

# [Experiment of parachute](https://assignbuster.com/experiment-of-parachute/)

We are going to investigate the effect that different weights have on my parachute. We are going to construct a parachute and drop it from an unchanged height with different weights attached to it and record the results.

To make my experiment, my parachute will be constructed from a black bin liner which will be 70cm x 80cm and the string will be 30cm long. I will have a piece of string coming from each corner of the parachute, joining together at the bottom to tie the weight onto. To make my experiment safe I am going to make sure that the area I am working in and dropping the parachute from is free from people and other various objects, which may obstruct the path of the parachute – this would make the test an unfair one. I am going to change the mass of weights attached to the parachute; therefore this will be my dependant Variable – the weights will be from 10-grams to 60-grams. Hence, my Independent Variable will be the vertical height that I drop my parachute from. I will also keep the parachute the same – not change the length of the string or the measurements of the bin liner. I am going to measure the time taken for the parachute to reach the ground from the desired height. Other variables that could be investigated are: The Surface area of the parachute, The Length of string (between the parachute and mass), which might control the volume of air under the parachute. A Distribution of mass, i. e. perhaps on the parachute itself as opposed to on string attached to the parachute (this of course would not be a continuous variable so it would not be of great value).

Prediction I predict that as the mass of the weights increase, the parachute will take a shorter amount of time to reach the ground. I believe this is correct because the force on the parachute is the weight due to gravity. This force makes it accelerate. As the parachute gains speed the force due to air resistance increases. This force acts in an upward direction; the air resistance depends directly on speed. When the parachute opens the force due to the air resistance increases and the parachute’s speed decreases. The two forces are now balanced and are now equal to the weight; the parachute will then be able to travel with terminal velocity. When it reaches the ground there is an upward force from the ground, which balances the weight.

Preliminary Readings I am going to take some preliminary readings to help me decide what height I am going to drop the parachute from. I will drop the parachute from 3 different heights: 1 metre, 2 metres and 3 metres. I will attach a 30-gram weight to the parachute (the average mass of my weights) and record the results.

Height

Mass

Time

1 metre

30 grams

1. 34 seconds

2 metre

30 grams

1. 22 seconds

3 metre

30 grams

1. 08 seconds

From the preliminary readings and the experience of the experiment I have chose the height of 2metres. This is because with 1 metre I believe the parachute does not have time to gain its terminal velocity and unfold itself – 3 metres is a hard height to drop the parachute from, I would need more than a bench to stand on to drop the parachute as it is so high I would probably need a ladder. 2 metres is therefore a reasonable height to drop the parachute from.

Method Firstly I will measure 2 metres high from the ground and make a mark so I am dropping the parachute from the same height every time, this is ensuring the test is a fair one. I will construct my parachute from the materials I need and attach the weights to it one by one. I will then drop the parachute and time how long it takes for it to reach the ground. I will do this for the 10 gram weight 20, 30, 40, 50 and finally 60 gram weight, recording the time each time until I have the six readings needed.

Apparatus and Materials Needed

\* Bin liner

\* String

\* Weights (6 x 10g)

\* A Bench to stand on

\* Space and a clear area

\* Metre ruler

\* Stopwatch

\* Pen and Paper

\* Stapler (to staple string at the bottom of the parachute together)

Diagram of Experiment

Table of Results

1.

Mass (g)

Time (s)

Distance

10g

1. 93

2 metres

20g

1. 65

2 metres

30g

1. 42

2 metres

40g

1. 56

2 metres

50g

1. 05

2 metres

60g

0. 97

2 metres

2.

Mass (g)

Time (s)

Distance

10g

1. 95

2 metres

20g

1. 65

2 metres

30g

1. 46

2 metres

40g

1. 23

2 metres

50g

1. 07

2 metres

60g

0. 99

2 metres

3.

Mass (g)

Time (s)

Distance

10g

1. 99

2 metres

20g

1. 62

2 metres

30g

1. 42

2 metres

40g

1. 25

2 metres

50g

1. 04

2 metres

60g

0. 94

2 metres

Average of number 1, 2 and 3.

Mass (g)

Time (s)

Distance

10g

1. 96

2 metres

20g

1. 64

2 metres

30g

1. 43

2 metres

40g

1. 44

2 metres

50g

1. 05

2 metres

60g

0. 97

2 metres

Conclusion From studying the graph I have found that when the mass pulling the parachute increases the time it takes to reach the ground decreases, therefore making my prediction correct. I will use experiment Number 1 as an example of this:

At 10g the time taken for the parachute to reach the floor was 1. 9 seconds.

At 60g the time taken for the parachute to reach the floor was 0. 9 seconds.

This shows that the increase in the amount of mass there is – makes the amount of time taken decrease.

I believe that there does seem to be a pattern in my results. The time taken for the parachute to reach the ground decreases by approximately 0. 2 – 0. 3 seconds with every 10g weight that I add. Although this does not count for 40g in Experiment number 1 as I am obliged to believe this is an anomalous result. My graph also produces a strong but small arc, which may indicate that the parachute was travelling with terminal velocity. The arc would be perfect if it was not for my 40g result which is not in the 0. 2 – 0. 3s region like the rest of my results, instead of decreasing by approximately 0. 2 – 0. 3 seconds the time increases by 0. 14s, therefore this must be counted as an anomalous result.

Therefore everything in my prediction was correct-

o Force on Parachute is weight due to gravity

o Parachute accelerates

o Parachute gains speed, force because of air resistance increases

o The force acts in an upward direction

o Air resistance depends on speed

o When parachute opens, force due to air resistance increases and parachute decreases

o Forces then balance – air resistance equal to mass

o Parachute travels with terminal velocity

o Reaches ground, upward force from ground which balances the weight

I am now going to calculate the velocity that my parachute was travelling for all of the drops and then calculate the velocity of the whole experiment over all.

Weight (N)

Time (s)

Distance

Velocity (m/s)

10g

1. 93

2

1. 02

20g

1. 65

2

1. 22

30g

1. 42

2

1. 40

40g

1. 56

2

1. 39

50g

1. 05

2

1. 90

60g

0. 97

2

2. 06

Therefore the average velocity for the experiment as a whole would be:

1. 40m/s

Evaluation I believe that my experiment did go well and was carried out in a sensible and fair way. Except for my anomalous result I believe that my experiment was a success as I gained a good set of results that appeared to have a small pattern. My results were as I expected because as the mass of the parachute increased the time taken to reach the ground decreased.

If I did the experiment again I would carry it out in a room with a high ceiling – like a hall. This would ensure the parachute had time to unfold, accelerate and gain terminal velocity making the experiment more accurate and precise. I could also maybe use different materials to make the parachute, like tissue paper instead of bin liner and cotton instead of string. If I did this, my results would change and I compare them to the data I have now. The 40g experiment was different to the remainder of my results so I am going to fairly say this is an anomalous result. This could have happened because the parachute’s path was obstructed by maybe a pupil or a stool, which would have slowed down the parachute. Another alternative as to why I gained this anomalous result is that maybe at the time we were carrying out the experiment a gust of wind from an open window may have blew the parachute off course or the classroom door was opened which may have created a draft.

Instead of changing the weight on the parachute I could change the surface area of the bin liner and the length of the string I used, this would vary my results and I could then compare the new data with the data I already have.