

## Ferries: Acting Forces

### Speeding across the Solent!

#### Student Introduction

- ▶ This activity is all about understanding forces in relation to ferries, and how they change throughout the phases of your ferry journey.
- ▶ You will also observe how friction affects vessels of different types.



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Look at the following [www.edudest.uk](http://www.edudest.uk)

This force diagram shows the forces acting on the Red Funnel vehicle ferry.

The ferry is floating because:

- ✓ The two forces acting upon it are the same size
- ✓ They are acting in opposite directions
- ✓ They are **balanced**.

**Balanced** forces cause an object to remain still or continue to move at the same speed in the same direction. This is **Newton's First Law of Motion**.



**Add force arrows to this picture** to show the ferry moving at the same speed in the same direction.

Label your force arrows:

1. Thrust from the propellers
2. Air resistance
3. Friction (from the water)

In the five boxes below, draw a storyboard of force diagrams to represent the journey of your Red Funnel ferry.

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On each diagram include three force arrows: Thrust, Air Resistance and Friction.

Don't forget to change the length of the arrows to represent the difference in force!

A. Ferry stationary at the ferry terminal dock.

Forces are **BALANCED**.



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C. Ferry travelling at a constant speed.

Forces are \_\_\_\_\_.



D. Ferry decelerating into the ferry terminal dock.

Forces are \_\_\_\_\_.



E. Ferry stationary at the ferry terminal dock.

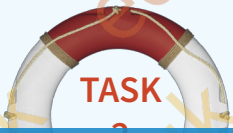
Forces are \_\_\_\_\_.



Draw a force diagram to show a Red Funnel vehicle ferry moving **backwards**.

Label your force arrows.

Don't forget to change the length of the arrow to represent the difference in force.



## BACK AT SCHOOL - HULL DESIGN CHALLENGE

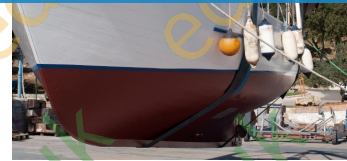
The hull of a boat or ship needs to move through the water with as little friction as possible. At school you will investigate how the movement of a boat is affected by the

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- ▶ Research different shapes of hull
- ▶ Plan how you will model different hull designs
- ▶ Plan an investigation - remember to control the variables to ensure a fair test
- ▶ What will be your independent variable?
- ▶ What will be your dependent variable?
- ▶ How will you make your results more reliable?
- ▶ Draw a table for your results!

**Not sure what to do?** You could...

- ✓ Try making models of the different shapes using modelling clay
- ✓ Fill a large measuring cylinder with wallpaper paste
- ✓ Tie a length of thread (longer than the measuring cylinder) around your model to help you retrieve it
- ✓ Time how long it takes each shape to travel down the measuring cylinder.

