



# HOW HIGH CAN YOU JUMP ON OTHER PLANETS?

Put this book down for a moment and jump as high as you can. How high do you think you went?

No matter how high you jumped here on Earth, the varied masses and gravities of other planets mean that things are very different when you leap with the same force anywhere else in the solar system!

If you were to jump **0.5m metres** on Earth, the jump would only last a second.

The gravity on the surface of the Moon is only **17%** that of Earth's. That means you could leap **3 metres** using the same force of a jump on Earth and you would remain in the air for about **4 seconds**.

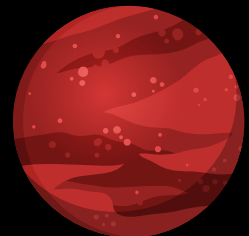
Mars is larger than our Moon but smaller than Earth with about **33%** of its gravity. On Mars you could jump **1 metre** and stay in the air for **2 seconds**.



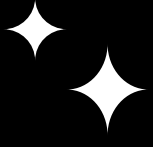
**EARTH**



**MOON**

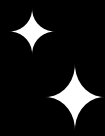


**MARS**



Pluto may be a dwarf planet, but it's still pretty big! The surface gravity on Pluto is just **6%** that of Earth's, meaning a jump there would take you **8 metres high**, and last for **9 to 10 seconds**.

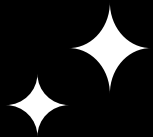
Saturn's moon Enceladus is only **14%** of the diameter of Earth's Moon. Jumping on this moon would be brilliant, as you would spring **43 metres** into the air. You would have plenty of time to enjoy it too, as it would take **60 seconds** to reach your peak before you floated back down to the surface.



If you found yourself on **Comet 67P** it would actually be best if you *didn't* jump. If you did take the leap, you would just float off into the darkness of space. This is because your legs are strong enough to generate a jump that would break the rock's gravitational field, which would mean you'd achieve **escape velocity**. Away you go!



**Escape velocity** is the speed at which an object needs to be travelling in order to escape the pull of a planet's gravity. The escape velocity on Earth is **11 kilometres per second!**



**PLUTO**



**ENCELADUS**



**COMET 67P**



## HUMANS CHALLENGE

Try to squeeze a tennis ball **60 times** in **one minute**. This is how hard your heart is working, every minute of every day.

# YOUR HEART WILL BEAT MORE THAN THREE BILLION TIMES IN YOUR LIFE

You have lots and lots of muscles in your body, but your hard-working heart is the most important of all. The heart just keeps going and going, pumping oxygen-rich blood all around your body, and it does this without you even having to think about it!

When resting, the heart will beat around **60 to 100 times per minute**. During exercise, your heart beats

on average **80 times per minute**, which is **4800** beats per hour. In a day, your heart is likely to beat close to **115,200 times**. Over a whole year that is **42,048,000 beats!** So, if you lived to be **80 years old**, your heart would have beat approximately **3,363,840,000 times!**

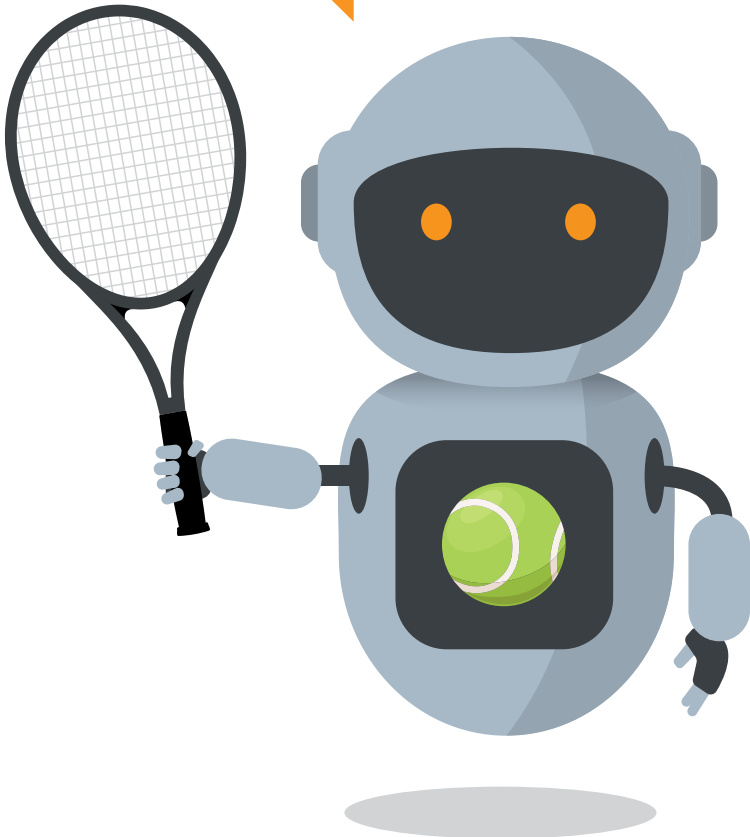
# 150,000

That's the total length in kilometres of all the blood vessels in your body. If all your arteries, veins and capillaries were laid out in a line, they would be long enough to stretch around the world almost **four times!**

# 75 TRILLION

That's the number of cells in your body that receive blood from your heart. The clear protective outer layer of your eye, the cornea, is the only place that receives no blood supply.

A tennis ball can show you just how hard your heart works. The amount of force you use to squeeze a tennis ball with one hand is the same amount required for your heart to contract and push blood through your body.

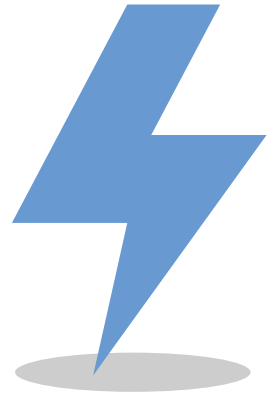


# 7500

The number of litres of blood your heart can pump around your body daily, supplying your organs and tissues with the oxygen and nutrients you need to stay alive.

## Beat it

Your heart has its own electrical impulse. This impulse means that if your heart was ever separated from your body it would continue to beat as long as it had a suitable supply of oxygen.



## Sweet harmony

Harmonising their voices is not the only thing that choirs synchronise; these singers also harmonise their heartbeats! When a choir sings together, their pulses speed up and slow down at the same rate, quickly becoming synchronised and beating in the same rhythm.





# FLUFFY CLOUDS WEIGH HALF A MILLION KILOGRAMS

## EARTH CHALLENGE

On the next blue-sky day with fluffy clouds, see if you can count each cloud and estimate the volume of water floating in the fluffy shapes above you.

Imagine lying on your back on a beautiful day and looking up at the bright blue sky filled with fluffy clouds. One minute, the clouds look like an ice cream, but moments later they appear to be a face or an animal.

Those little white clouds you see dotted around the sky may look light and fluffy, but they are actually extremely heavy! They're called **cumulus clouds** and on average they weigh an astonishing **500,000 kilograms!**

As well as cumulus clouds, there are also **cirrus clouds** (which are thin and wispy), **stratus clouds** (that form a huge, grey blanket across the sky) and **nimbus clouds** (the dark clouds you see during a thunderstorm).

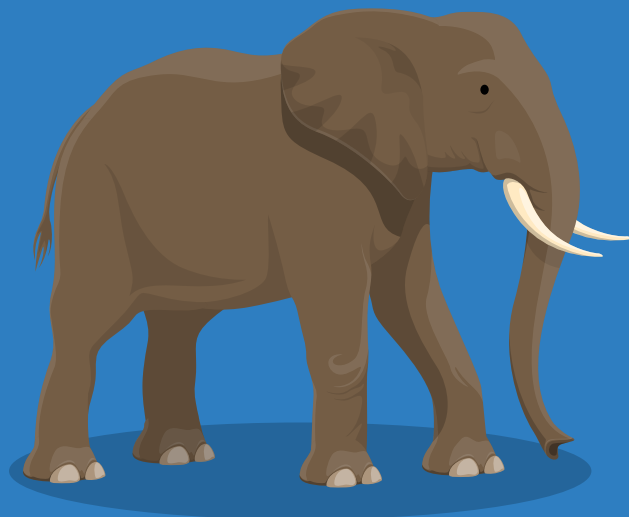


## Shape shifters

The wonderful ever-changing shapes of cumulus clouds are caused by the air that surrounds them. The clouds are affected by the air temperature, which is constantly changing. When it's windy, the clouds are pushed and pulled, which results in their fantastic variety of shapes.

## The elephant in the room

To put the weight of a cumulus cloud into perspective, **500,000 kilograms** is equal to **100 elephants!**

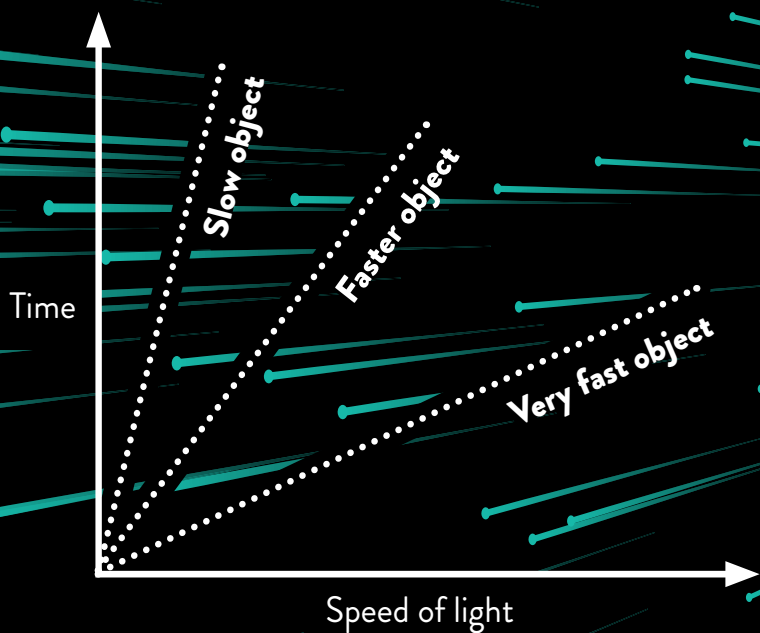


## Floating on air

Clouds are made up of water, and water is heavier than air. So how do clouds float? Although most clouds do contain a large amount of water, it's spread out across a giant area in the form of very, very small droplets or crystals. They are so small that gravity hardly affects them.

# TIME STOPS AT THE SPEED OF LIGHT

Although we cannot travel at the speed of light, Albert Einstein used to think about what would happen if we could. According to Einstein's Theory of Special Relativity, the faster you go, the slower time passes for you relative to your surroundings. This theory means that if you travelled at the speed of light, time would appear to stop. No way!



As the graph above shows, slower objects have faster passages of time than very fast objects, for which time passes much more slowly. When an object reaches the speed of light, it will hit zero on the time axis, which means that it will not have moved at all in the time direction. In other words, when the speed of light is reached, time stops for the traveller!





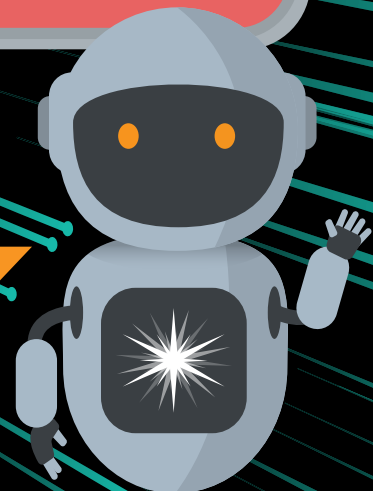
# TOPS AT OF LIGHT



## To infinity and beyond

As things approach the speed of light, they become heavier. If you were travelling at the speed limit of the universe, your mass would climb so high that it would start to reach infinity! It would require endless energy to move at that weight, which is why it's only possible for us to reach the speed of light in our imaginations.

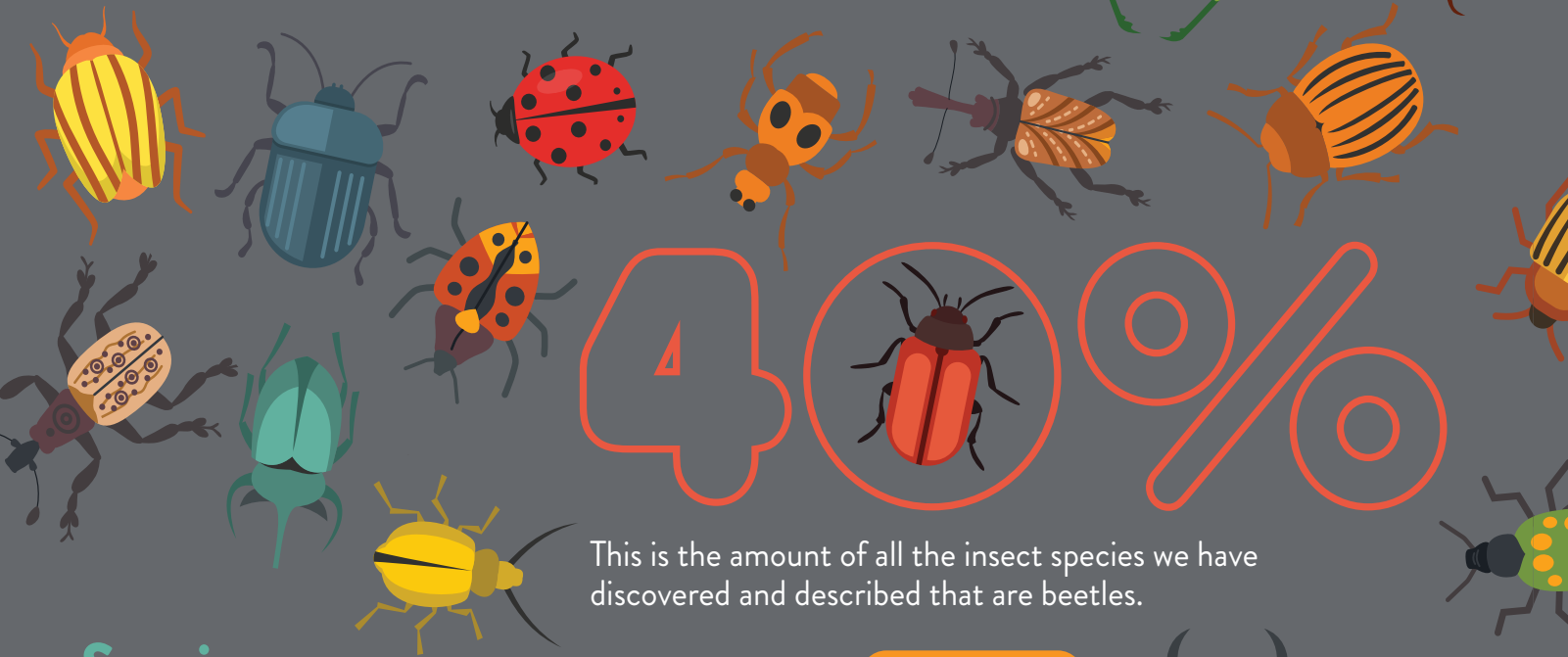
Photons, the particles that make up light, have a mass of zero. The non-existent weight of light is why it's able to move at such incredible speed!



# ONE IN EVERY ON EARTH IS A

There are a *lot* of beetles about. These insects make up a **quarter of all the animal species** humans have discovered. So far, we have found and described over **400,000 different types of beetles**, but we suspect that there may be as many as **3 million** of them out there! Beetles don't just dominate the animal kingdom; they also make up

between **one fifth** and **one third** of all the types of life on Earth that we've so far managed to describe. The undeniable success of the humble beetle is all because of the way they have evolved to perform extremely varied and specific roles, from pollinating trees to eating animal dung. Not glamorous, but very effective!

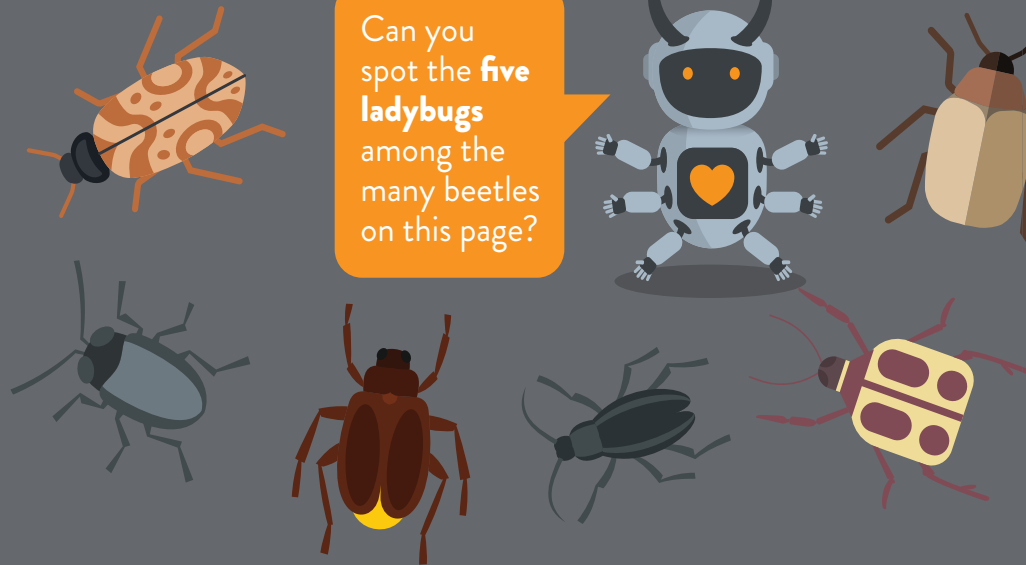
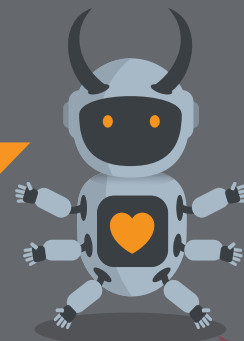


This is the amount of all the insect species we have discovered and described that are beetles.

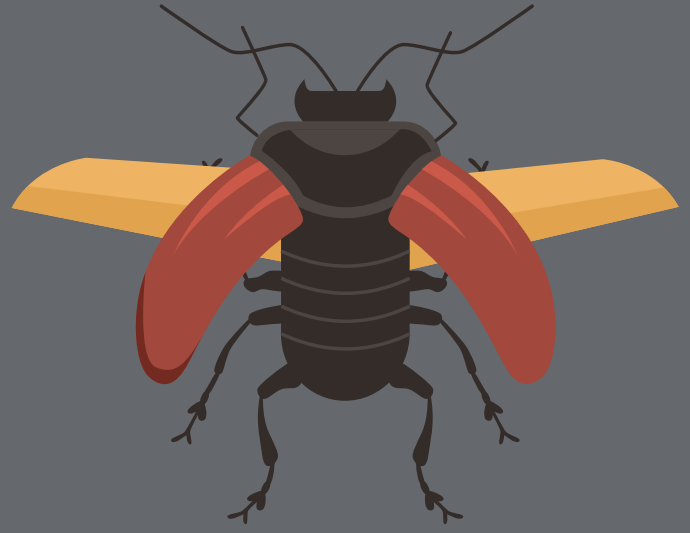
## Survivors

The beetles we recognise today have existed for **270 million years**. This means that they were scurrying around the Earth before dinosaurs. It also means that whatever killed the dinosaurs couldn't kill these tough little cookies. For millions of years, the beetle somehow managed to adapt and to survive.

Can you spot the **five ladybugs** among the many beetles on this page?



# FOUR ANIMALS BEETLE



## Winging it

Beetles have not just one, but two pairs of wings! The first pair are hardened wing cases that protect the second pair, which are used for flying.

## Here, there and everywhere

Beetles live just about everywhere on the planet, but the only place we haven't found them is on the ice of the polar regions and in the saltwater of the oceans.

## Tiger king

Relative to its size, the **tiger beetle** is the fastest creature on Earth. These beetles can run at a speed of **9 kilometres per hour**, which is **125 times** their own body length in a single second! For comparison, humans can only run about **five times** their own body length in that time. To beat the tiger beetle in a race, a person would have to run **770 kilometres per hour!**

# SOLVING SHAPE PUZZLES CAN IMPROVE YOUR MATHS SKILLS

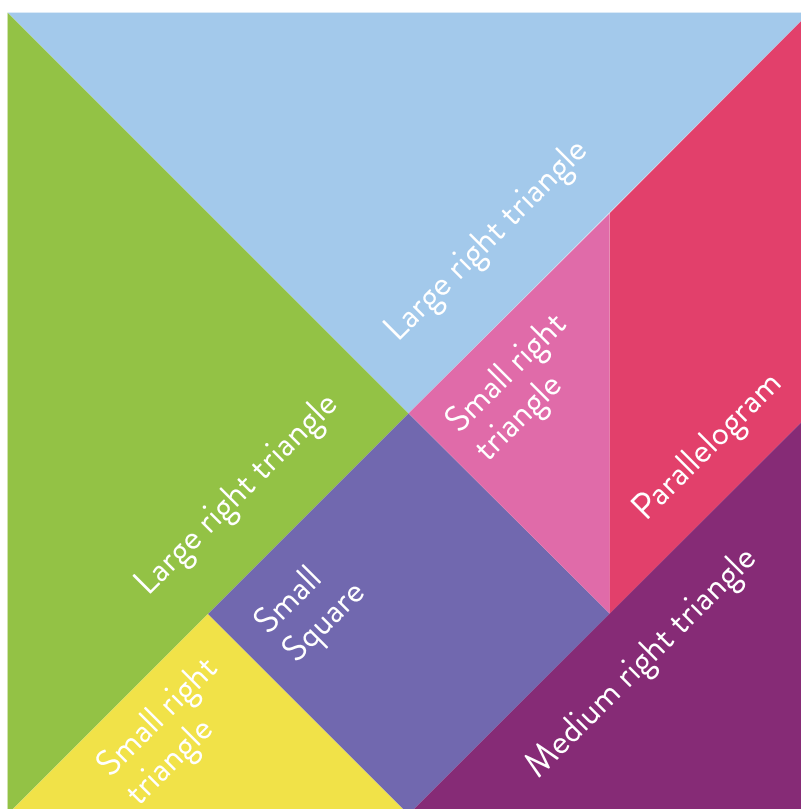
If you like solving shape puzzles, then you might be interested to hear that doing so can improve your score in a maths test! Children who solved shape-rotation puzzles in the **40 minutes** prior to an arithmetic test generally achieved better results in that test.

## Cut up

A **tangram** is a 200-year-old Chinese rearrangement puzzle that is made by cutting a square into seven **geometric shapes** called **tans**. The seven shapes are:

- 2 large right triangles
- 1 medium-sized right triangle
- 2 small right triangles
- 1 small square
- 1 parallelogram

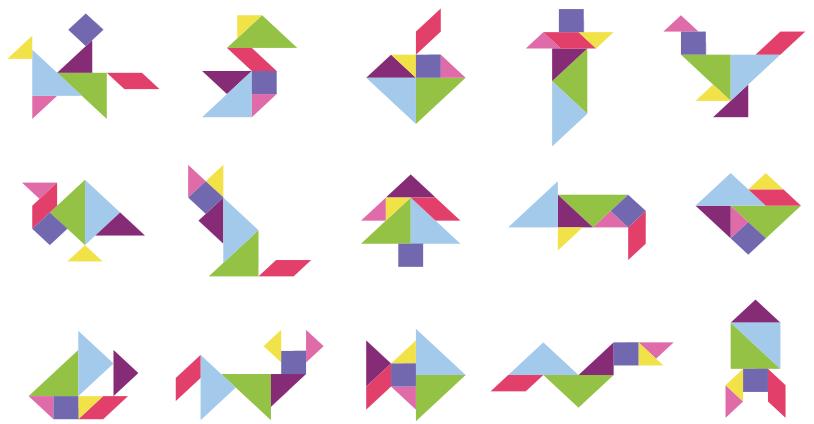
When these shapes are arranged correctly, they fit together and form a large square, rectangle or triangle.



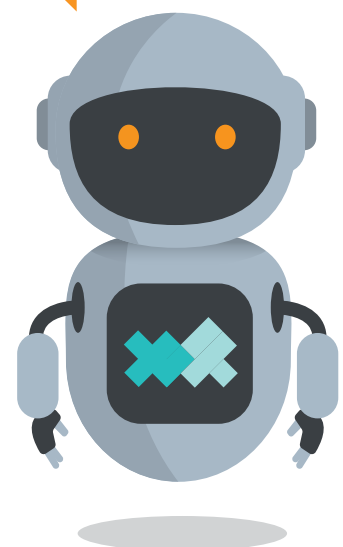


## Get in shape

As well as forming shapes, tangrams can be arranged in many different formations to create some wonderful configurations, like the ones below:



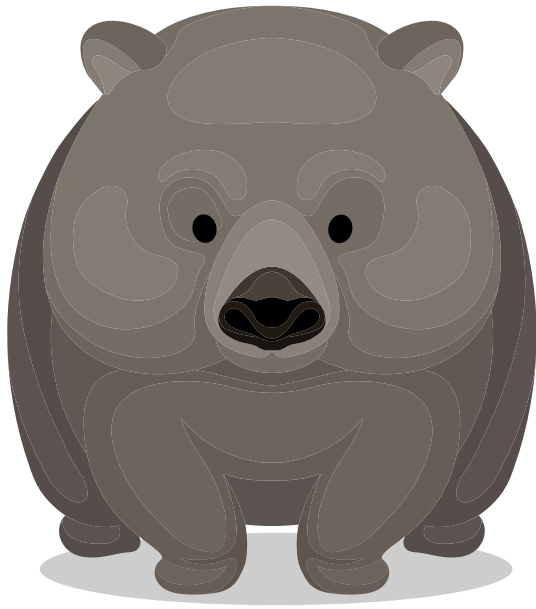
Do you think that you could make just one cut to divide the shape to my left into two identical parts? It may sound impossible, but here's a clue: this shape is made of two identical shapes. Try to partition the big shape into two! The answer is on my screen.



A stylized illustration of a wombat's rear and legs, rendered in shades of brown and grey. The wombat is positioned on the left side of the frame. To its right, three cube-shaped pieces of poop are stacked on the ground. The text 'WOMBATS POOP CUBES' is written in large, white, bold, sans-serif capital letters across the middle of the wombat's body.

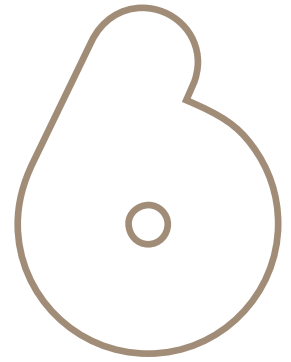
# WOMBATS POOP CUBES

Wombats are the only animals that we know of who produce cube-shaped faeces. Cubic poop! They leave these very dry little poop cubes everywhere they go, not in an attempt to build little brick houses, but rather to mark their territory and communicate with other wombats.



## Gut feeling

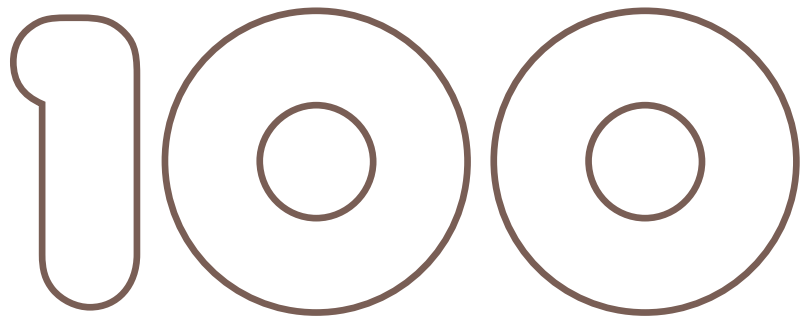
The reason for these cubic poops lies in the wombat's irregularly shaped intestines, which are a mind-blowing **nine metres** in length! That's huge, much bigger than a human's, and bonkers when you consider the small size of a wombat. As food passes through a wombat's long gut, these grooved intestines shape it into poop cubes.



The number of days it takes a wombat to digest its food.

## Up to speed

When they're not eating or pooping, wombats tend to waddle around, but if threatened they can really get a wriggle on. Wombats can sprint at speeds of up to **40 kilometres per hour** and do so for up to **90 seconds** at a time!

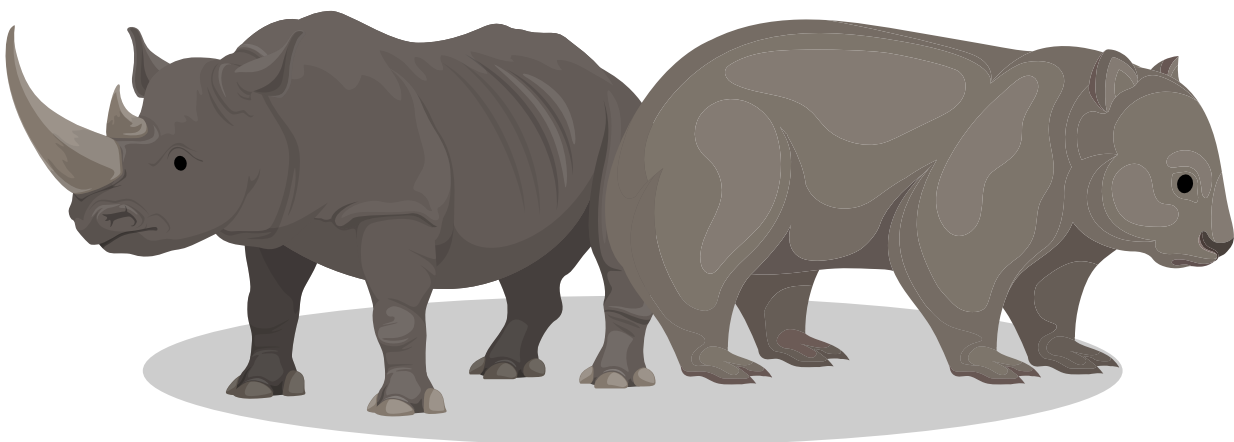


The number of poop cubes that a wombat can produce daily.

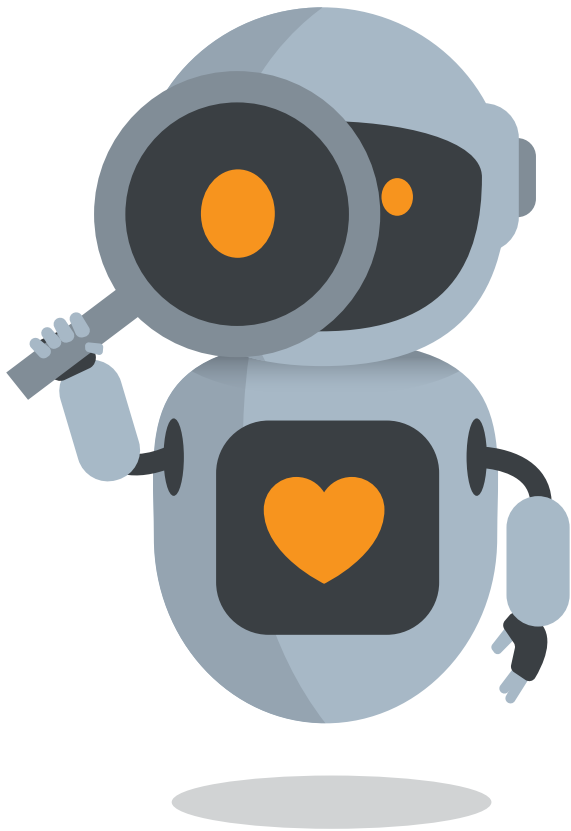
## Giving it large

**2.5 million years ago**, the wombats in Australia would have looked a little different. They would have been the size of a rhinoceros! This mega wombat was called the

**Diprotodon**, and weighed a staggering **2700 kilograms** and stretched **4 metres** from nose to tail. Just imagine how big those poop cubes would have been!



# For readers 8+



Get ready to go on a journey of discovery that will make you say, *No Way!* Learn all about space, humans, Earth, science, animals and maths, with the help of your trusty robot sidekick KLAUS.

### Did you know ...

Uranus is leaking gas into space?

The average yawn goes for six seconds?

There are over *three trillion* trees on Earth?

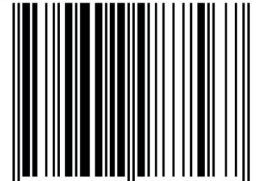
Spider's silk is five times stronger than steel?

Bicycles ride themselves?

This beautifully designed children's book is full to the brim with facts, challenges and questions that will teach you all the wildest and weirdest things about the world around you!

LOST  
THE  
PLOT

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