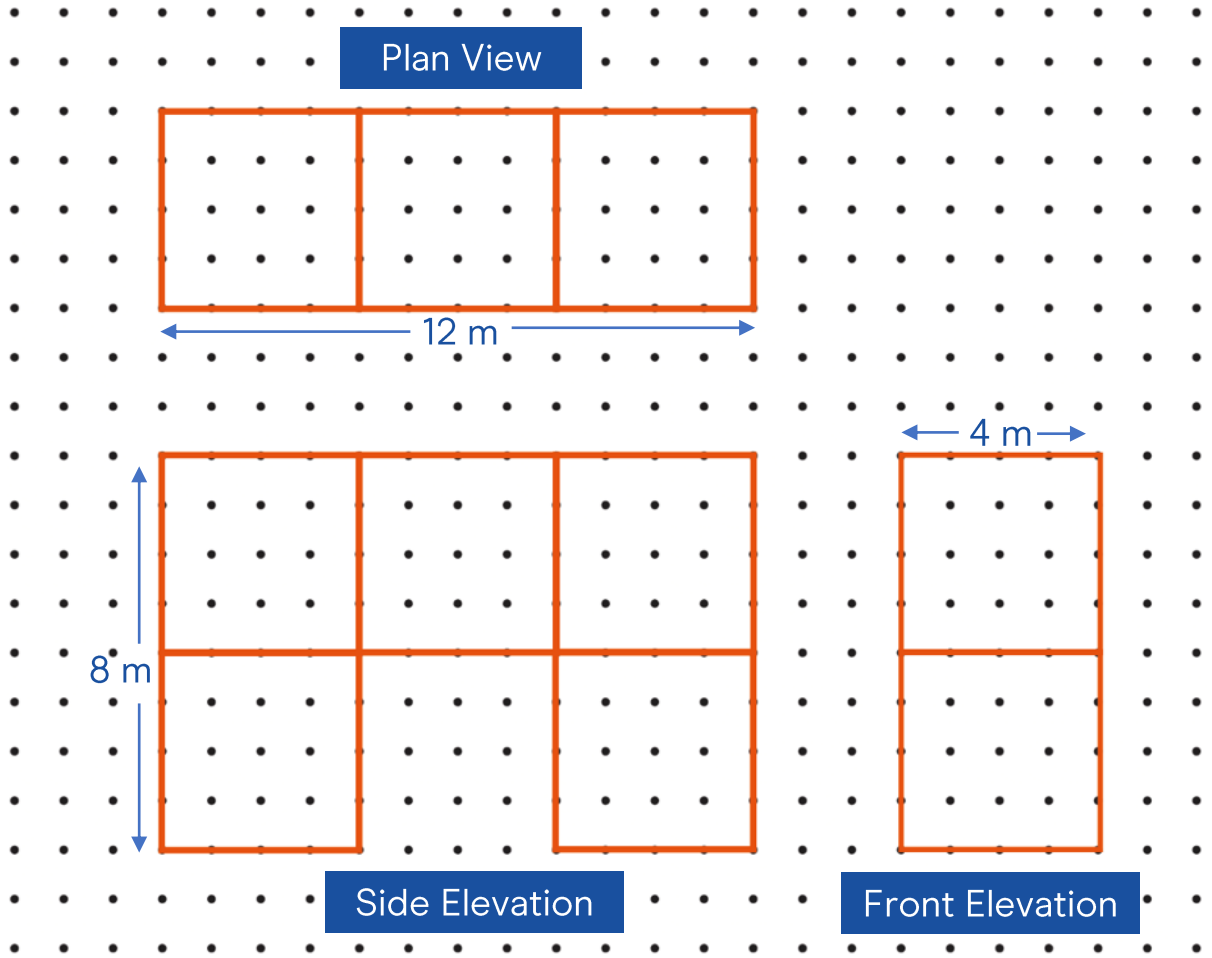
1. Sketch what the **3D version** of this object would look like (Use isometric paper to create a drawing to scale or just a sketch on plain paper).

2. Work out the **SURFACE AREA** of the side elevation.

3. Work out the **VOLUME** of the entire object.

TOP TIP

The object is made up of 5 cubes, each 4m x 4m square.



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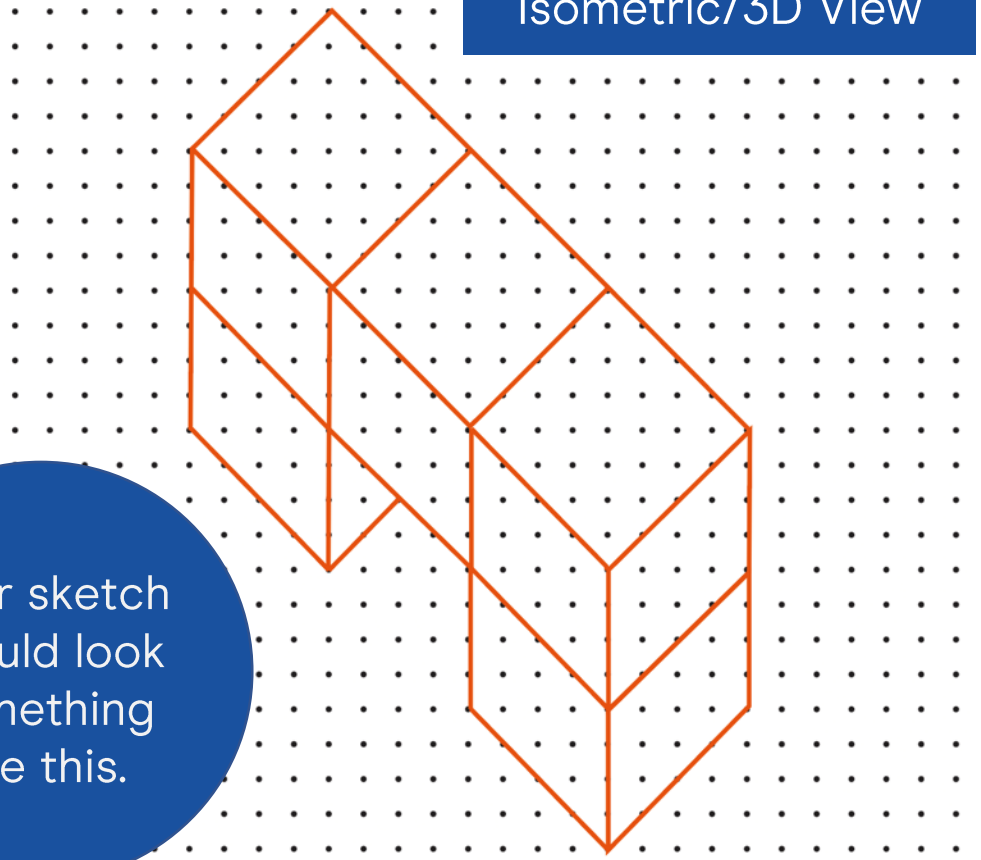
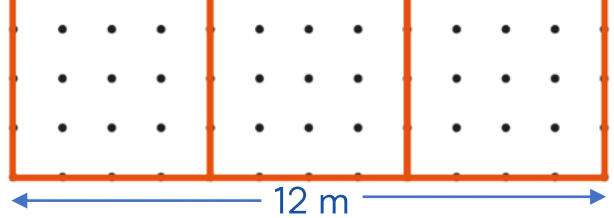
Isometric/3D View

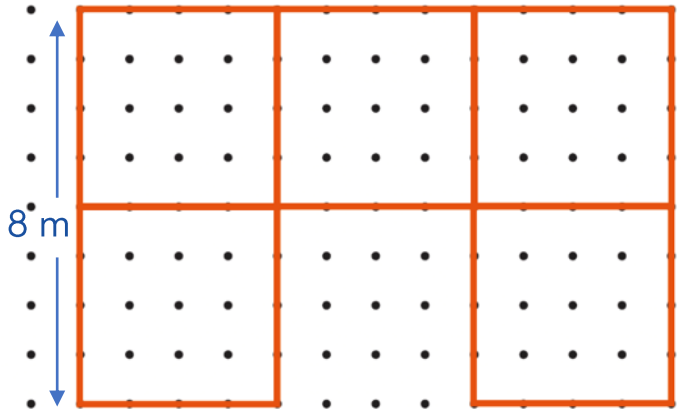


Your sketch should look something like this.

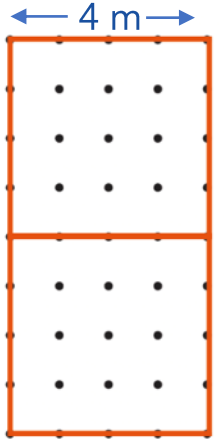
Plan View



Side Elevation



Front Elevation



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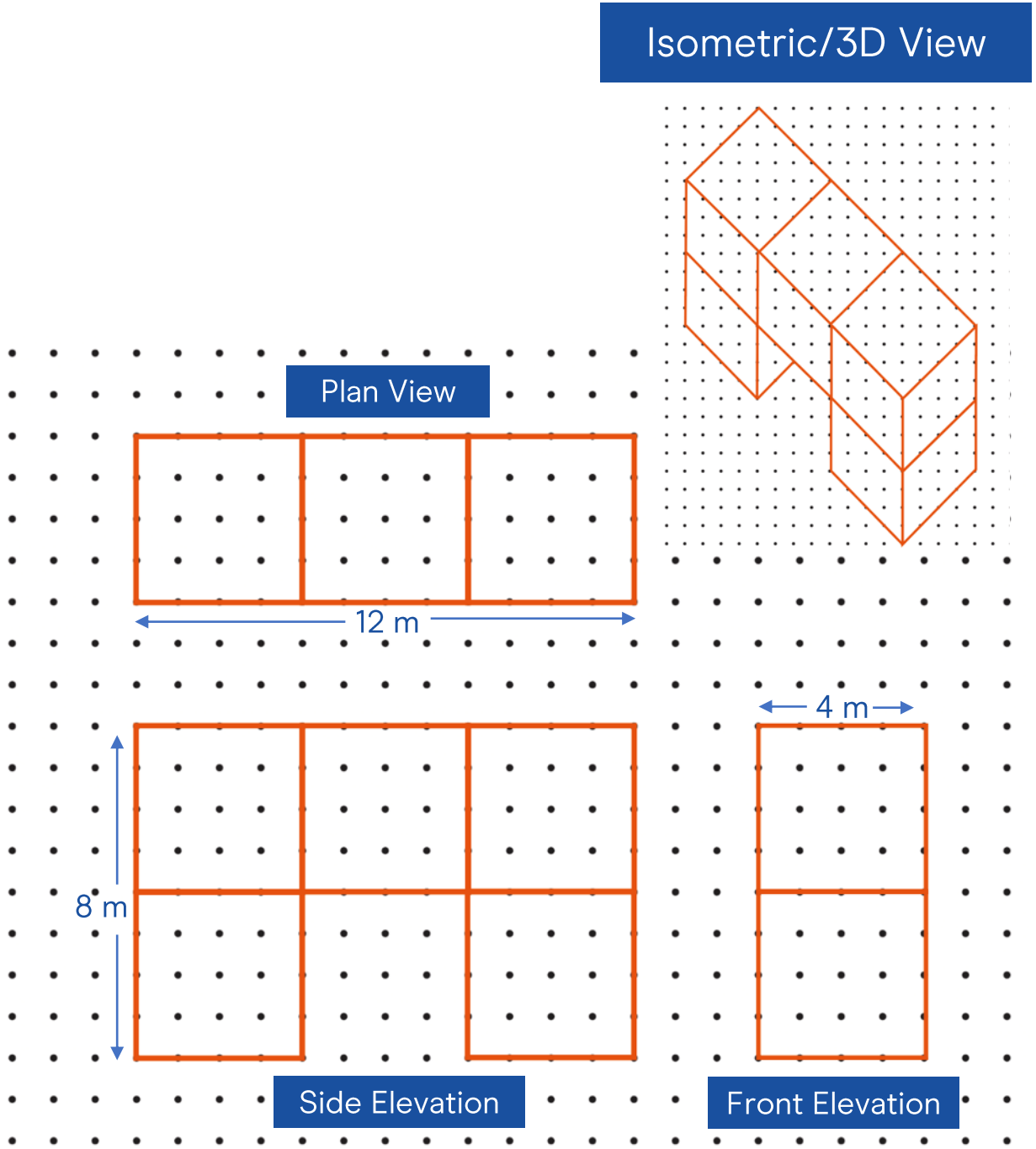
Answers:

1. **SURFACE AREA** of the side elevation:

   4m x 4m = 16^2m (surface area of 1 cube)
   16^2m x 5 = 80^2m (surface area of side elevation)

2. **VOLUME** of the entire object:

   4m x 4m x 4m = 64^3m (volume of 1 cube)
   64^3m x 5 = 320^3m (volume of entire object)



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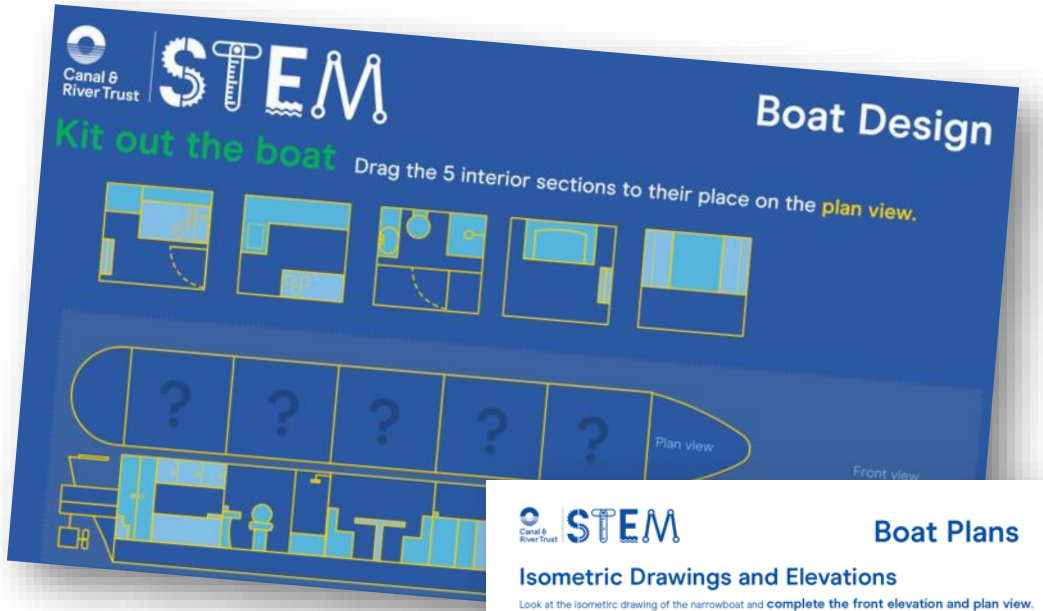

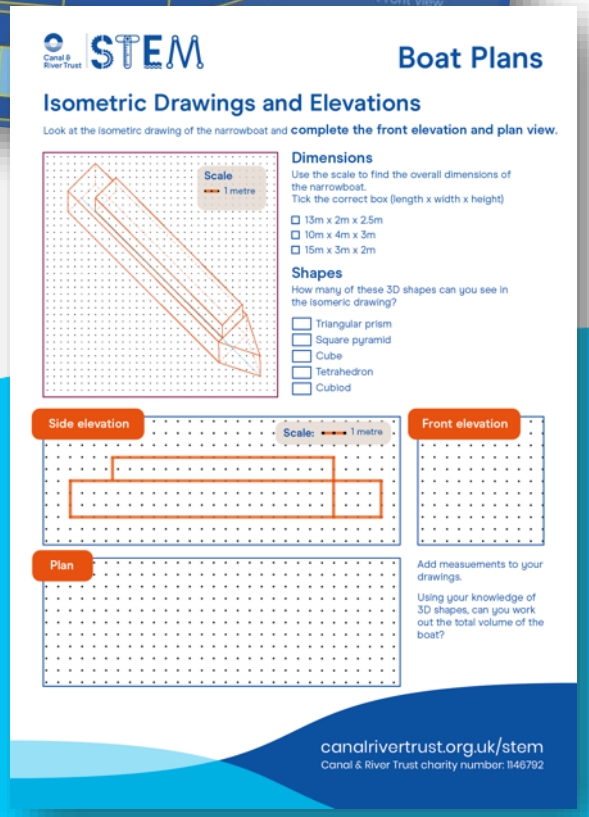

Good work! Find more activities at:

canalrivertrust.org.uk/stem