

### Lesson Plan : Activity 3

#### Brief

To be able to locate different minerals and resources on Mars, using the radar stations to establish their exact coordinates. To be able to calculate distances and read bearings.

#### Objectives

- To be able to accurately locate a resource based on the information given from up to three radar stations.
- To be able to calculate distances and bearings in order to find exact locations.
- To be able to enter coordinates correctly.

#### Learning outcomes

To complete all the questions in the activity accurately and in the quickest time possible to achieve the highest score available.

#### Ability level and national curriculum links

Please refer to the teacher's notes for more detail on areas of the national curriculum which may be addressed using this activity.

With guidance and an introduction to the topic, this can be completed by a pupil of ability level 4 or 5. For more able students, give limited guidance or pose questions about strategy and reasoning behind placement of radar stations, or if/why they needed to use the protractor/circular ruler aids.

Each stage of the activity has a supporting worksheet and set of PowerPoint slides, both of which are described in the teacher's notes.

#### Introduction to topic

Show basic examples on the board prior to starting this task, i.e. plotting coordinates in the first quadrant. Explain that the  $X$  axis co-ordinate is always input first, followed by the  $Y$ . Show a couple of examples on the board.

The first stage of the activity requires counting edges, so it is focused on the perimeters of the squares in the coordinate grid. The key point here is that there should be no reversal of direction once a particular path has been chosen. You may want to reinforce the idea of shortest path using the edges of the squares. For example,  $(1,1)$  to  $(1,2)$  is one length. You could go  $(1,1)$  to  $(2,1)$  to  $(2,2)$  to  $(2,1)$ , which would be three lengths but is not the shortest route.

The second stage of the activity requires knowledge of bearings and points of intersection. Talk about bearings and how they relate to degrees in a circle. You may want to reinforce some common directions or

positions on a clock-face. For example East is  $090^\circ$ , 10 o'clock is  $300^\circ$ , etc. Clocks can also help reinforce measuring clockwise from North (or 12 o'clock).

Use the Supporting Worksheet activity to show a compass with bearings marked on it. Talk about how the compass always points north and demonstrate how to use a protractor.

You will also need to show how to work out a location based on the distances to three separate landmarks. Within the activity there is a grid of scale 1 square = 100km. Students will be asked to place the radar stations on the grid and will be told how far away it is from the resource. They can then use the circular ruler and mark off possible positions. The distance will represent the radius of a circle with the current station at its centre. Students must then place another station on the map and observe the distance given for this station; they can then discard points from the first station if they do not satisfy the second station, and so on until they are only left with one possible position.

The circular ruler only goes out to a radius of 500km, so placing a radar station at (10,0), for example, may result in a distance of 835.86km, which cannot be measured using the circular ruler. Students may need guidance with this, particularly at level 4.

### Examples

Please see the Supporting Worksheets and refer to the Teacher's Notes for this activity.

### Differentiation

There is a hint button available for struggling students which will provide example sums and tips.

The task is differentiated by the score students will earn for their performance. They may revisit the activities as many times as desired to improve their score, but the questions will be different every time to prevent them from memorising answers.

You may want to ask students higher up on the leaderboard to discuss strategies and approaches, to encourage Ma1 communication and reasoning skills and to assist those who are struggling.

### Timing

This task should take around 10 minutes to complete. If students are to look at the method first and complete the supporting worksheets it will take longer. Students may also want to try the task a few times in order to improve their score. We would therefore allow around 30-40 minutes for completion.

### Resources

- Paper (for working out)
- Calculator
- Supporting worksheets (if needed), together with rulers, compasses, protractors and pairs of compasses
- PowerPoint slides for introducing the topic (if needed)