



# Centrifugal and Centripetal Force

This worksheet introduces centrifugal and centripetal force with practical activities, follow up questions and real life examples.

## Learning Objectives:

- To understand that forces apply to a spinning object which 'pull' material to the outside.
- To learn that weight and speed affect centrifugal force.
- To practice using and understanding the terms centrifugal/centripetal.
- To understand why centrifugal force can cause a challenge for engineers, especially in BLOODHOUND SSC, but can also be very useful.

## Key Vocabulary

Force  
Centre of rotation  
Centrifugal  
Centripetal



## Lesson 1

### Spinning Bucket Demonstration

- 1) Why did the water stay in the bucket?
- 2) What would have happened if the bucket had been spun very slowly?
- 3) Can you think of any everyday examples the same forces apply? (Think about the play park.)

### Blu Tack practical

Record your results in the table below:

Action	Did the centrifugal force increase or decrease?
Spin faster	
Spin slower	
More weight	
Less weight	

Extension: Perform the experiment again but this time observe and record the shape of the blu tack at the beginning and end of the experiment. Did the blu tack change shape? If so, why? How could you make it change shape more or less?

### Plenary / Extension

Think of a real life example of centrifugal force in action. Draw a diagram of your example and label it to show the direction of the movement of the object and direction of the centrifugal force. Try to think of the most interesting example that you can!

Hint: anything that spins involves these forces.



## Lesson 2 – Centripetal force and real life examples

### Introduction

Fill in the blanks with the most suitable answer from the list of words below.  
(Beware, there are some words there just to trick you!)

Last lesson we performed an experiment where we spun blu tack on a string. We experienced a force on the blu tack which pulled it away from the ..... This force is called ..... force. The faster we spun the blu tack the ..... the force. The force was also affected by the weight of the blu tack used and the force became stronger when the weight was .....

Stronger

Spin

Decreased

Gravity

Weaker

Centre of rotation

Increased

Centrifugal

### Real life examples of centrifugal and centripetal force

#### Example 1:

Hayley designs roller coasters for a theme park and wants to include a loop the loop in her latest creation.

- 1) Draw a loop the loop, with a roller coaster cart at the top of the loop, and draw arrows to represent the direction of the centrifugal and centripetal force.
- 2) The theme park health and safety team think its very important that the roller coaster cart stays on the tracks during the loop. If the cart is going to stay on the tracks, and not fall down, which of the two forces you have drawn must be bigger?
- 3) In order to keep the cart on the track, should the roller coaster be designed to travel slowly or fast?

**Example 2:**

Satellites are used for everything from communication to predicting the weather and there are thousands of them currently in orbit around the earth. The speed that the satellites are moving at is causing some centrifugal force pulling them away from the earth.

- 1) Which force is stopping them from moving away? (Hint: its the same force that brings you back down to the ground after you jump up.)
- 2) What would happen if a satellite suddenly slowed down, decreasing its centrifugal force?

**Example 3:**

The wheels of BLOODHOUND SSC spin roughly 10,000 times each second. This creates a massive amount of centrifugal force which tries to pull the wheel apart (engineers call this 'radial g force').

- 1) Circle the correct property that the engineers of BLOODHOUND SSC looked for when designing the wheels.

Strong / Weak

Heavy / Light

Hard / Soft

Flexible / Rigid

- 2) What material should the BLOODHOUND SSC engineers use to make the wheels? Explain your choice.