



Bounce Engineers

Fair Testing

Background

Athletes and coaches use science and engineering to improve performance and increase their chances of winning. With the constant drive to develop new technologies that will improve equipment and performance, engineers and scientists must always investigate their creation using the **fair test** principle.

In this task you will plan your own fair test to investigate how changing one factor affects the bounce height of balls.

Fair Testing and Variables

When a scientist plans an experiment they need to ensure that it is a fair test.

In order to do this, scientists need to consider all of the factors that may affect the outcome of the test. These factors are called **variables** because they can vary (change) in type, size or amount.

A true fair test changes only one variable at a time; this variable is called the **independent variable**. All other variables should be kept the same; these are called **controlled variables**.

It is only by carrying out a fair test that you can be sure that it is the factor you have changed (**independent variable**) that is affecting what you have measured (**dependent variable**).

Scientists ask these questions when planning a fair test:

- What is being tested? (**aim**)
- What is being changed? (**independent variable**)
 - How is the independent variable being changed?
- What is going to be kept the same? (**controlled variables**)
- What is going to be measured? (**dependent variable**)
 - How is the dependent variable being measured?

Your Task

Ball sports come in all shapes, sizes and materials! They are also played on different surfaces, are made from varying materials and require different ways of propelling (e.g. throwing, kicking and/or hitting).

Your task is to investigate how **one** of the following affects the height a ball bounces:

- The height from which a ball is dropped
- The surface a ball is dropped
- Type of ball

You will design and conduct a fair test at home using items from around the house. You will require at least one type of ball and something to measure with (a tape measure from the toolbox, a measuring tape, a few rulers or measure app on iPhone or iPad).

Identify Variables

In your fair test you will be measuring the **height of a ball bounce** in cm (rounded to nearest mm).

Below is a list of variables (factors) that *could* affect the height of a ball bounce.

- **Force** ball is dropped/bounced with
- **Height** ball is dropped/bounced from
- **Type of ball** bounced (e.g. soccer ball, tennis ball)
- **Surface** ball is bounced on to

1. **Can you think of at least one other factor that could affect the height of a ball bounce?**

2. **Choose **one** of these factors (not force) as your independent variable and explain how you will change it in your fair test?**

Note: you must change your independent variable in at least three ways (three different balls, surfaces or height drops).



3. Complete the variables table.

In a fair test only one variable, the independent variable is changed. This means any other variable that could affect the height of a ball bounce must be a controlled variable.

Table 1: Variables

| I will change: (independent variable) | I will measure: (dependent variable) |
|---|--|
| | |

| I will keep the same: (controlled variables) | |
|--|--|
| Variable | How I will keep the same |
| Force ball is dropped with | Ball will be dropped by opening hand and releasing with no bounce force. |
| How height of ball bounced is measured | |
| | |
| | |
| | |
| | |
| | |



Aim



The aim of any fair test is “To investigate the effect the independent variable has on the dependent variable.” Use the example to help you write the aim for your investigation.

Example:

- Independent Variable: Force of ball bounce
- Dependent Variable: height of ball bounce
- Aim: To investigate the effect of the force a ball is bounced with on the height of the ball bounce.

1. Write an aim for your investigation:

Hypothesis

A hypothesis is a prediction and can be written as an “if...., then....” statement.

“If the dependent variable is changed like this, then the dependent variable will change like this”

Example: If a tennis ball is bounced with more force, it will bounce higher than the same tennis ball bounced with less force.

1. Write the hypothesis for your investigation:

Method

A method is detailed instructions of your investigation. Your materials and method must be clear enough that someone else could read it and repeat your fair test.

Plan and write down the steps you will take to conduct your fair test.

1. List the materials you will use:

2. Write steps you will follow to complete your investigation.



Your steps should make clear:

- How the independent variable was changed.
- How the dependent variable was measured.
- How the controlled variables were kept the same.

3. Draw a labelled diagram or attach a photo of how you will set up the equipment.

Results and Conclusion



1. Conduct your fair test and record your results in Table 2.

Example:

- The purple cells show the independent variable and how it was changed. You can see why force of drop is not a very easy independent variable change (yours will be different to the example).
- The blue cells are measurements of the dependent variable. You must complete three bounces and calculate the average height for each row.

| Force of ball bounce | Bounce Height (cm) | | | |
|----------------------|---------------------|---------|---------|---------|
| | Trial 1 | Trial 2 | Trial 3 | Average |
| Dropped | 5 | 6 | 4 | 5 |
| Some force | | | | |
| Medium force | | | | |
| High Force | | | | |

Table 2: Results

| | Bounce Height (cm) | | | |
|--|---------------------|---------|---------|---------|
| | Trial 1 | Trial 2 | Trial 3 | Average |
| | | | | |
| | | | | |
| | | | | |

1. Use values from your results table to explain whether your hypothesis was supported or not supported.

2. Are there any changes that could have been made to your method to improve the accuracy?

3. What conclusion can you draw from your fair test?

4. Complete the fair testing report flow chart document to communicate your findings.