

Walk the line

Purpose:

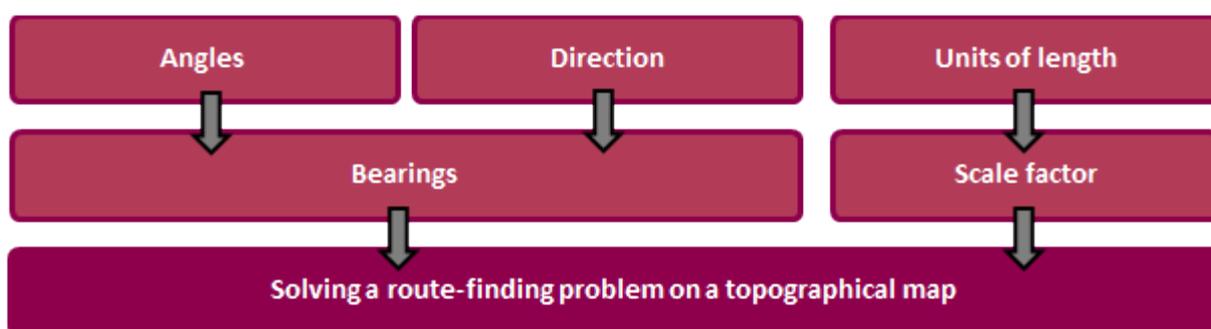
The purpose of this multi-level task is to engage students in using grid references as co-ordinates on a plane along with scales and bearings to solve a problem.

Achievement Objectives:

GM5-8: Interpret points and lines on co-ordinate planes, including scales and bearings on maps.

Description of mathematics:

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



This task may be solved using only practical measurements of lengths and angles, or by using trigonometry to resolve the co-ordinates of a vector. The approach should be chosen in sympathy with their skills and depth of understanding.

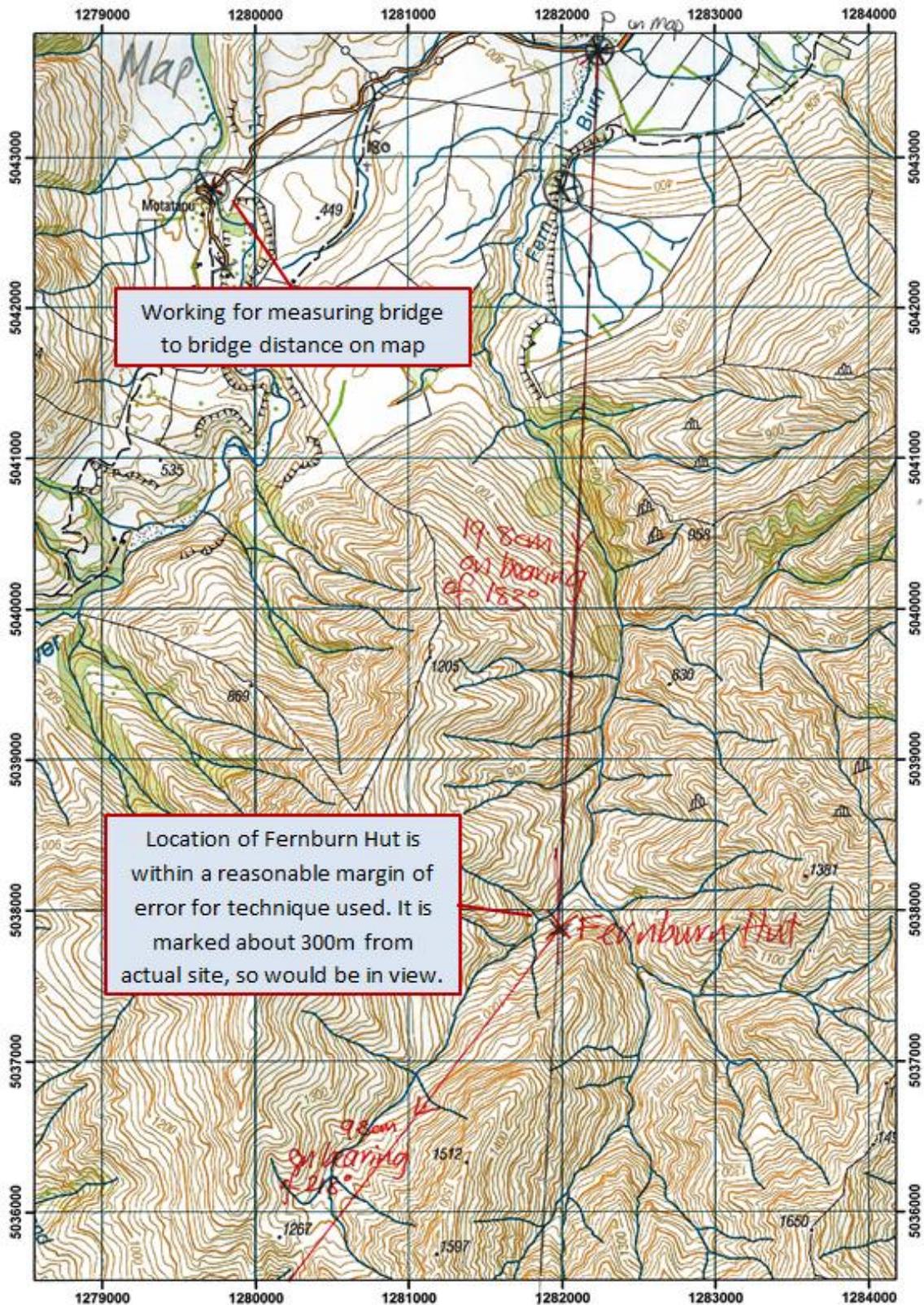
Activity:

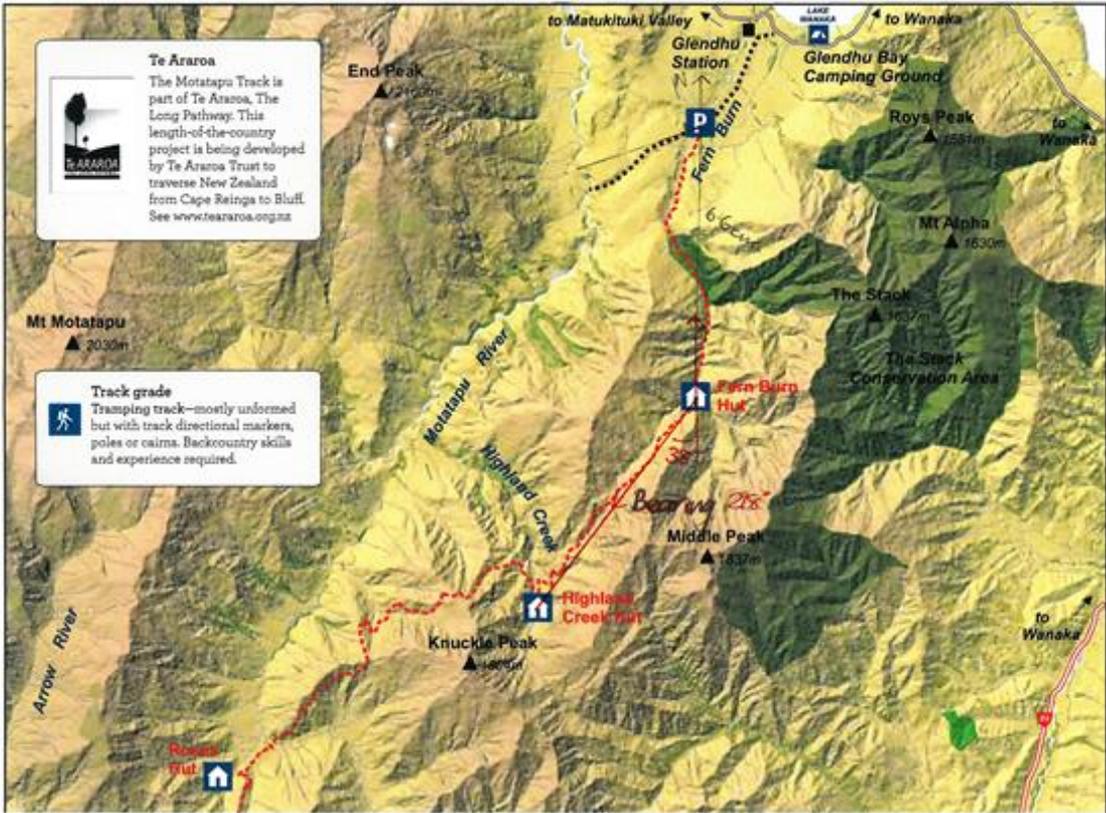
Task: A group of outdoors enthusiasts are planning to walk the Motatapu track.

The track is clearly marked on the Department of Conservation guide, but does not appear on the topographical map. They have been advised that, while the terrain is relatively open, the track is not clearly marked between Fern Burn Hut and Highland Creek Hut.



Mark the route that follows these bearings, on the map and work out how much further the group will have to walk than is visible on the map, to get to the second hut.





The conceptual approach

The student is able work with measurements and calculations of co-ordinates, to solve a problem involving maps, bearings and displacement.

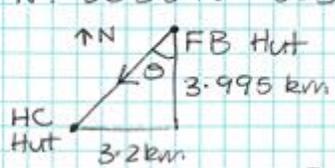
Prompts from the teacher could be:

1. Use the grid references given below, to mark Fern Burn Hut on the map. Fern Burn Hut: Topo50, E1282089, N5038118 Highland Creek Hut: Topo50, E1278889, N5034123
2. Using, the grid references, find the bearing and distance to cover from Fern Burn Hut to Highland Creek Hut. Mark this displacement vector on the map.
3. Find how far will the group still have to go when they 'walk off the map'?

1. Fernburn Hut on the map:

$$0.089 \times 3.4 \text{ cm} = 0.32 \text{ cm} \quad \text{So E1282000 and 0.3cm}$$
$$0.118 \times 3.4 \text{ cm} = 0.4 \text{ cm} \quad \text{So N 5038000 and 0.4cm}$$

2. To Highland Creek Hut Using Grid References

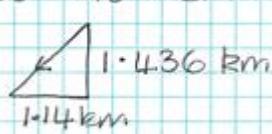
$$E: 1282089 - 1278889 = 3200 \text{ m}, 3.2 \text{ km}$$
$$N: 5038118 - 5034123 = 3995 \text{ m}, 3.995 \text{ km}$$

$$\tan \theta = \frac{3.2}{3.995}$$
$$\theta = 38.7 \rightarrow 39^\circ$$

Bearing $180 + 39 = 219^\circ$

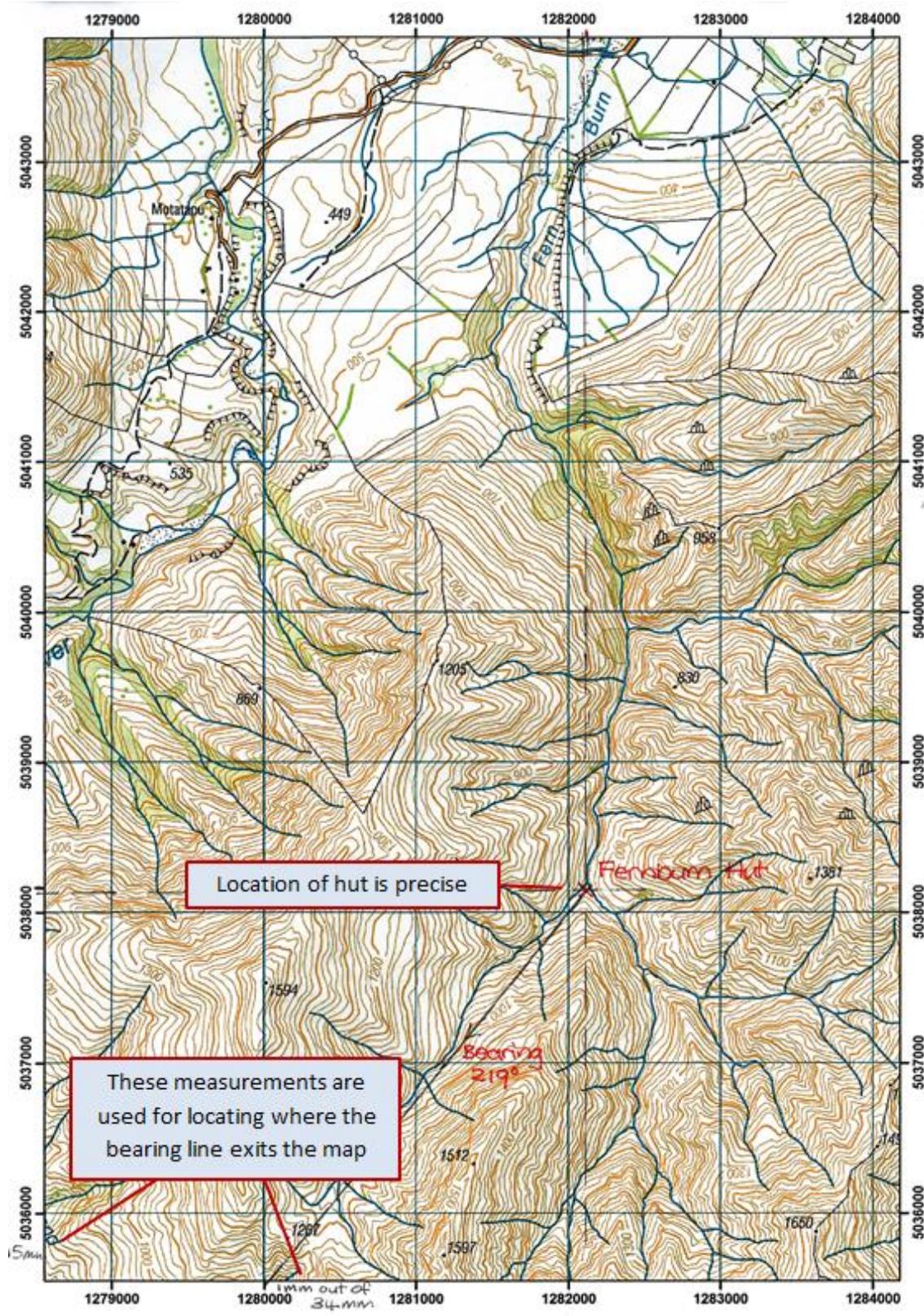
3 Comes out on Map at

$$E: 1280000 + \frac{1}{34} \times 1000 = 1280029 \quad (-1278889 = 1140)$$
$$N: 503559 - \frac{15}{34} \times 1000 = 503559 \quad (-5034123 = 1436)$$

How far is this from the hut?


$$\sqrt{(1.436)^2 + (1.14)^2} = 1.8 \text{ km from hut}$$

(Might not see it from there).
Keep walking on same bearing!



Location of hut is precise

These measurements are used for locating where the bearing line exits the map

Bearing 219°

1mm out of 34mm