

Hut building

Purpose:

The purpose of this activity is to engage students in relating two dimensional projections to a three dimensional perspective in the context of a scale and unit conversion measurement problem.

Achievement Objectives:

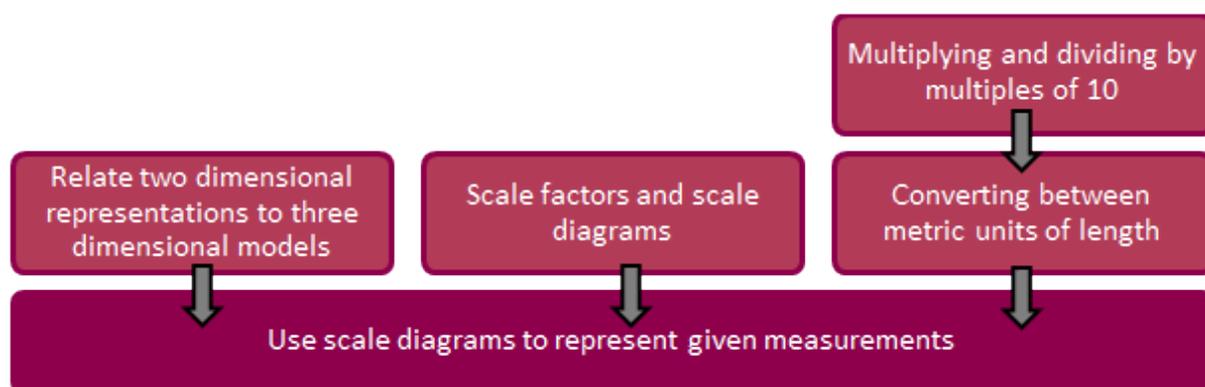
GM4-1: Use appropriate scales, devices, and metric units for length, area, volume and capacity, weight (mass), temperature, angle, and time.

GM4-2: Convert between metric units, using whole numbers and commonly used decimals.

GM4-6: Relate three-dimensional models to two-dimensional representations, and vice versa.

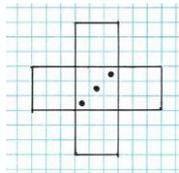
Description of mathematics:

The background knowledge and skills that need to be established before and/or during this activity are outlined in the diagram below:



Relate two dimensional representations to three dimensional models

Fill in the missing dots on the four sides surrounding the 'three' of a standard die.



Scale factors and scale diagrams

If a 25 m high structure is being drawn to a scale of 1:500, how high will it be drawn?

Multiplying and dividing by multiples of 10

Find one thousandth of 23.4

Converting between metric units of length

Convert 24.5 mm into m.

Use scale diagrams to represent given measurements

A 45 cm x 60 cm rectangle is lying on its long side. Draw this rectangle to a 1:5 scale.

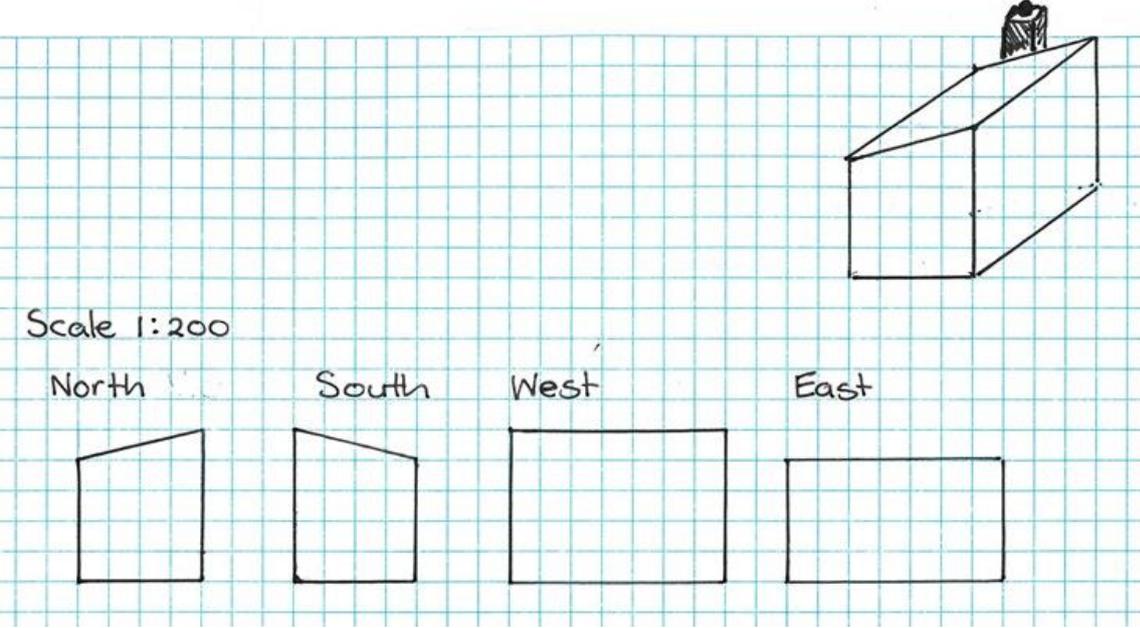
This activity may be carried out with step by step guidance, or by allowing the student to follow their own method of solution. The approach should be chosen in sympathy with students' skills and depth of understanding.

Activity:

A hut is to be built with a single pitch roof. The plans below show the main structure of the hut, but needs a chimney to be added with the following specifications.

- The top of the chimney must be 500 mm above the top of the roof.
- The chimney will be attached to the centre of the outside of the South wall.
- The base of the chimney is to be 1m wide by 50 cm deep.

Note: Each of the squares on the paper are 5 mm x 5 mm.

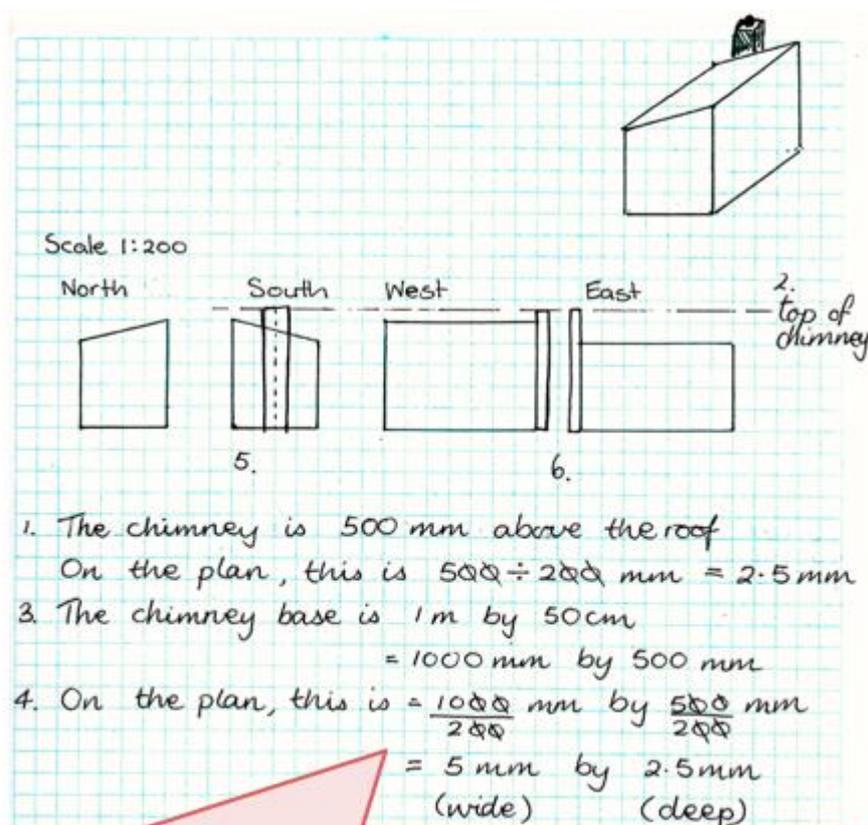


The procedural approach

The student is able to follow a procedure in order to make the specified changes to two dimensional plans, consistent with the three dimensional perspective and the measurements given in a range of units.

Prompts from the teacher could be:

1. On the plans, how much higher will the chimney be than the top of the roof? (You will need to use the scale to calculate this.)
2. On the plans, of the hut, mark a horizontal construction line to show where the top of the chimney will be.
3. Convert the dimensions on the base to the same units as that chimney's height above the roofline.
4. Use the scale (1:200) to work out the dimensions of the base of the chimney on the plans.
5. Show the chimney on the South view of the plans.
6. Show the chimney on the West and East views of the plans.



T: I'm interested in how you calculated the scaled lengths for the plans.

S: Well if 1 plan mm is 200 real mm then the plan is one two hundredth of real life, so I just divided everything by 200.

T: And you've worked mainly in mm?

S: Well I like cm better. I understand them. But the squares are too small so mm are better here.

The conceptual approach

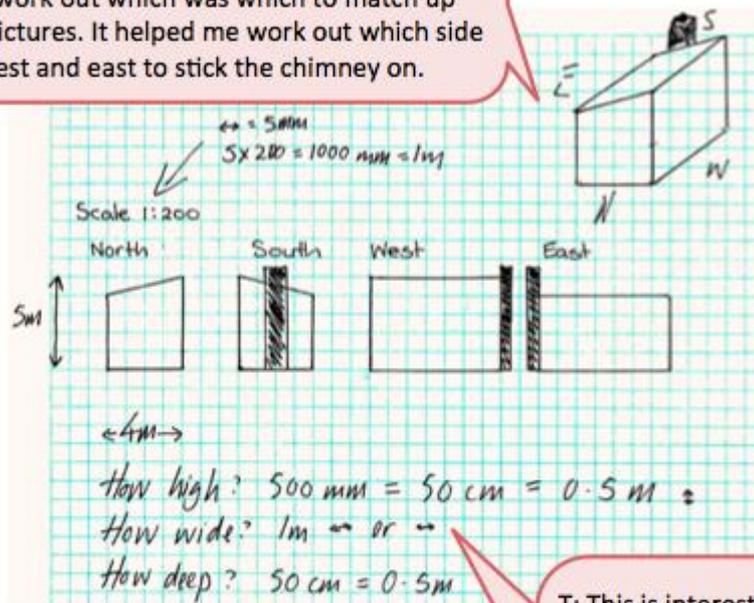
The student is able to make the specified changes to two dimensional plans, consistent with the three dimensional perspective and the measurements given in a range of units.

Prompts from the teacher could be:

1. Consider what is meant by the scale 1:200. Are the squares on the paper a useful size?
2. What will the chimney look like on each of the North, East, South and West views?
3. What length will each of the chimney's specifications be on the plans?

T: I like how you've labelled the perspective drawing with N S E W.

S: I had to work out which was which to match up the 2D pictures. It helped me work out which side of the west and east to stick the chimney on.



T: This is interesting how you've shown 1m as a number or a line.

S: The line is in scale with each square being 1m, but on my south drawing I had to have the middle on a line so I've gone out half a square each side.