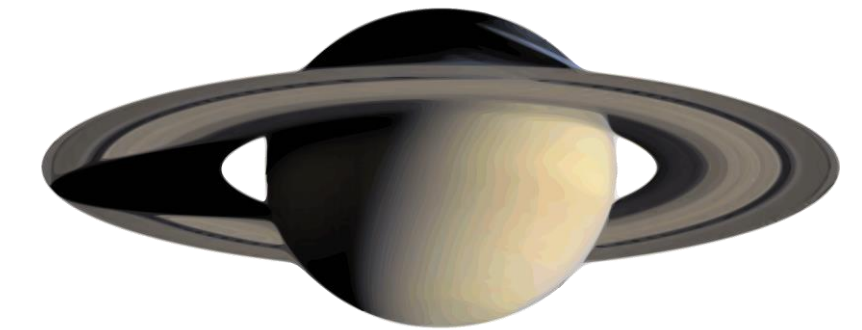
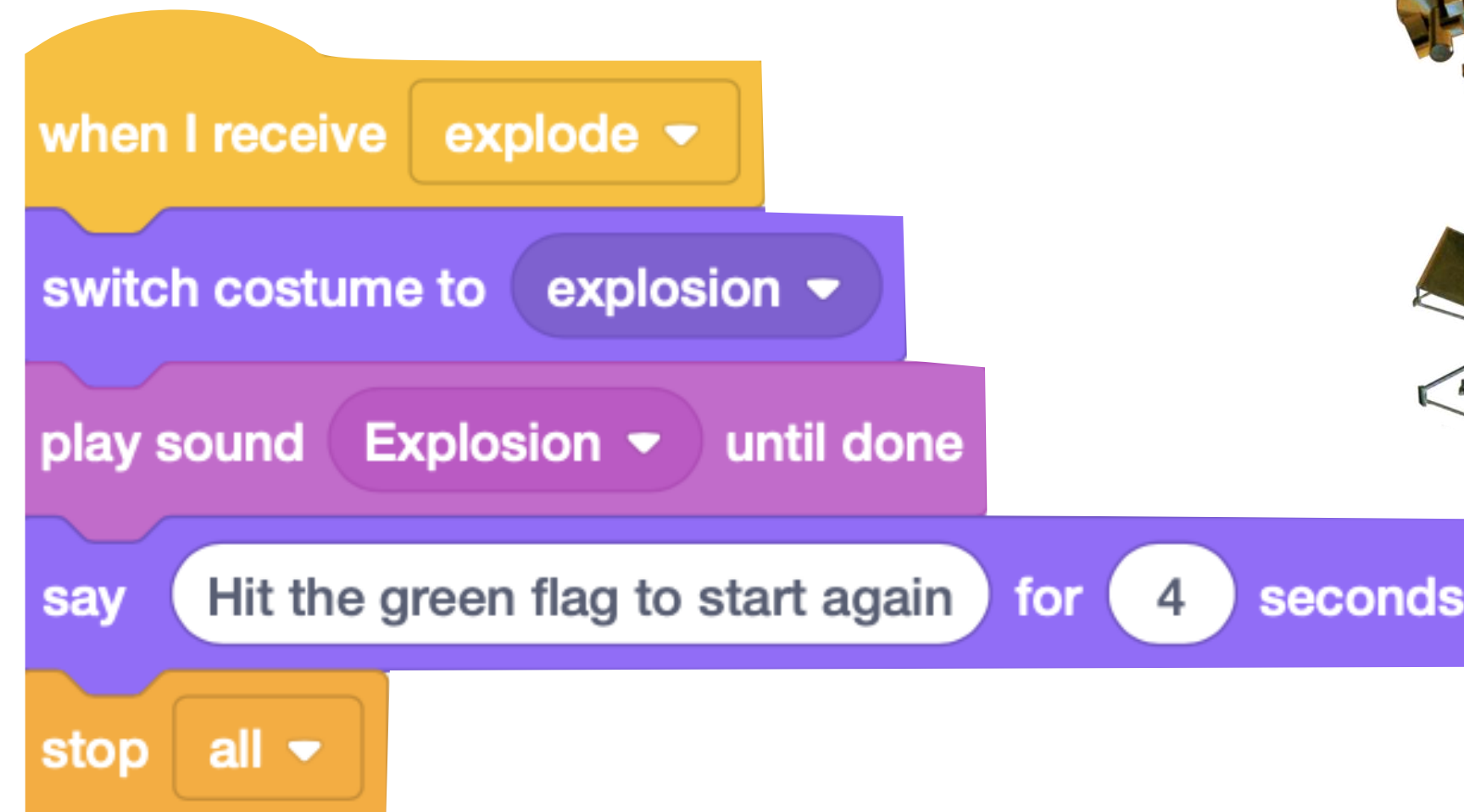
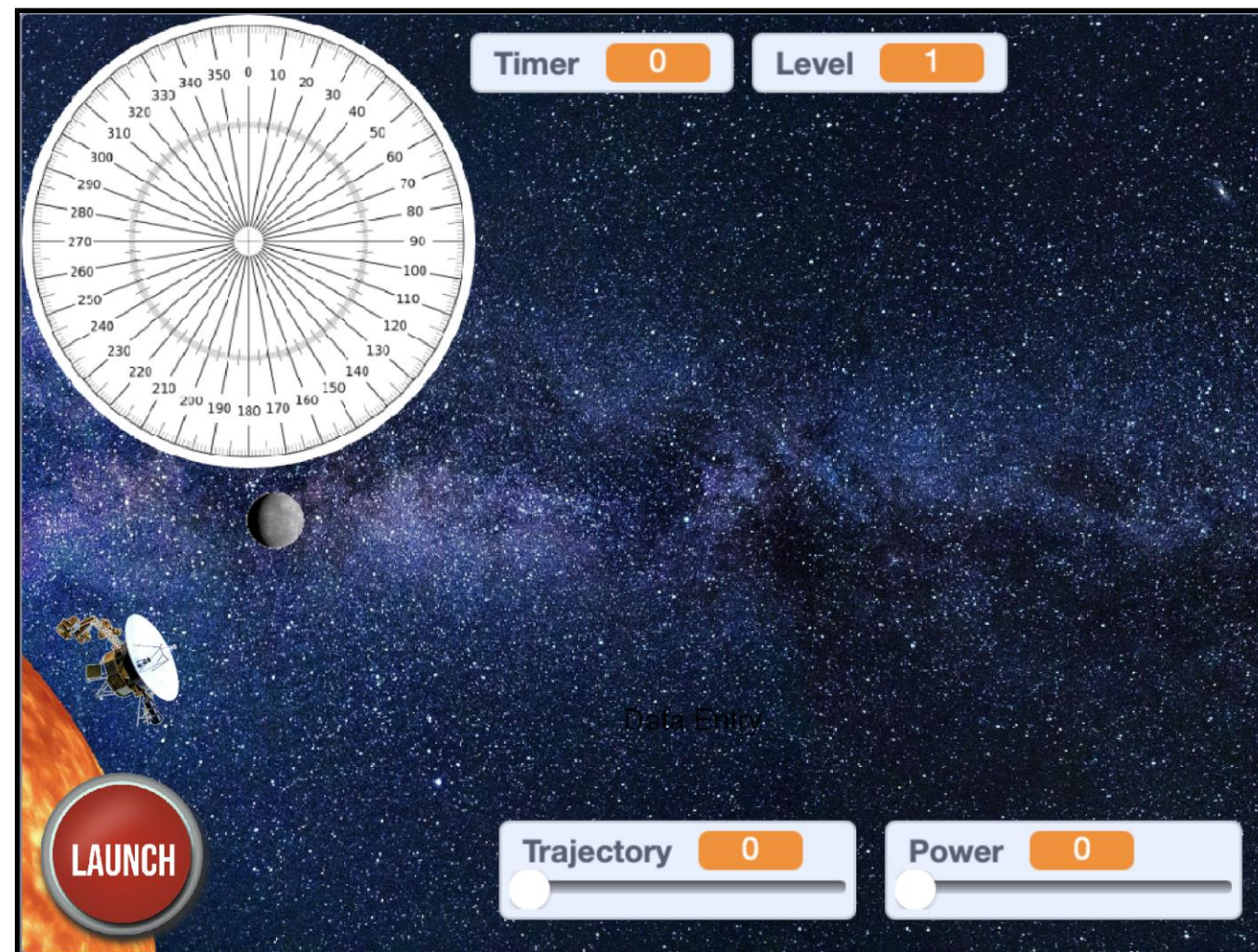


RAF Code Commanders: Cosmic Launch Project

Session 2



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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.



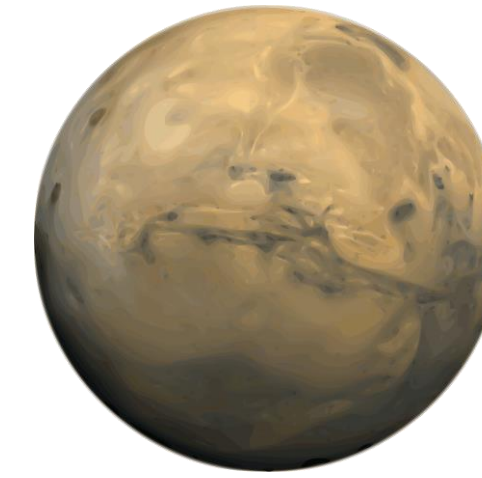
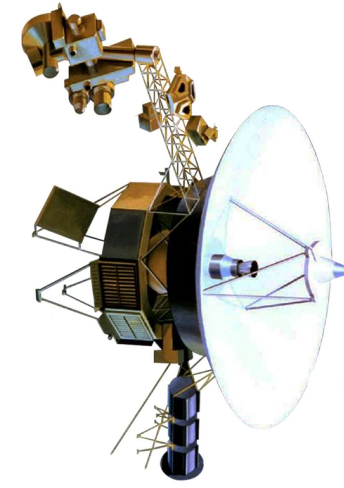
We'd love to see how you're getting on with this project. Please share students' participation, progress and enjoyment of this project on social media using the hashtag **#RAFCodeCommanders** and follow **@rafyouthengage** and **@hyetteducation** to keep up to date with RAF Youth & STEM and Hyett Education's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



Session 2: Variables and lift off!

Overview

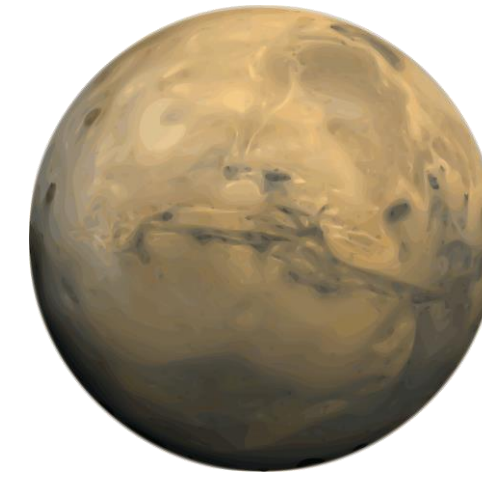
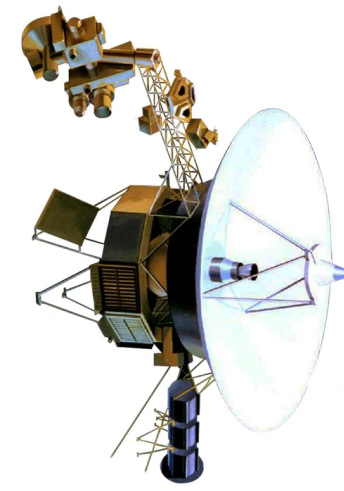
In this project you will:



- 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.

Last session

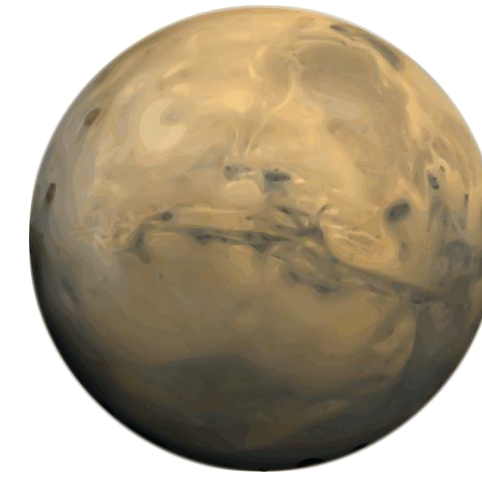
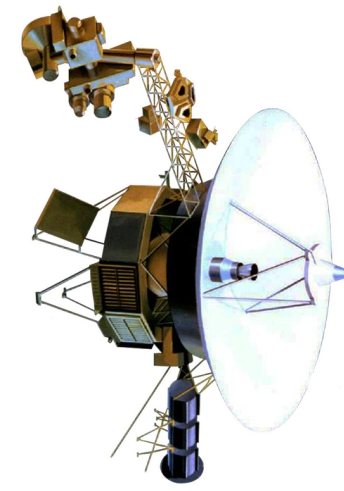
You:



- Learned what an algorithm is
- Learned about the basics of Scratch
- Revised / learned the names of the planets, their order from The Sun, and which of them is largest / smallest
- Created an algorithm to make our probe point move at the angle and power set by the user

This session

You will:



- Learn what a **variable** is when we're writing computer programs
- Learn how to make the probe launch when the 'Launch' button is clicked
- Learn how to make the probe return to its starting conditions when the green flag is clicked
- Think about ways in which our game is realistic and unrealistic!



Discuss

“What is a variable?”

Share your ideas

Watch the video clip

- This video clip - <https://youtu.be/pDzp1bwgWds> - will explain to you what a variable is.
- Discuss with your partner or as a group: what other examples of variables from video games or other apps can you think of?



... from the dictionary

“A variable is a quantity that may assume any one of a set of values”

Merriam Webster Dictionary

... another definition

“A variable is a named item whose value **can** change as a program runs”

* This doesn't mean that its value **must** change as a program runs

... a more technical definition (GCSE)

“A variable is a **memory location in a computer**. It has a name that is associated with that location. The memory location is used to hold data ... the value associated with a variable name may change during program execution”

- from BBC Bitesize (<https://www.bbc.co.uk/bitesize/guides/zc6s4wx/revision/5>)



Discuss

**What variables have we used in
our program so far?**

Angle and Power are variables

Angle

Power

... and so are **Level** and **Timer**, but we'll come to those in a later session

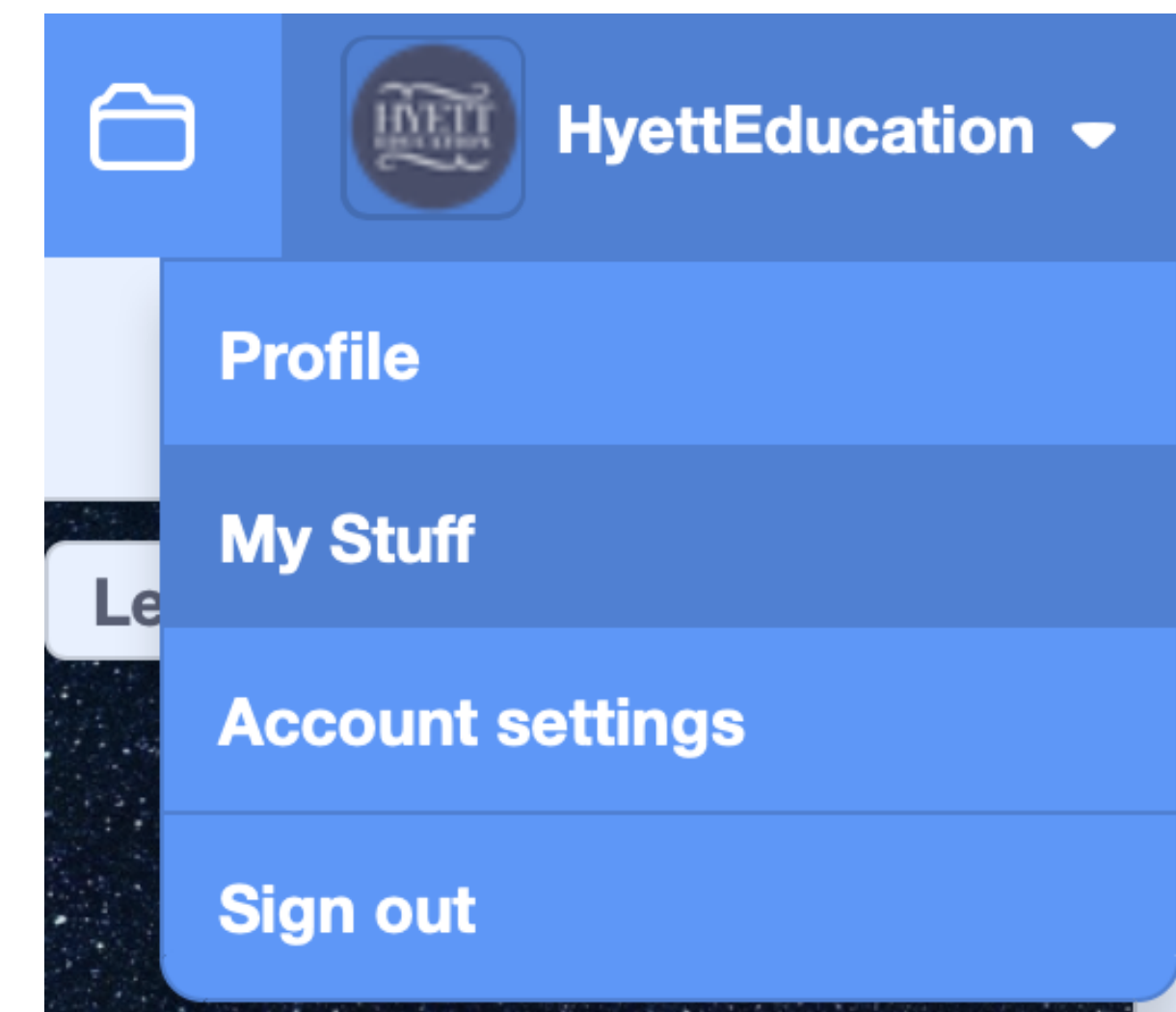
Level

Timer

Opening up your project

- Log into your Scratch accounts with your username and password
- Click onto your username in the top right hand corner, then onto '**My Stuff**'
- You should see your project in the list - click onto it to open it up again.

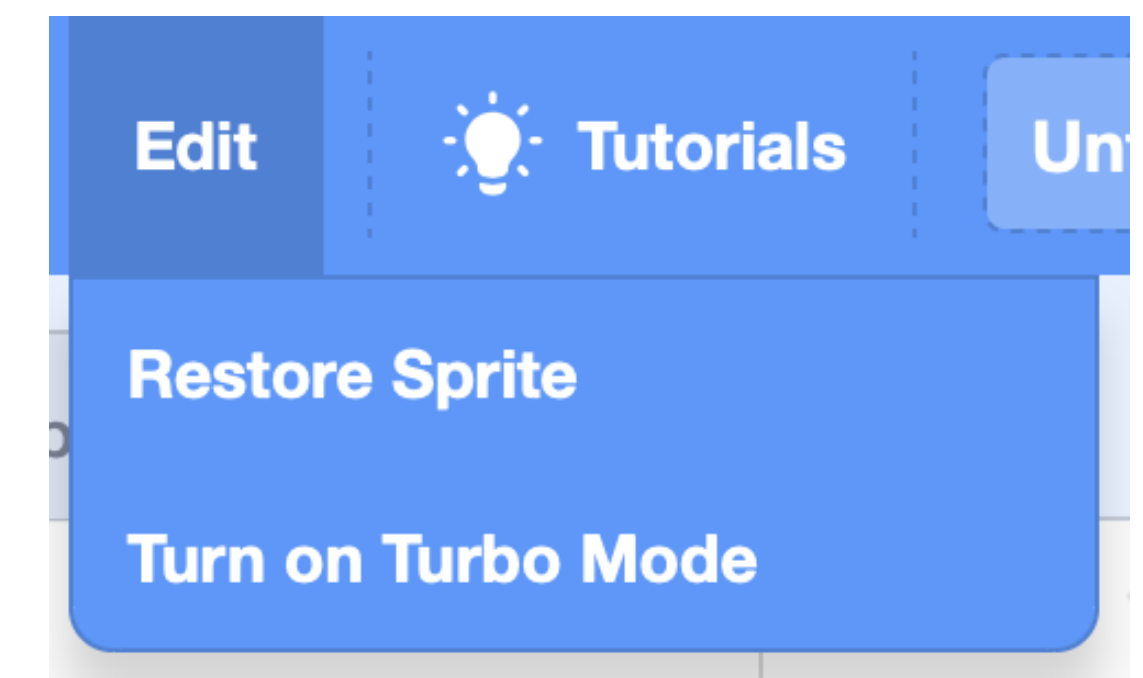
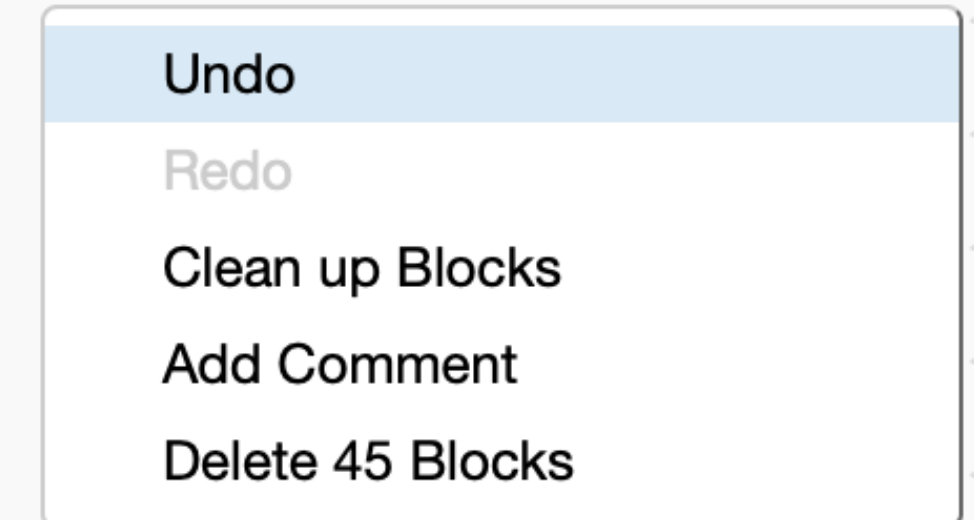
Learn



Correcting mistakes

- 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**'.

Learn



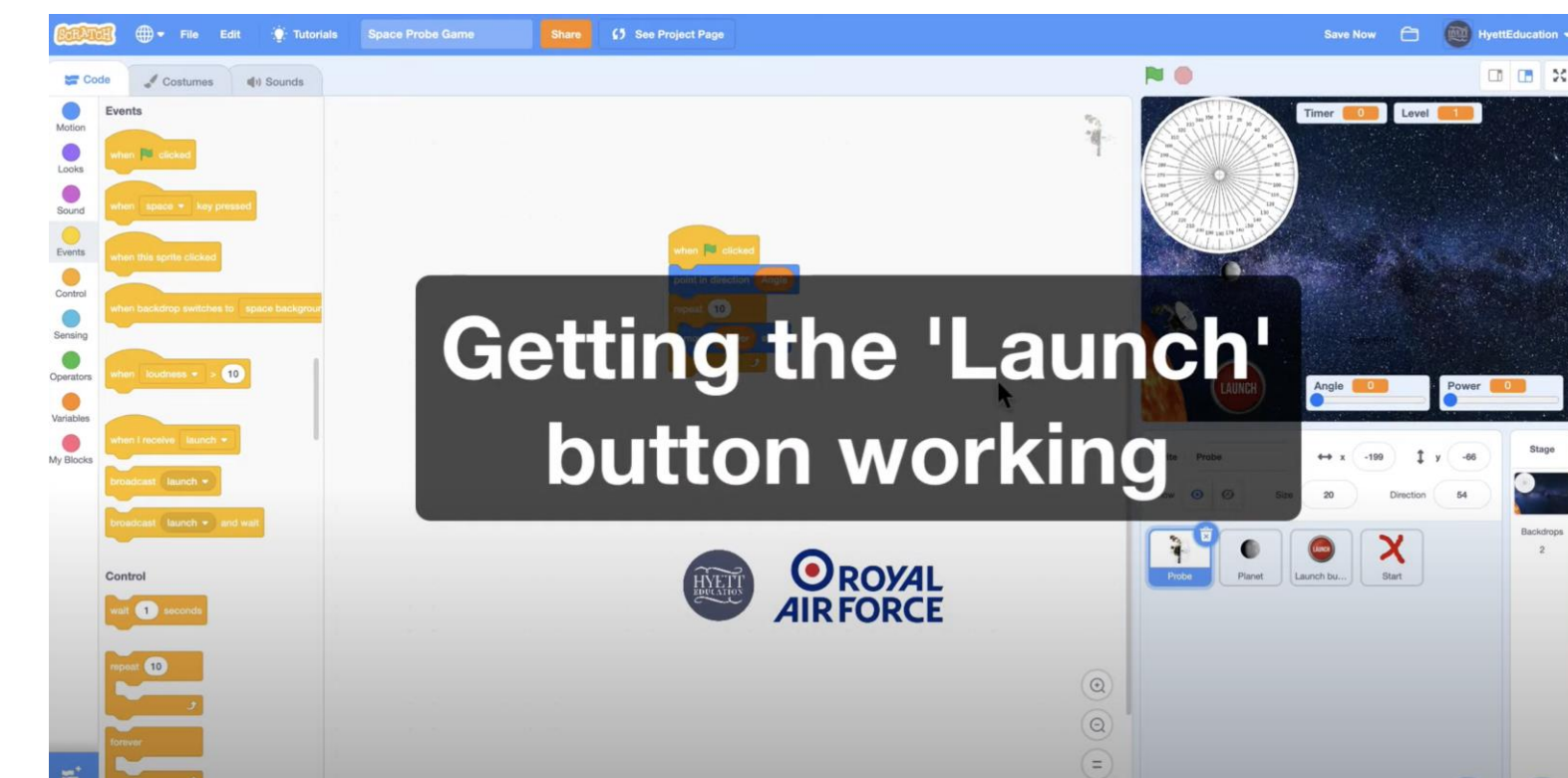
3. How does the player launch the probe?

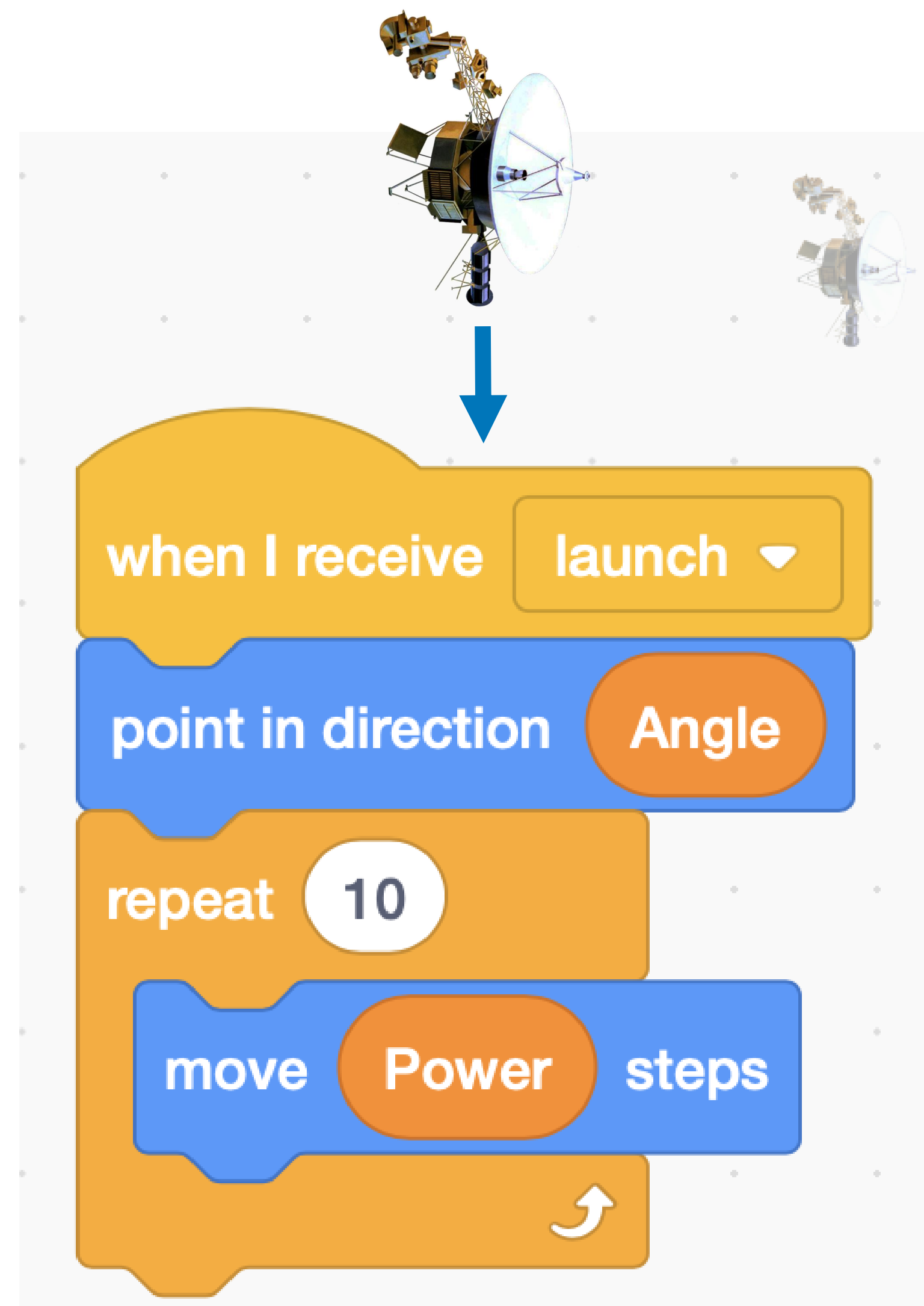
Making the Launch button work

- At the moment, we launch the probe by clicking on the green flag.
- We now want to change that so that it launches when the 'Launch' button is clicked.
- To do this, we will use **broadcast** and **when I receive** code blocks to trigger action between sprites
- Watch the video to find out how - <https://youtu.be/u96L9WWxM1w>

Watch

LAUNCH



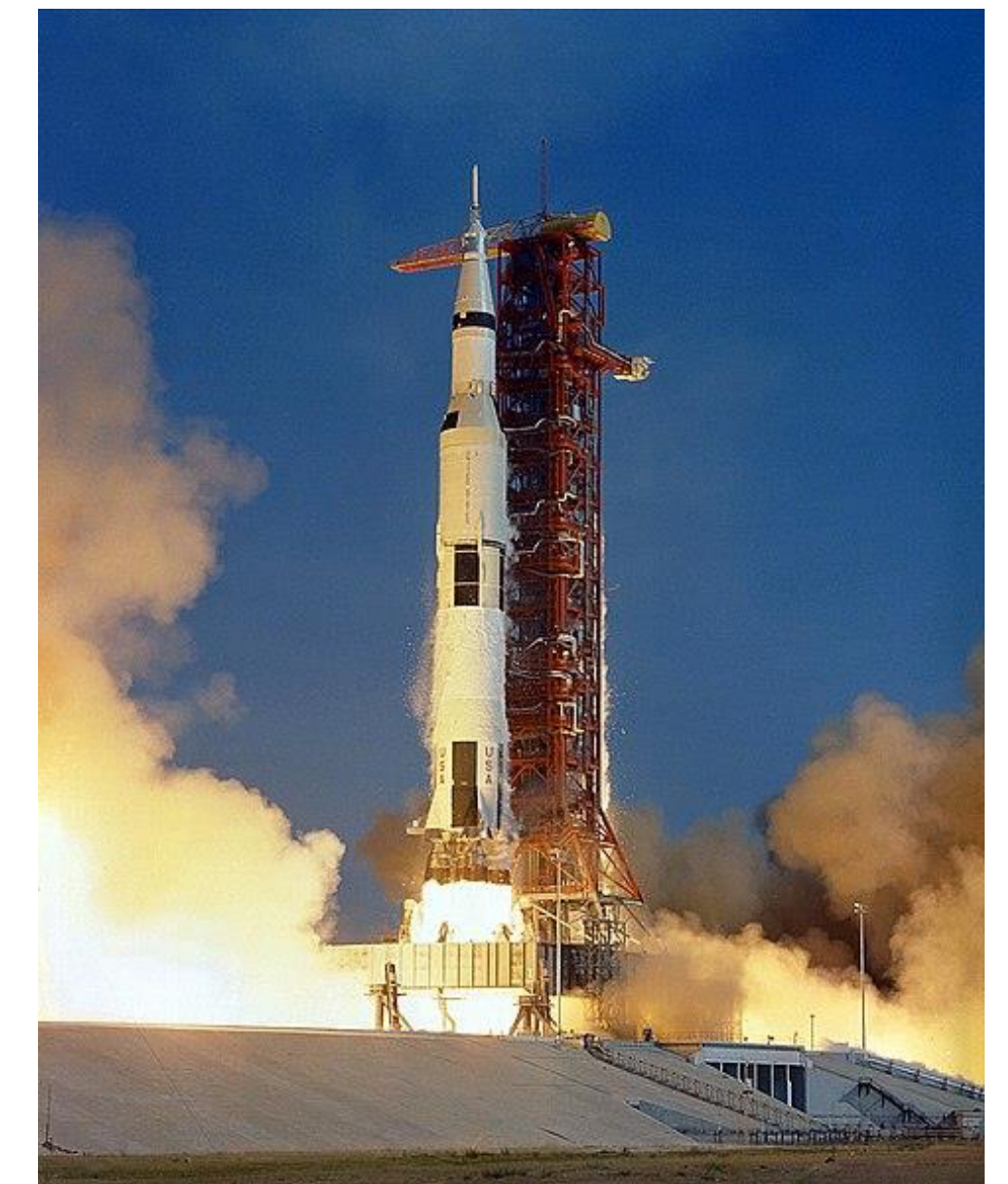


Learn

What happens in a real rocket launch?

- In our game, the probe is being launched from an area of outer space near to The Sun.
- In a real rocket launch, we launch from The Earth.
- The largest rocket ever launched from Earth was the **Saturn V rocket**. The Saturn V was 111 metres tall.
- The Saturn V rocket carried Apollo astronauts to The Moon during missions between 1968 and 1972, including the Apollo 11 mission in July 1969, during which Neil Armstrong became the first person to walk on The Moon.
- Watch this video clip of the launch of the Saturn V rocket for the Apollo 11 mission – see youtu.be/S3ufJ7lcr08

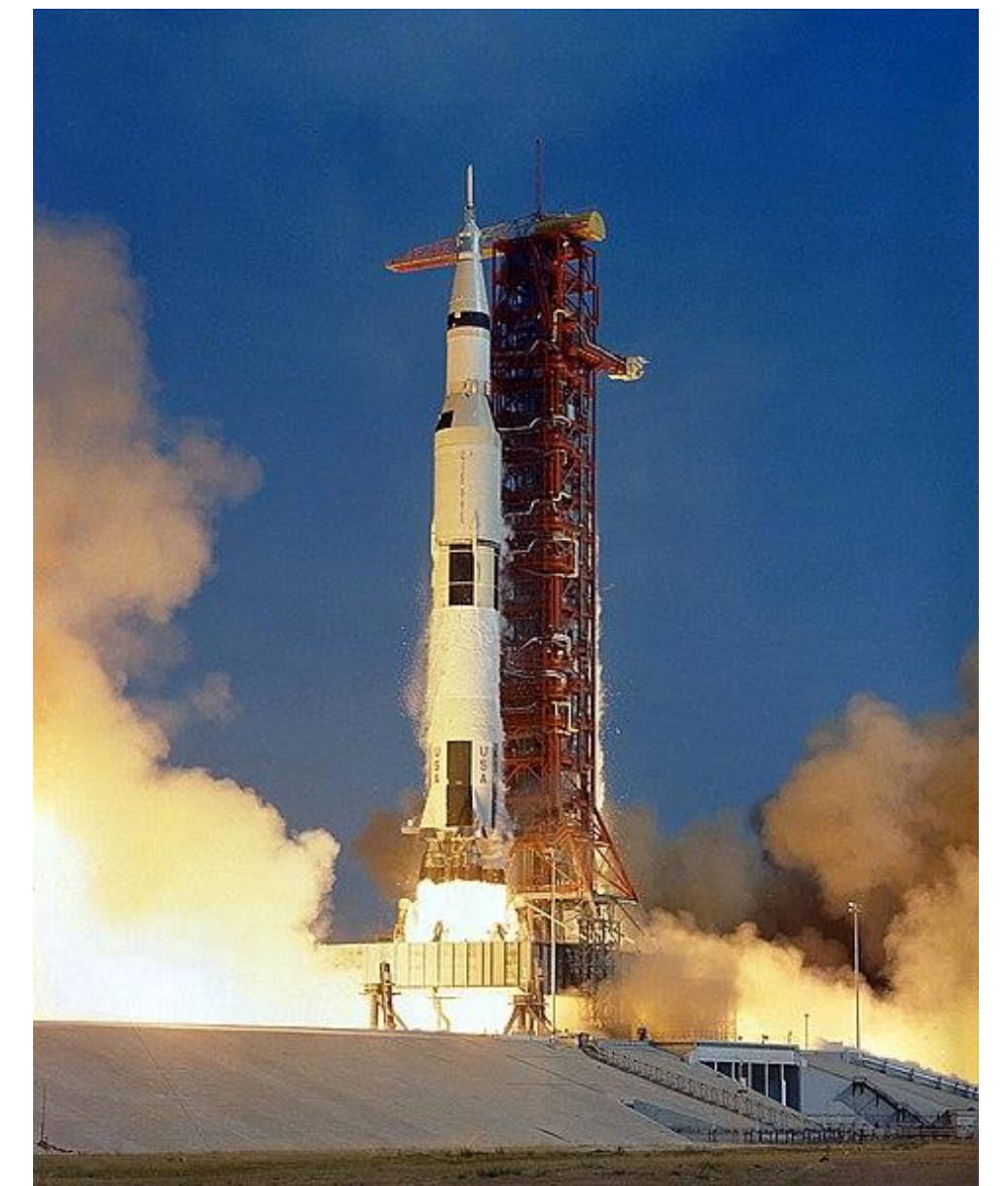
Watch



The reality of a real rocket launch

- **It is quick!** – the Earth's atmosphere is only about 100 miles thick. A rocket is in outer space within 10 minutes of launch. To get into orbit, a rocket needs to accelerate to approximately 17,000 mph.
- **It is expensive!** – the cost **per launch** of the Saturn V rocket was the equivalent of over \$1 billion dollars today. The Saturn V rocket burned over 20 tons of rocket fuel per second during launch.
- **It is not a smooth ride!** – A space rocket is fundamentally just a missile without an explosive. During launch, astronauts experience about 3Gs: i.e. 3 times the force of gravity that we experience on Earth.

Learn



1. How does the player
start the game?

Resetting variables

- When we click the **green flag**, we need to reset the power and angle variables to zero.
- Which pieces of code might we use to do this?
- Look through the pieces of code under **Variables**. Can you find one that might be useful to reset the values of 'Angle' and 'Power'?

Discuss

Learn

1. How does the player start the game?



Discuss

“What else needs to reset when the green flag is clicked?”

Share your ideas

What we need to 'reset':

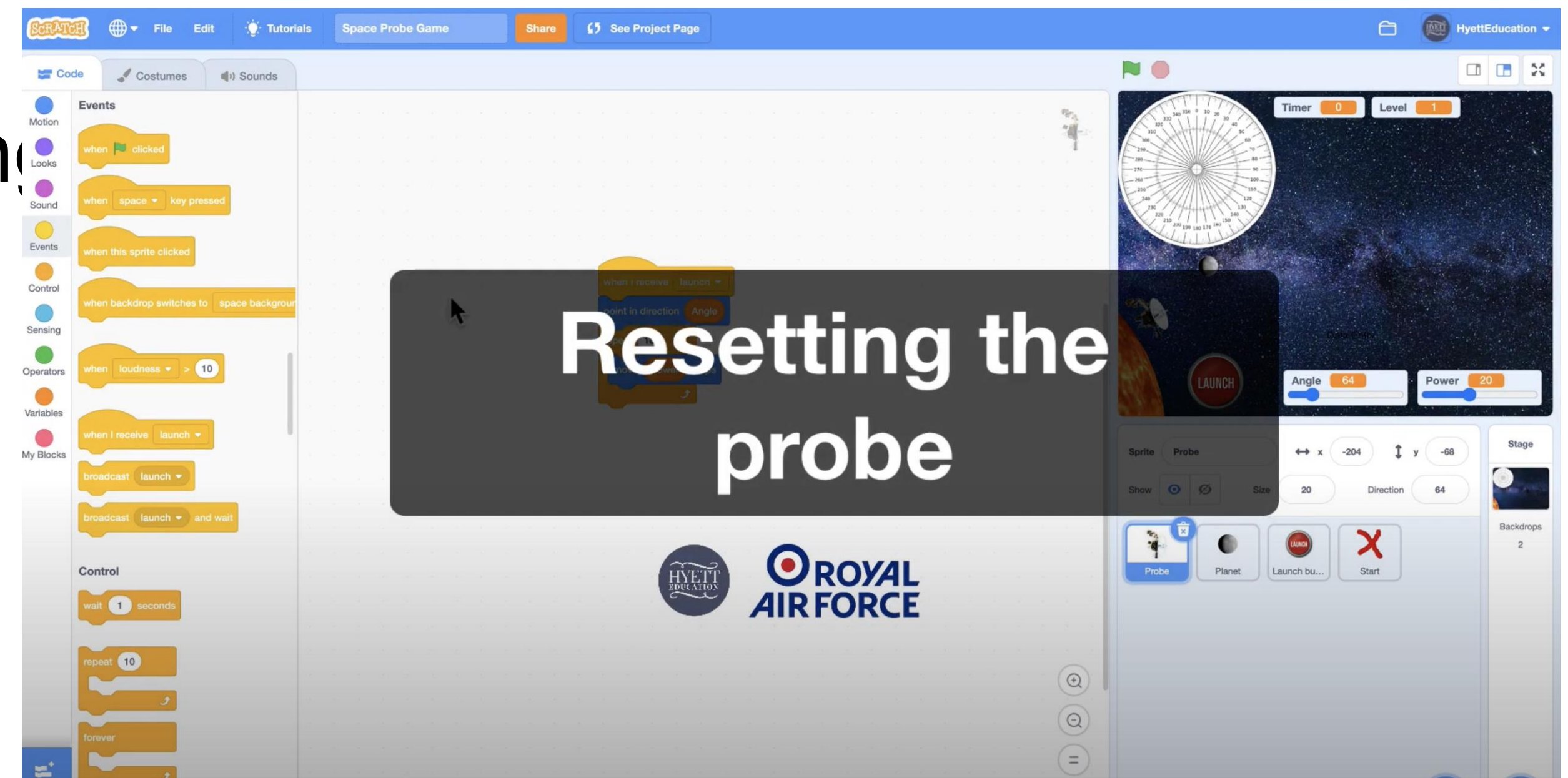
Discuss

- **Angle** variable
- **Power** variable
- **Position** of the probe on the stage
- **Direction** that the probe is pointing
- the '**costume**' of the probe ... why?
- ... the **Level** variable ... why?
- ... the **Timer** variable ... why?

Watch the video clip

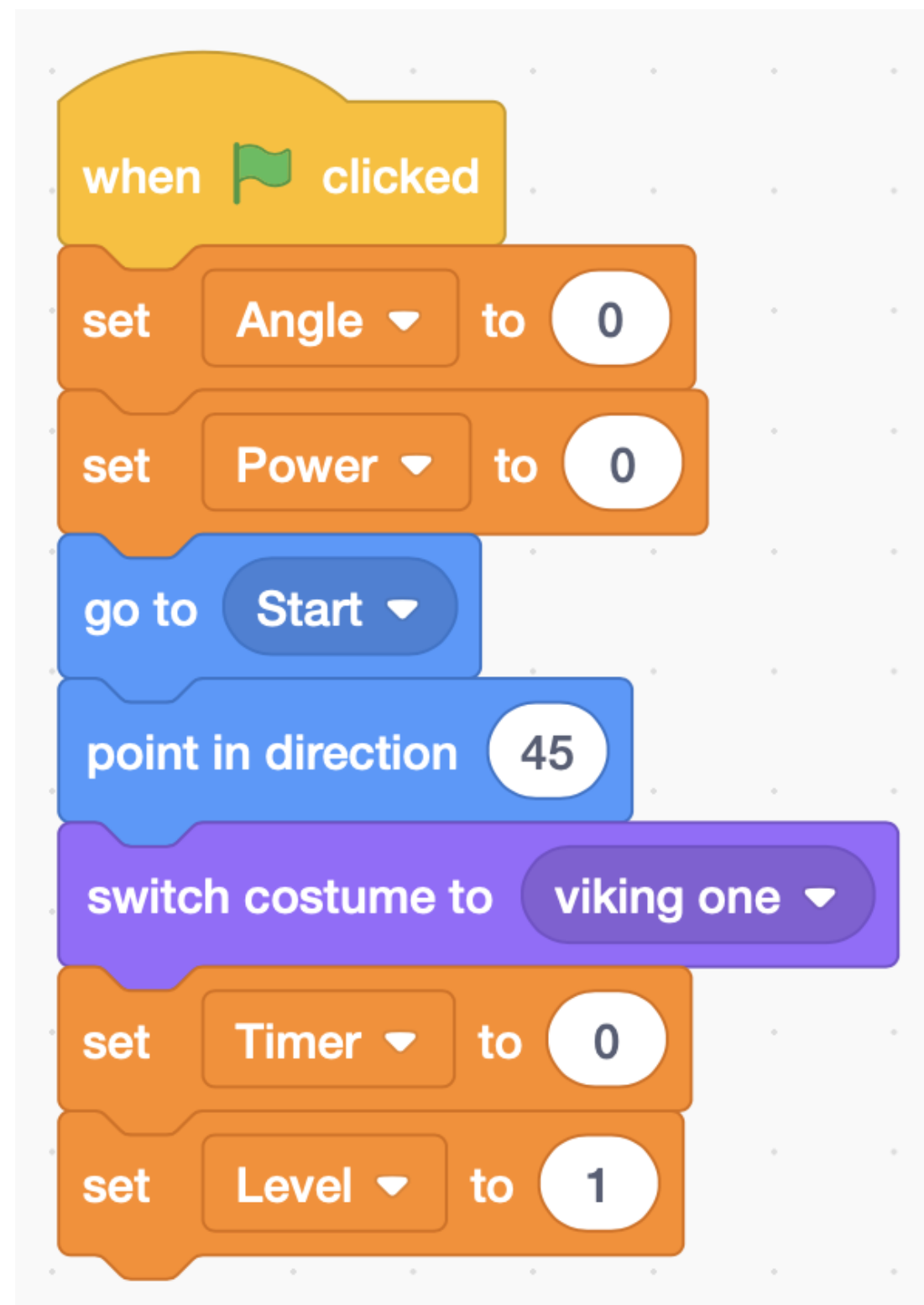
- How to reset the probe - https://youtu.be/I96bMvu_JhE
- The code you've added is very similar to what we'll need for moving to the next level.

Watch



The completed algorithm:

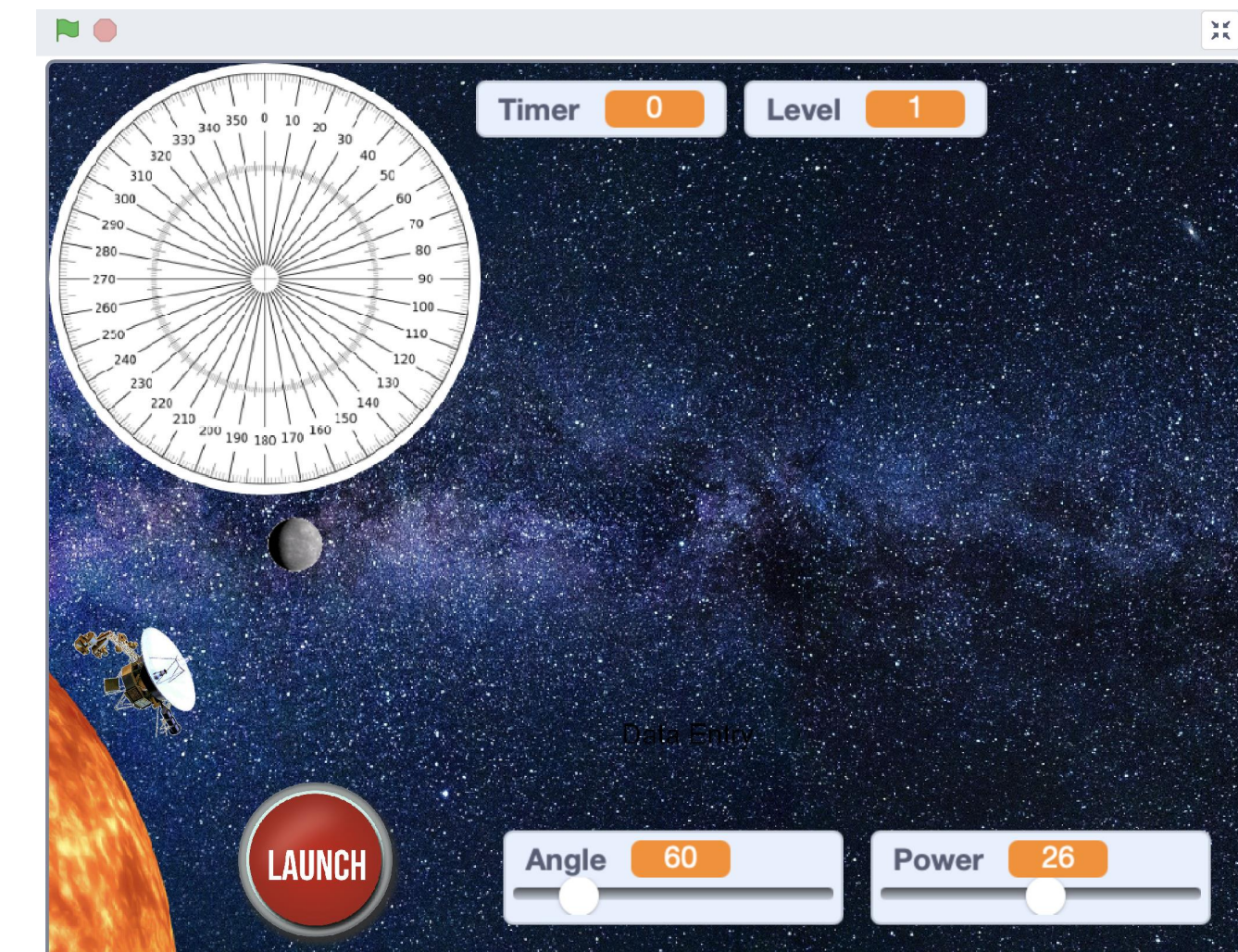
Learn



How realistic is our game?

- Discuss with your partner, or as a group, how realistic you think our game is going to be?
- Which elements are very unrealistic?
- Consider:
 - distances
 - times to travel
 - the relative sizes of planets
 - the path that the probe takes through space
 - anything else that you can think of!

Discuss



Kahoot!

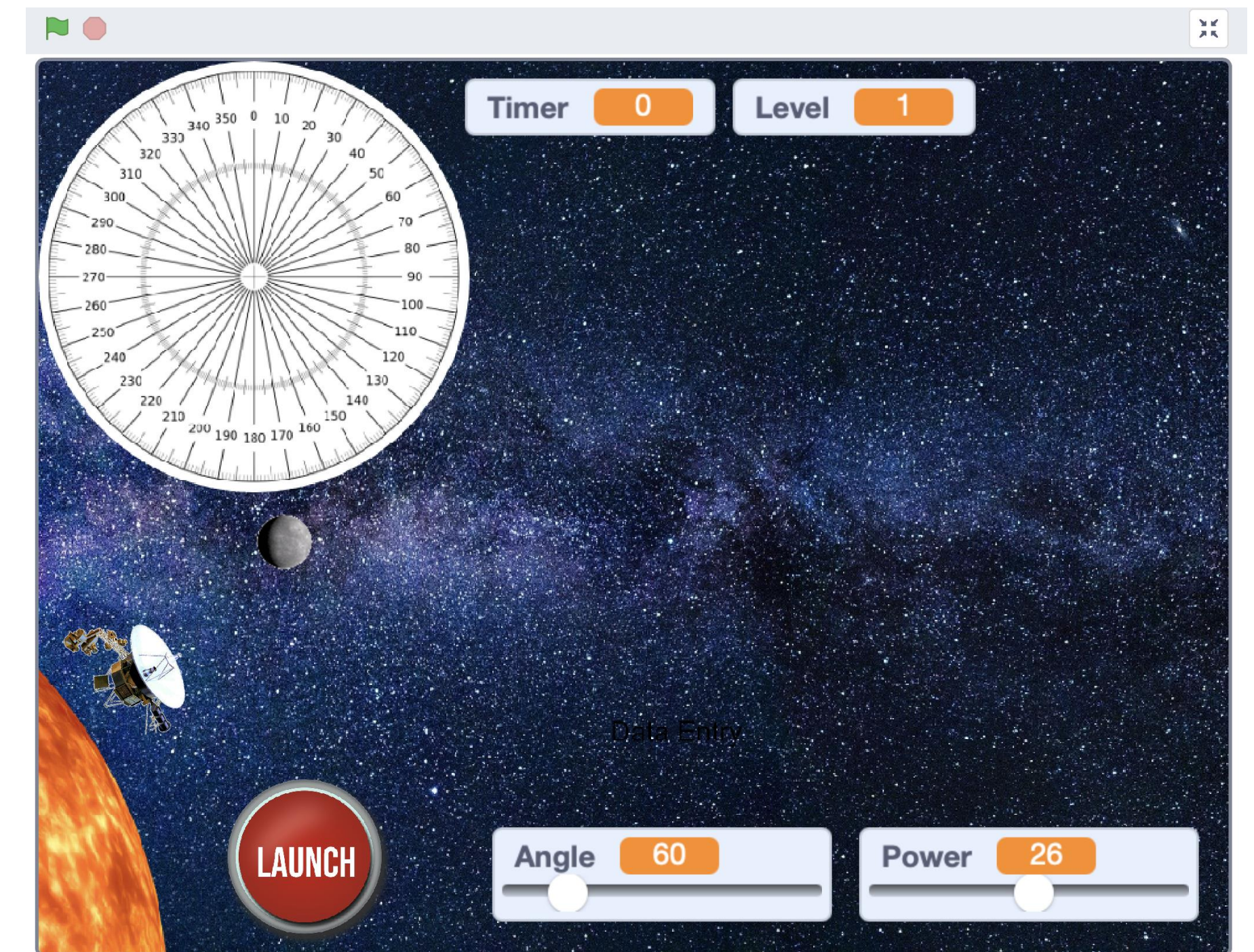
Learn

Checking our knowledge and understanding

<https://create.kahoot.it/v2/share/raf-code-commanders-session-2-quiz/23b15155-a6b5-4159-9494-a12ec2b35278>

Next time

- We're going to learn more about the realities of travelling through the solar system: how is our program realistic ... and very unrealistic?
- **Coding:** what happens when the probe hits a planet?
- **Coding:** what happens when the probe hits the edge of the stage?



Project credits

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

Special thanks to Flt Lt Michelle Randall (RAF Youth & STEM), Antony Hyett (Hyett Education – www.hyetteducation.com) & Richard Anderson (TechMentor UK – www.techmentor.uk).



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