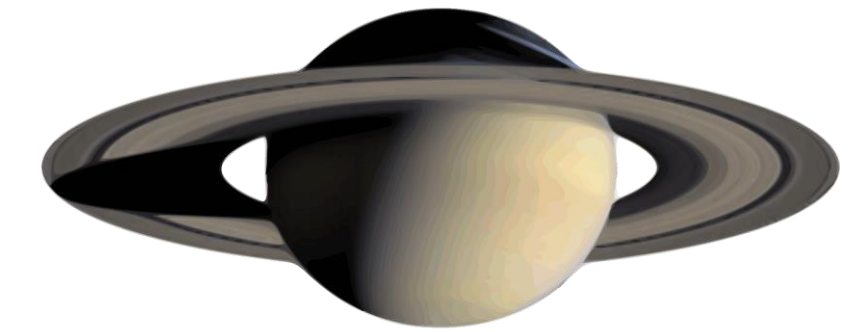
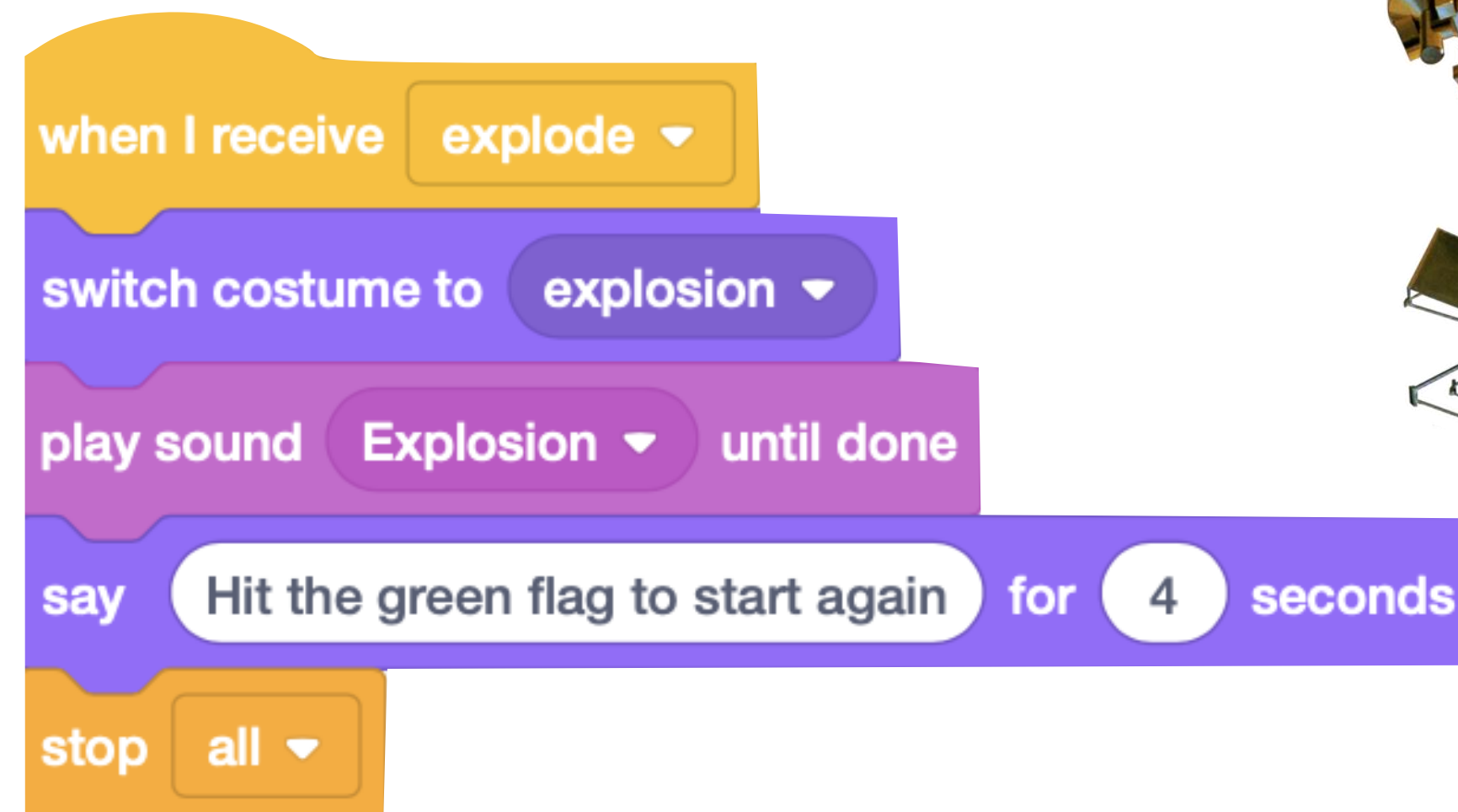
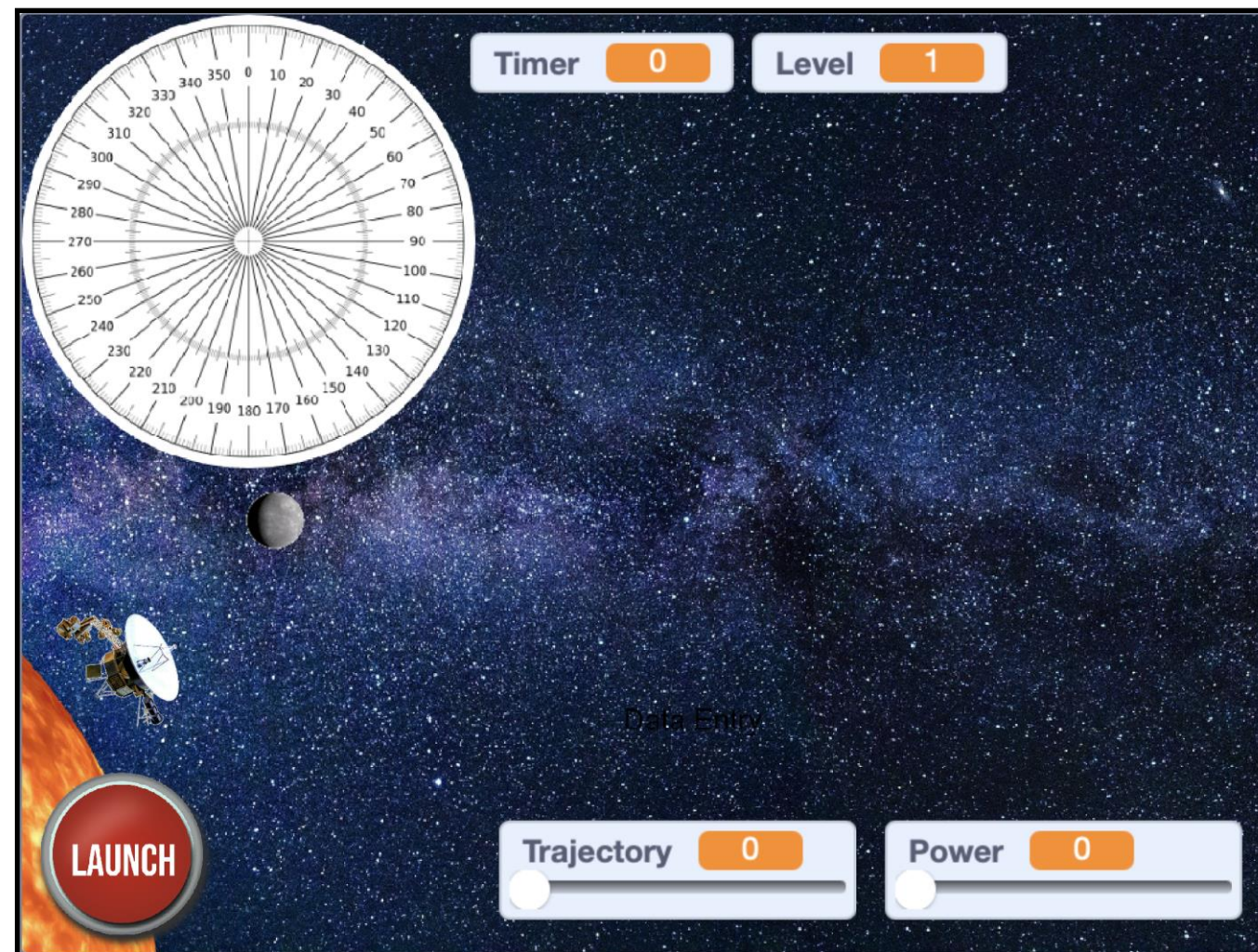


RAF Code Commanders: Cosmic Launch Project

Session 3



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@rafyouthengage

#RAFCodeCommanders #RAFCosmicLaunch

@hyetteducation



Feedback & Social Media

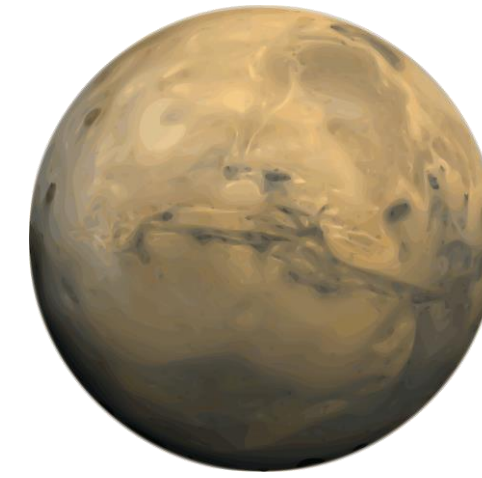
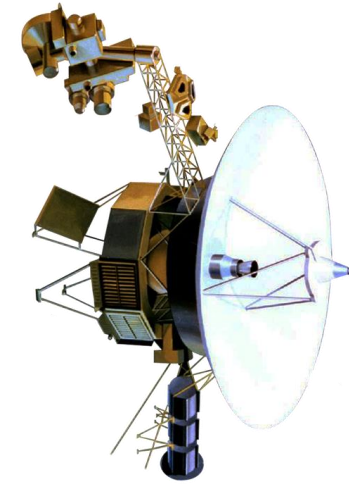
We welcome feedback! If you encounter any errors or broken links in this project, or have constructive suggestions for improvement, please email Antony Hyett at antony@hyetteducation.com and provide details. Your cooperation and feedback is greatly appreciated.

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 3: Adding levels and exploring the Solar System

Overview

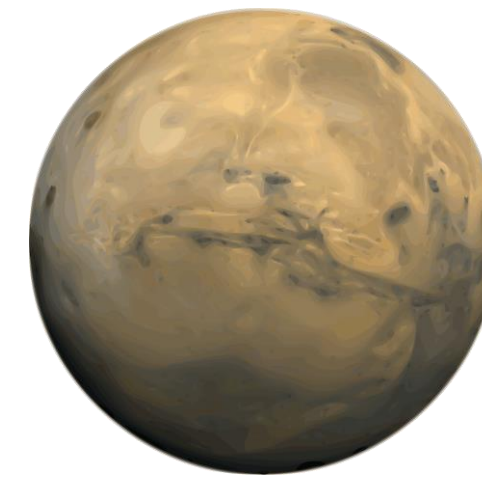
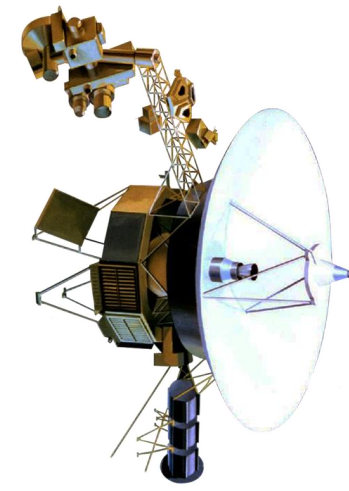


In this project you will:

- 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:

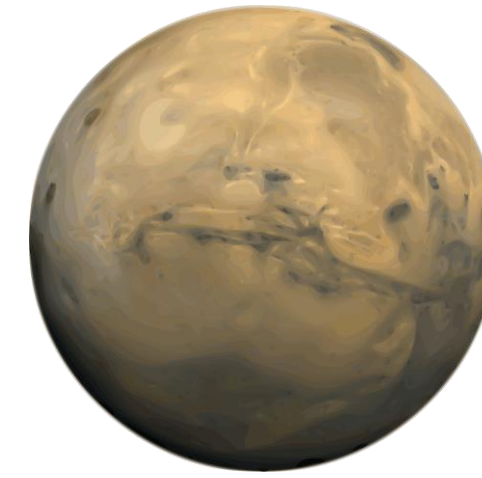
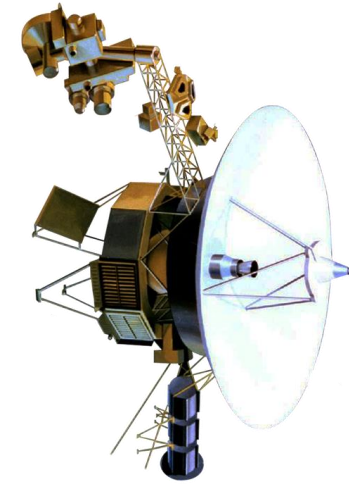


SCRATCH

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

This session

You will:



SCRATCH

- Learn how **unrealistic** our game is, in many ways ...
- Learn how to code what happens to the probe and the planet when the probe touches a planet i.e. **how to add levels**

How realistic is our game?

- In the last session you discussed how realistic, or otherwise, our game is in:
 - distances
 - times to travel
 - the relative sizes of planets
 - the path that the probe takes through space
 - anything else that you can think of!



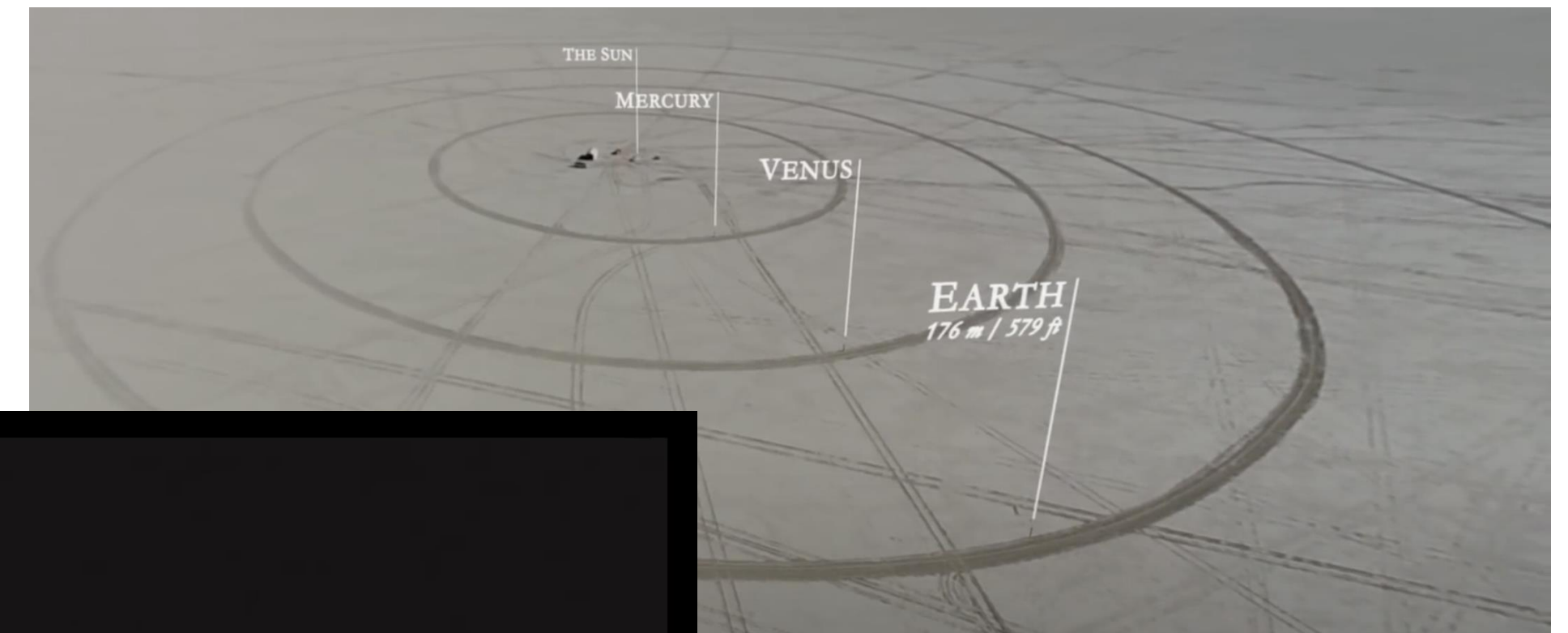
Watch the video clip

- In this video clip, a filmmaker creates a scale model of The Solar System in an area of desert in Nevada in the USA -

<https://youtu.be/Kj4524AAZdE>

Watch

Discuss



What do you notice?

- This photo shows the **12 astronauts** who walked on The Moon between 1969 and 1972.
- What do you notice about them?



Discuss

What do you notice?

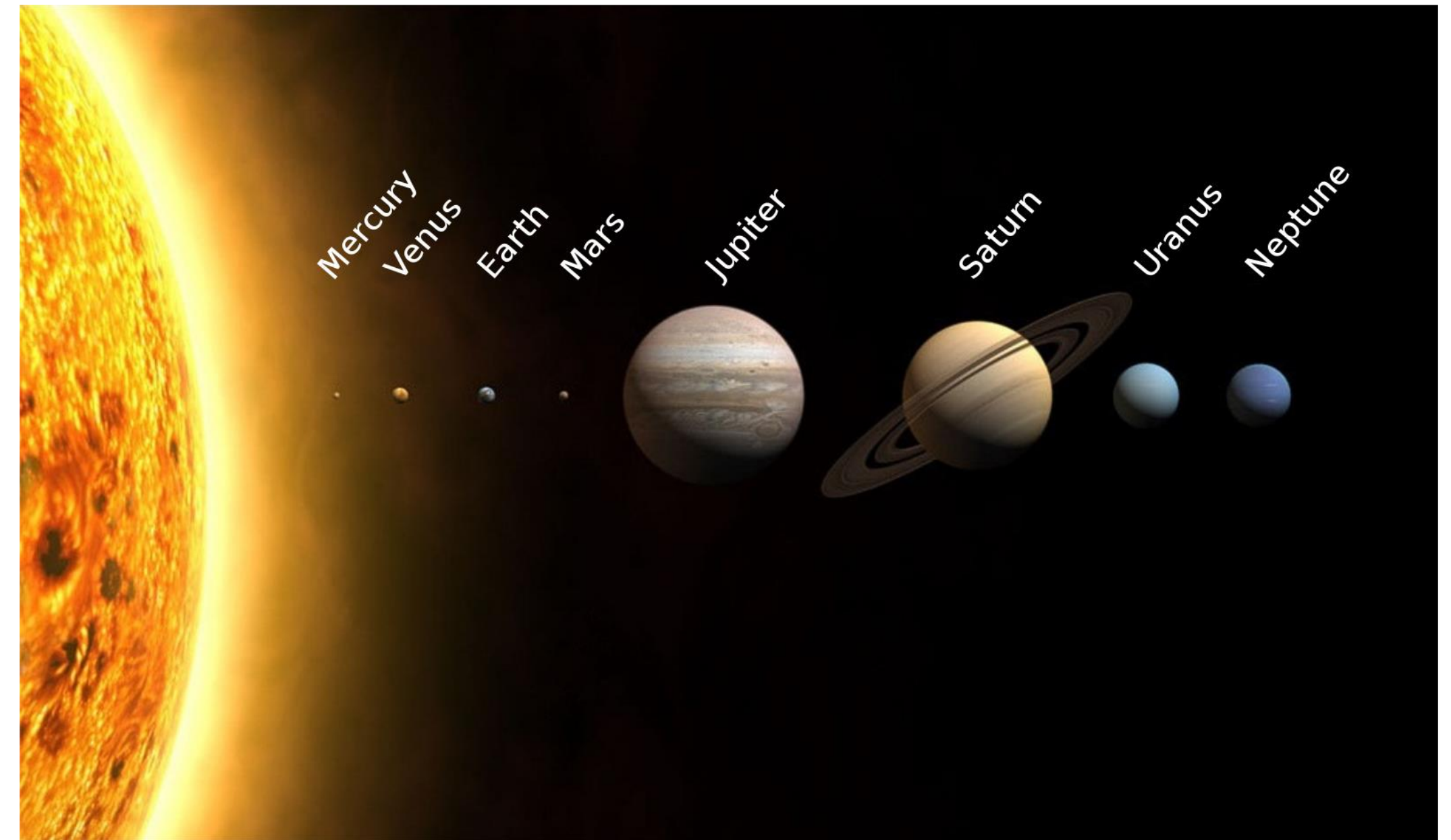
Discuss

- Here are more recent photos of astronauts and engineers linked to the space programme.
- What do you notice now?



In our game ...

- The planets are much, much, much too close to each other, and are much too close to The Sun ...
- Although the **order** of sizes of the planets is correct, the sizes compared to one another are not ... Jupiter should be much larger compared to The Earth, for example.



The relative sizes of The Sun and planets

What about the path our probe takes through space?

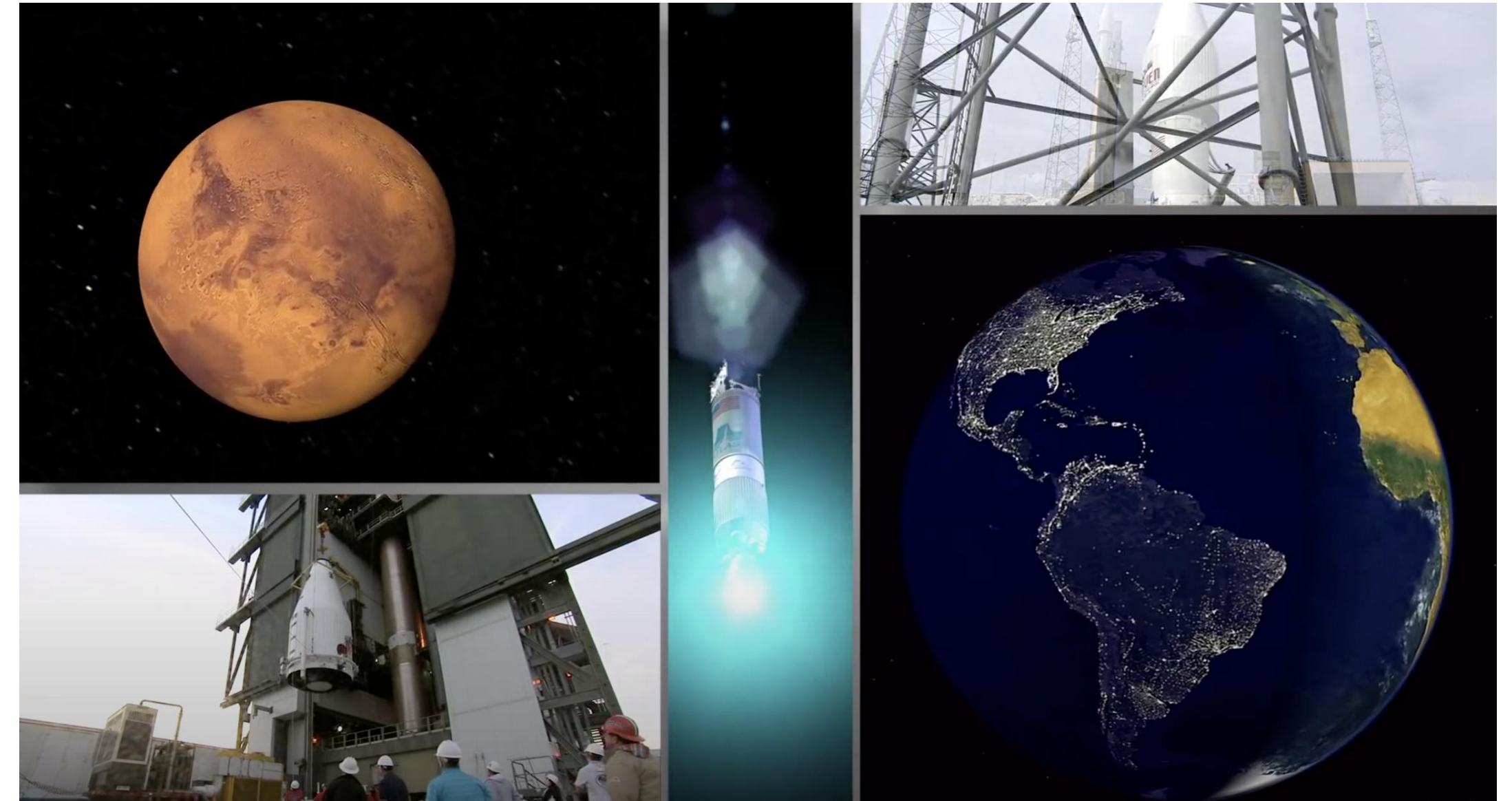
- In this video clip, made in 2014, we find out how the Maven space probe was sent to Mars from Earth:

https://youtu.be/UmcDhK_Bc9I

- Watch the video and discuss how it is very different from what happens with our probe!

Watch

Discuss



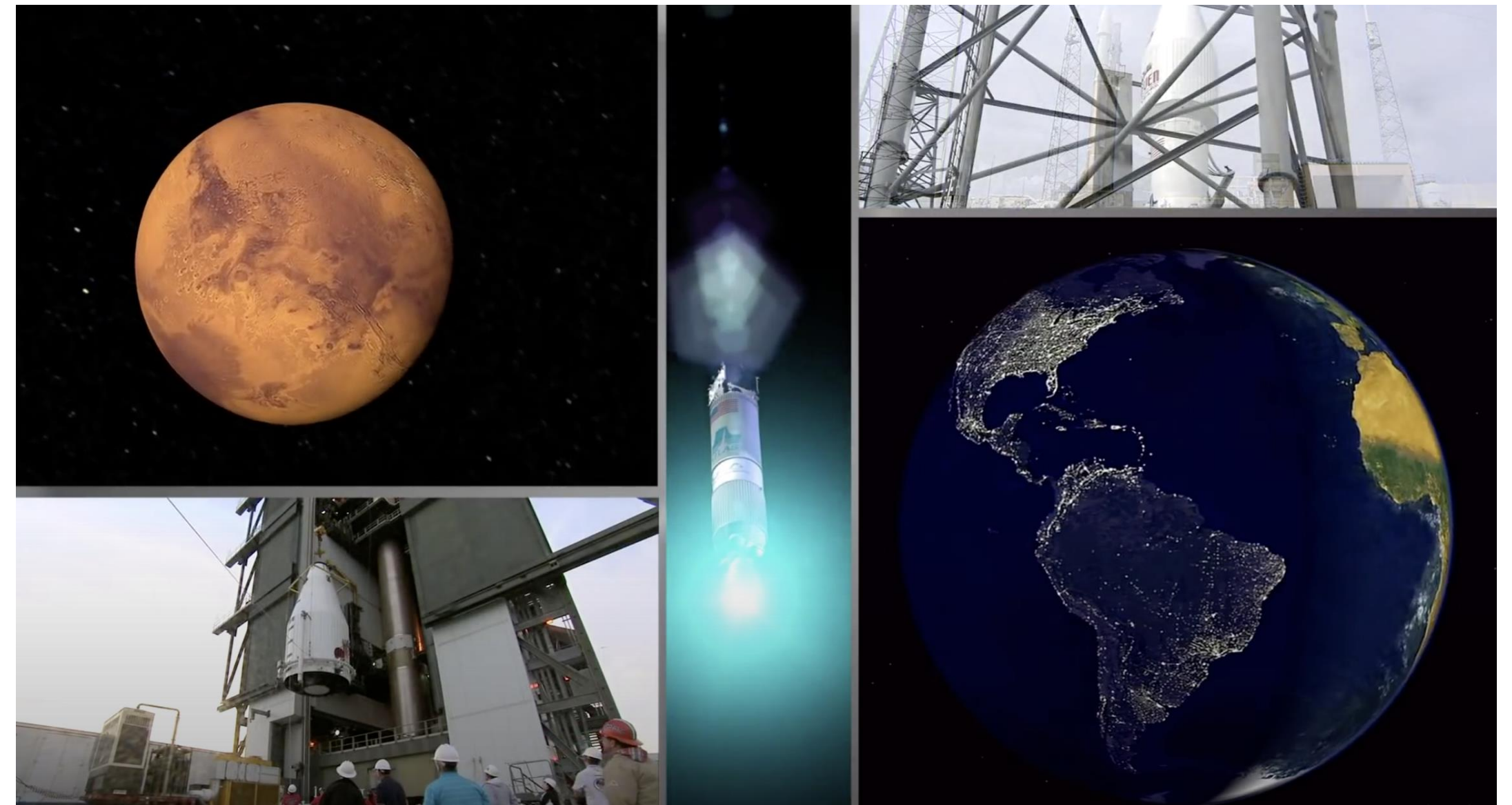
What about the path our probe takes through space?

- When we launch a space craft to another planet, we are aiming at a **moving target**, and launching from The Earth, which is also moving!
- The paths that space craft take through space are not straight lines, they are curves (parabolas)
- We'll think about **journey times** to other planets in our next session ... but can you remember what was said in the video about how long Maven took to reach Mars?
- See the latest updates from the Maven project -

<https://mars.nasa.gov/maven/>

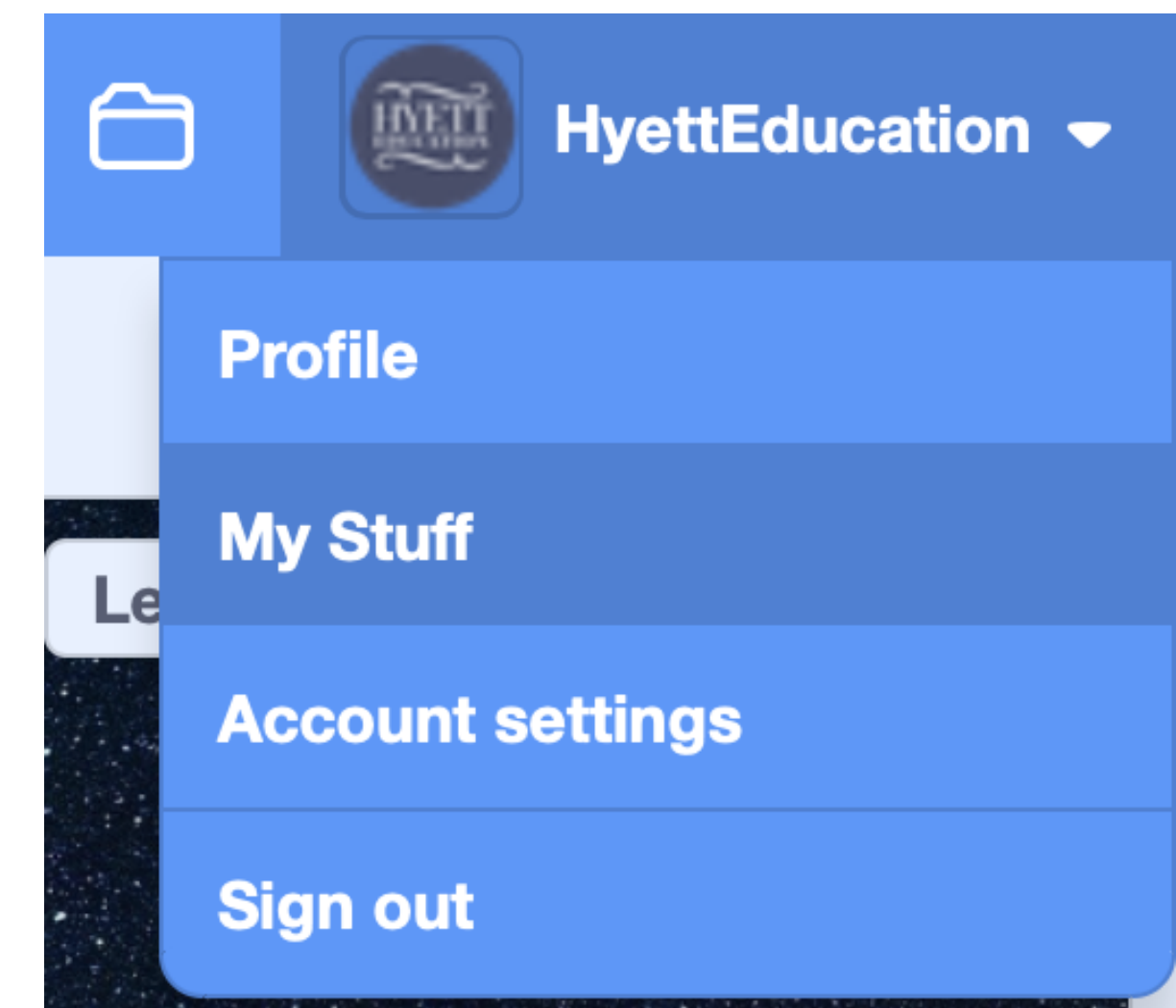
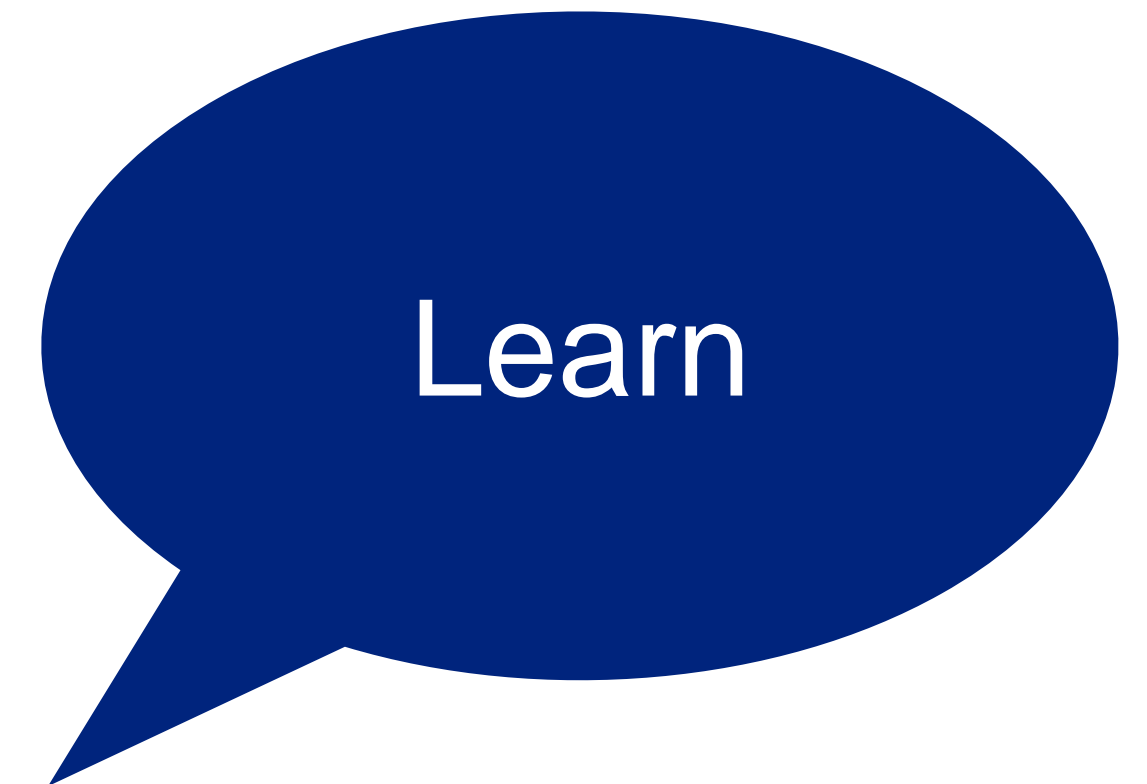
Watch

Discuss



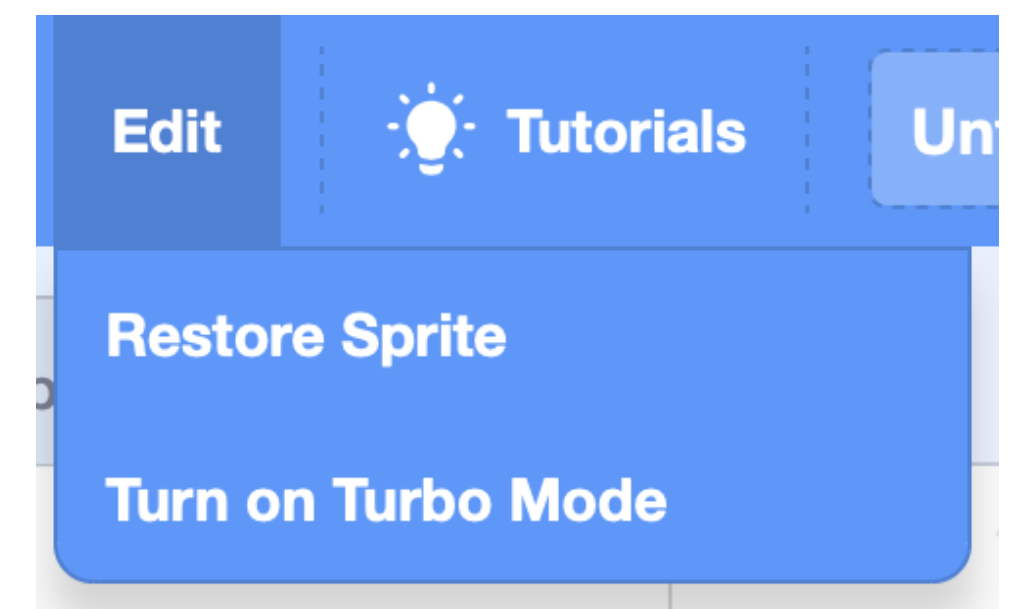
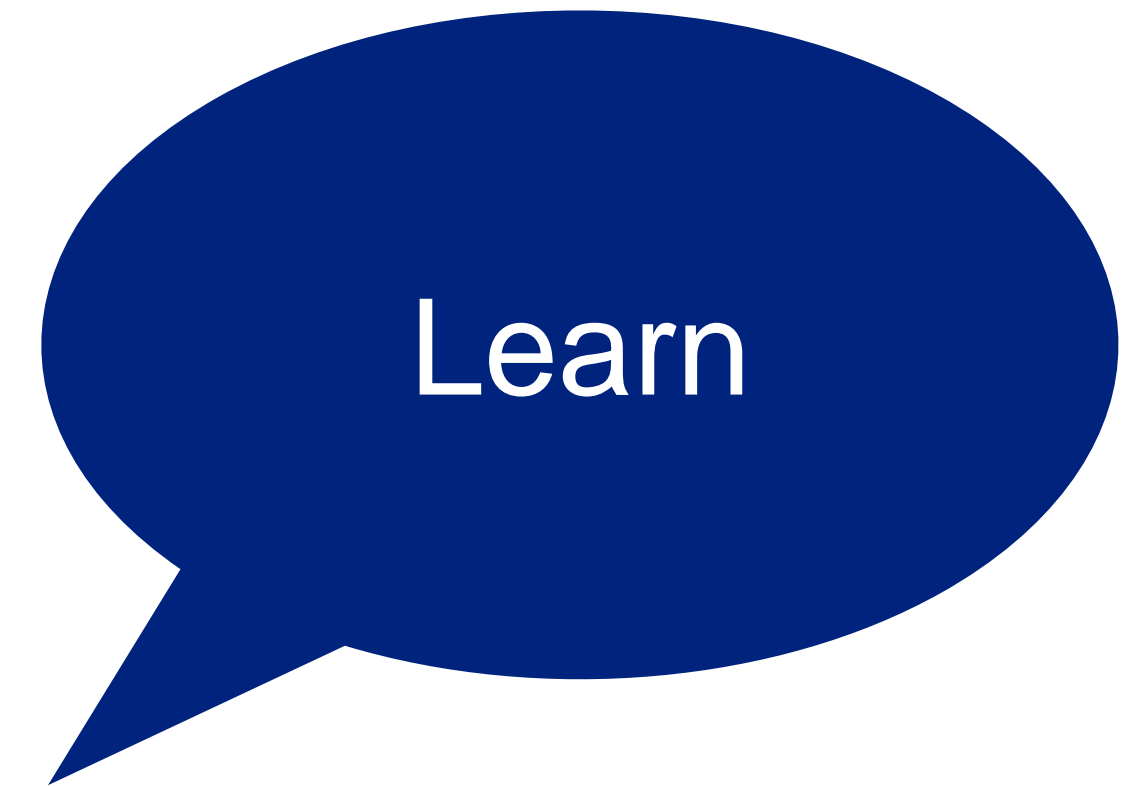
Opening up your project

- 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.



Correcting mistakes

- If you make a mistake when using Scratch – e.g. by deleting pieces of code accidentally - and are using a device with a keyboard, you can ‘**undo**’ that mistake by pressing the **Ctrl** key (to the left of the space bar) and the **Z** key together. There is a limit to how many steps back you can take though, so do this as soon as you realise your mistake.
- If you accidentally delete a sprite, go to ‘**Edit**’ at the top of the screen and click ‘**Restore sprite**’.

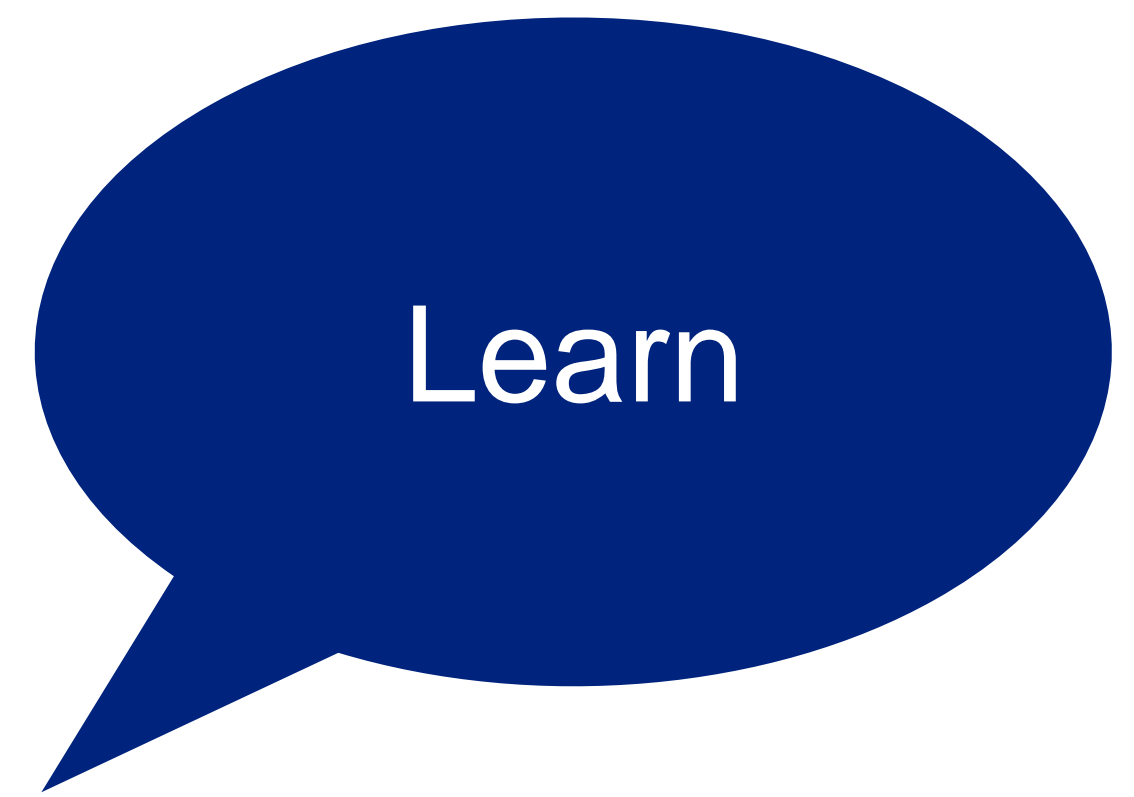




In coding, we use **selection.**
What do you think this means?

What is **selection**?

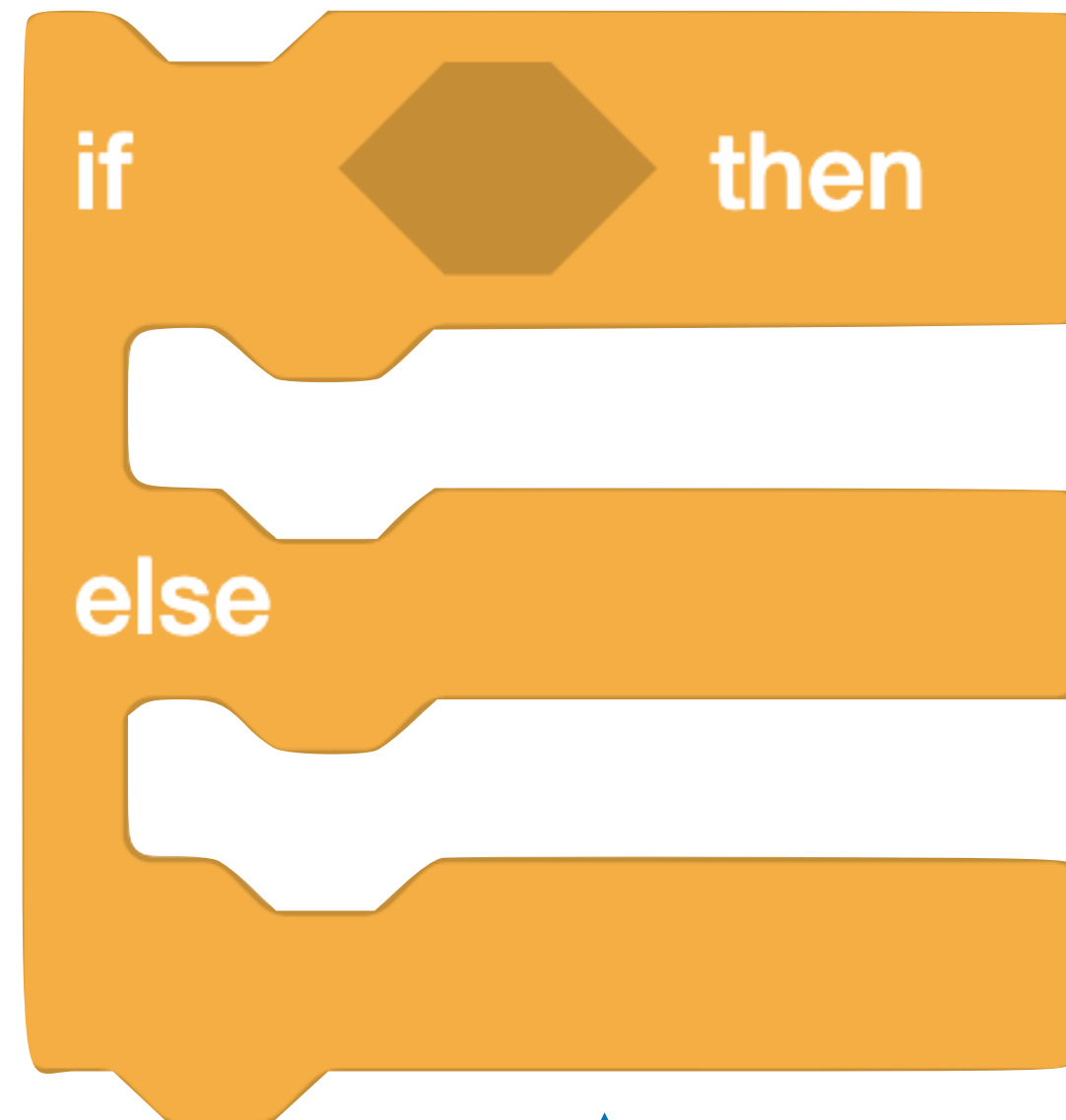
- Most programs require the user / player to **do something**: to press keys on the keyboard, click buttons, type information.
- The way the program then works **changes** depending on what the user does.
- For example, **if** the user presses the up arrow on the keyboard, **then** a sprite might move in an upward direction.
- **If** a sprite bumps into a star, **then** the score might increase by 1.
- **If** the player answers a question correctly, **then** play a bell sound. **If** the player answers incorrectly, **then** play an alarm sound.



Selection code blocks in Scratch



If something is true, **then** do something



If something is true, **then** do something, otherwise, do something **else**



Repeat an action **until** something is true

Where is the **selection** in these?

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

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

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

Discuss

Starting to add levels to our game

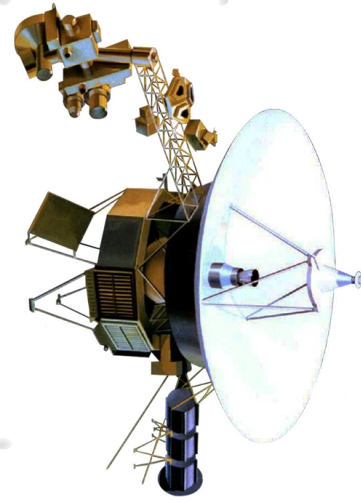
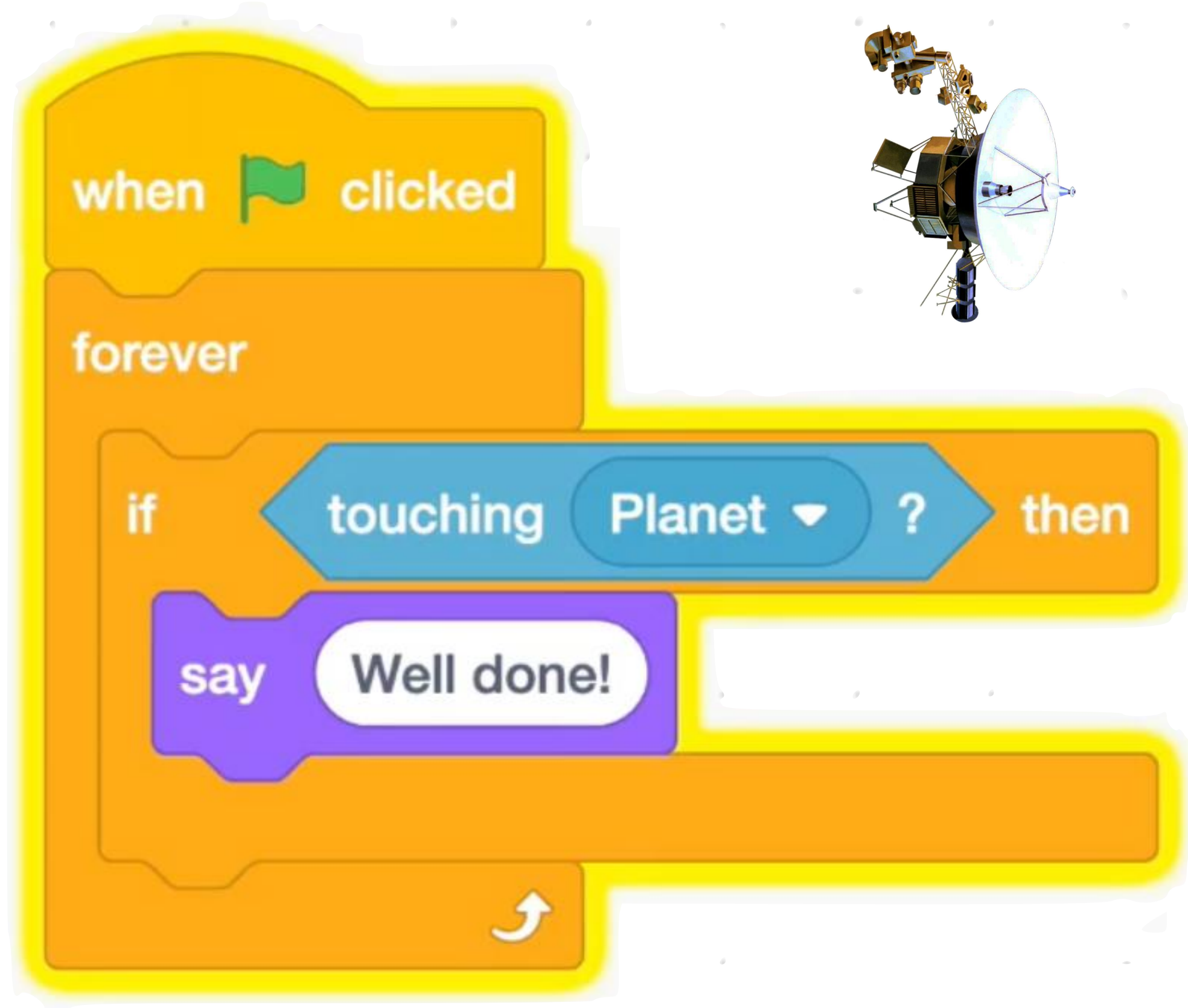


- **If** the probe reaches a planet in our game **then** the following happens:
 - the **planet** changes to the next planet
 - the **probe** returns to the starting point, and to pointing in the correct direction
 - the **angle and power variables are reset**
 - the Level variable increases by 1
- **Watch the first video clip to get started -**
https://youtu.be/tNQ_XLLIVCw

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

We now have this:

Learn



- When the **green flag is clicked**
- Keep checking **forever** to see if the probe is touching the planet
- If it is, **say 'Well done'**
- **We now need to modify this algorithm to trigger the changes for a new level.**

Adding levels to our game

- If the probe reaches a planet in our game **then** the following happens:
 - the **planet** changes to the next planet costume
 - the **probe** returns to the starting point, and to pointing in the correct direction
 - the **angle** and **power** variables are reset
 - the **Level** variable increases by 1
- Watch the video clip -
<https://youtu.be/3sChVGDdFyI>

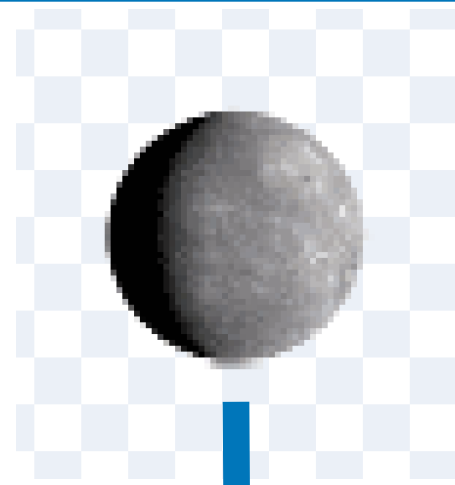


4. What happens to the probe when it touches a planet?

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

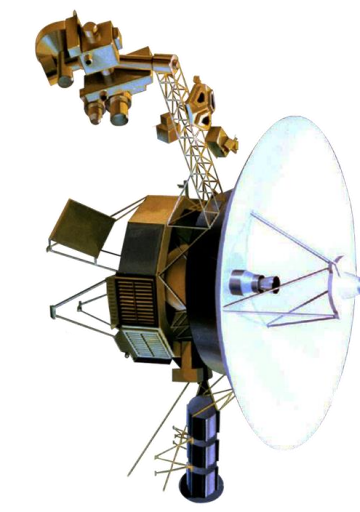
7. When does the 'Level' at the top of the screen change?

This session's final algorithms



```
when I receive next level
  next costume

when clicked
  switch costume to Mercury
```



```
when clicked
  forever
    if touching Planet ? then
      broadcast next level
```

```
when I receive next level
  set Angle to 0
  set Power to 0
  go to Start
  point in direction 45
  change Level by 1
```

Kahoot!

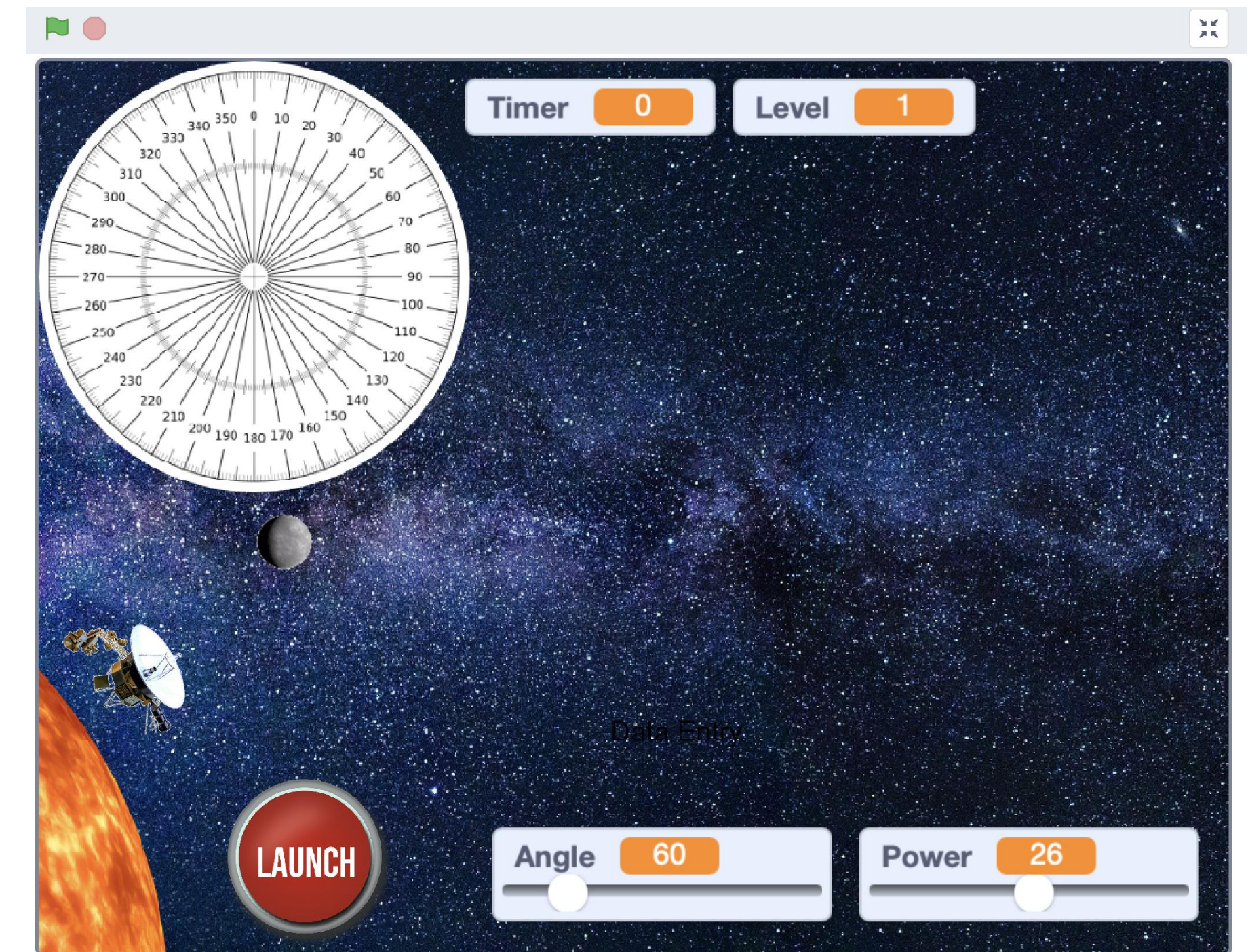
Learn

Checking our knowledge and understanding

<https://create.kahoot.it/v2/share/raf-code-commanders-session-3-quiz/7756db4d-d494-4c8b-b43d-6730b59f1296>

Next time

- What is beyond Neptune?
- What happens if the probe touches the edge of the Stage? **Creating an explosion**
- Adding finishing touches to our game:
 - What happens when the player completes all of the levels?
 - Adding a timer to our game
 - Adding sound effects to our game



Project credits

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



Other credits

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- Voyager One probe image - Public domain (NASA) - https://en.wikipedia.org/wiki/Voyager_1#/media/File:Voyager_spacecraft_model.png
- Orbits in the desert - still image from <https://youtu.be/Kj4524AAZdE>
- The relative sizes of The Sun and planets - <https://commons.wikimedia.org/wiki/File:Planets2013.svg>: used under the Creative Commons Attribution-Share Alike 3.0 Unported license
- Maven Mars image - still from https://youtu.be/Umc dhK_Bc9I
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