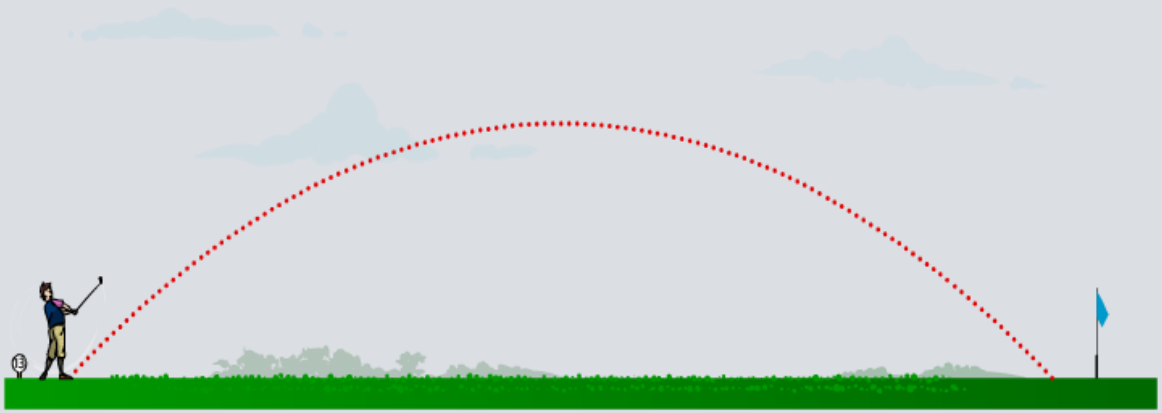
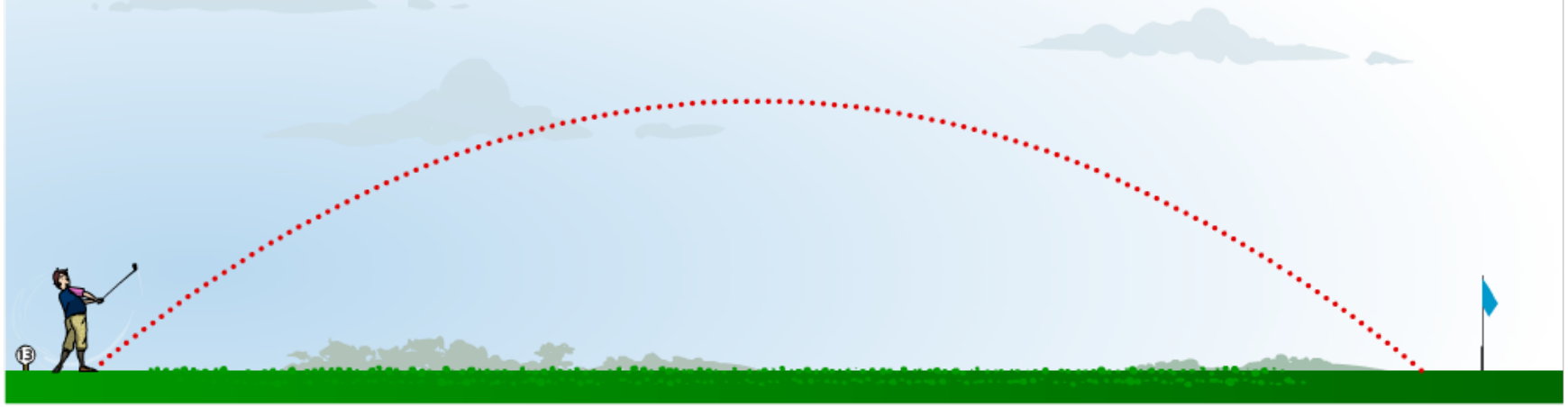
Projectiles



Describing parabolic motion

What are some of the terms that are used to describe projectile motion?

- A **trajectory** is the path of any moving object.
- A **parabola** is the name given to the shape of the curve a projectile follows when gravity is the only force acting on it.
- A **projectile** is an object that is given an initial force, then allowed to move freely through space.



Forces on a projectile

What are the two forces that act on a freely moving projectile?

Air resistance and **gravity**.

Depending on the shape and density of an object, it is often possible to ignore the effects of air resistance.

This reduces the forces on the object to one constant force in a constant direction, giving:

- constant horizontal velocity
- constant vertical acceleration.

Horizontal motion is therefore very simple, and vertical motion can be solved with the **constant acceleration equations**.

When is a trajectory a parabola?

When gravity is the only force acting on a projectile, it follows a **parabolic trajectory**. Some projectiles are affected by other forces such as air resistance, and do not follow a parabolic trajectory.

Click "**start**" to see how much you know.

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Understanding projectile motion

What are the missing words about projectile motion?

1. An object that is allowed to move freely through the air after an initial force is called a [?].

2. The path of a moving object is called a [?].

3. The downwards force on all objects moving through the air is called [?].

4a. When studying projectile motion, it is useful to assume that [?] is zero, to make

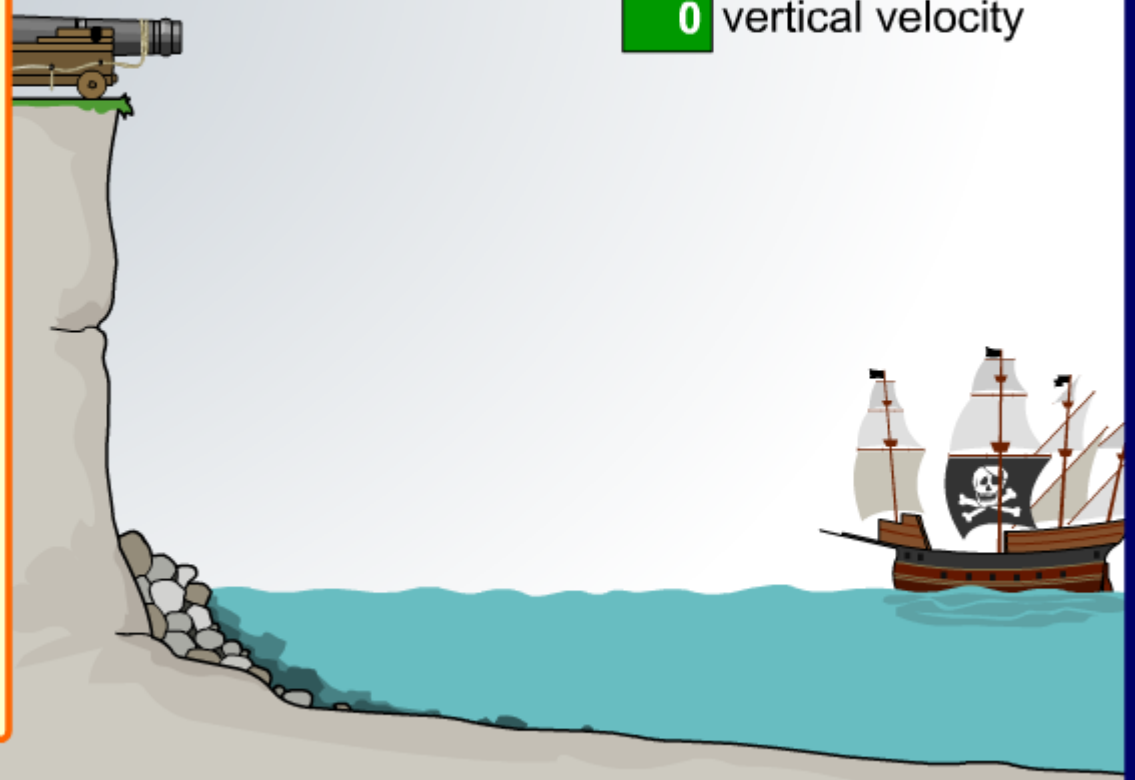
solve

Forces on a projectile

What is parabolic motion?

A cannon is set at the top of a cliff. A cannonball is fired towards a ship in the water below.

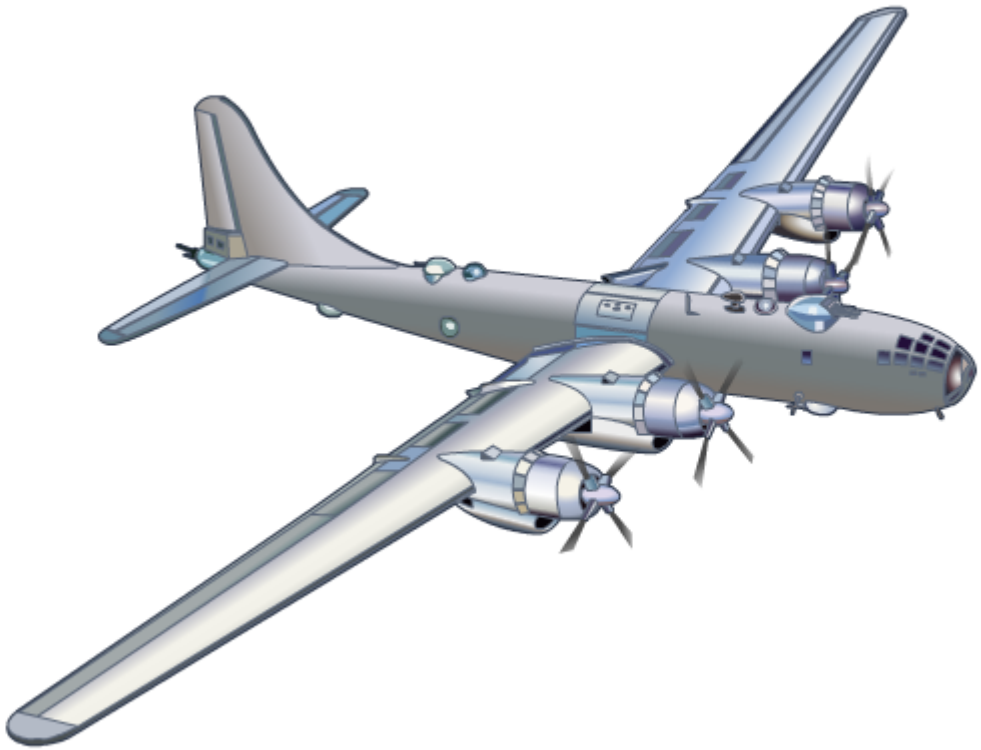
Click "**play**" to find out what happens to the cannonball after it leaves the cannon.



Horizontal and vertical motion under gravity

Parabolic motion seems complex, but it can be simplified by separating it into **horizontal** and **vertical components**.

Click "**start**" to find out more.



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Solving projectile motion

How should you go about solving a problem involving projectile motion? Split the problem into two parts:

Horizontal motion at constant velocity:

- Use the equation, ***speed = distance / time*** (equation 1).

Vertical motion under constant acceleration:

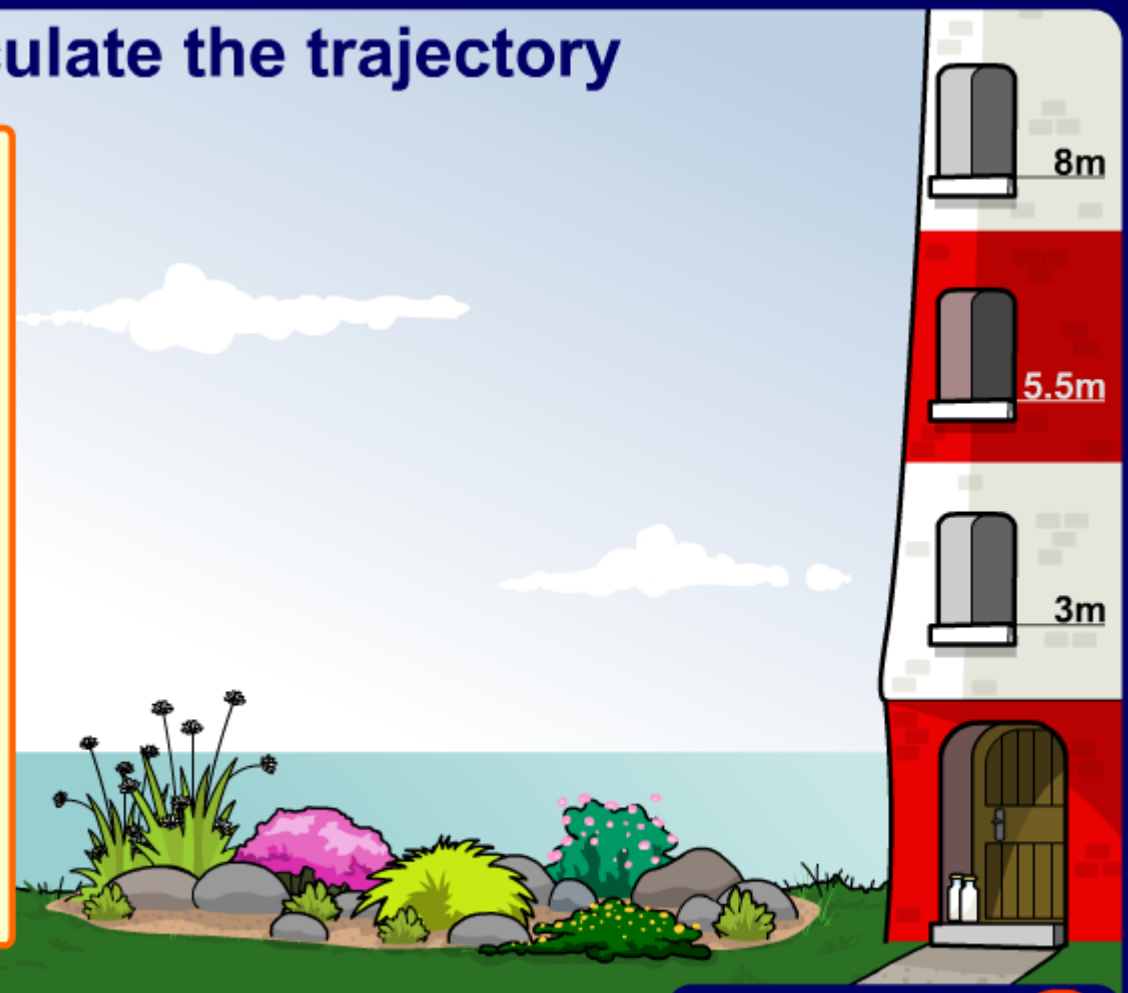
- As always, start by writing down what you already know about *u*, *v*, *a*, *s* and *t*.
- Choose a constant acceleration equation (equation 2).

The order you use these two equations in will depend on the nature of the problem. Start by writing down everything you know, and the rest should follow!

Projectile calculations

Calculate the trajectory

Bill lives in a lighthouse with his cat Trevor. He is very proud of his rockery, but Trevor keeps digging it up! Bill decides to buy a waterbomb launcher to protect his plants. Click "**start**" to help Bill to use it properly.



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