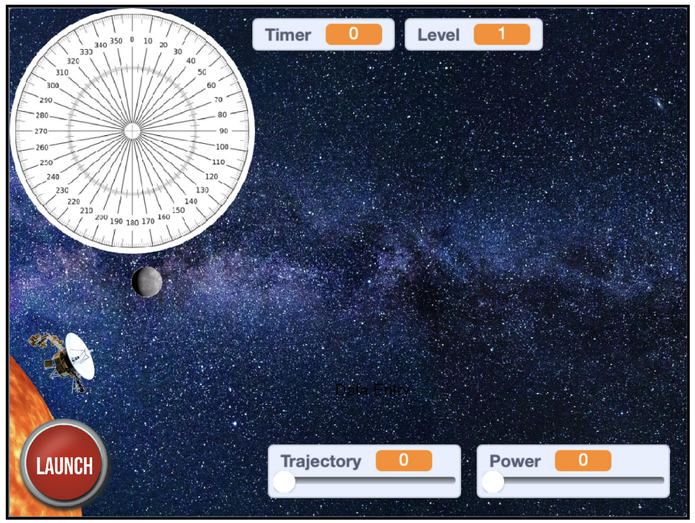
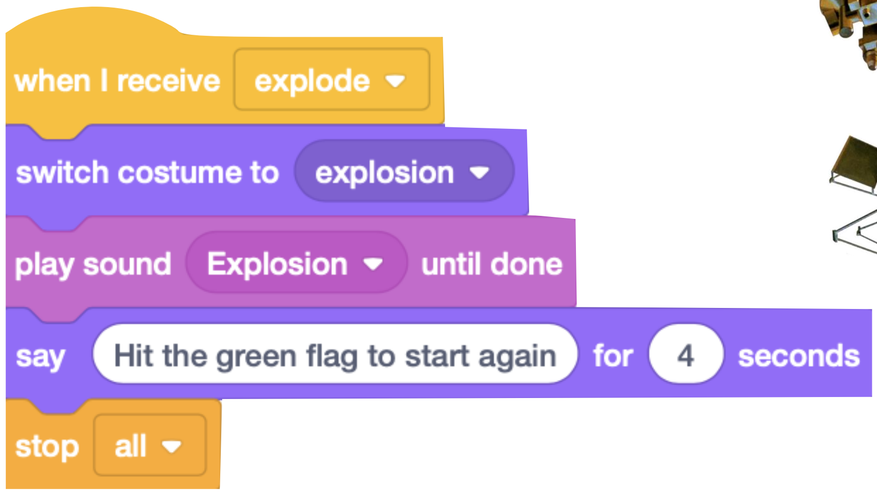
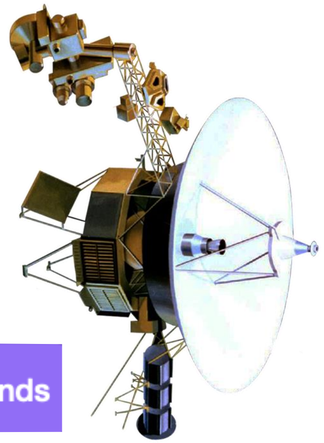
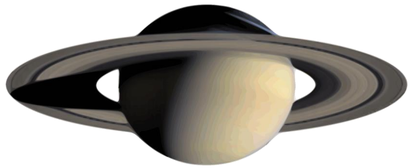
RAF Code Commanders: Cosmic Launch Project

Session 1









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For more free and exciting STEM resources go to www.rafyouthstem.org.uk

Science, Technology, Engineering and Math (STEM) are key subjects that support research and help solve problems on Earth and in Outer Space.

In this project, you will learn how to apply computer science to creating your own video game, while also learning about the Solar System and space travel.

Have fun!

Disclaimer: Included in this project are links to YouTube videos and other websites selected to support learning outcomes for students. These links and media have been checked for their suitability at the time of publication.

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The content of third-party links may change over time. We recommend that project facilitators carefully review media and third-party links before sharing them with students.

Feedback & Social Media

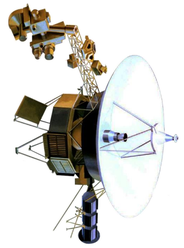
We welcome feedback! If you encounter any errors or broken links in this project, or have constructive suggestions for improvement, please email Antony Hyett at antony@hyetteducation.com and provide details. Your cooperation and feedback is greatly appreciated.

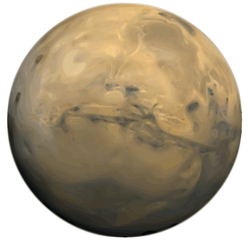
We'd love to see how you're getting on with this project. Please share students' participation, progress and enjoyment of this project on social media using the hashtag **#RAFCodeCommanders** and follow **@rafyouthengage** and **@hyetteducation** to keep up to date with RAF Youth & STEM and Hyett Education's work with schools.

Session 1: Getting started!

Overview

In this project you will:





- Learn to code a space game using the programming tool **Scratch**
- Learn key vocabulary in computer science, including **algorithm, sequencing, selection,** and **iteration**
- Revise and extend your knowledge of our Solar System
- Consider the challenges of exploring our Solar System and beyond.

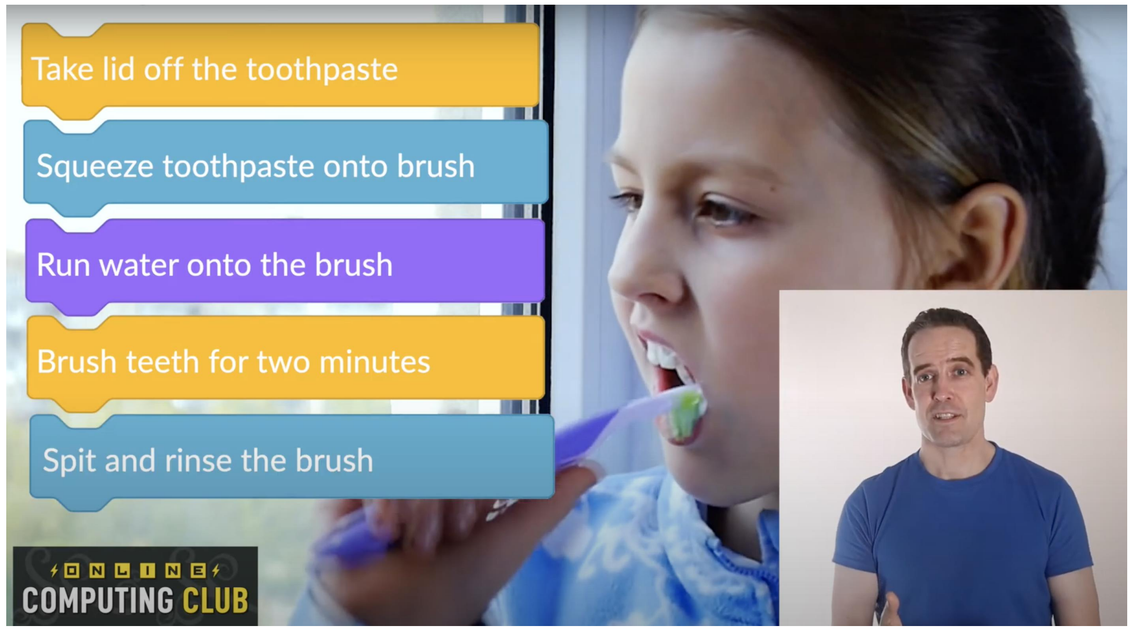
“What is an algorithm?”

Here’s a video clip to help you!

Watch

‘What is an algorithm?’

https://youtu.be/2Do-q47hKxI



From ‘What’s an algorithm?’ by Richard Anderson (TechMentor UK)

… from the dictionary

“An algorithm is a step-by-step procedure for solving a problem or accomplishing some end”

Merriam Webster Dictionary

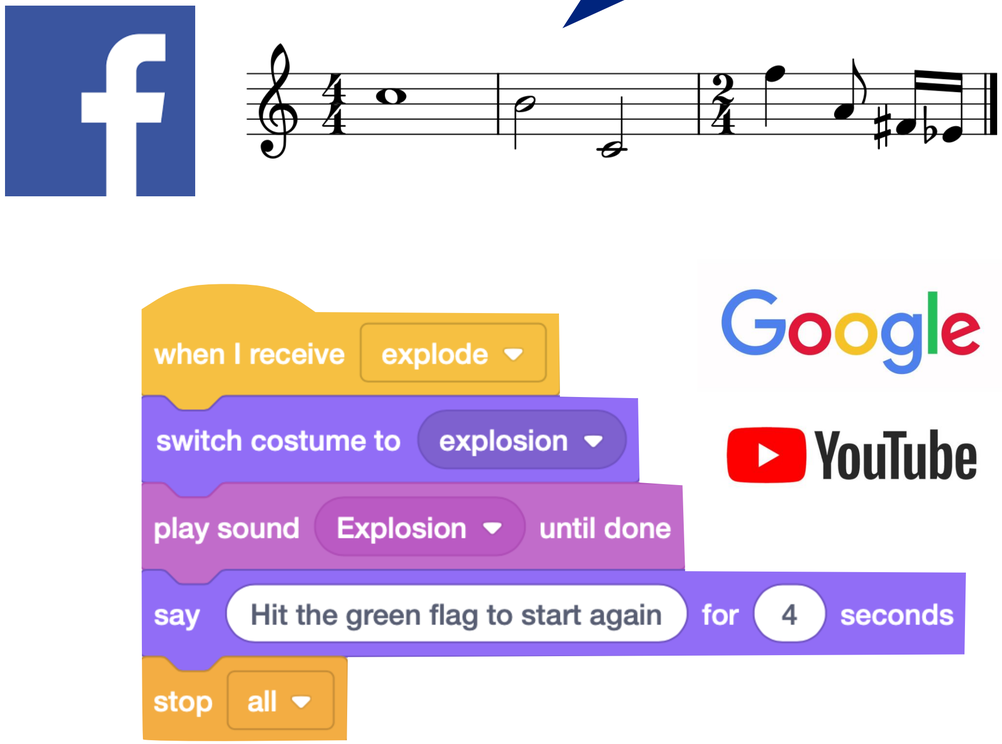
… an easier definition

"An algorithm is a set of instructions, placed in the right order to make something happen"

Algorithms are everywhere!

Learn

- Playing music is an algorithm
- Following a recipe is an algorithm
- Algorithms are often used to make computers do what we want them to do.
- Many of your **favourite websites** use algorithms to decide what to show you: Google, YouTube and Facebook all use lots of algorithms
- We’re going to be using a programming tool called **Scratch** to create our own algorithms.



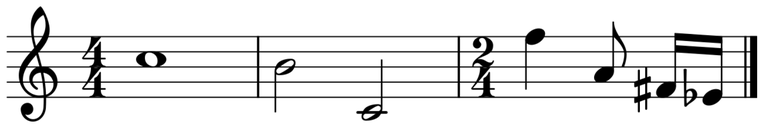
An algorithm in Scratch

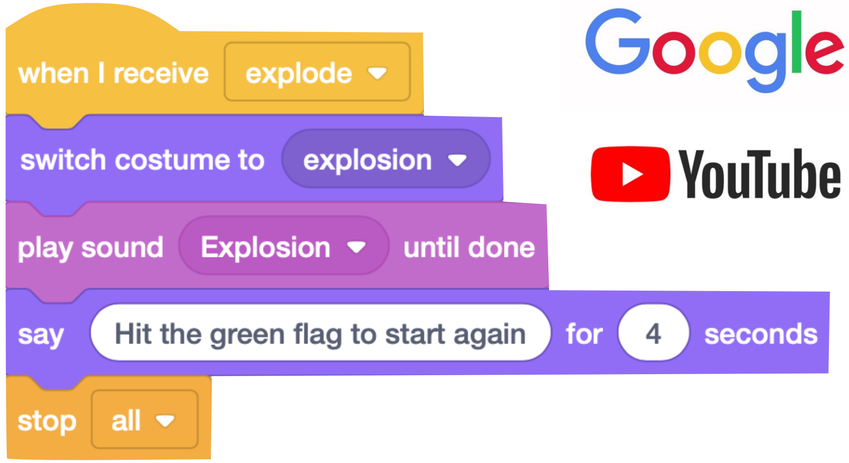
Can you think of any other examples of algorithms?

In an algorithm, the order of instructions is very important

Learn

- In most algorithms, the **order of instructions** is critical to making it work properly.
- Getting the **sequence** of our code correct is very important.
- If the sequence is wrong, it's like playing music with 'the right notes, but not necessarily in the right order'!





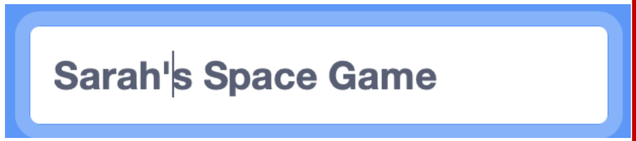
Google

YouTube

An algorithm in Scratch

Let’s get started!

- Log into your Scratch accounts with your username and password
- Open up the Scratch template at scratch.mit.edu/projects/419026147. Type this carefully!
- Click on the ‘Remix’ button at the top of the webpage to create your own copy.
- Give your project its own name by typing into the box at the top of the screen.
- Scratch should save your project on its own, but, if you see **‘Save Now’** at the top right, click that to save your work.



Session 1: Exploring Scratch

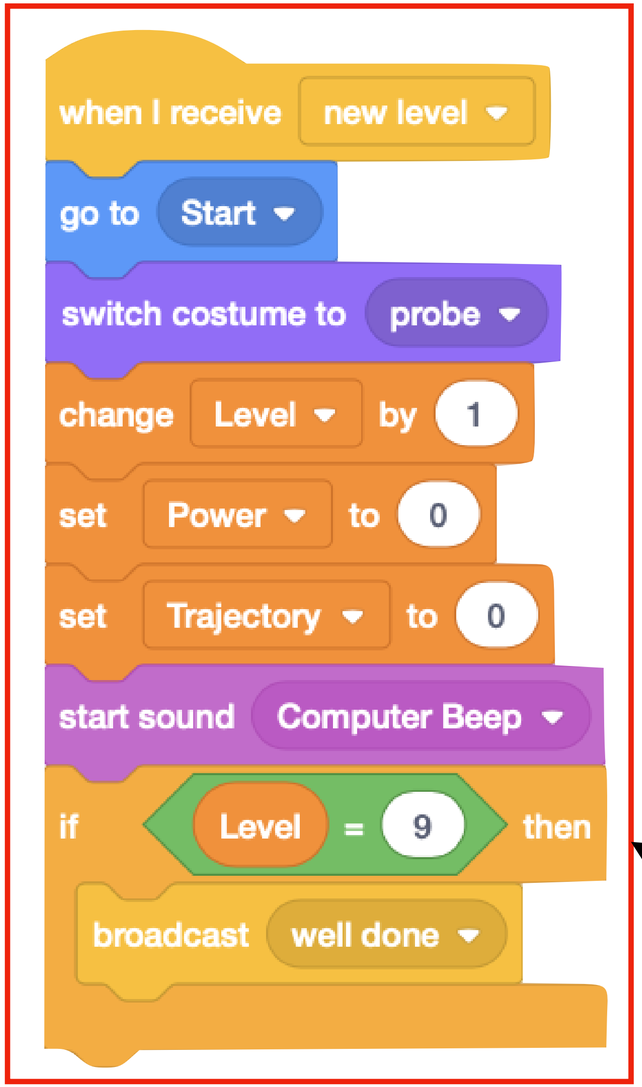
In Scratch

Learn

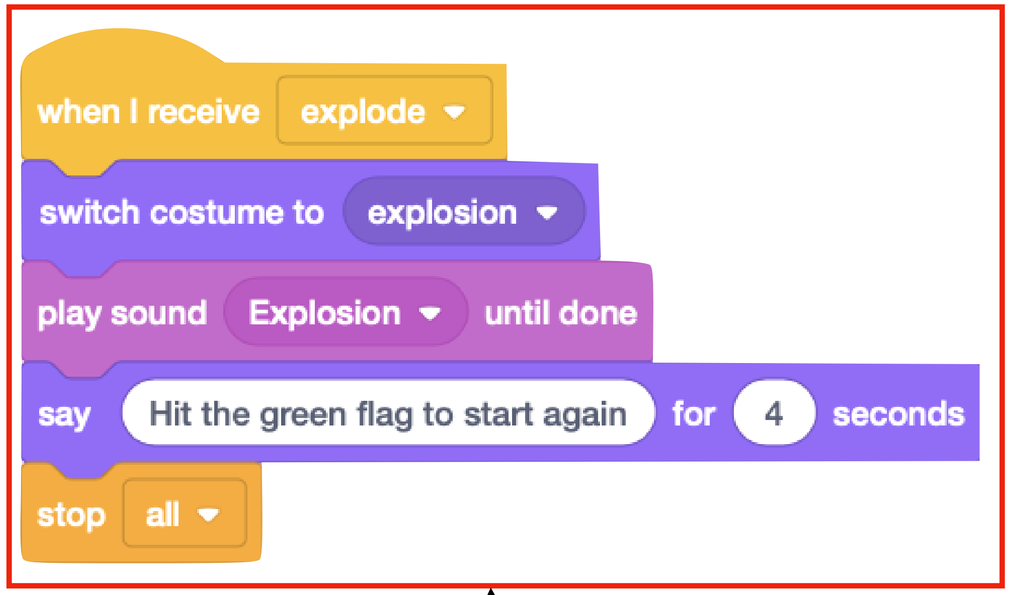
- **code** is the instructions that we use
- **coding** is putting those instructions together to create algorithms
- an **algorithm** is one set of instructions combined together
- a **computer program** is all of those algorithms together - the whole project.

An algorithm in Scratch

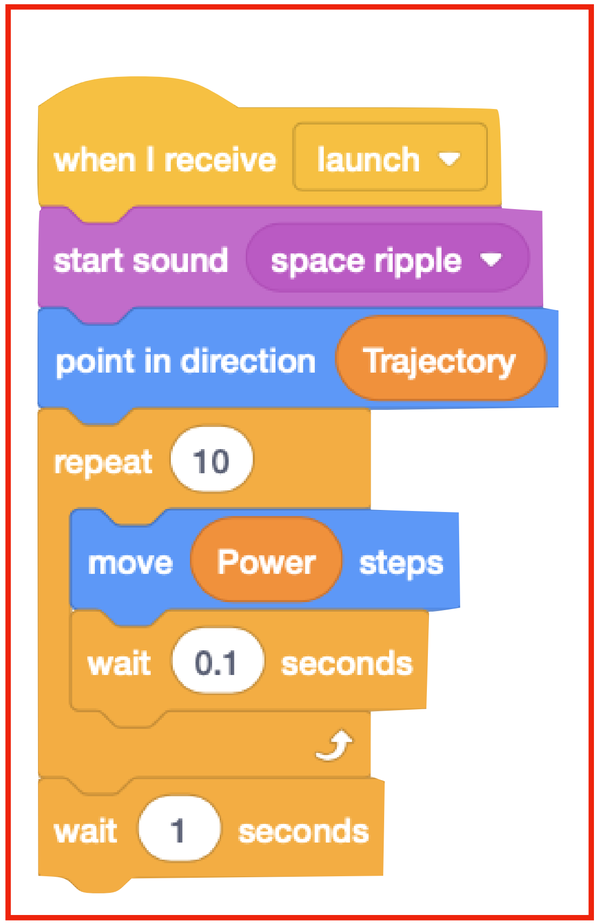
A computer program is made from **more than one algorithm**



An algorithm



Another algorithm

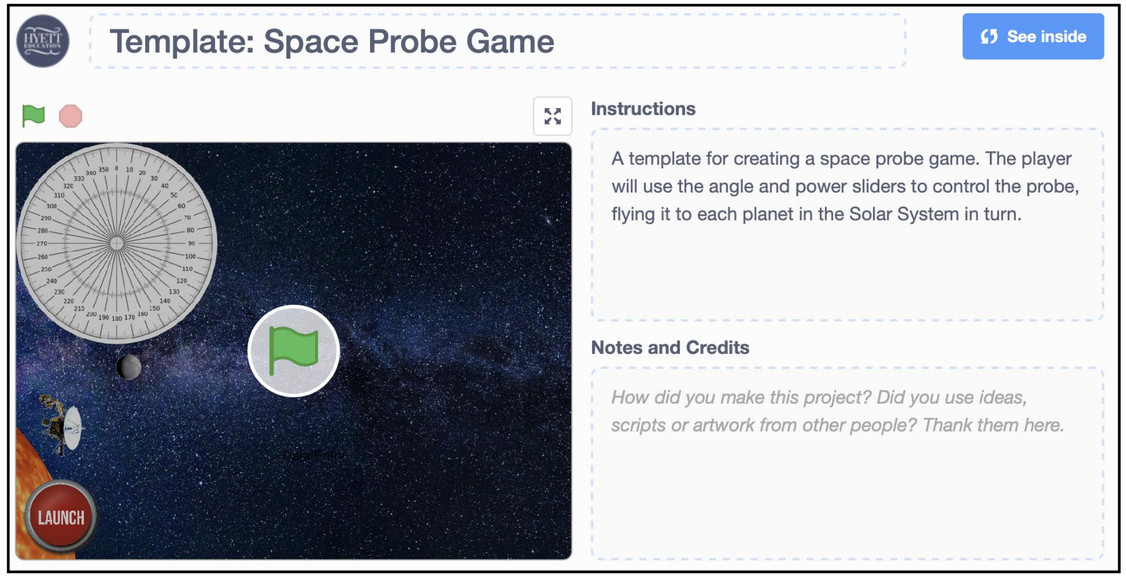


And another one!

Exploring Scratch

Watch

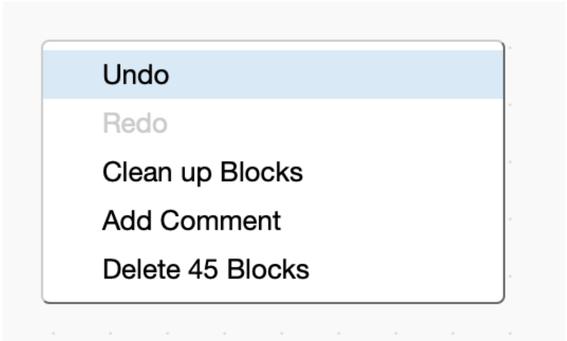
- Watch this video clip, which introduces you to the basic layout of Scratch: https://youtu.be/uBUU4j9gsFA
- Don’t click onto anything in your Scratch project yet!
- Make sure that you don’t drag items around, or place any new objects into your project!

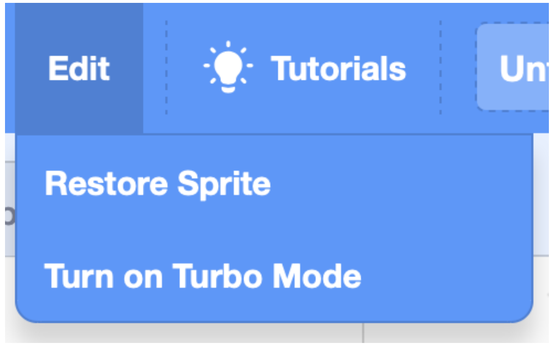


Correcting mistakes

Learn

- If you make a mistake when using Scratch – e.g. by deleting pieces of code accidentally - you undo your mistake by **right-clicking onto any empty area of the Coding area**, and then clicking '**Undo**'.
- On an iPad, **tap and hold** in a blank area of the coding area, and select '**Undo**'.
- If you accidentally delete a sprite, go to **'Edit'** at the top of the screen and click '**Restore sprite'**.

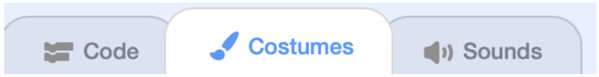




“What are the names of the planets in our Solar System?
Which planet is closest to The Sun, and which is furthest away?
What order are they in as you move away from The Sun?
Which planet is the smallest and which is the largest?

Exploring Scratch

- To check your answers, click onto the

in your Scratch template
- Click onto 

- Click onto each of the costumes to check your knowledge on the order and size of the planets. **Don’t drag the planets around the stage.**
- Discuss: why do you think the last costume is a balloon?

Learn

Discuss

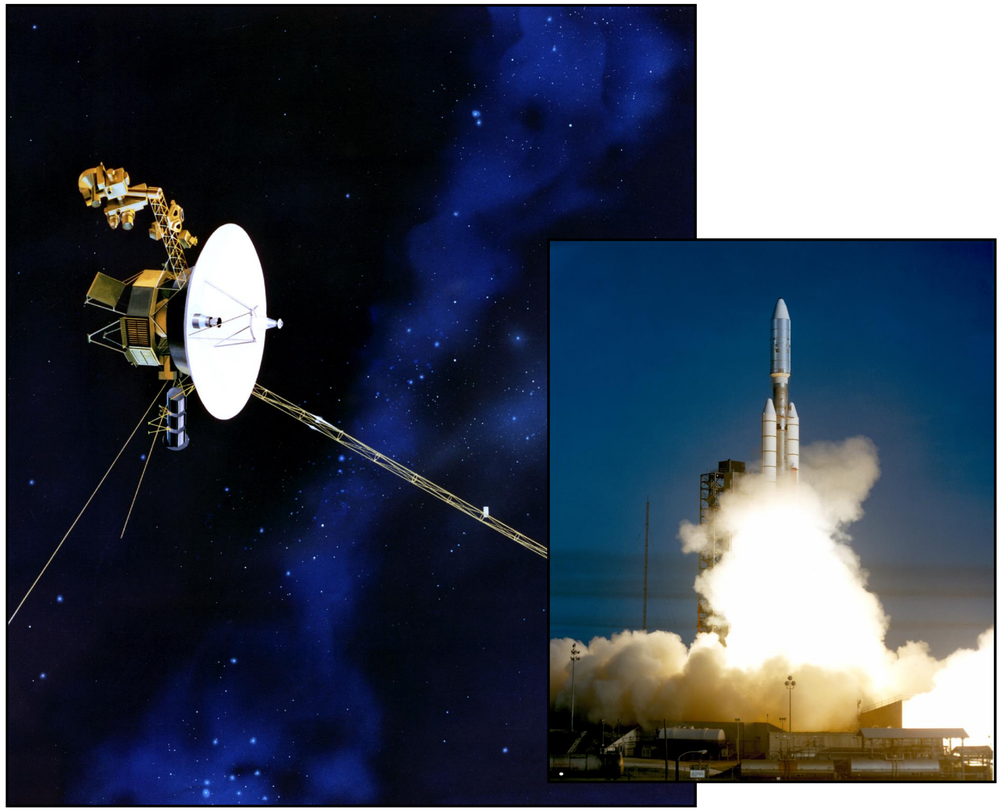
Video clip: ‘Solar System 101’:

https://youtu.be/libKVRa01L8

The probe in our game is Voyager One

Learn

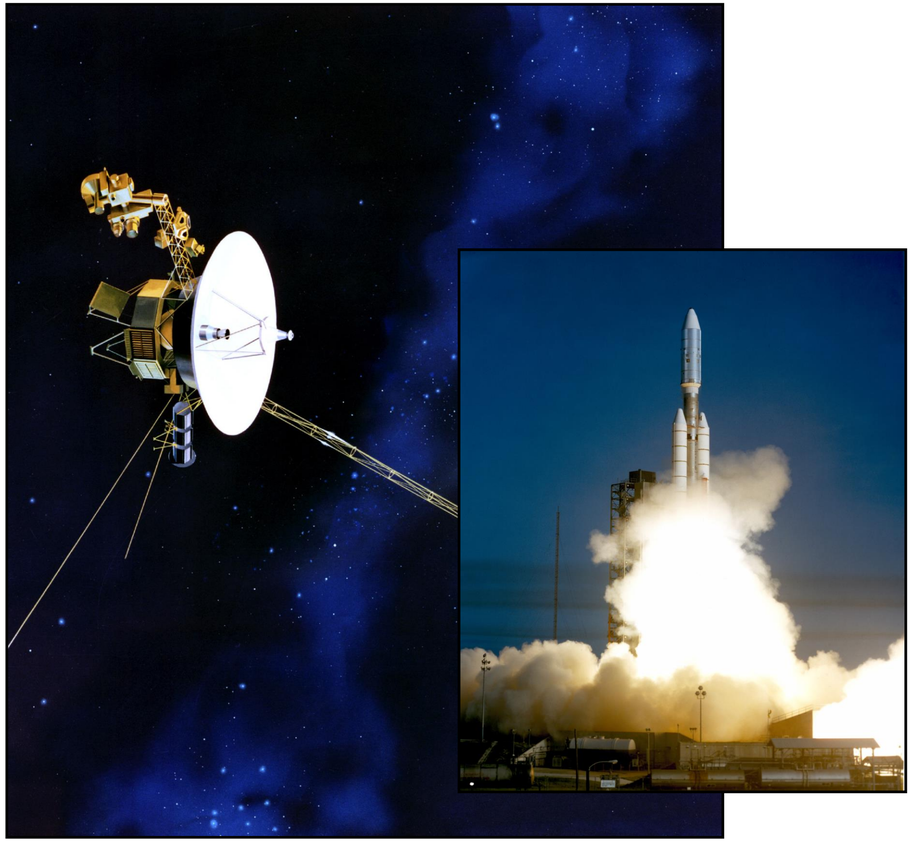
- A probe launched from Earth in **1977** to explore our Solar System
- Even today, over 40 years later, it still receives data and instructions from Earth.
- After visiting Jupiter and Saturn, it has now left our Solar System, heading to a nearby star called AC + 79 3888, which it should reach in about 40,000 years …



The probe in our game is Voyager One

Learn

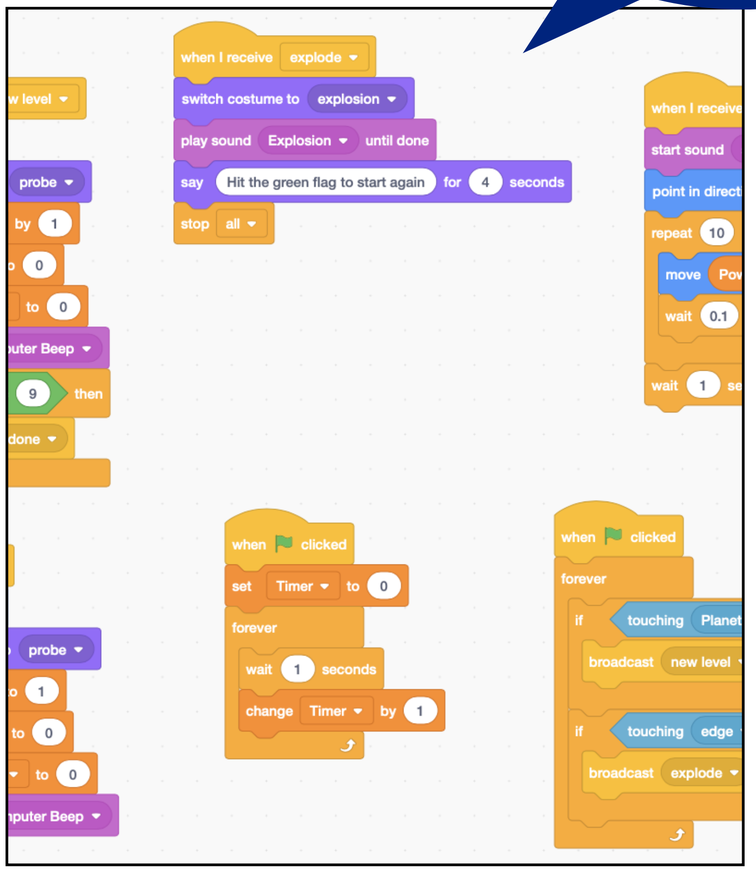
- Voyager One is currently over 13 billion miles away from Earth.
- It carries ‘The Golden Record’, a time capsule which contains information about Earth and humans for any aliens who might find the probe in the distant future!
- The probe sprite in our template has a costume. Can you think why?



Decomposition

Learn

- It is difficult to create all of our algorithms at once, so it is often better to **break down** the finished program into a set of simpler problems.
- We solve each of these problems in turn.
- We call this **decomposition**.

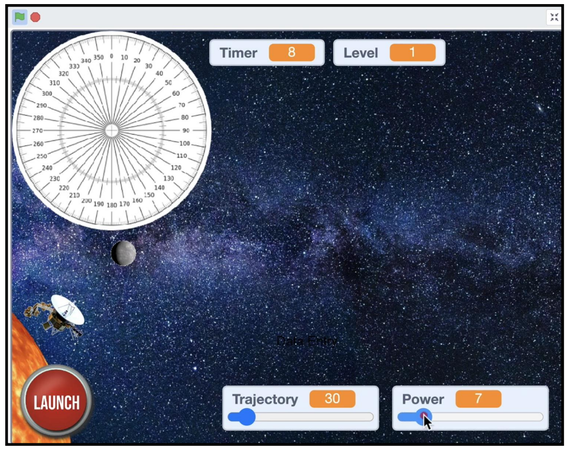


Looking at the completed project

Watch

Discuss

- To help us break down (**decompose**) our finished project into smaller steps, you're going to watch a video clip now of the finished game being played.
- While you are watching, **think about, and discuss the questions on the next slide.**
- Look over the questions on the next slide first, then watch the video, then discuss the questions again.



1. How does the player start the game?

4. What happens to the probe when it touches a planet?

7. When does the ‘Level’ at the top of the screen change?

2. How does the player control the movement of the probe?

5. What happens to a planet when it is touched by the probe?

8. What happens to the timer as the game is played?

3. How does the player launch the probe?

6. What happens if the probe hits the edge of the screen?

9. What happens if the probe successfully reaches all eight planets?

Analysing gameplay

Watch the gameplay demo video

https://youtu.be/QhOCT0MfLoI

1. How does the player start the game?

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Discuss

Analysing gameplay

1. How does the player start the game?

By clicking the green flag

2. How does the player control the movement of the probe?

By setting the trajectory (angle) and power for the probe

Getting our probe launching!

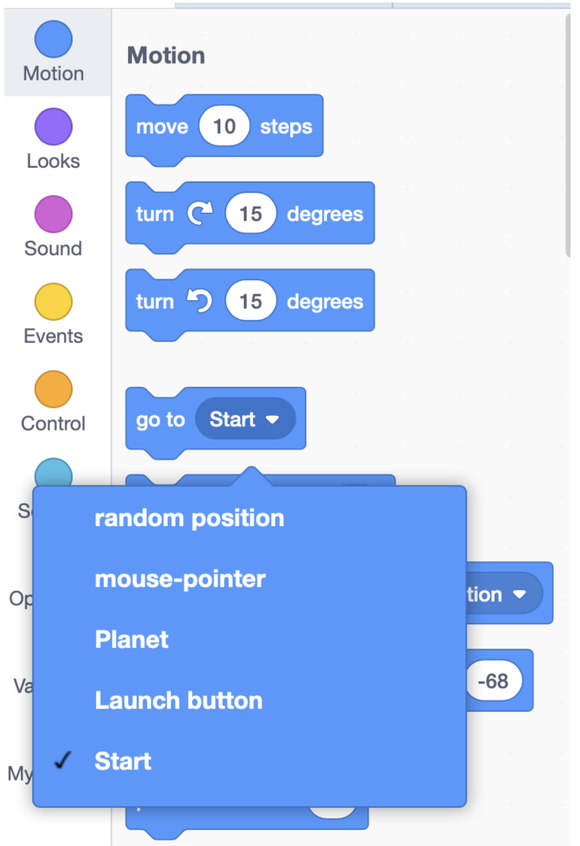
- You’re going to learn how to get the probe moving!
- **Video clip:** https://youtu.be/Ml_aPduxKeo
- Listen and watch carefully.
- At some points in the video, you’ll be asked to pause playback.
- You will be asked to predict what will happen, or to experiment with your code to create algorithms in Scratch.

1. How does the player start the game?	By clicking the green flag
2. How does the player control the movement of the probe?	By setting the trajectory (angle) and power for the probe

I’ve lost my probe … what do I do?

Learn

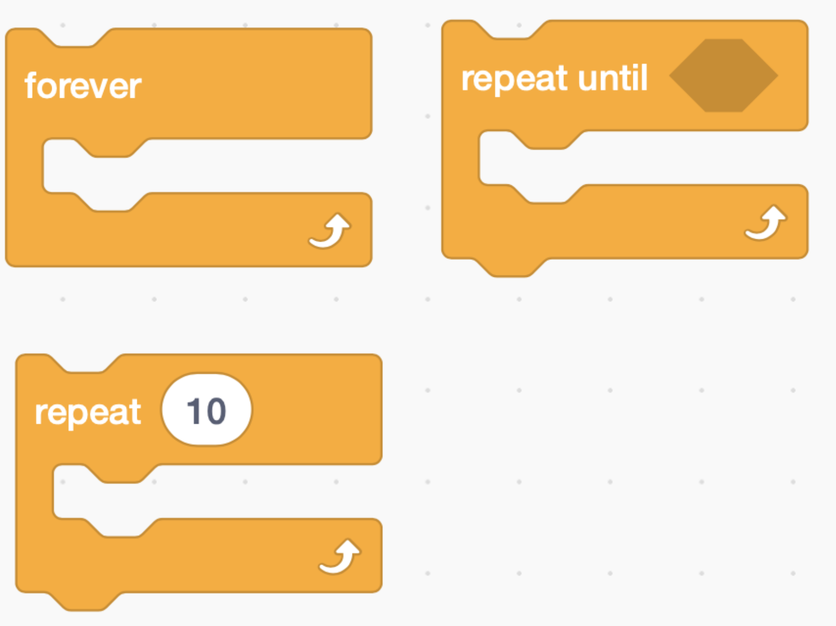
- If your probe disappears off the edge of the stage, click onto the **Motion** code blocks, and look for the ‘**Go to**’ command.
- Select ‘Start’ from the drop-down menu.
- **Double-click onto the code block** to move the probe back to the red cross. (You do not need to drag this block into the coding area).



Iteration

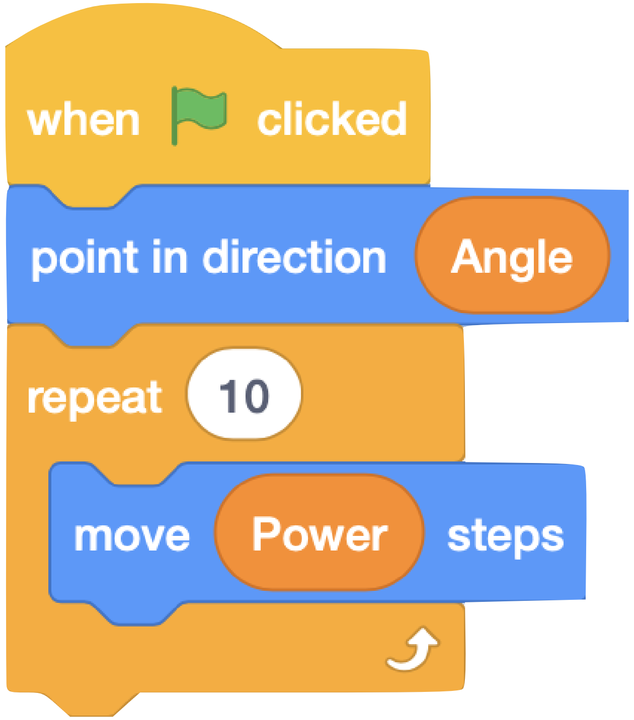
Learn

- The word **iteration** means to **repeat** sections of code to make them run more than once.
- Iteration is sometimes called **repetition**.
- You might also hear the word ‘loop’ to describe iteration.
- In Scratch, all code for iteration are listed under ‘**Control**’.
- Examples are ‘**forever**’, ‘**repeat**’ and ‘**repeat until**’



The completed algorithm

Learn



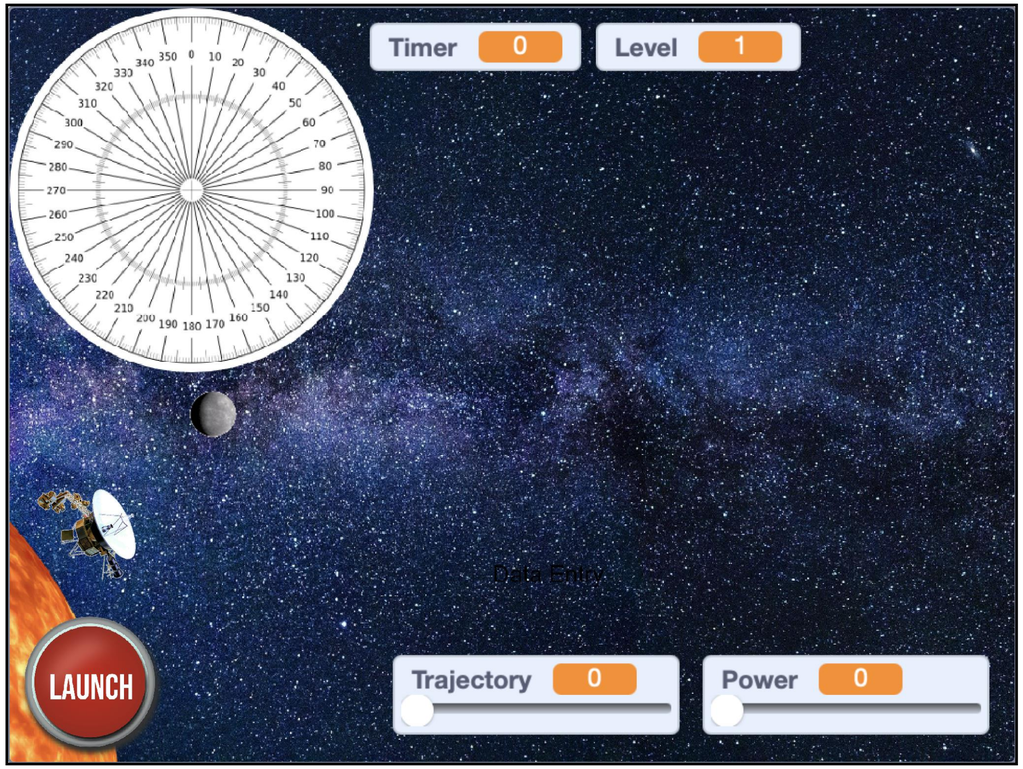
Kahoot!

Checking our knowledge and understanding

https://create.kahoot.it/v2/share/raf-code-commanders-session-1-quiz/a5668a3b-e843-4c90-abe2-e05307ae69a2

Next time

- Making the **Launch** button work
- Learning what a **variable** is
- Learning how to reset our program every time the green flag is clicked
- Considering ways in which our game is **realistic** and **very unrealistic** compared to launching a real space probe.



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