

Tsunami (or Tidal Wave)

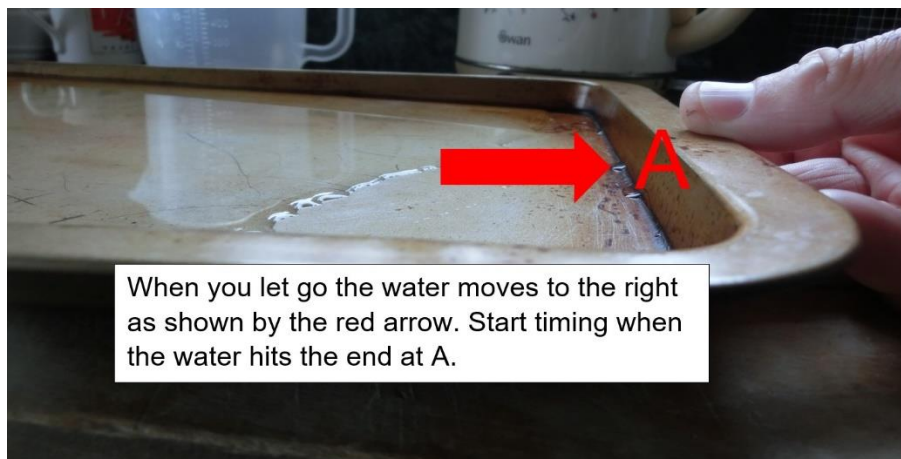
On December 26, 2004, an **earthquake** spawned a massive tsunami that hit 14 countries. Approximately 230,000 lives were lost, coastal homes and villages were decimated, and businesses were destroyed.



This image shows one of the waves in the 2004 Indian Ocean tsunami hitting the shore in Thailand. Note the size of the person on the beach. The photographer of this picture died. (www.andaman.org, 2004.)

Events such as earthquakes and landslides release a colossal amount of **energy** that is transferred to the surrounding water. An ocean wave is not moving water, but energy that is passing through water. In deep water, a tsunami's energy is mostly located below the sea surface and the wave height is just a couple of metres. This is why ships on the open ocean usually don't move much when a tsunami passes. In deep water tsunamis can travel at over 500mph. When the tsunami moves into shallower water it slows down. The wave catches up with itself and grows taller, the 2004 Indian Ocean tsunami grew to 30 m high in places.

MAKE YOUR OWN WAVE AND INVESTIGATE HOW DEPTH AFFECTS SPEED



When you let go the water moves to the right as shown by the red arrow. Start timing when the water hits the end at A.

COMPETITION:

Who can determine the value of g most accurately? The given value is 9.81 m s^{-2} .

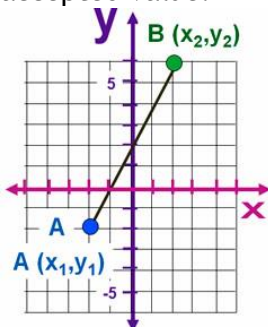
METHOD:

- Put water in tray and measure depth (1.0 cm)
- Lift end of tray and drop to generate a wave
- Determine speed of the wave (you may want to record several lengths as the wave reflects back and forth)
- Repeat for different depths

Depth/m	Distance/m	Time/s			Mean Time/s	Velocity/ ms^{-1}	Velocity squared/ ms^{-2}
		1	2	3			
0.01							
0.02							
0.03							
0.04							
0.05							

Analysis

1. Draw a graph of v^2 (y-axis) against depth (x-axis).
2. Determine the gradient of the line drawn (you should have straight line).
3. Your gradient should equal g ($= 9.81 \text{ m s}^{-2}$).
4. Calculate the difference between your value and the accepted value.



To find the GRADIENT between two points:
Point A and Point B

The Gradient "m" is:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta Y}{\Delta X}$$

Δ means "change in"

$$v = \sqrt{gd} \quad \text{a}$$

$$v^2 = gd$$

$$y = mx + c$$

