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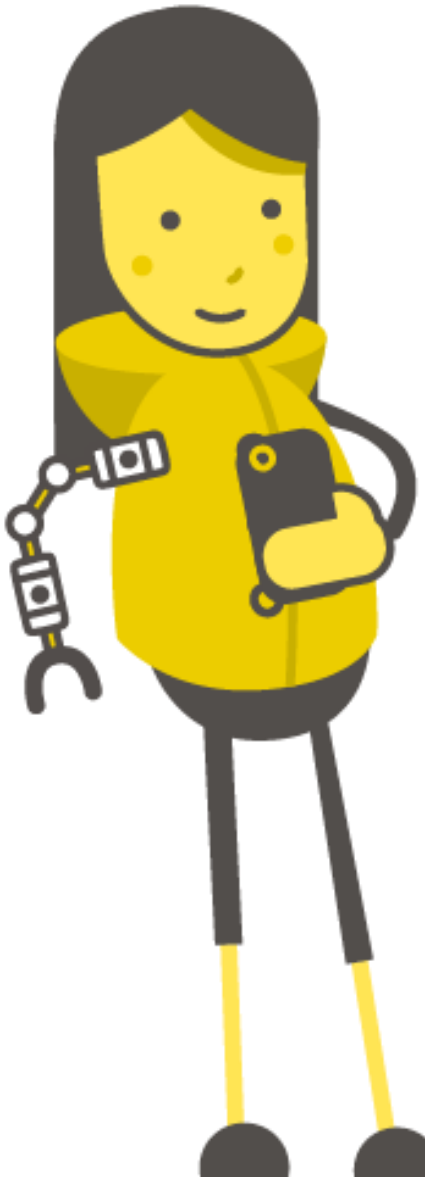
The Solar System



What is the Solar System?

Planets of the Solar System

Planets of the Solar System

Planets of the Solar System

Planets of the Solar System

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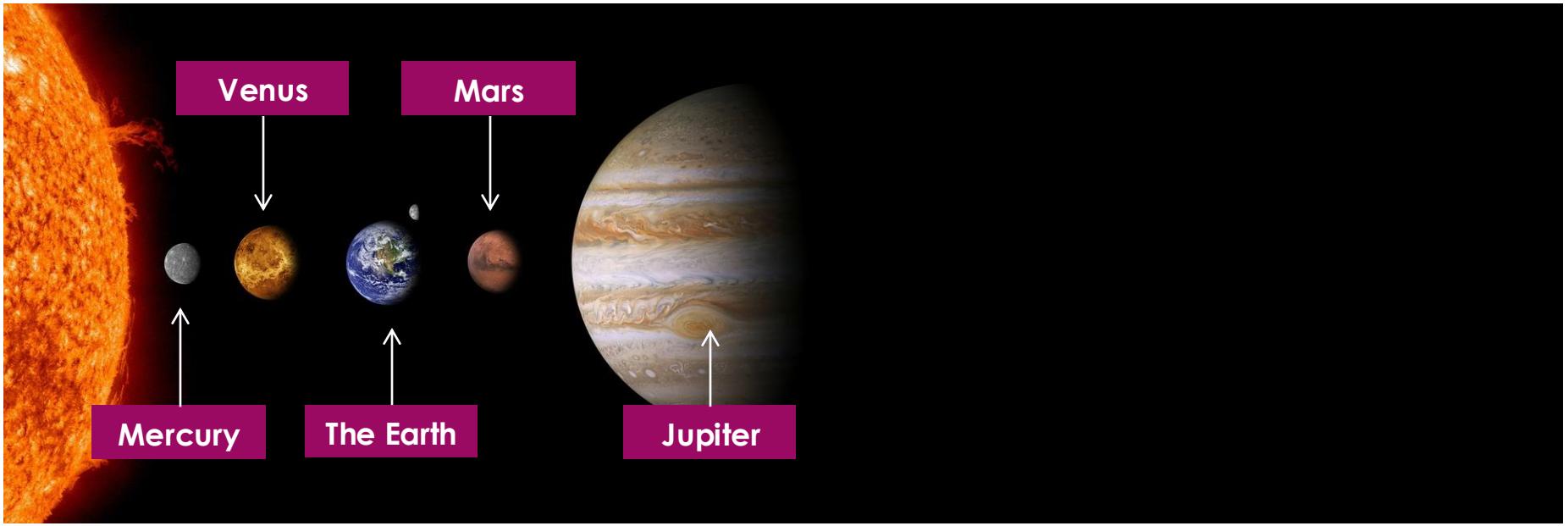
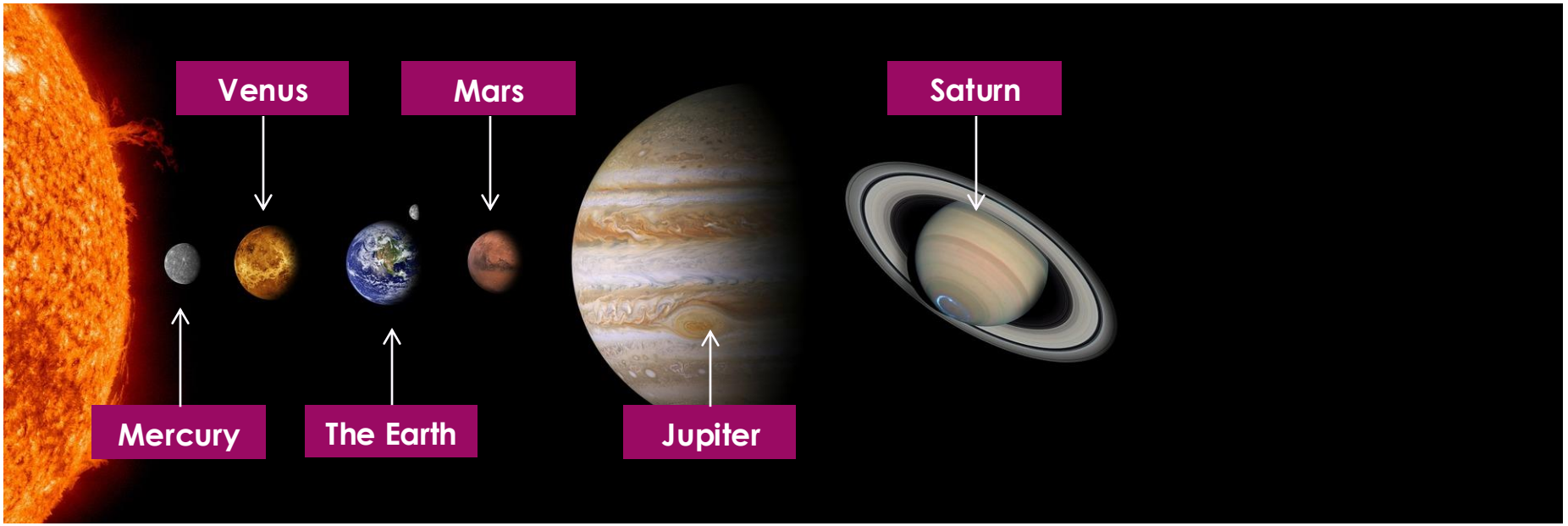
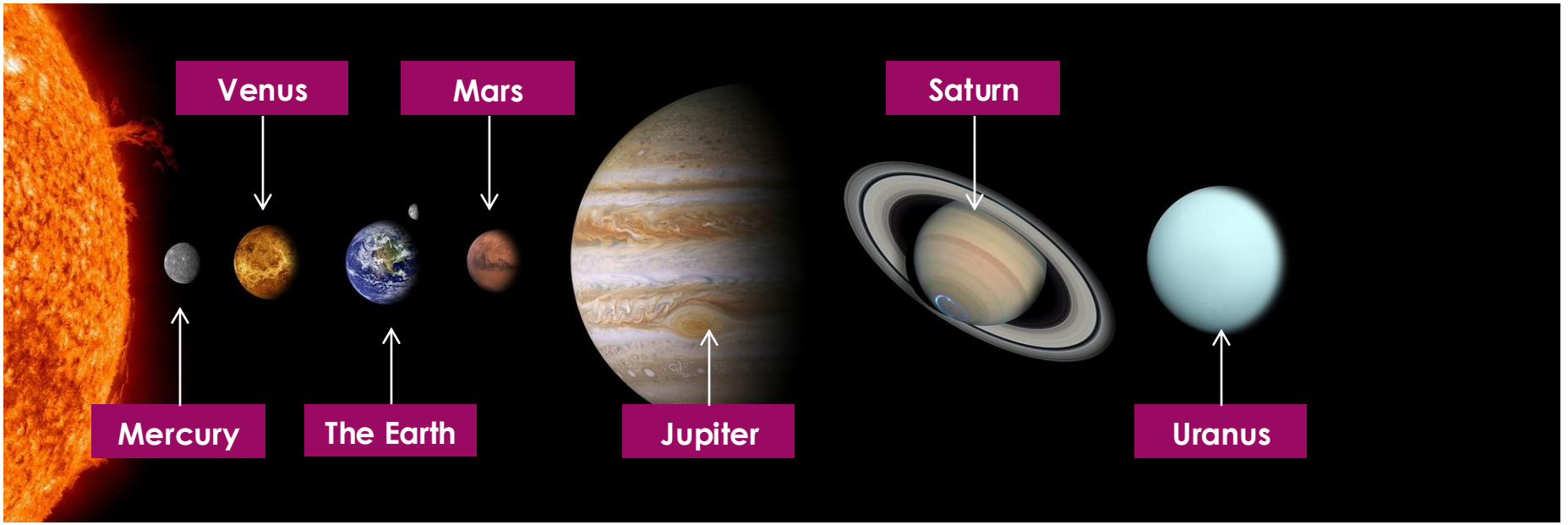
Planets of the Solar System



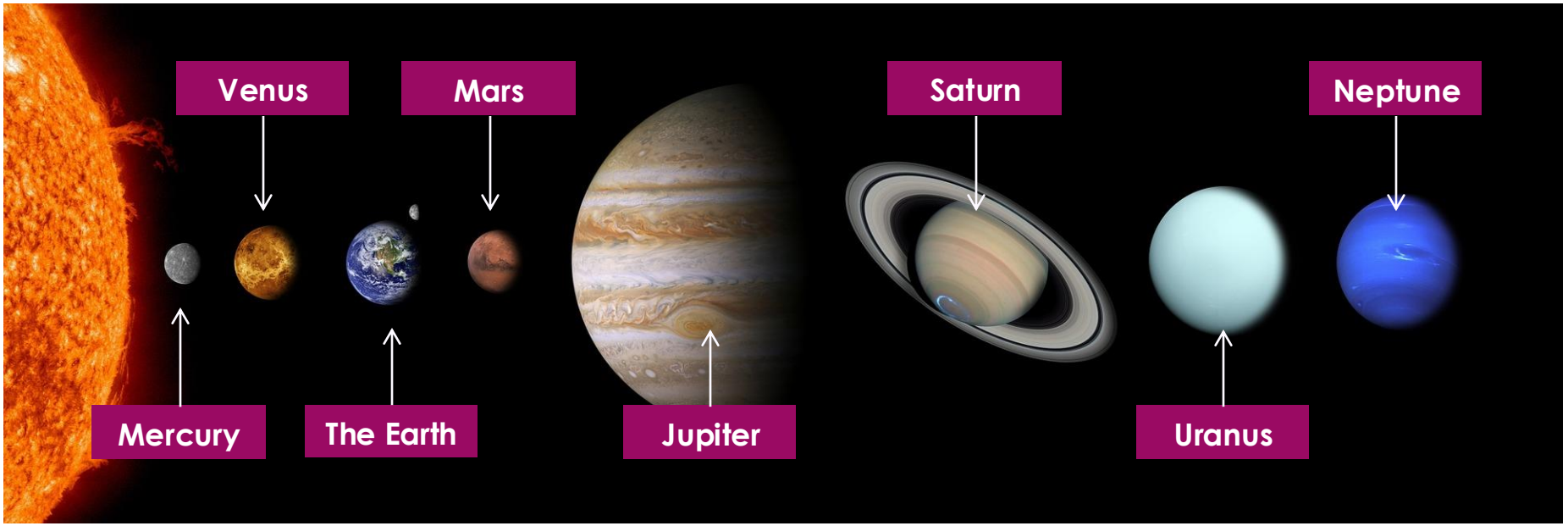
Planets of the Solar System



Planets of the Solar System

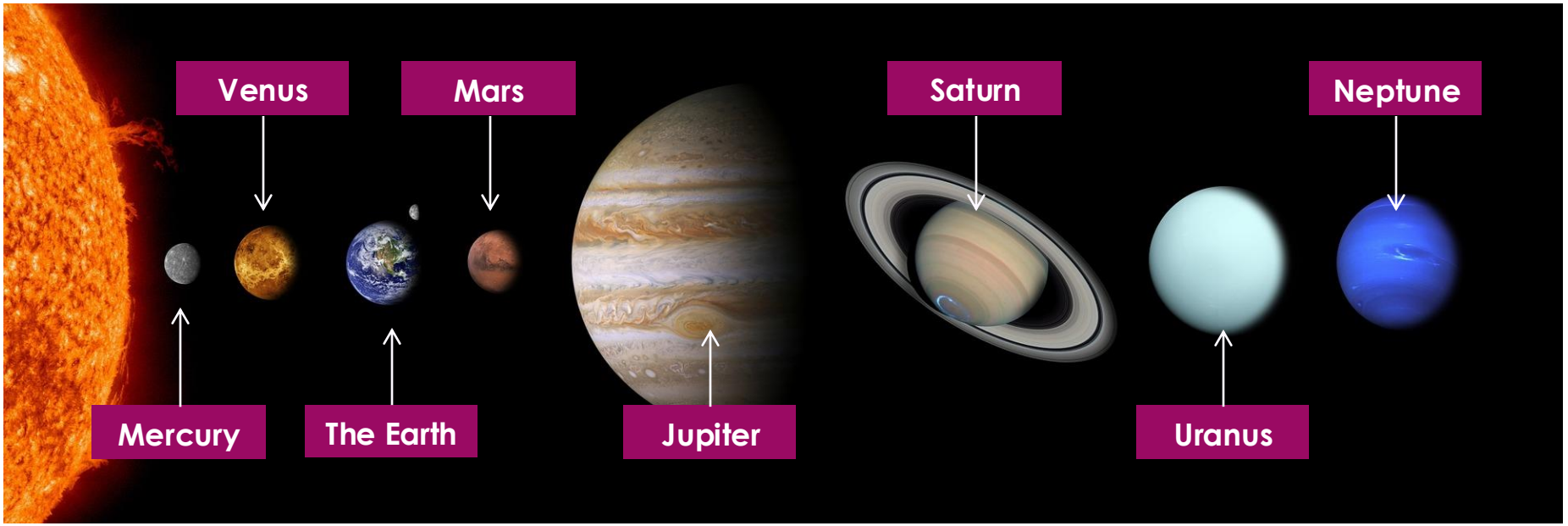


Planets of the Solar System



Planets of the Solar System

What are the planets made of?



What are the planets made of?

Terrestrial = **Rock**

Giant = **Gas**

Terrestrial Planets	Giant Planets
Mercury	Jupiter
Venus	Saturn
The Earth	Uranus
Mars	Neptune

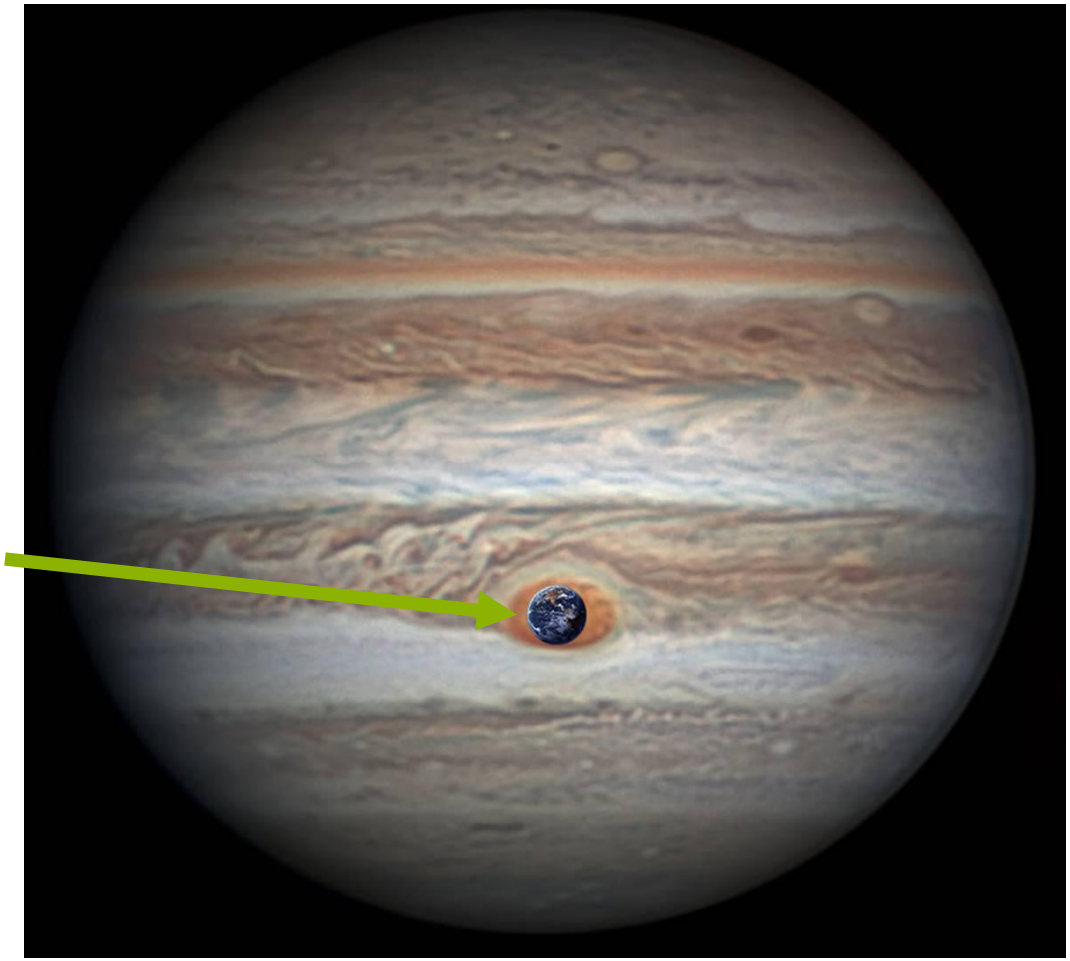
The Size of Planets

The Terrestrial planets are far smaller than the Giants.

Here are the two biggest planets of each; The Earth and Jupiter.

The entire Earth would fit inside Jupiter's big red spot!

What is the red spot?



Just How Big is Space?

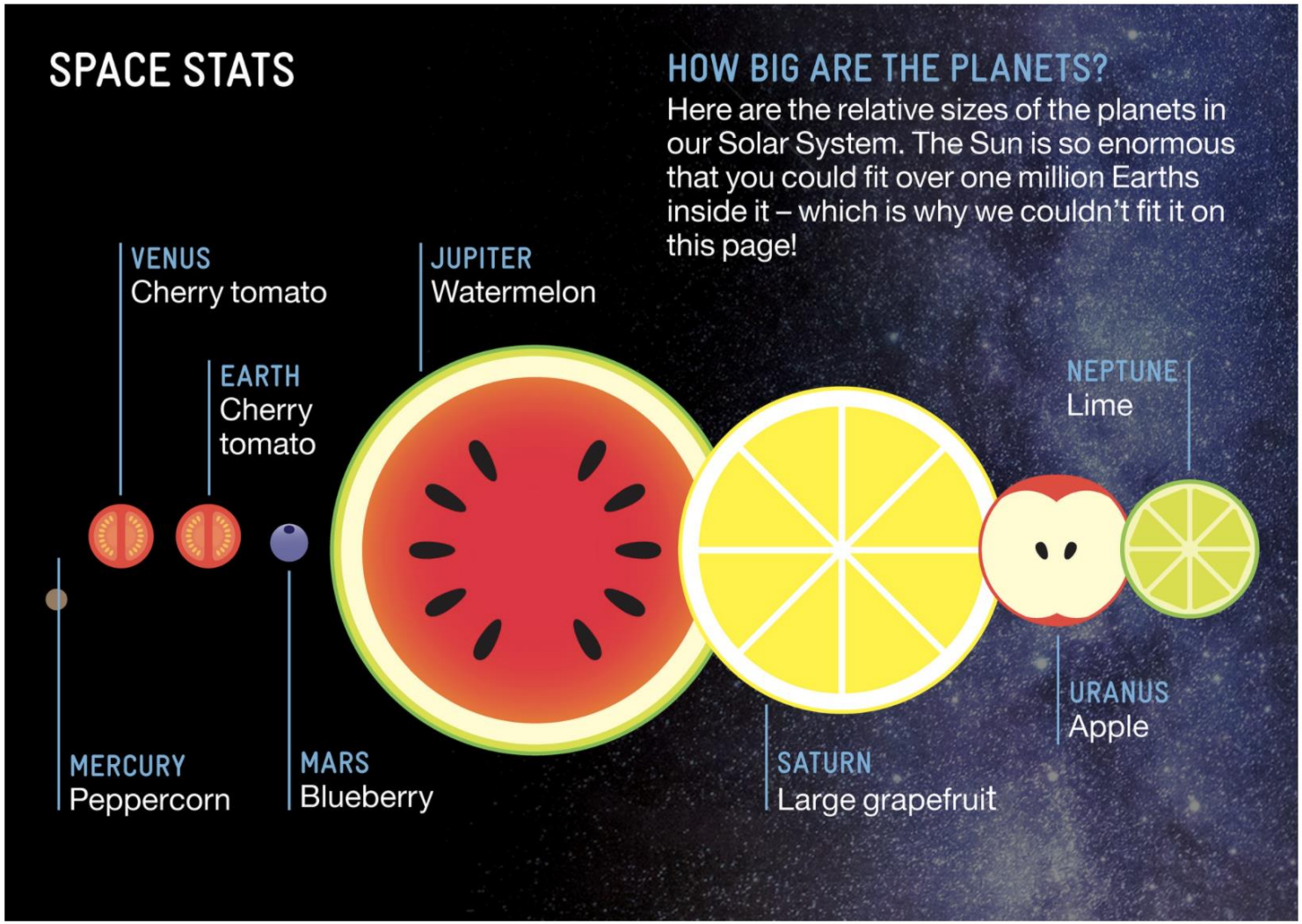
Planets are big. Some are really big.

But from only looking at the numbers it can be quite hard to visualise how big they really are, especially compared to each other.

To get a better idea we will scale them down to sizes we can understand and picture.

Planet	Approximate Radius
Mercury	2,400 km
Venus	6,000 km
Earth	6,300 km
Mars	3,400 km
Jupiter	70,000 km
Saturn	58,000 km
Uranus	25,000 km
Neptune	24,000 km

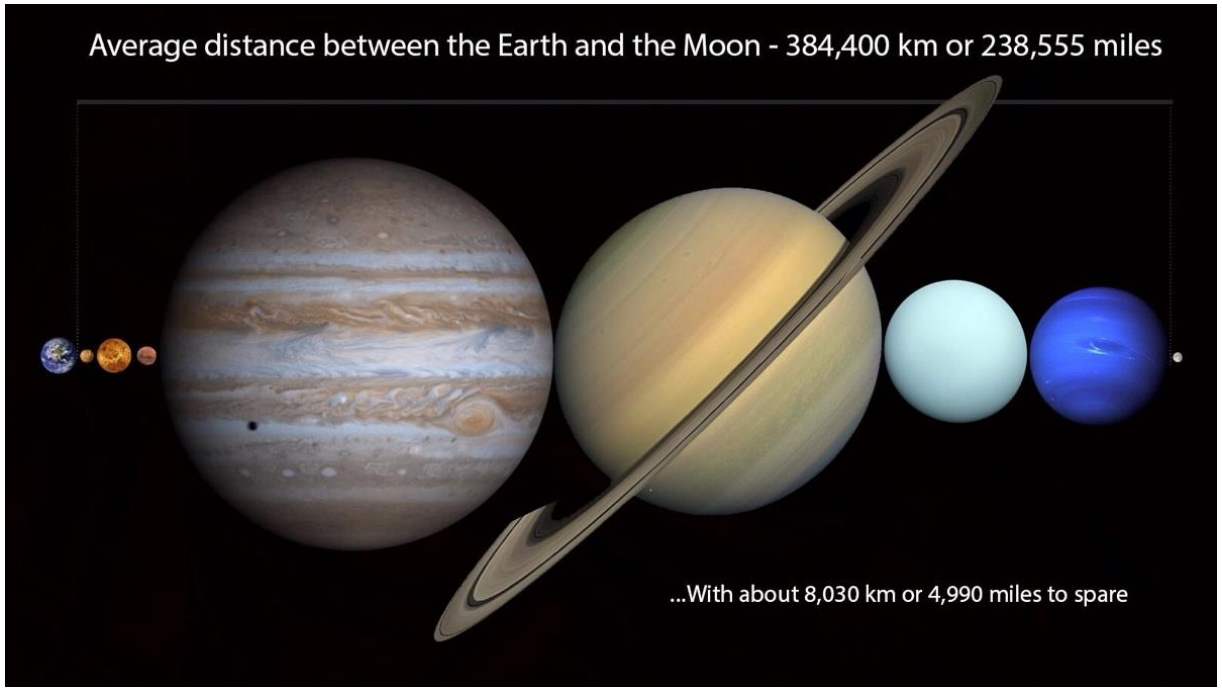
Space


SPACE STATS
HOW BIG ARE THE PLANETS?
Here are the relative sizes of the planets in our Solar System. The Sun is so enormous that you could fit over one million Earths inside it – which is why we couldn't fit it on this page!
VENUS
Cherry tomato
EARTH
Cherry tomato
JUPITER
Watermelon
NEPTUNE
Lime
URANUS
Apple
SATURN
Large grapefruit
MERCURY
Peppercorn
MARS
Blueberry

Distances

It turns out the empty space between the planets is much much larger than the size of the planets themselves.

In fact, you could fit every single planet in our solar system in a line between the earth and the moon.

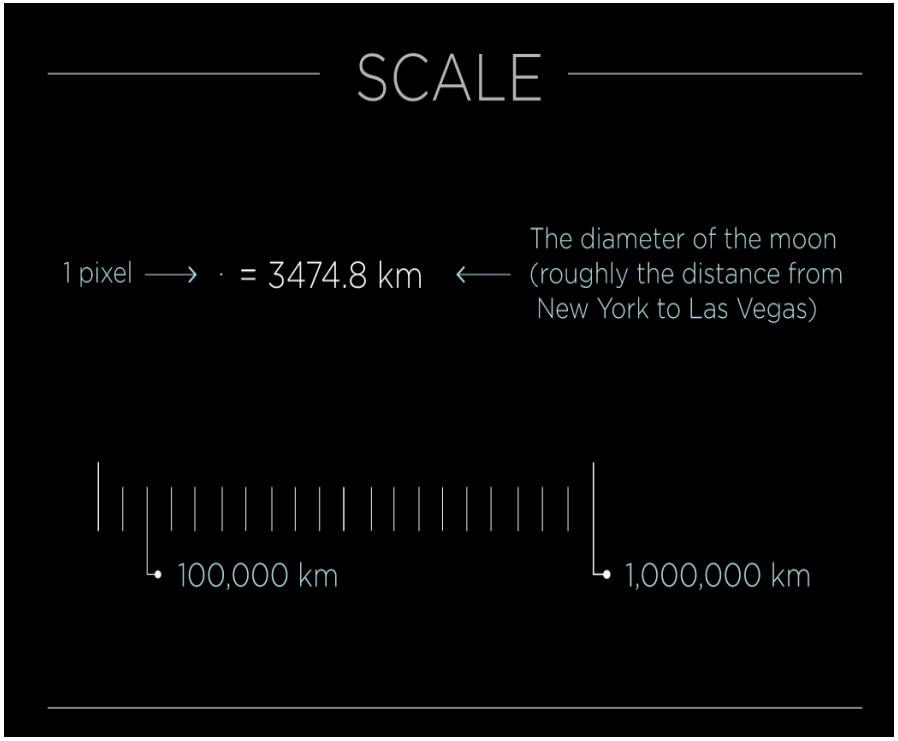


Distances

Because the empty space are much bigger than the planets most diagrams don't keep the distances between planets and the sizes of planets to the same scale.

But what if they did?

1pixelmoon.com



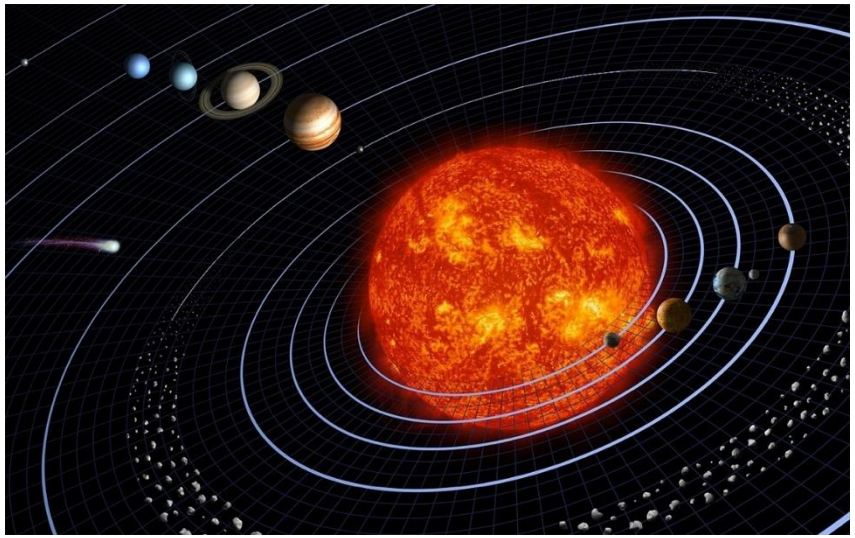
What is the Orbital Period?

Orbital Period of Planets

The planets in the Solar System are continually travelling around the Sun. The Orbital Period of a planet is the amount of time it takes to complete one full rotation.

For the Earth this takes 365 days, or 1 year.

The time it takes for each planet to orbit is unique.



Research: Orbital Period

Go online to research the number of Earth days it takes for each of the planets to orbit the sun.

An Earth day is 24 hours long, the length of days are different for each planet too, so we use Earth days to be consistent

Try searching something like

"Orbital Period of planets in Days"

Could a source like **NASA** be helpful?

Answers!

Planet	Time to orbit the Sun (Earth days)
Mercury	88
Venus	225
Earth	365
Mars	687
Jupiter	4,331
Saturn	10,751
Uranus	30,685
Neptune	60,155

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Modelling the Solar System in Scratch

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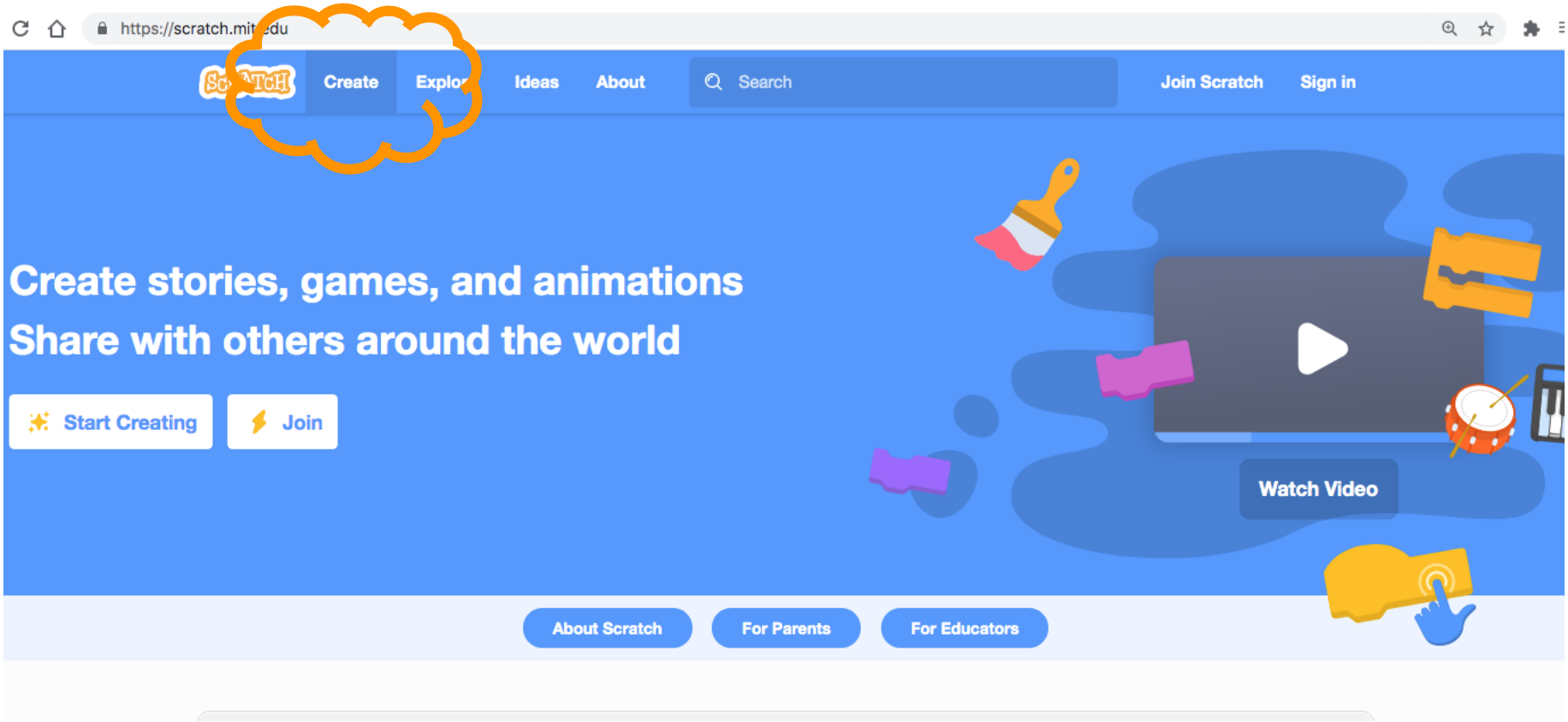
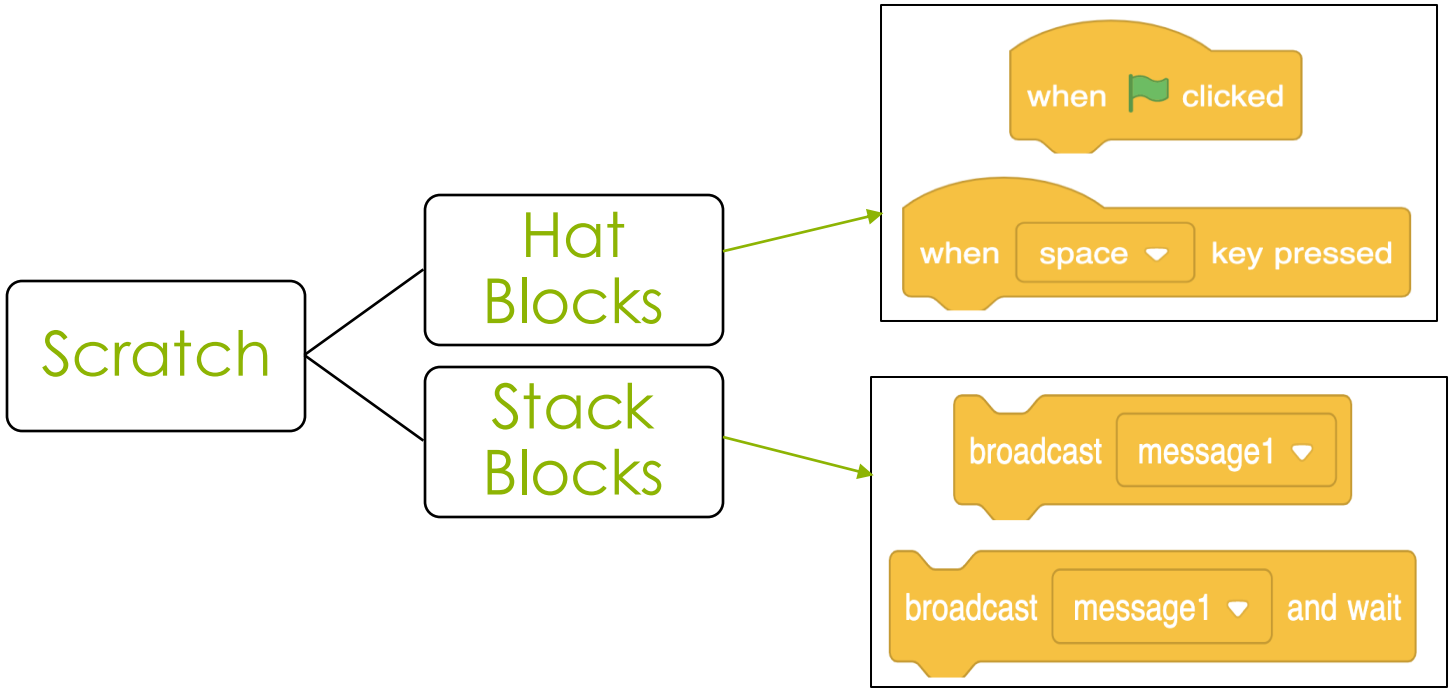
scratch.mit.edu



Scratch

- Drag and drop blocks to give instructions
- Easy to create games
- User friendly



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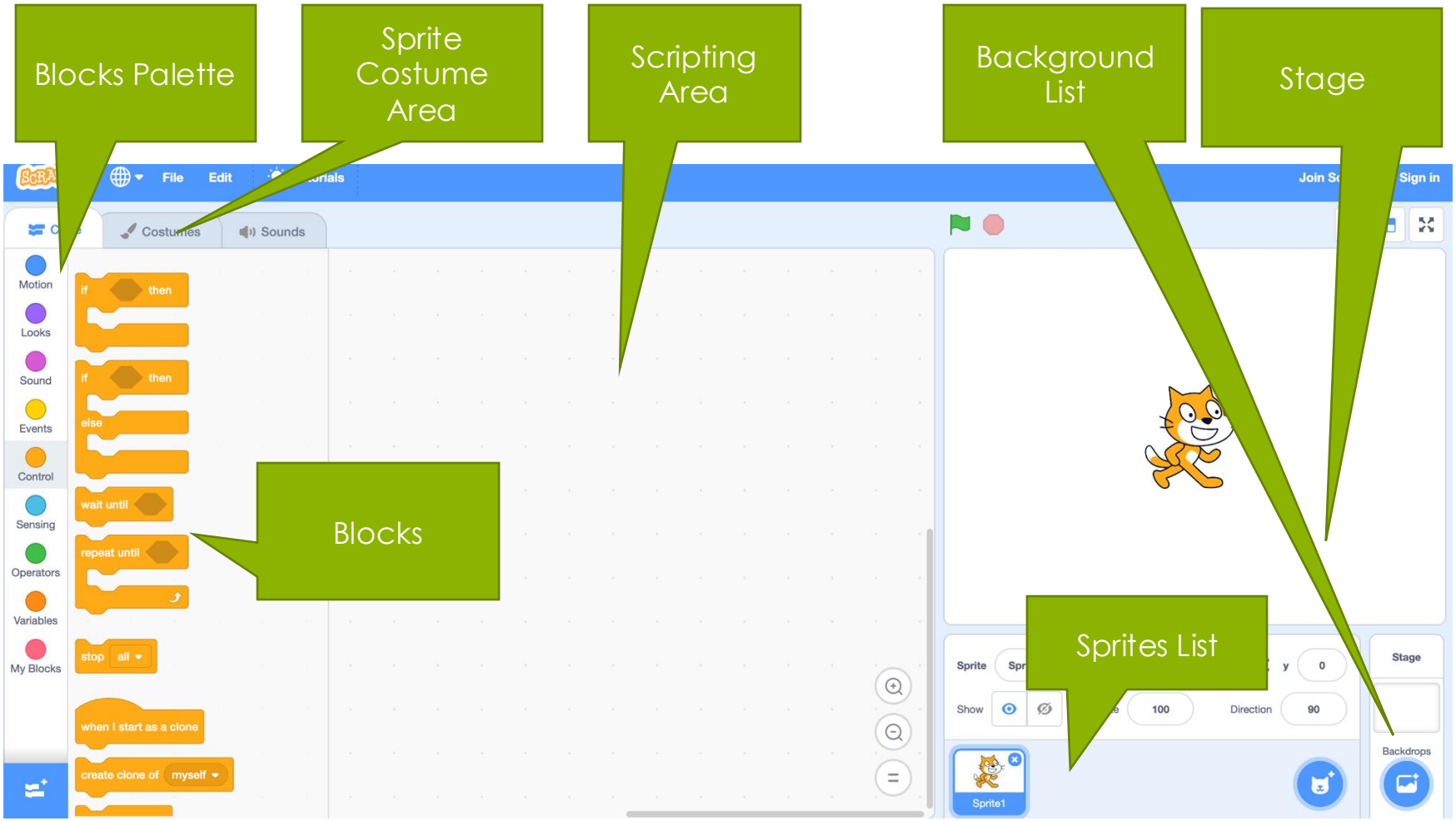
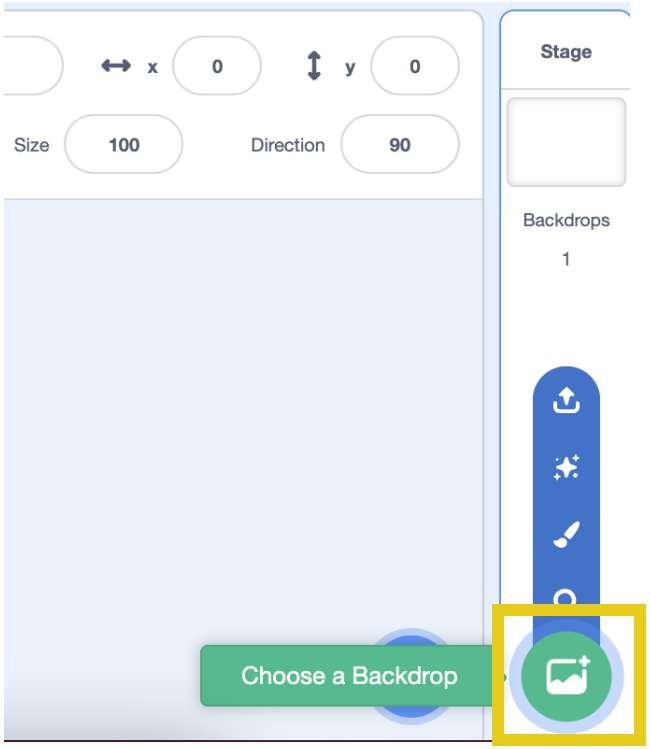
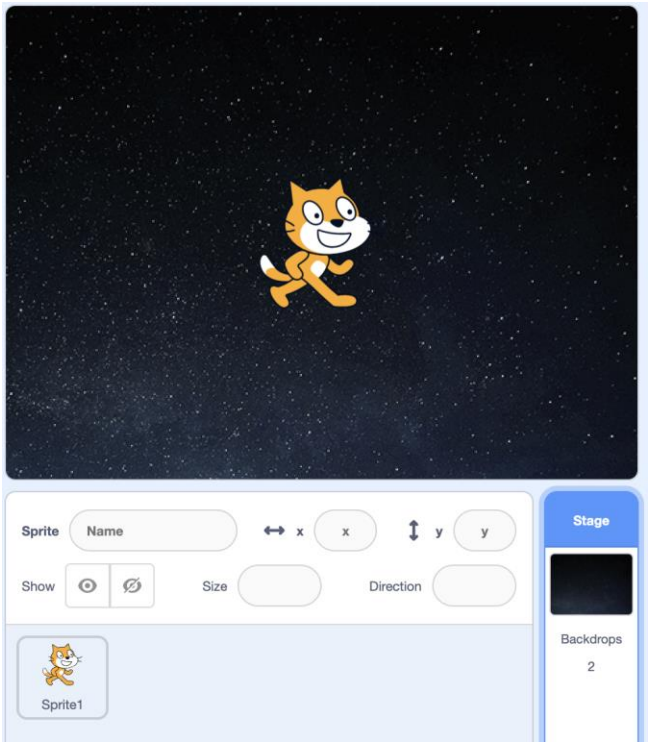
Scratch Basics



Add a Background

Click “Choose a Backdrop” and search for the background “Stars”.

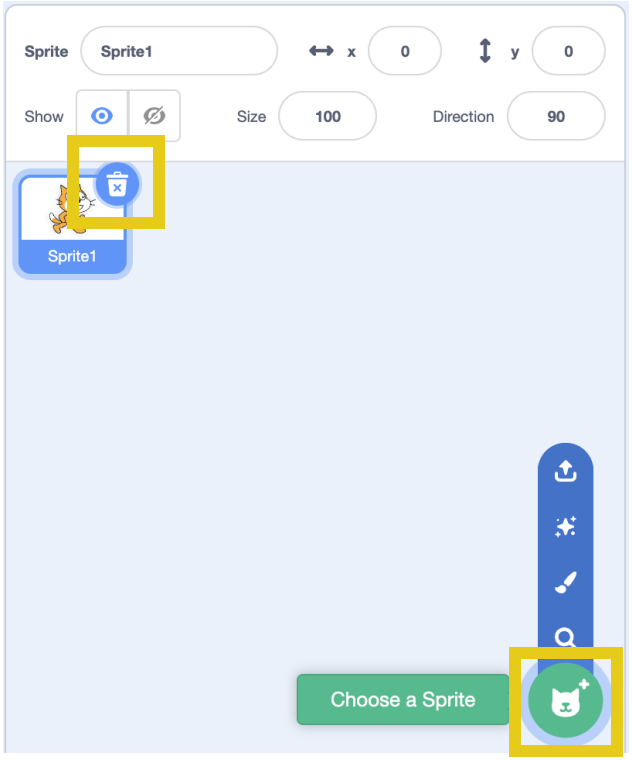


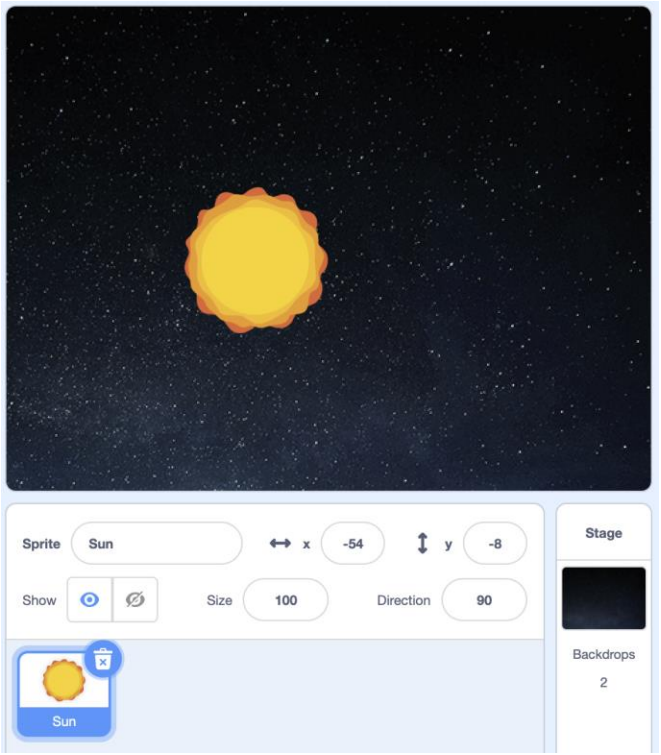


Replace the Cat with the Sun

Click on the rubbish bin next to the cat to delete it.

Click on "Choose a Sprite" and search for "Sun".



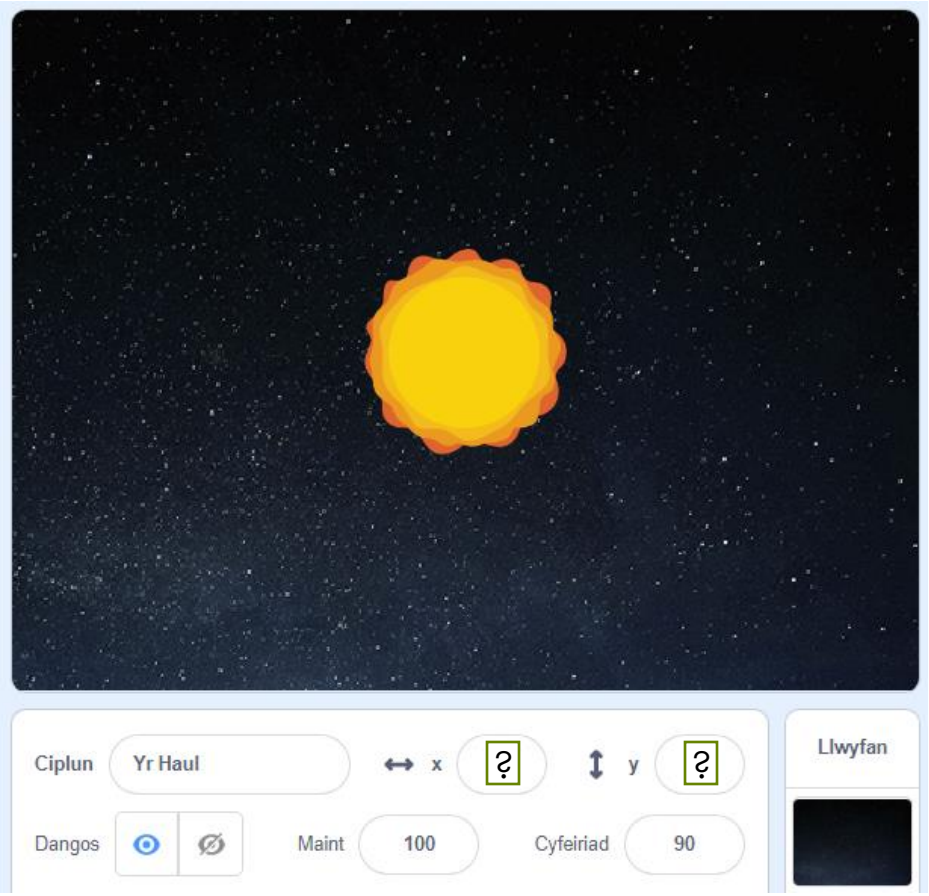


Coordinates

In Scratch you can position everything on the screen with only two numbers.

This is exactly like a grid where **x** is one number, and **y** is another.

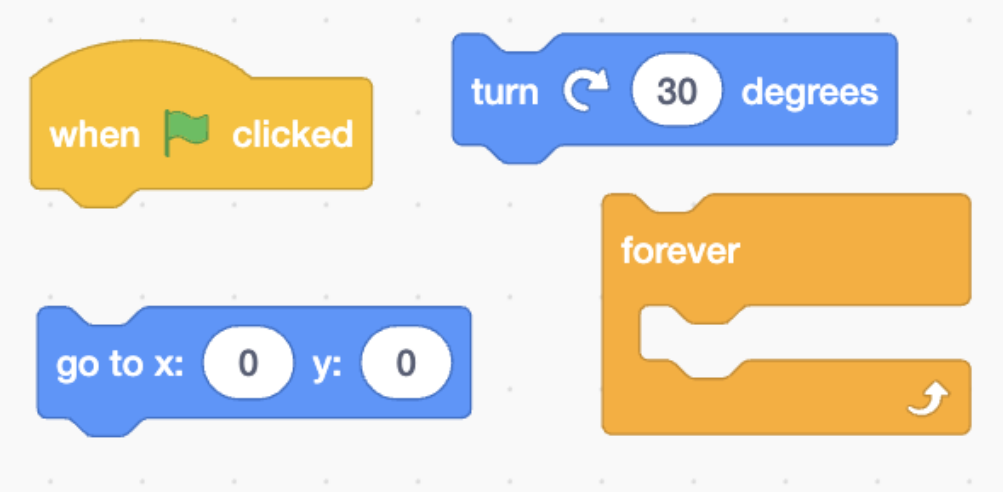
But which two numbers will place the Sun in the centre of the screen?



Rotating the Sun

The Sun is not stationary, the Sun's surface is constantly moving around violently and it is not a perfect sphere. The surface of the Sun takes around a month to rotate.

Put these blocks together to make the Sun rotate!

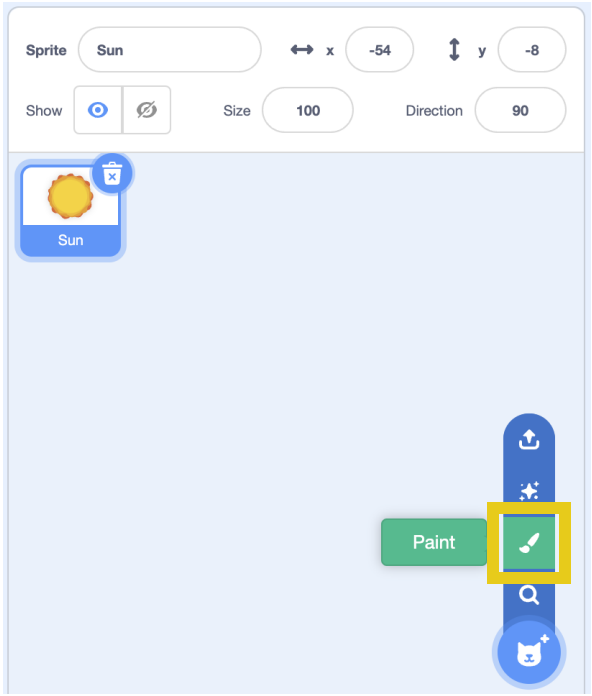


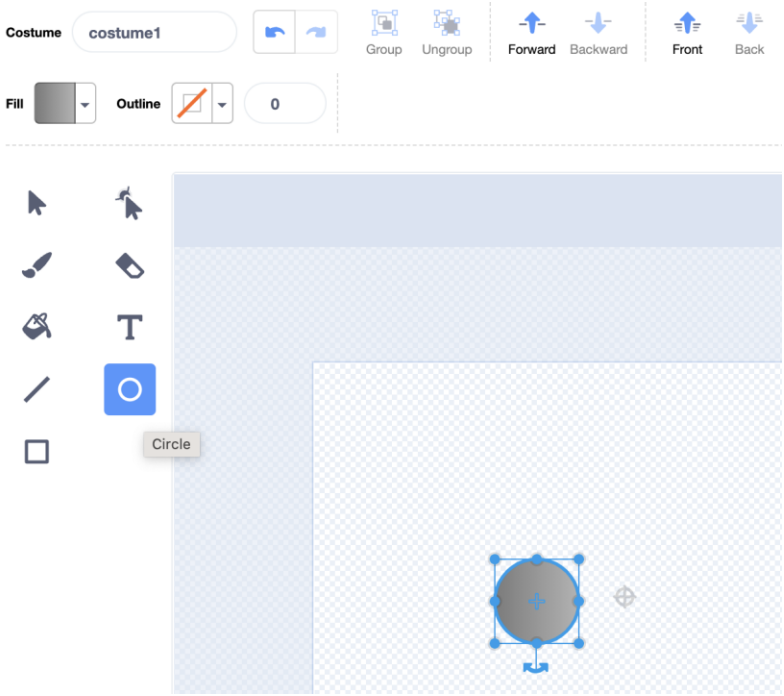
Adding Mercury

Add a new Sprite but this time choose "Paint".

Use the circle tool and choose the right colour.

Hold down the Shift key (⇧) to make a perfect circle!



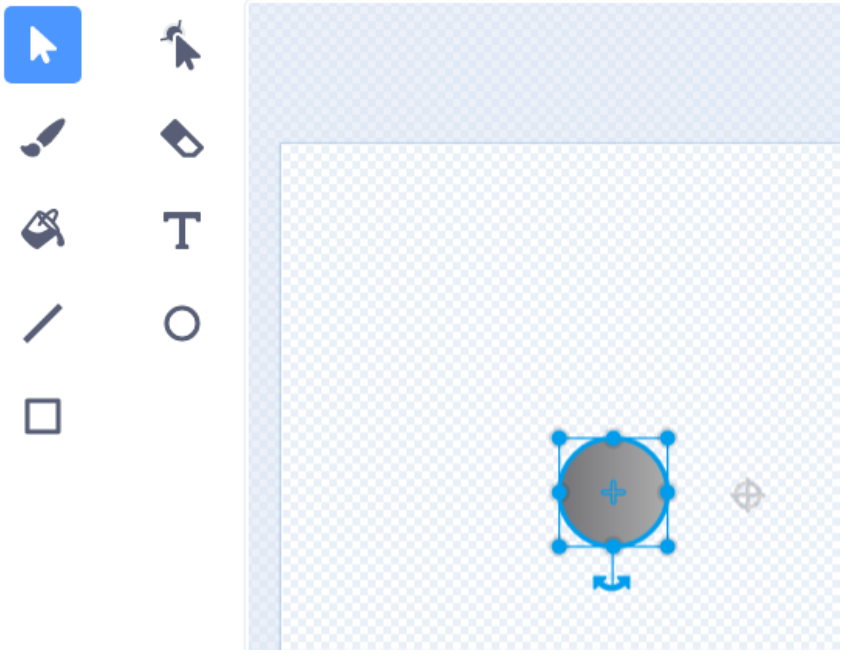


Centre the costume!

Every time we make a costume it is important that we centre it!

That is to select the costume and drag it to the crosshair.

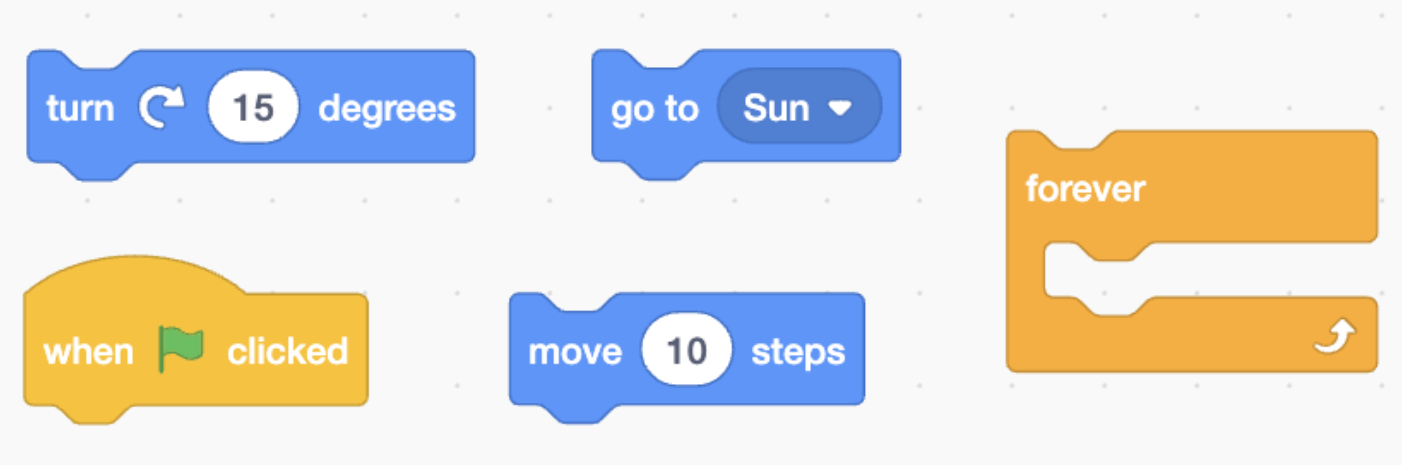
Then name the Sprite!



Mercury Movement

When we click the Green Flag we want Mercury to:

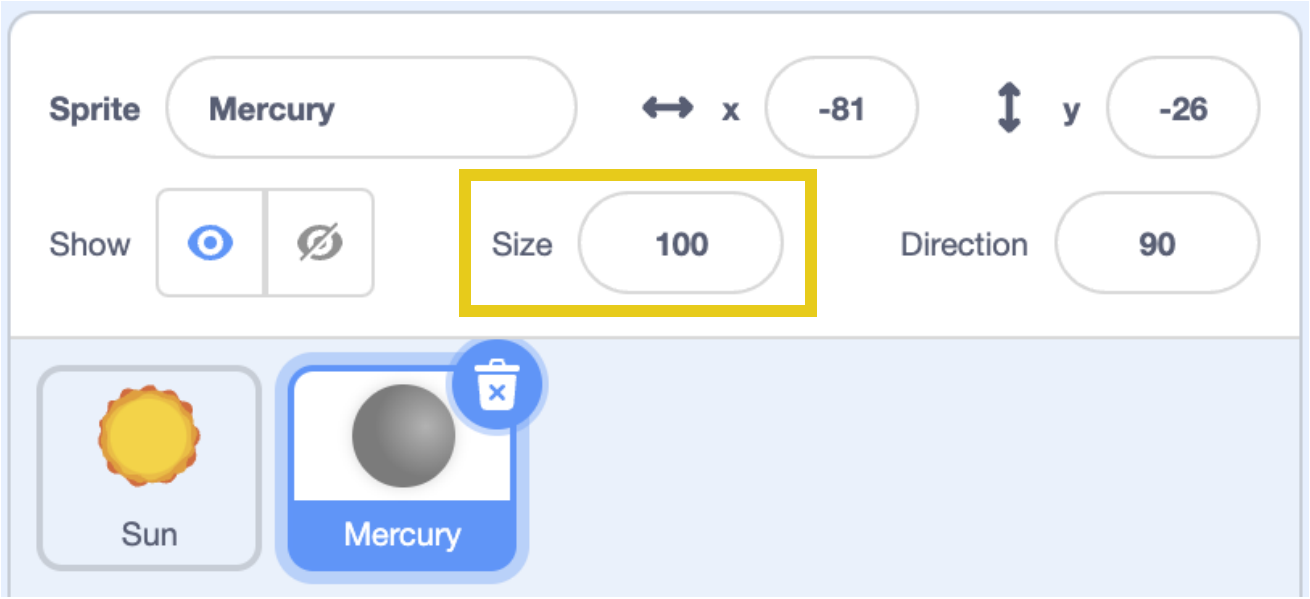
- Go to the Sun
- Turn a number degrees
- Move some distance forward
- Repeat this forever



Changing the Size

It's possible to change the size of Sprites with the "Size" value.

Click on the Mercury sprite then change the value of "Size" to change the size of the sprite.



Speed of the Planets in Scratch

All of the planets orbit the Sun with different speeds.

In order to get our planets to orbit correctly in our model, we will have to add the speeds for each planet.

To calculate the speed of each planet we will have to use this equation:

365 / orbit of planet in days = speed of planet

Orbits

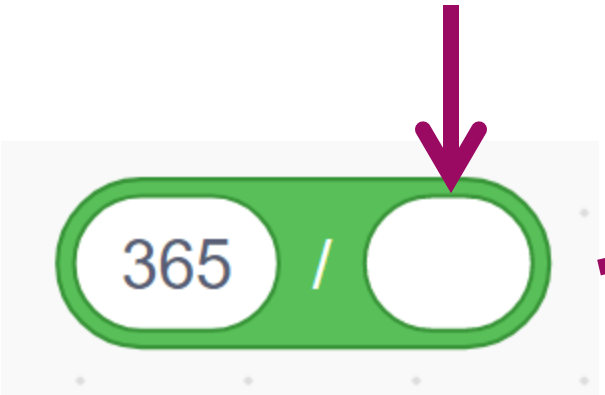
Planet	Time to orbit the Sun (earth days)
Mercury	88
Venus	225
Earth	365
Mars	687
Jupiter	4,331
Saturn	10,751
Uranus	30,685
Neptune	60,155

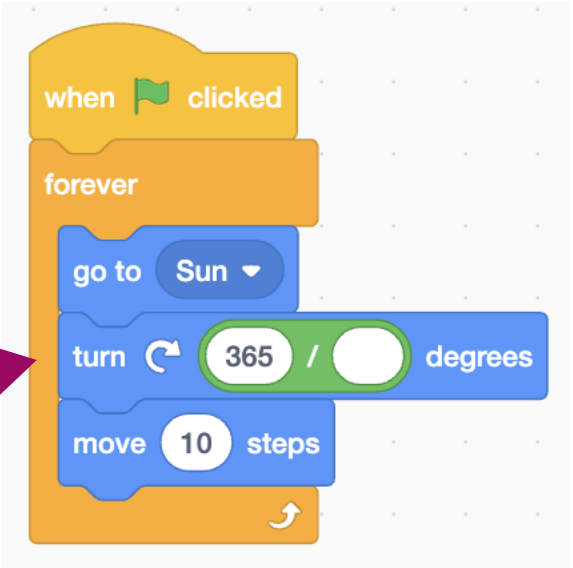
Oes angen newid y cyflymder?

To make Mercury and the other planets rotate at the right speeds, we will need to add the divide block and add:

"365 / orbit of planet in days".

Who remembers what this number is?

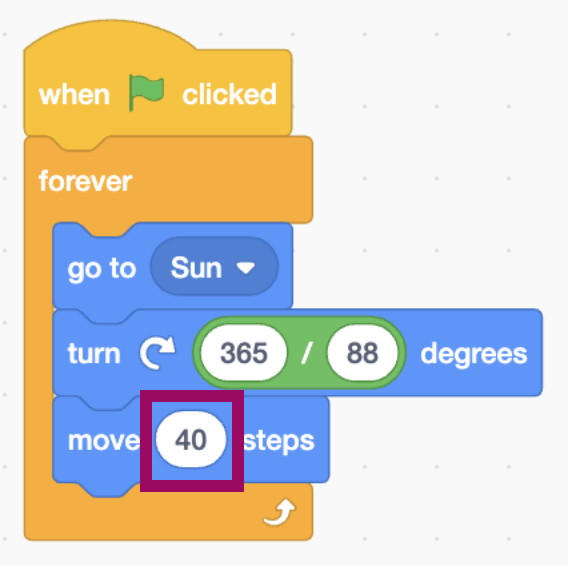




Do we need to change the position?

To change the position of Mercury we can change the number of steps it takes.

If it takes more steps then it will make a bigger circle!



Adding a Second Planet

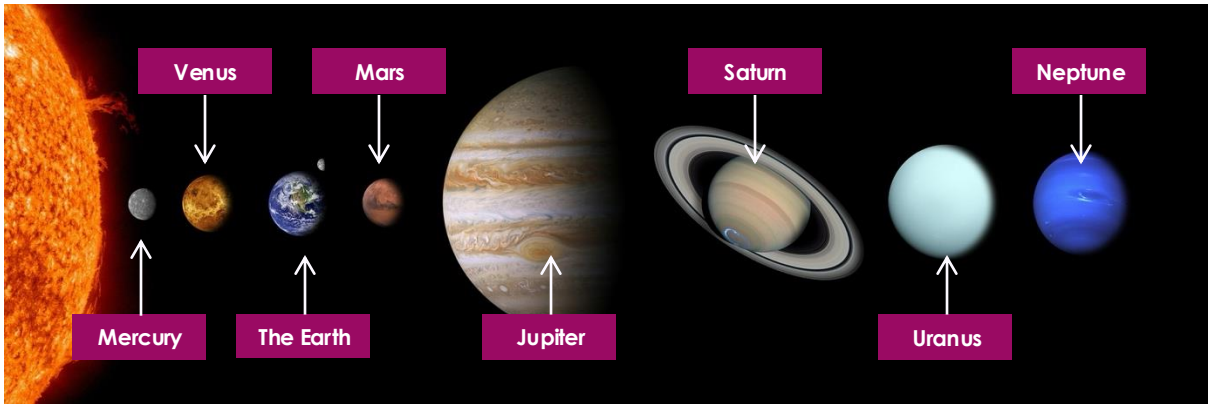
Repeat the proses to add a second planet, this will be Venus.

Adding All the Planets

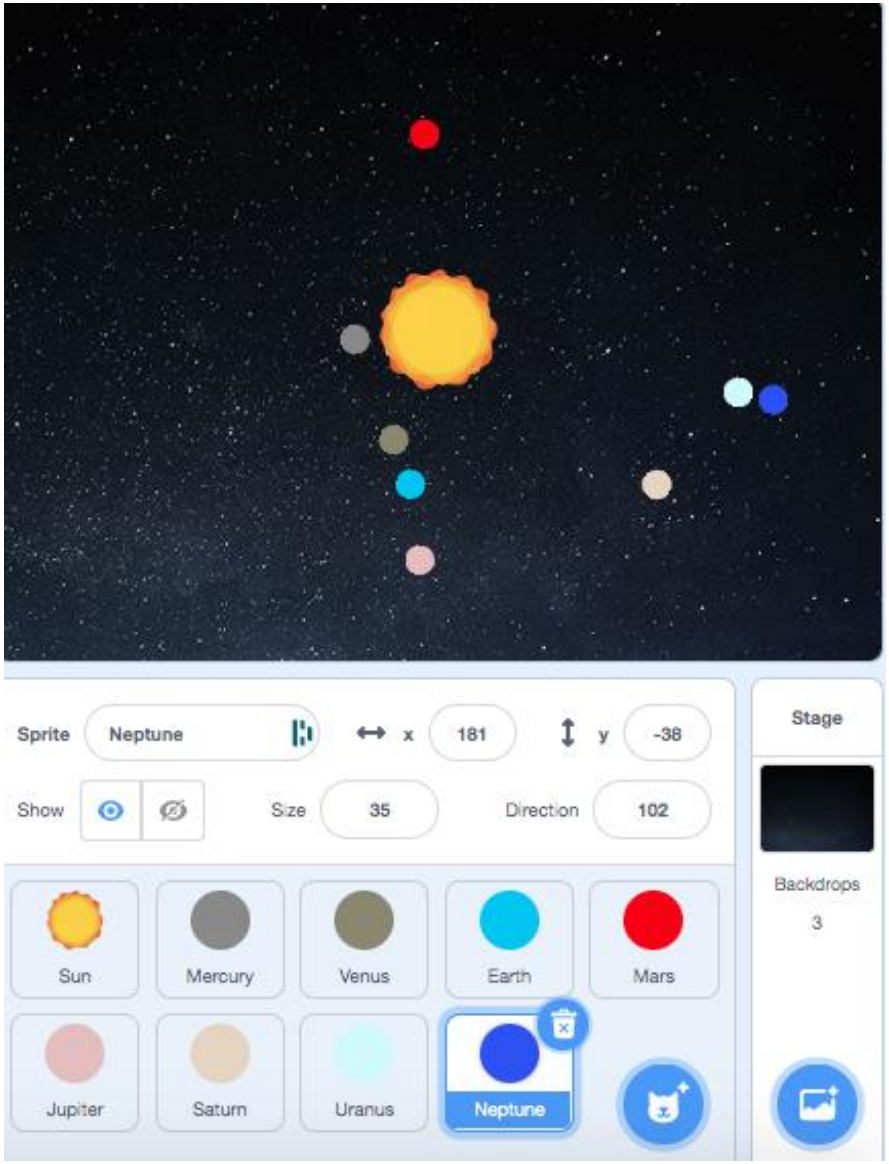
Attempt to add all of the planets into our model!

We will need to change the **colours** and **sizes** to make sure each planet looks right.

To get the right orbits and order we will need to change the **number of days to orbit** and the **number of steps**.

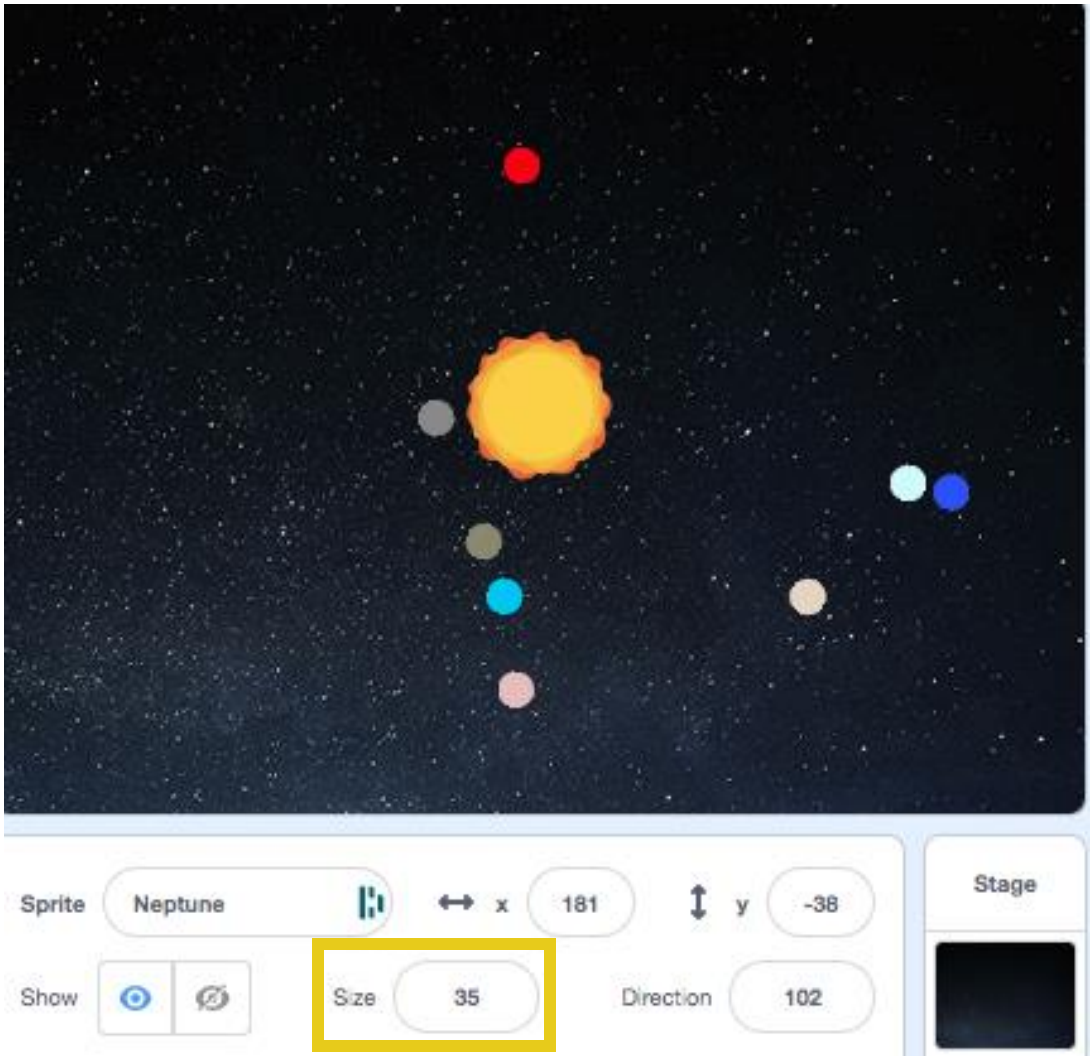


Change the colour of all planets to look correct.



Change the size of all the planets.
The sizes I have used here are:

Mercury	20
Venus	30
Earth	30
Mars	25
Jupiter	50
Saturn	45
Uranus	40
Neptune	35



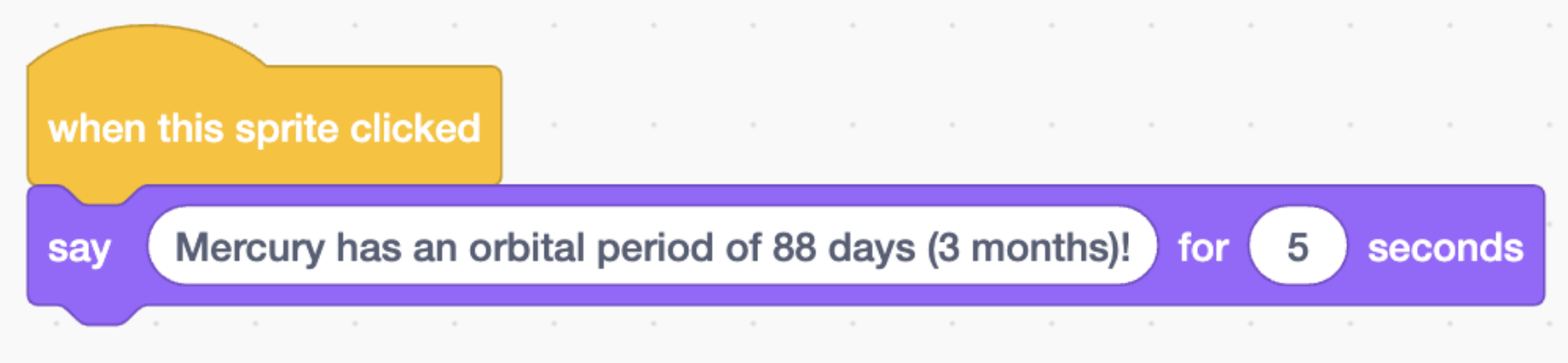
Orbits

Planet	Time to orbit the Sun (earth days)
Mercury	88
Venus	225
Earth	365
Mars	687
Jupiter	4,331
Saturn	10,751
Uranus	30,685
Neptune	60,155

Extension: Planet Facts

We want each of our planets to respond when we click them by:

- Saying a fact about that planet for 4 seconds



Extension: Better Models

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1pixelmoon.com

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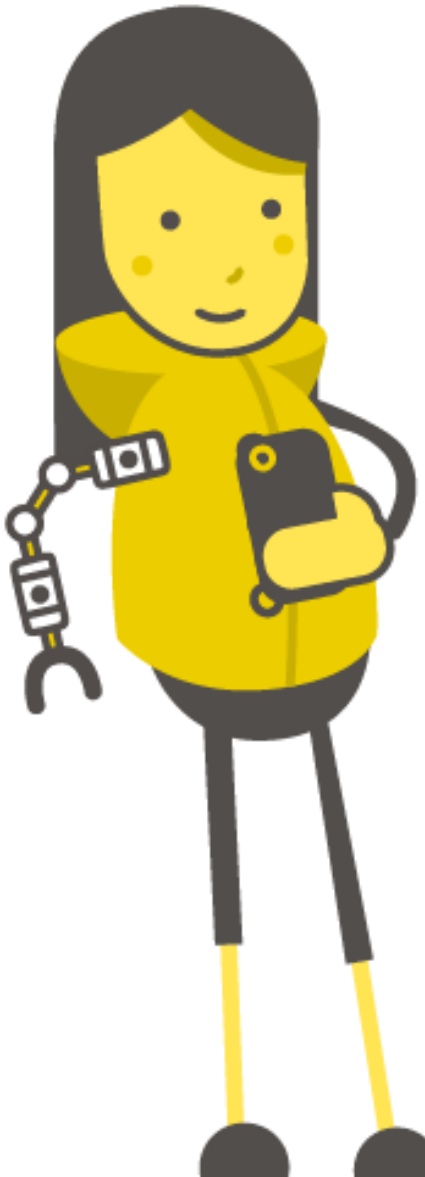


Gravity and Your Weight

What is Gravity?

Gravity is the force that keeps us all on the ground.

When you jump, it's gravity that pulls you back down.

When you throw a ball, gravity is what makes it fall down instead of flying off into space.

What has Gravity?

Gravity is something that everything has, but the bigger something is, the more gravity it has.

Only planets have enough gravity to keep you stuck to their surface.

What then is weight?

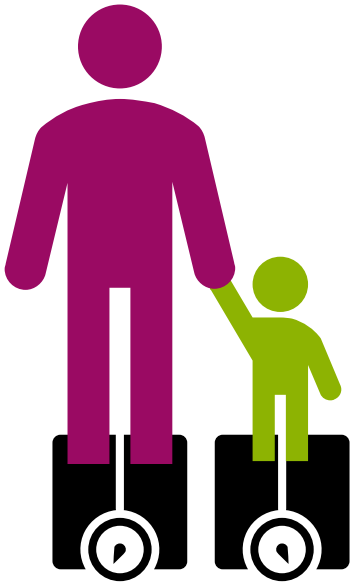
Weight is something that you have because of gravity.

Weight is how strongly **you're** pushing down on the ground because of gravity!

What then is weight?

A weighing scale works by measuring how hard **gravity** is pulling **you** toward the ground.

The bigger **you** are the harder **gravity** has to work to pull you down.



Our Weight

We can all easily measure our weight at any time using a weighing scale. You probably have one of these in your bathroom!

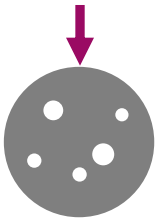
We are all going to measure our weight on the scale! Make sure you write it down!

How Does Gravity Change?

Because the size of something matters, this means that different planets and moons in the Solar System have different gravities.

The Earth pulls you down harder than the Moon would.

And Jupiter will pull you down harder than the Earth does.



How Does Weight Change?

That means that on different planets you can **actually weigh more or less!**

The moon has **5 times less** gravity than Earth, which means we would also weigh **5 times less** there.

As a group, work out how much you would weigh on the moon by using your measurements:

Earth Weight ÷ 5 = Moon Weight

Astronauts on the Moon

Astronauts on the moon felt a lot less gravity.

Because they weighed less, they push up more with each step and take longer to fall back down!

https://www.youtube.com/watch?v=3Cm83yYtDns

Astronauts in Space

Astronauts in space, such as those on the International Space Station, are in zero gravity.

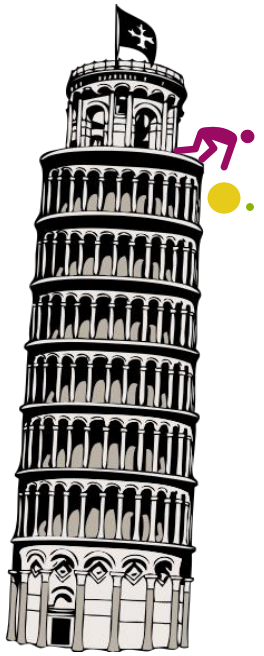
This means that they don't have any weight, and can float about!

https://www.youtube.com/watch?v=UyFYgeE32f0

Discussion!

Someone climbs up to the top of the Leaning Tower of Pisa, carrying a ping-pong ball and a bowling ball.

When they reach the top, they hold them both over the edge, and drop them at the same time!



Which one do you think will hit the floor first?

- Bowling Ball
- Ping-Pong Ball
- Same time

Weight does not affect Gravity!

While weight is an effect of gravity, but gravity is not affected by weight.

This means that gravity pulls everything down at the same speed, no matter how light or heavy it is!

We can test this in class right now!

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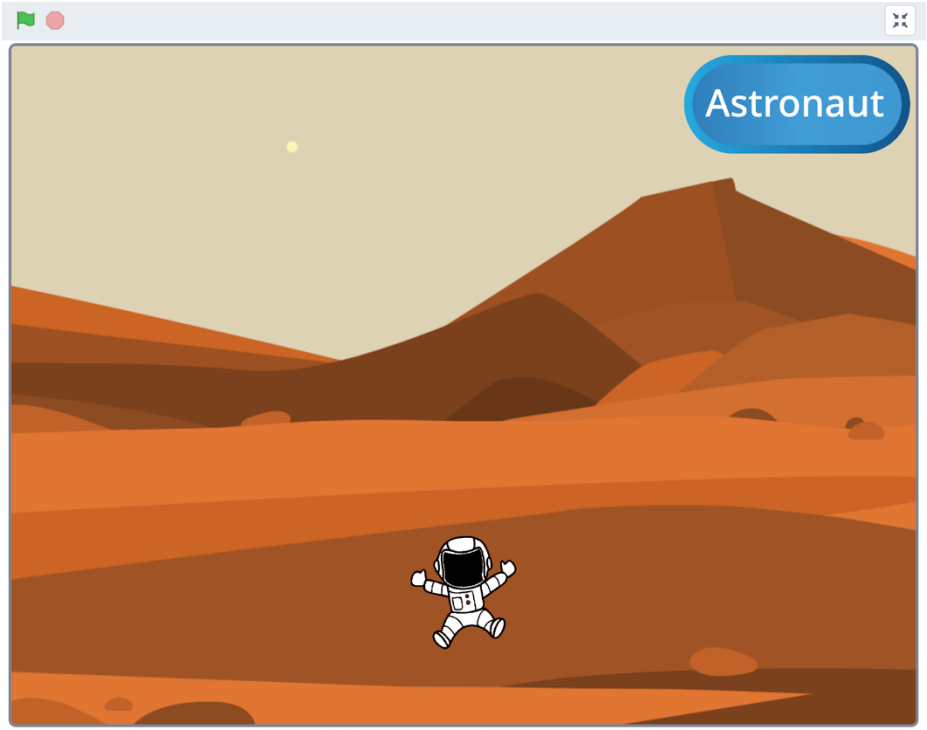
Modelling Gravity with Scratch

Modelling Gravity

Now we're going to attempt modelling gravity in the Solar System using Scratch.

A model has been built that will let us test how an astronaut would jump, and how a rocket would launch, on different worlds.



Scratch Model

Download the Scratch model here:

tc1.me/

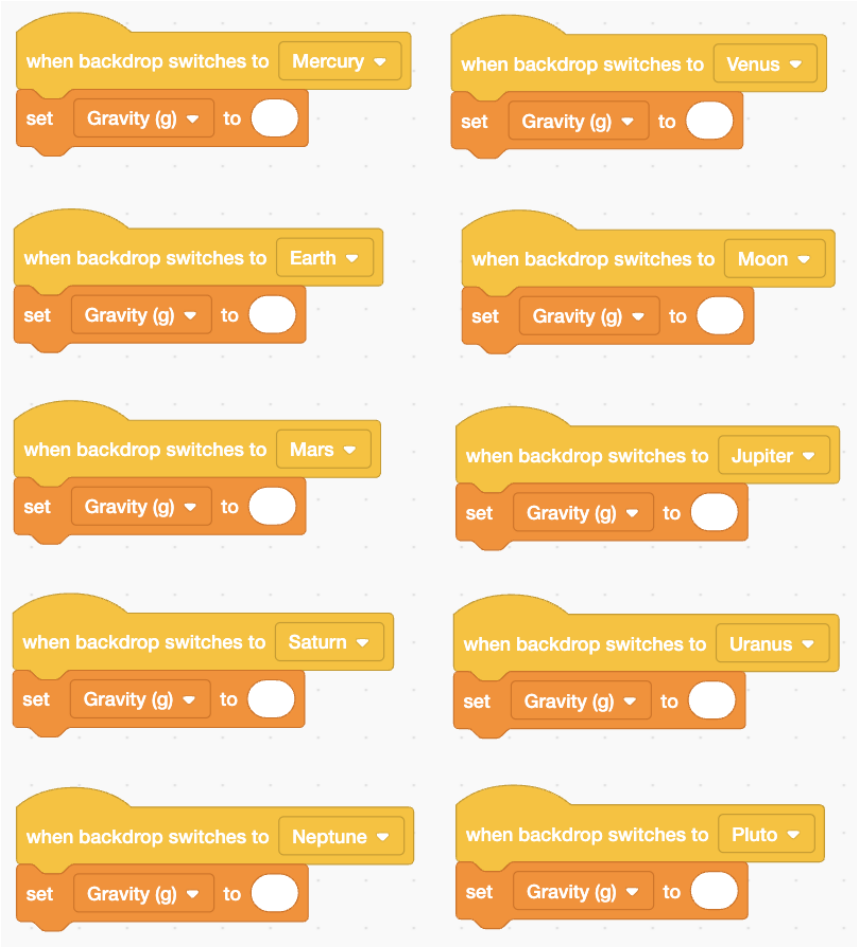
We will need to fill out the correct values for gravity on each world!

Filling in our model

These are the values that you will have to fill in to get our simulation working.

You will find them in the code for the **Stage**.

Fill them out and then test the model by clicking the Green Flag!



Gravity Values

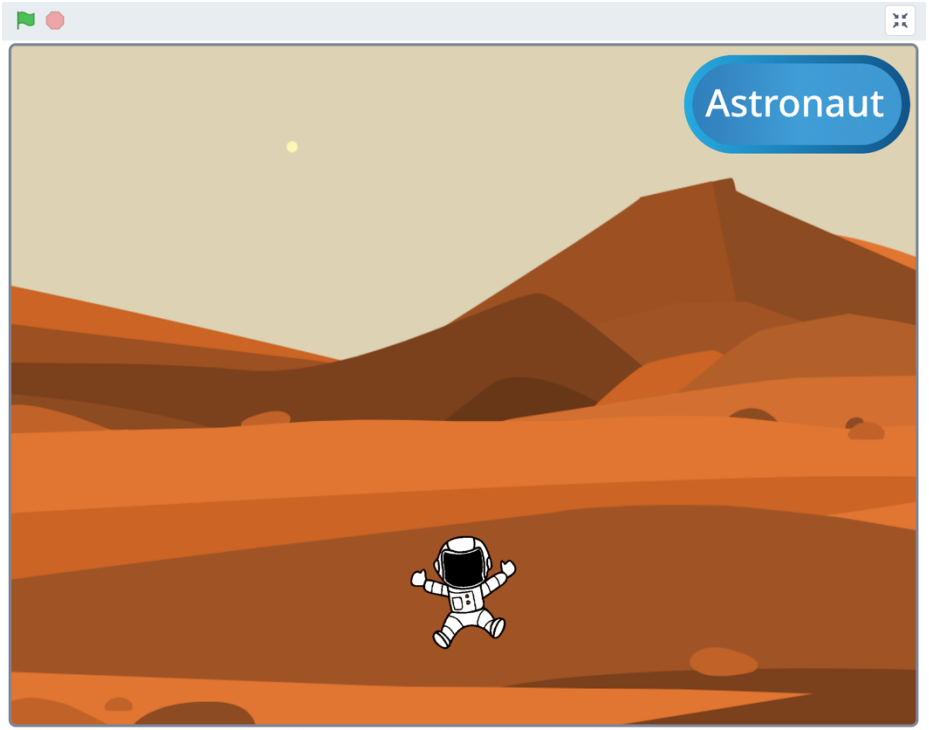
Location	Gravity (compared to Earth)
Mercury	4
Venus	9
Earth	10
Moon	2
Mars	4
Jupiter	25
Saturn	11
Uranus	9
Neptune	11
Pluto	1

Controls

To start the model press the Green Flag and type in where you'd like to visit.

Press the Space Bar to make the Astronaut jump, or to make the Rocket launch.

You can switch between the Astronaut and Rocket using the button:

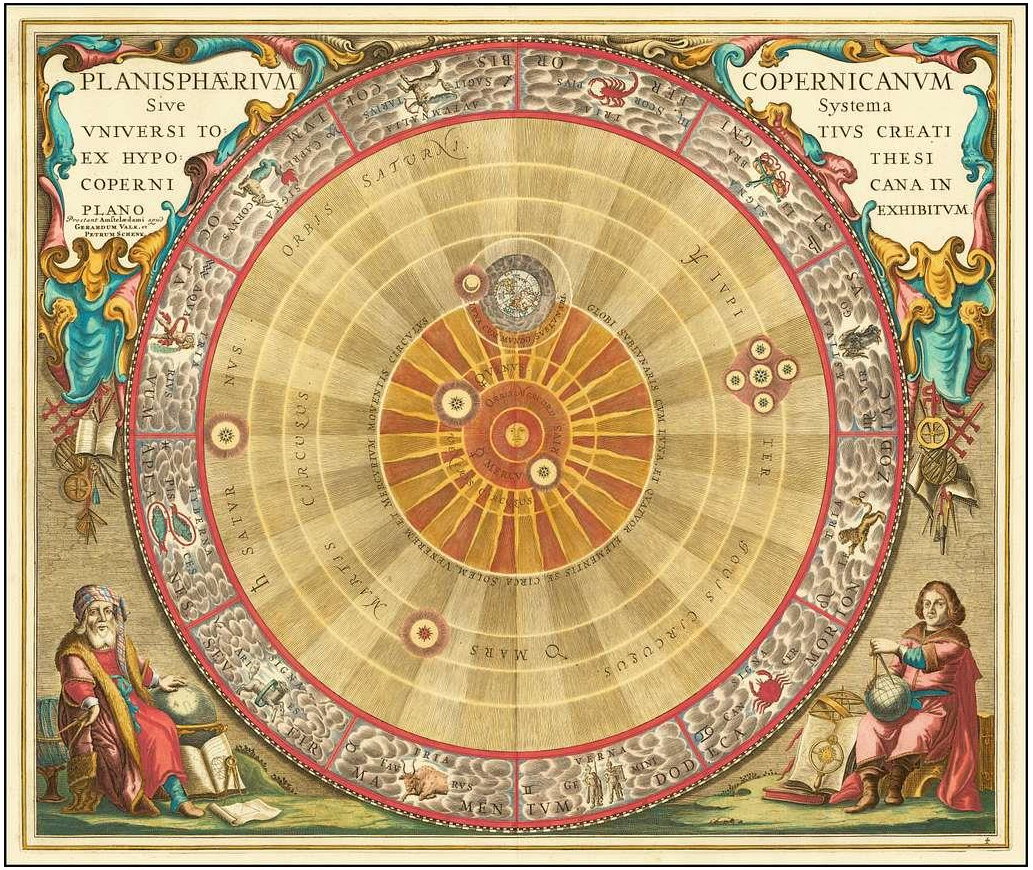


Exploring the Solar System

Looking at Space

Humans have been exploring the Solar System with telescopes for hundreds of years!

By looking at how the other planets move across the night sky we were able to make the first accurate model of the Solar System in **1543!**

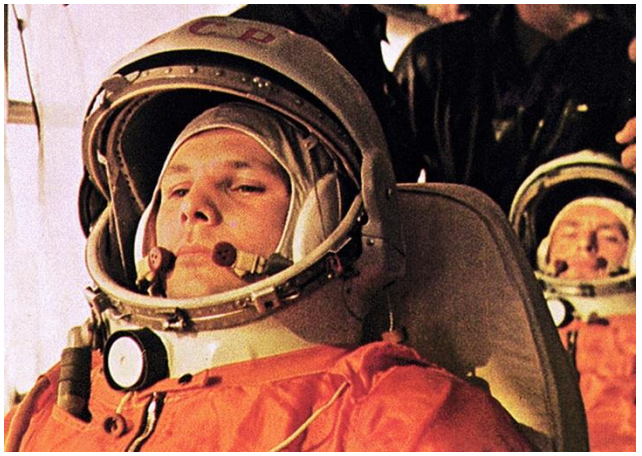


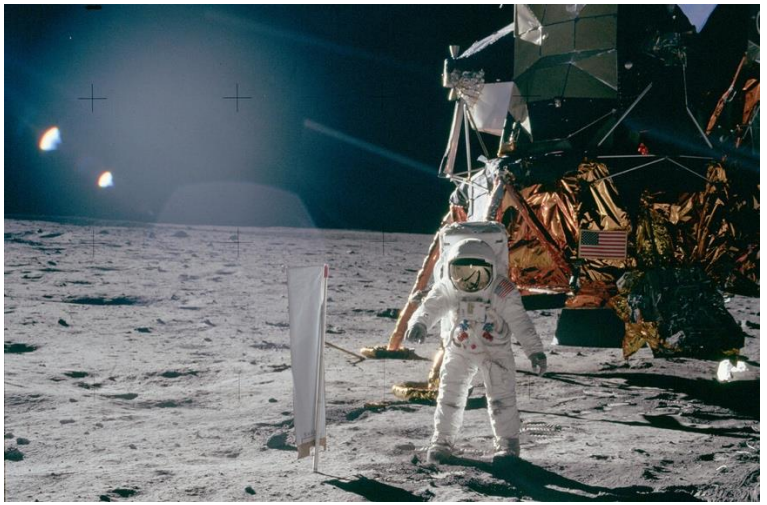
Going to Space

In the 1940's we began building the rockets that would take people into space.

Yuri Gagarin became the first man in space in 1961, when he orbited the Earth in a rocket!

Only 8 years later, in 1969, Neil Armstrong became the first man to walk on the Moon!

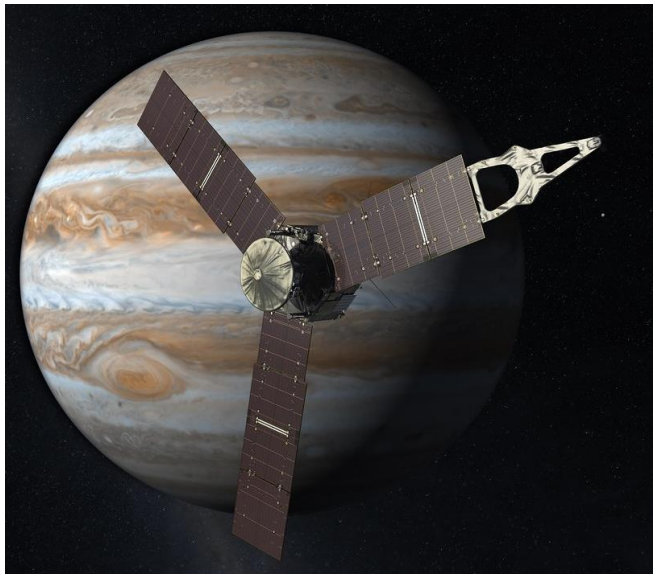


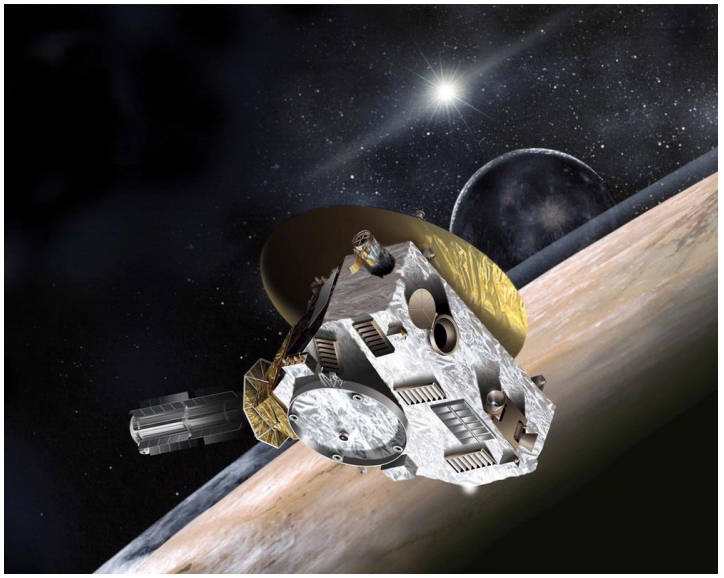


Exploring Space

Humans have yet to travel farther into the Solar System, but we have sent several robots out to explore for us.

We've sent several probes to different planets, to the edges of our Solar System and further in toward the Sun!

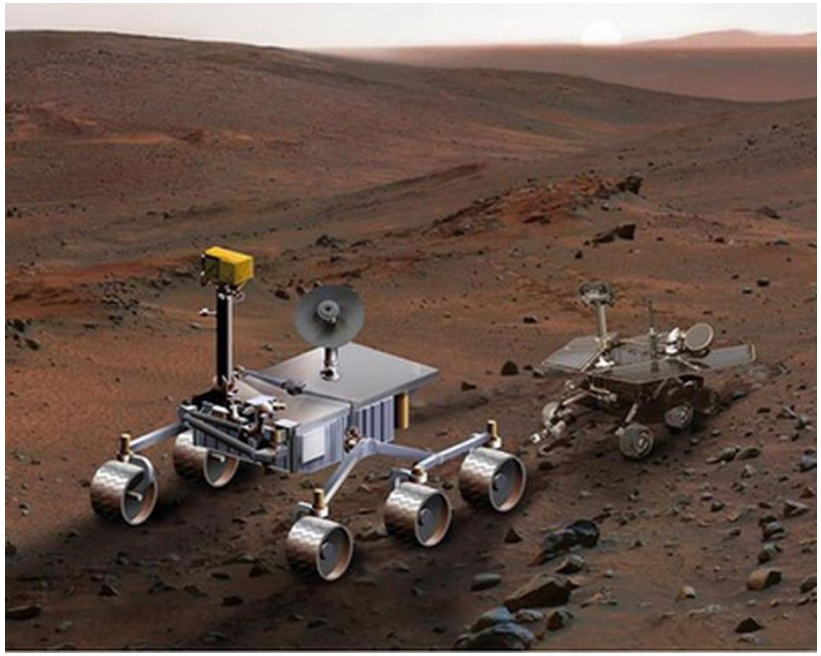


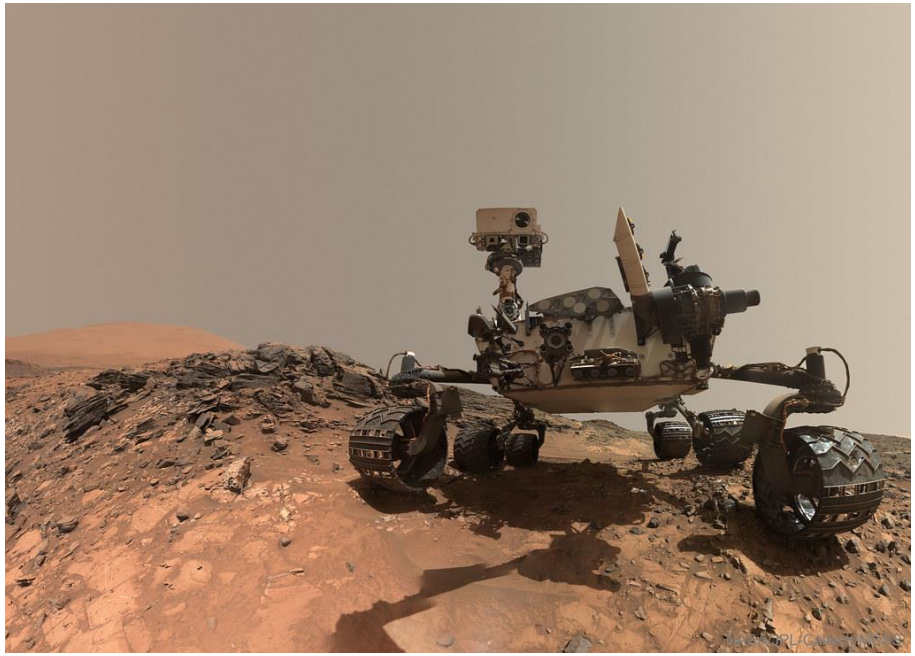


Exploring Mars

We have also landed some of these robots on planets!

Several rovers have been sent to study Mars!

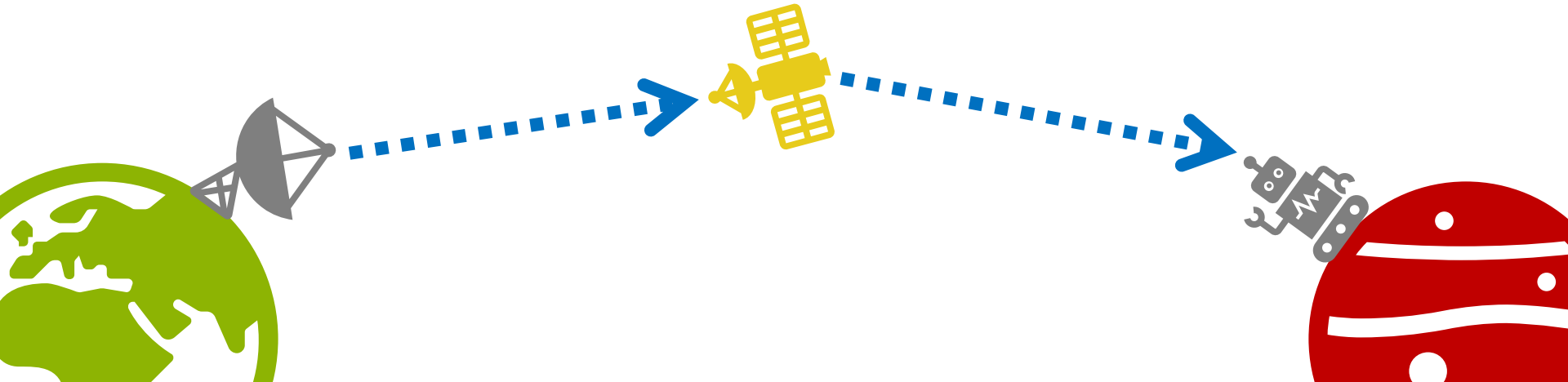




Sending Instructions

All alone on an alien world, we can't just control these robots with a remote control, they're far too far away for that!

Instead we have to send instructions ahead of time, and hope that the robot is clever enough to follow them without getting damaged!



Scratch Rover

Play the Scratch Rover game here:

tc1.me/

Try to program the Mars rover to collect all of the science!

You'll have to avoid the big rocks and boulders to keep the rover safe!

technocamps

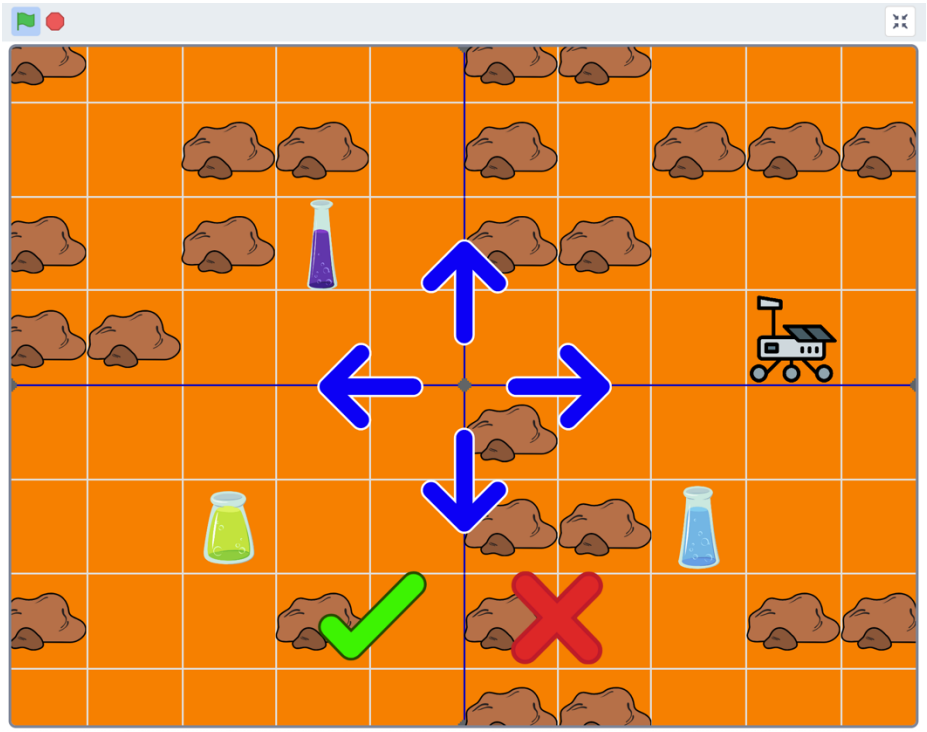
Collect the Science on Mars!

Press the **Space Bar** to begin programming your rover.

Use the Arrows to enter the directions for your rover (it will move **1 square at a time**).

Press the Green Tick to run the program, or the Red Cross to cancel and restart.

Press the Green Flag to start on a new map.



Bibliography

https://commons.wikimedia.org/wiki/File:Solar_system_model_2.JPG
https://freesvg.org/leaning-tower-of-pisa-vector-image
https://freesvg.org/weighing-machine
https://freesvg.org/red-analog-scale
https://www.flickr.com/photos/itupictures/16042132243
https://www.flickr.com/photos/projectapolloarchive/48334391441
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