

The background is a light blue color. It is decorated with several colorful arrows pointing in different directions (red, teal, orange, yellow) and several 3D rectangular blocks in blue and orange. The word "Forces" is written in a large, white, sans-serif font with a subtle drop shadow.

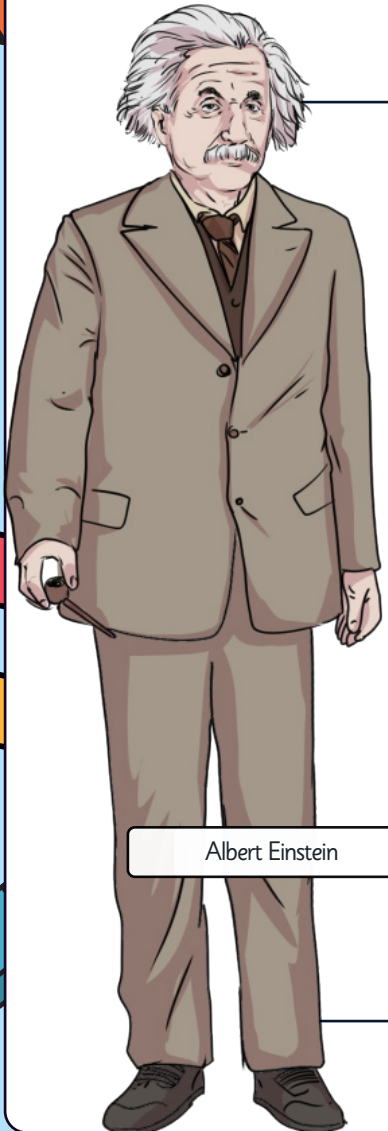
# Forces

**Are there different types of forces?**

**Lesson 2: Do heavier things fall faster?**



# Scientific enquiry types and skills



Albert Einstein

## Scientific enquiry types



**Testing** ✓



**Researching**



**Observing**



**Pattern seeking**



**Identifying & classifying**



**Problem solving**

## Working scientifically skills



**Asking questions**



**Making predictions**



**Setting up tests** ✓



**Observing & measuring** ✓



**Recording data** ✓



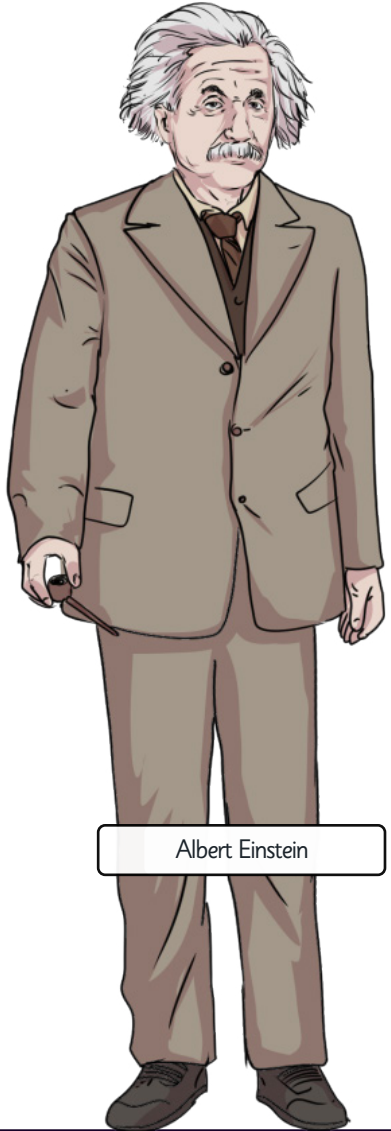
**Interpreting & communicating results** ✓



**Evaluating**



# Are there different types of forces?



Albert Einstein

**Lesson 1:** Why do things fall to Earth?

**Lesson 2:** Do heavier things fall faster?

**Lesson 3:** How does air slow things down?

**Lesson 4:** Which shoes grip best?

**Lesson 5:** Why is it hard to move through water?

**Lesson 6:** How can simple machines make jobs easier?



Stephen Hawking



# Key vocabulary for this lesson



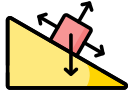
**prediction**

– a statement saying what we think will happen



**variable**

– something that can be changed



**force**

– something that makes an object move, stop, change shape, speed or direction




**gravity**

– a force that pulls objects towards each other



# Testing



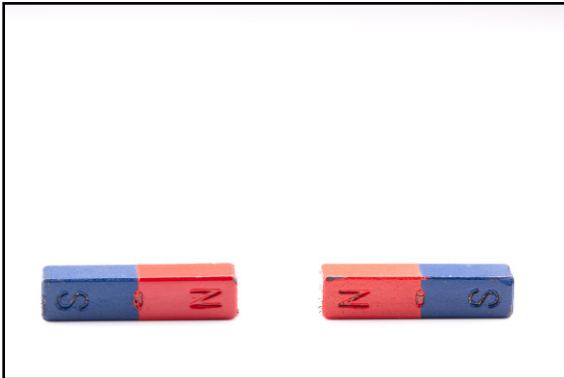
Hi, it's me again, Springer. Thanks for helping me learn all about forces in our last lesson. I had so much fun discovering how gravity  works.

Now, I'm getting ready to try something new. This time, I want to find out what happens when I do a **tandem** skydive, which means with another person! I'm wondering if having two people together will make us fall faster, maybe too fast! Let's use our scientific enquiry skills to test, measure and explain what happens when we skydive with different weights.



# Let's recap

What forces are in action in the photos below?  
Are they **contact forces** or **non-contact forces**?  
Discuss these questions with your learning partner.



Be ready to share your feedback with the class.

Use the following sentence starters to help you.

**“In the photos, the forces I can see are...”**

**“These forces are contact/non-contact forces because...”**

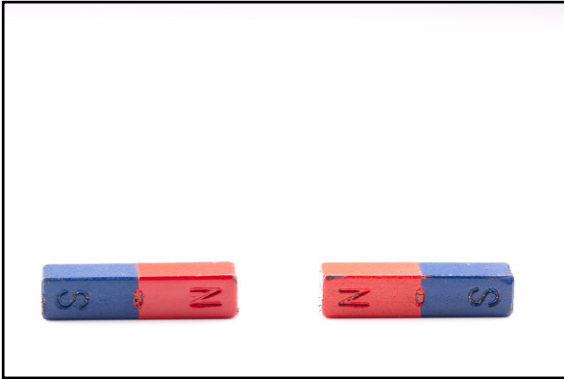




# Let's recap


## answers

Forces  are everywhere. Even if we can't see them, we can see what they do!



Like poles of the magnets **repel**. This means they push away from each other. This is a **non-contact force**.



**Gravity**  will pull the skydiver towards the Earth. This is a **non-contact force**.



The suitcase is being **pulled** along behind the boy. This is a **contact force**.



## Let's discuss

When Springer jumps out of the plane to do a skydive, he is falling fast! What helps him to slow down?  
Look at the photos and explain what forces you can see with your learning partner.



Be ready to share your feedback with the class.

**Use the following sentence starters to help you.**

**“Both pictures show ...”**

**“The parachute...”**



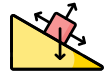


# Let's discuss

## answers

Both pictures show gravity  pulling the person towards the Earth.  
The parachute slows the skydiver's fall.



If the parachute slows Springer down, then there must be a force  acting in the opposite direction.  
Let's find out what this force is called!

# Air resistance

The force  acting in the opposite direction is called air resistance.



air resistance



gravity



air resistance



gravity

Springer can feel the **force** of **air resistance** all the time, but this is greater when he opens the parachute. It slows down his descent and allows him to land safely.

## New word alert!



**air resistance** - a force that slows an object down as it travels through the air

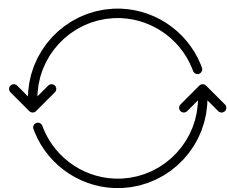


# Word detective



**air resistance** - a force that slows an object down as it travels through the air

The word '**resistance**' comes from Latin. It first meant standing up against force or authority, like people resisting unfair rules. In science, it describes '**the quality of materials or air taking a stand against motion**'.



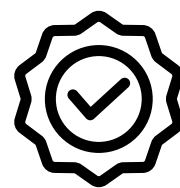
**re**

“again or  
back”



**sist**

“take a stand”



**ance = resistance**

“state, quality  
or concept”

**Together, these word parts form a word meaning ‘pushing back against something’.**

This makes sense because when something moves through the air,  
the air pushes back and slows things down.



## Let's discuss

What difference do you think it will make if two people do a tandem skydive?

Discuss this question with your learning partner.

Be ready to share your feedback with the class.



Use the following sentence starter to help you.

**“If two people do a tandem skydive, I think the difference will be...”**





# Let's watch



**Hi, I'm Freya.** Springer wants our help finding out whether jumping with a partner makes you fall faster. Let's work together to investigate **what happens when there's more weight during a skydive.** We can use our **science skills** to test, **measure** and **explain the results.**  
**Let's watch this video featuring some children discussing testing how quickly objects fall.**



[https://youtu.be/c\\_zraxYn5DQ?si=g5VeKPP\\_40\\_W-8x\\_](https://youtu.be/c_zraxYn5DQ?si=g5VeKPP_40_W-8x_)







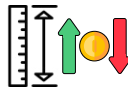
# Fair test

Let's set up a **fair test** to find out if **heavier objects fall more quickly than lighter objects**. We need to think about **all the variables**, the things that **might change** to make this a **fair test**, and make sure the only thing that we change is the **weight of the object**.



The one thing we change

The thing that we will change is our **independent variable**.  
We will change the **weight** of the object that we drop.



The things we measure or observe

We see if the time it takes to fall to the ground changes.  
This is our **dependent variable**.



The thing(s) we keep the same

We need to keep everything else the same.  
These are **control variables**.

## New word alert!



**fair test** - when we only change one thing and keep everything else the same, so we can see the effect that one change has

Let's make sure we set up  
our **fair test correctly!**



# How to do a fair test



We need to make sure all our tests are the **same size and shape**. You could use some cardboard tubes filled with coins or marbles to represent the skydivers!



“I’m going to do four different tests. I can change the weight in the skydiver test tube! I will use 2 coins, 5 coins, 10 coins, and 20 coins. Make sure you seal up the tube so they don’t fall out.”



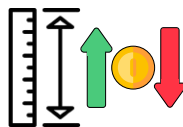
# How to do a fair test



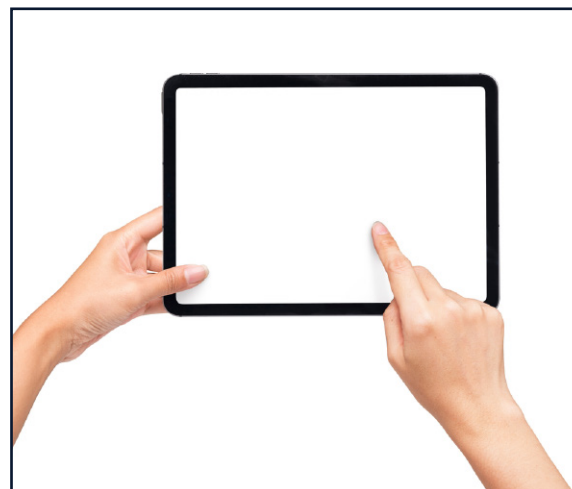
If we all follow this **method**, our results should be similar.



We should drop the objects from the **same height** at the **same time**.



We should time how long it takes for the skydiver test tube to fall to the ground. You could use a stopwatch, but filming will be better because they don't take long to fall to the ground!



# Investigation



Springer thinks that heavier objects will fall faster.

What do you think?  
Write your **prediction** on your **investigation worksheet** before you start **testing**.

Then, record all the things you have done to make sure this is a **fair test** in the **variables** boxes.

Don't worry about filling in the other sections of the worksheet yet. We will go through them together.

Investigation sheet	Falling objects	fair test	comparative test
I want to find out if heavier objects fall more quickly than lighter objects.			
Question: If we drop a heavier object, will it fall more quickly than a lighter object?			
Prediction			
things to keep the same Control variables	one thing we will change Independent variable	what we will measure Dependent variable	
Results:			
Weight of object (number of coins or marbles)	Time taken to drop		
	test 1	test 2	test 3
Conclusion:			

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# Investigation



Testing



Observing &amp; measuring



Recording data

Time to test your **skydiver test tubes!**

**Test! - Drop! - Repeat!**

**We repeat the tests** to make sure our **results are reliable**. If you filmed it, review the video and see if you can work out the time for **each drop**.

Write down your results in the **results table** on your **investigation worksheet**.

Don't worry about filling in the final section of the **worksheet** yet. We will go through it together.



Investigation sheet	Falling objects	fair test	comparative test																											
I want to find out if heavier objects fall more quickly than lighter objects.																														
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<b>Results:</b> <table border="1"> <thead> <tr> <th rowspan="2">Weight of object (number of coins or marbles)</th> <th colspan="3">Time taken to drop</th> </tr> <tr> <th>test 1</th> <th>test 2</th> <th>test 3</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>				Weight of object (number of coins or marbles)	Time taken to drop			test 1	test 2	test 3																				
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# Results



Testing

Interpreting &  
communicating  
results

They didn't take long to fall to the ground! Here are my results.  
It's a good job Springer wears a parachute to slow him down!

Weight of object (number of coins or marbles)	Time taken to drop (seconds)		
	Test 1	Test 2	Test 3
2 coins	0.64	0.65	0.64
5 coins	0.63	0.64	0.64
10 coins	0.64	0.63	0.64
20 coins	0.63	0.64	0.63

Let's look at the numbers. Did the heavier tubes fall faster than the lighter tubes?



# Investigation



Testing

Observing &  
measuringRecording  
data

Study your results and write your conclusion for this investigation on your investigation worksheet.

Investigation sheet

Falling objects

fair test

comparative test

I want to find out if heavier objects fall more quickly than lighter objects.

Question: If we drop a heavier object, will it fall more quickly than a lighter object?

Prediction

things to keep the same  
Control variables

one thing we will change  
Independent variable

what we will measure  
Dependent variable

Results:

Weight of object (number of coins or marbles)	Time taken to drop		
	test 1	test 2	test 3

Conclusion:



# What did we find out?

Look back at your prediction and discuss whether it matches your conclusion.

Springer predicted  that heavier objects would fall faster than lighter objects. He is really surprised that the tubes all took the same amount of time to drop.

What did your results show?

Discuss this with your learning partner. Be ready to share your feedback with the class.



Use the following sentence starters to help you.

“I found that the heavier tubes fell...”

“The weight in the tube ...”



# What did we find out?

answers



Interpreting &  
communicating  
results



You may have said:

“I found that the heavier tubes fell at the same speed as the lighter tubes.  
The weight in the tube didn’t make a difference.”

**What do you think would happen if you dropped the objects over a greater distance? Do you think they will still reach the ground at the same time?**

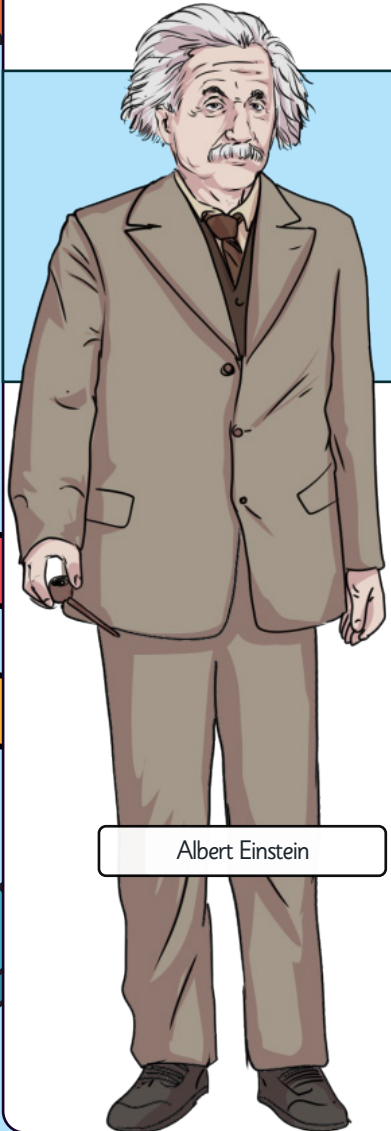




# Challenge

**Discuss the following** question with your learning partner.

Let's imagine we drop a light ball and a heavy ball of the same size and shape. Over a short drop, the balls reach the ground at almost the same time. Over a greater drop, the heavier ball reaches the ground first. Why might the results change when the drop is greater?



Albert Einstein

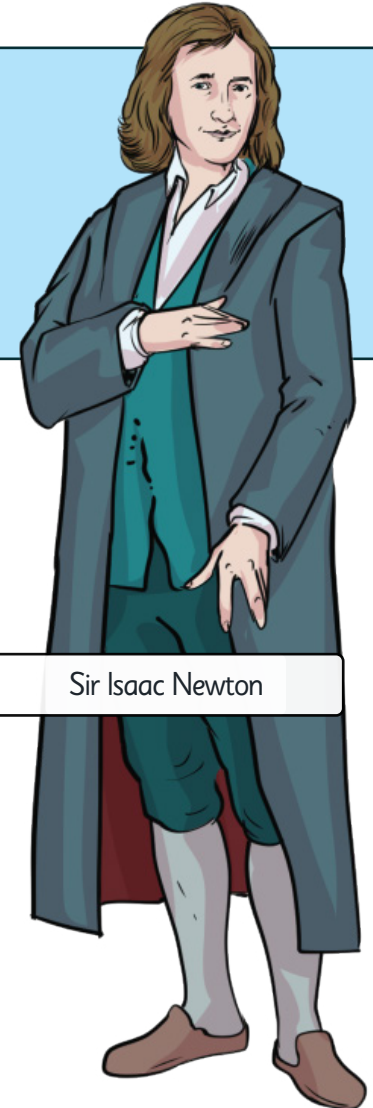


**Be ready to share your feedback with the class.**

Use the following sentence starters to help you.

“When the drop is short...”

“When the drop is greater...”

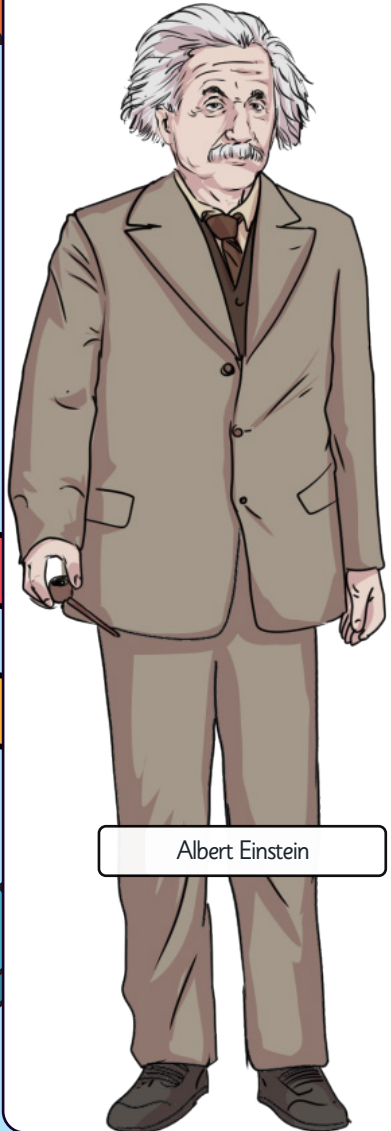


Sir Isaac Newton







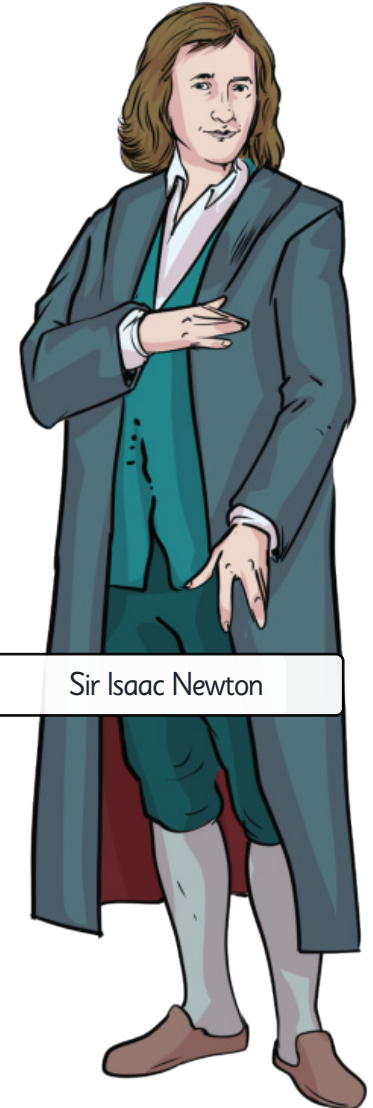
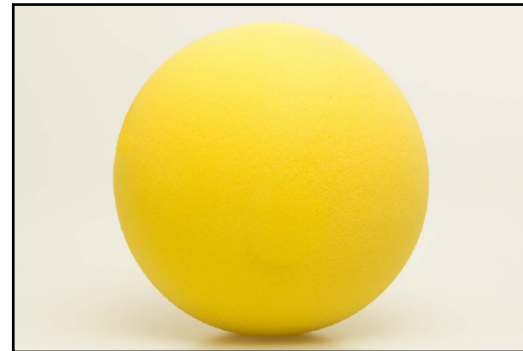
# Challenge answers



Albert Einstein

When the drop is short, gravity  pulls both balls in the same way and they are not affected by much air resistance  so they fall at the same time.

When the drop is greater, air resistance has more effect on the lighter ball and slows it down more.



Sir Isaac Newton

