

## PHYSICS

### OMEGA SECTOR

#### Brief summary of activity:

For this puzzle the user has to launch a spaceship and dock it with a space station, taking into account the effect of gravity. The user chooses the speed and direction of the spaceship, but once launched only gravity will steer the ship.

#### Specific Curriculum Area:

**Year 9** — Unit 9J: Gravity and space, Section 1: What is gravity? Section 6: a. What keeps the planets and satellites in orbit? Section 7: b. What keeps the planets and satellites in orbit?

#### Assessment method:

Teacher observation.

#### Differentiation:

There is no obvious area of differentiation within this task except for the increasing difficulty when levels are completed.

#### Learning objectives:

Children should learn: that gravity is an attractive force which acts on the Earth towards the centre of the planet, that gravity is an attractive force between objects with mass, about how the idea of gravity was related to empirical observations; that the Sun is massive and exerts a very large gravitational force, which keeps planets in orbit; to relate the model of circular motion to data on the orbits of planets and satellites; that the Moon is a natural satellite of the Earth, whose orbit is maintained by the Earth's gravitational pull.

#### Use of Activity in a lesson:

This task could be set as a homework activity, assuming Internet access is possible. Alternatively, the teacher could demonstrate the task to the class (via an Interactive Whiteboard).

#### Hints and tips for teachers:

1. Tell pupils not to get frustrated if they do not succeed until having had many attempts—encourage trial and error.
2. At higher levels the planets shoot at the spaceship—so you must be aware of this!
3. Pupils having difficulty should keep the 'trail lines' visible so that they can see where their previous attempts have gone wrong.

URL:

The screenshot shows a space simulation game interface. On the left is a 'Velocity Vector' panel with a grid and a vector arrow. The 'Current Velocity' is displayed as 41 km/s. Below this is a 'Launch' button and instructions: 'Position the velocity vector, then click on "Start" to launch the ship'. At the bottom of the panel are 'Level: 1', a 'Sound' checkbox, and an 'Instructions' button. The main game area on the right shows a spaceship at the top left, a target space station at the bottom center, and two planets (blue and orange) in the background. A 'Clear Trails' button is at the bottom right. Annotations with arrows point to various elements: 'The Spaceship starts here' points to the spaceship; 'The "Velocity Vector" - GRABBING and ROTATING this will determine the SPEED and DIRECTION of the spaceship.' points to the velocity vector panel; 'Current velocity is displayed here.' points to the 'Current Velocity: 41 km/s' text; 'Click here to LAUNCH the spaceship.' points to the 'Launch' button; 'This is the target spacestation that the spaceship has to dock with.' points to the target space station; 'The "trail" lines can be reset by clicking here.' points to the 'Clear Trails' button. A second screenshot below shows the same interface after the spaceship has been launched, with a white trail line indicating its path. Annotations for this screenshot: 'Direction and speed have been chosen.' points to the velocity vector panel; 'Trail indicates path of the spaceship.' points to the white trail line.

The Spaceship starts here

The 'Velocity Vector' - GRABBING and ROTATING this will determine the SPEED and DIRECTION of the spaceship.

Current velocity is displayed here.

Click here to LAUNCH the spaceship.

This is the target spacestation that the spaceship has to dock with.

The 'trail' lines can be reset by clicking here.

Direction and speed have been chosen.

'Trail' indicates path of the spaceship.

### Troubleshooting:

If you cannot change the direction or speed of the spaceship, ROTATE the 'Velocity Vector' to determine the direction, and DRAG the 'Velocity Vector' to determine speed. Then click 'LAUNCH'.

### Other links:

[http://www.standards.dfes.gov.uk/schemes2/secondary\\_science/sci09j/09jq1](http://www.standards.dfes.gov.uk/schemes2/secondary_science/sci09j/09jq1)  
[http://www.standards.dfes.gov.uk/schemes2/secondary\\_science/sci09j/09jq5a](http://www.standards.dfes.gov.uk/schemes2/secondary_science/sci09j/09jq5a)  
[http://www.standards.dfes.gov.uk/schemes2/secondary\\_science/sci09j/09jq5b](http://www.standards.dfes.gov.uk/schemes2/secondary_science/sci09j/09jq5b)