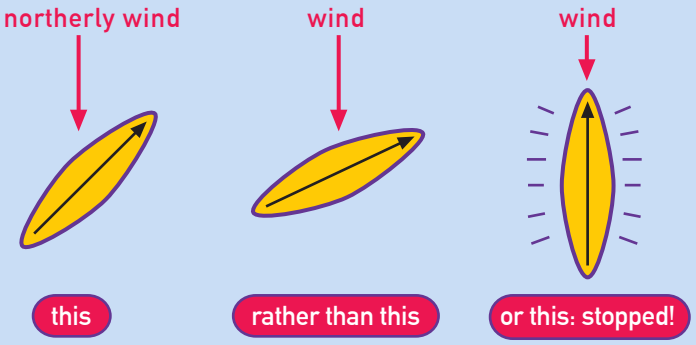
Sailing with Maths

You need ☑ a protractor ☑ a calculator (optional) ☑ square grid paper ☑ a ruler ☑ a sharp pencil

This activity gives you some idea of the mathematical calculations involved in sailing in races such as the America's Cup.

When NZL60 is sailing to windward, it is heading at the closest angle to the wind that it can.
If the yacht tried to sail at a tighter angle, it would eventually stop dead in its tracks. That is why tacking is used.



Nautical terms you will need:

- **buoys:** anchored markers
- **legs (of the race):** the distance from the start/finish line to the A or B buoy or from one buoy to the other
- **port:** the left side of the course according to the way the yacht is facing
- **starboard:** the right side of the course according to the way the yacht is facing
- **windward:** the side that the wind is blowing towards
- **downwind:** in the direction in which the wind is blowing
- **rhumb line (pronounced "rum"):** the shortest distance between the buoys on the course
- **tacking:** zigzag manoeuvres

Activity

To join NZL60 on its training run, you need to know that a knot is a measure of boat speed: 1 knot is 1 nautical mile (1 852 metres) per hour.

1. The diagram on page 19 shows the America's Cup 2000 course. The race had six legs. Use the measurements on the diagram to work out the total length of the course in metres. (This does not include tacking or rounding the buoys.)

2. If NZL60 travelled in a straight line at an average speed of 7 knots, how far would it go in 5 minutes? (Give your answer in metres.)

3. On your square grid paper, use a scale of 60 millimetres : 1 852 metres (1 nautical mile). Mark the following on your page:
   - ☆ the A and B buoys
   - ☆ the start and finish line
   - ☆ the committee boat
   - ☆ the rhumb line.

   Now draw an arrow at the top to show the wind coming directly from the north (down the page).

4. Plot NZL60's first training leg by following these instructions and drawing the yacht's journey on your grid paper.

   a. Start where the committee boat touches the start line. Draw NZL60's first tack out to the port side of the course at 45 degrees to the rhumb line for 926 metres.

   b. Turn 90 degrees to starboard and sail for 1 852 metres.

   c. Design a path into the wind that will take NZL60 to A buoy, making sure that each turn (to port or starboard) is 90 degrees.
   Compare your course with a classmate's.

5. Leg 2 is downwind. Discuss with a classmate how this would affect speed and tacking.