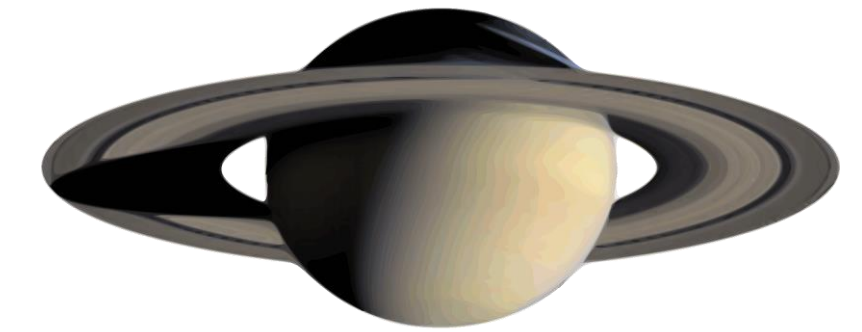
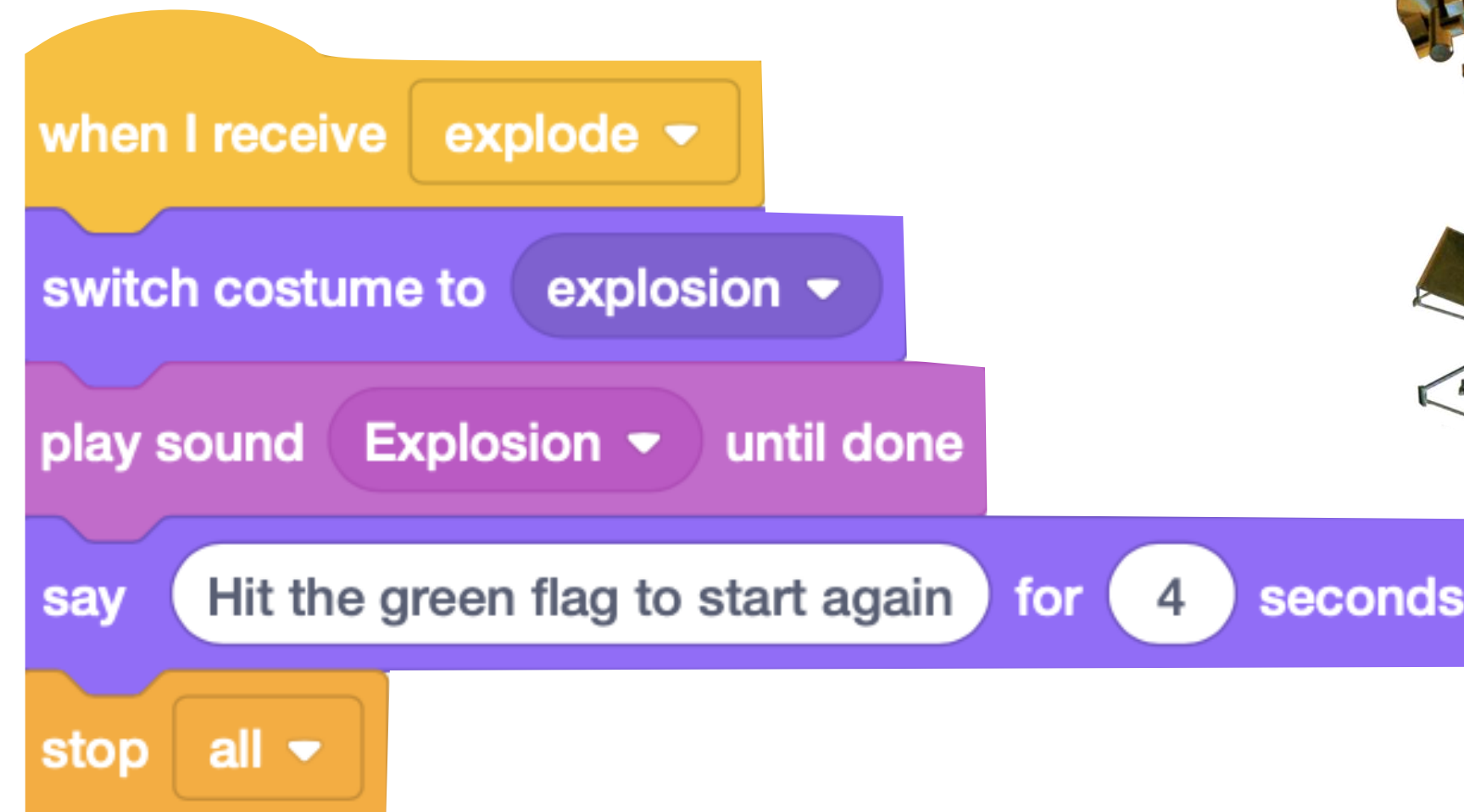
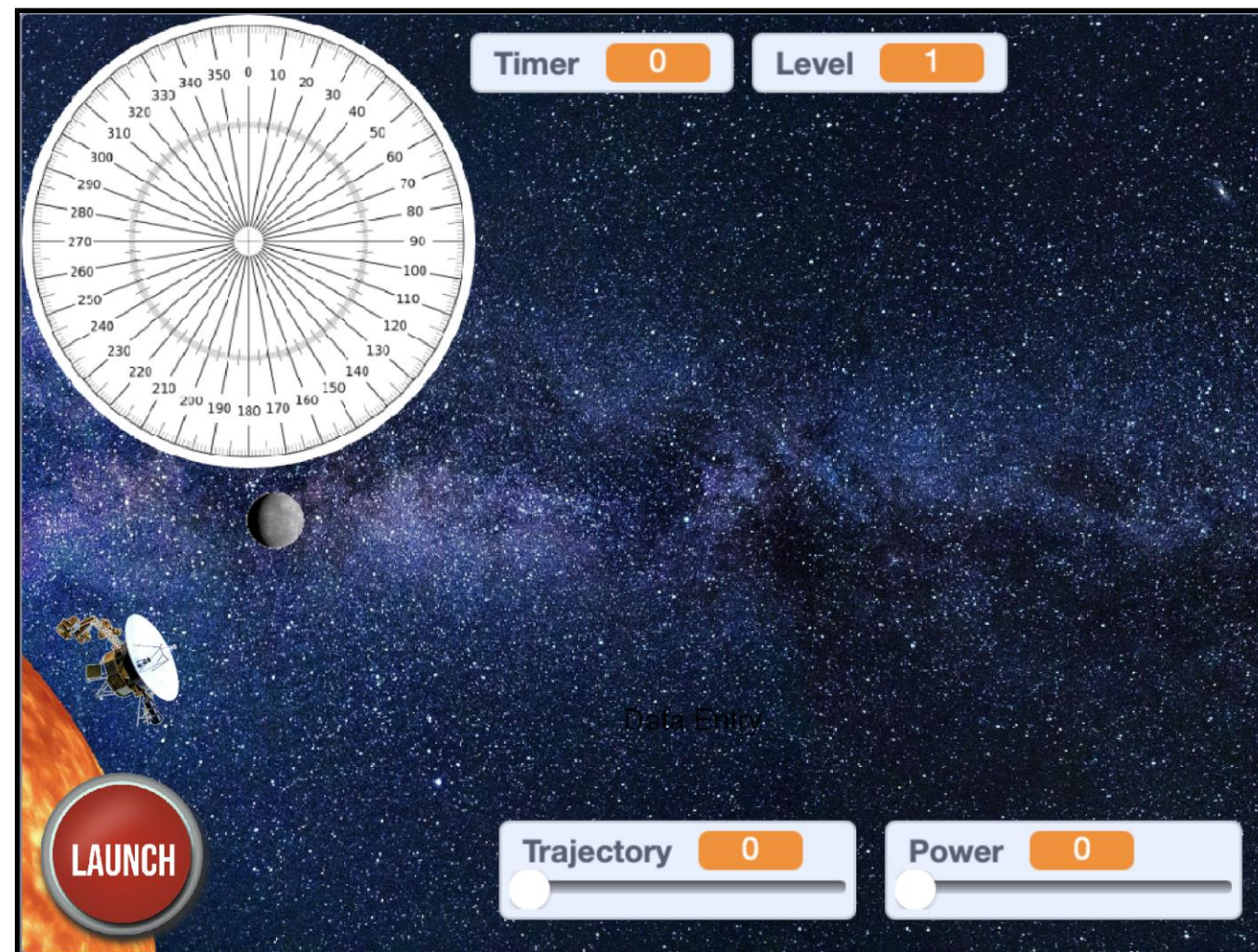


# RAF Code Commanders: Cosmic Launch Project

Session 4



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# 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](mailto: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.

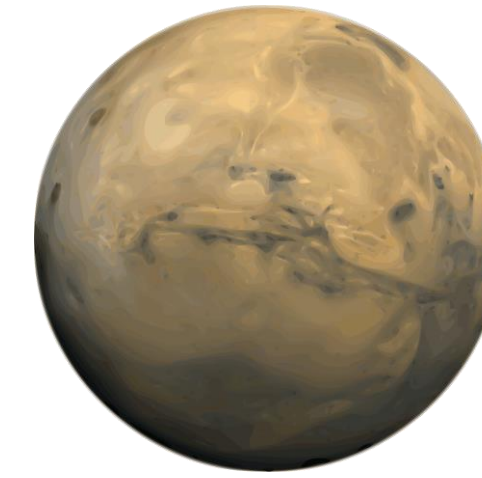
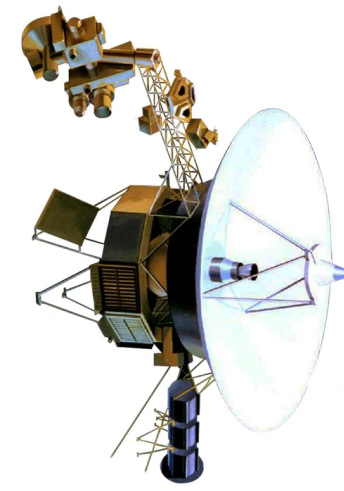


# Session 4: Beyond the Solar System, and completing our game program



# Overview

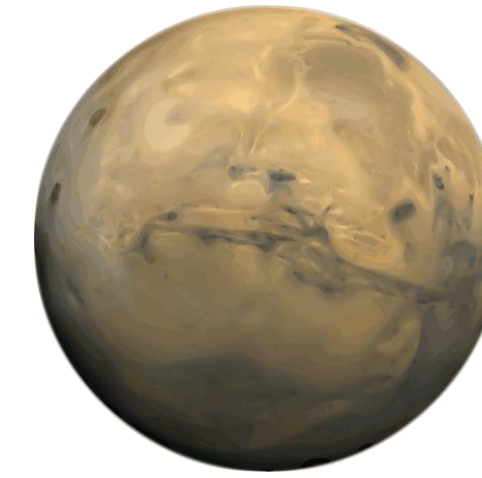
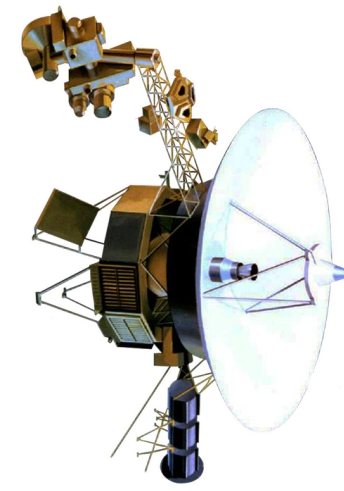
In this project you will:



- 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

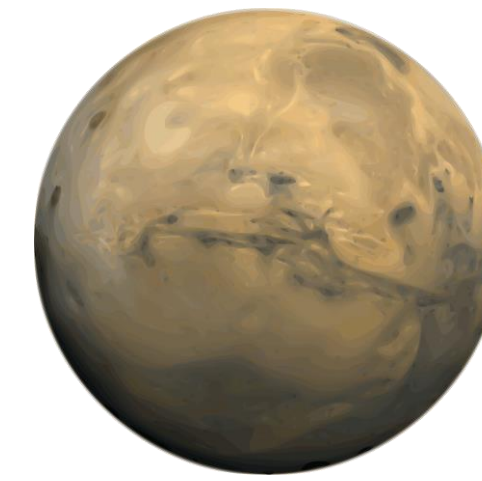
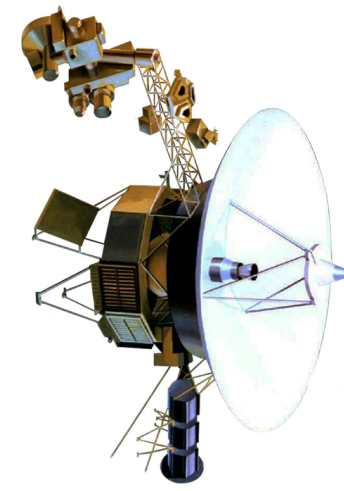
You:



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

# This session

You will:



- Learn about the true scale of The Solar System within our galaxy, and of of galaxy within the Universe ...
- Create an explosion if the probe hits the edge of the Stage
- Code what happens if the player completes all levels
- Add a timer to the game
- Add sound effects to **complete our game**



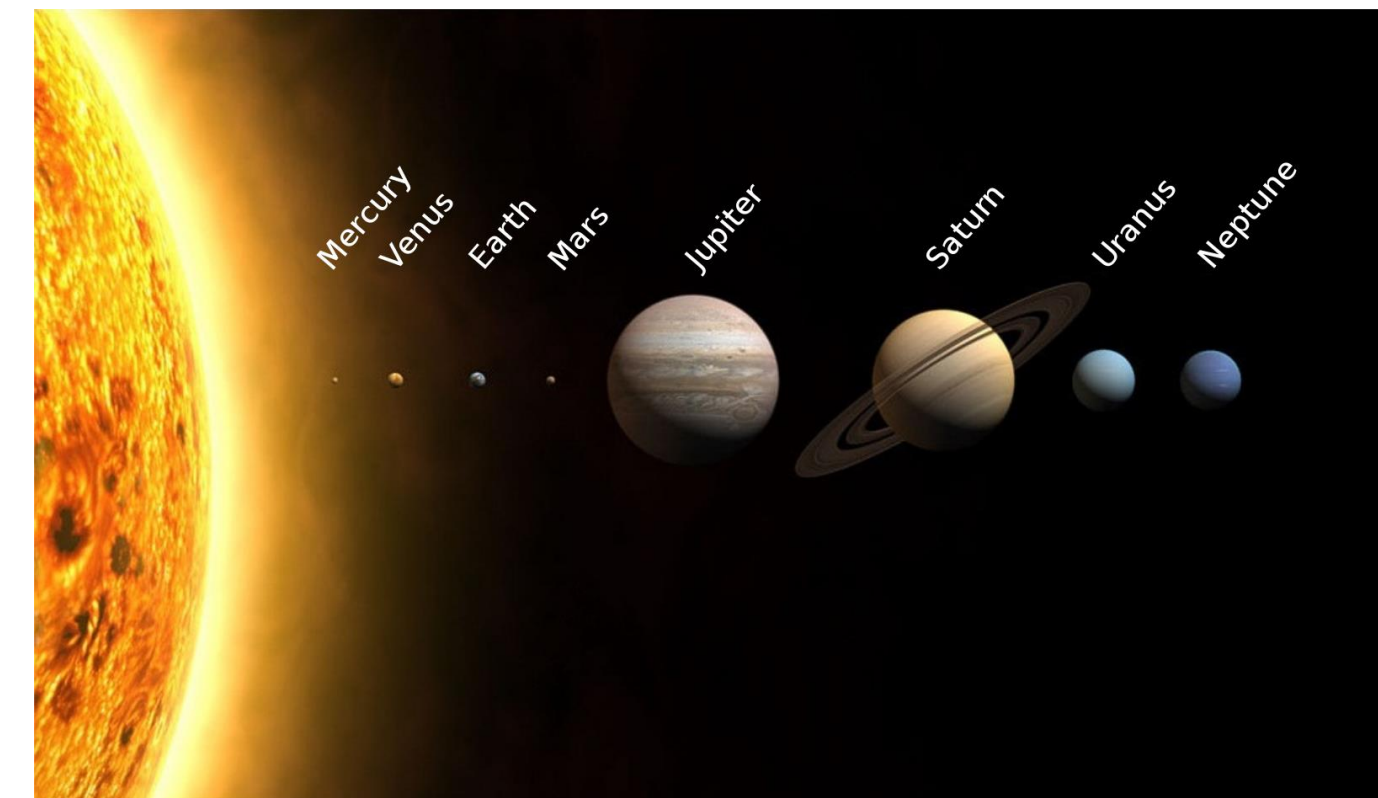
# Discuss

Discuss

- How long do you think it would take for humans to fly, on a rocket travelling at the speed of the Space X Falcon 9 Rocket, when leaving the Earth (about 17,500 mph), from the Earth to:
  - The Moon
  - Mars
  - Jupiter
  - Neptune
  - The Sun (our nearest star!)
  - The nearest star apart from The Sun?
- **Discuss with your partner, or as a group**



The Space X Falcon 9 rocket

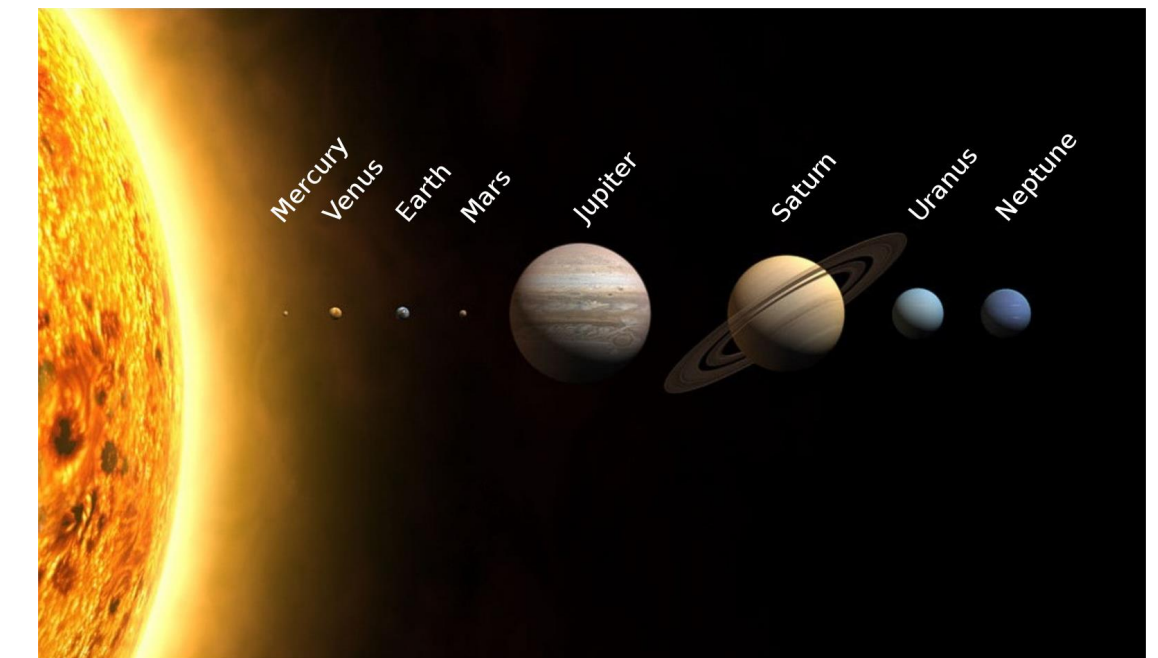




# Journey times within our Solar System

Learn

- Travelling at **17,500 mph** (the speed of the Space X rocket when leaving the Earth's atmosphere), journey times are:
  - To the **Moon**: 14 hours (note that in the Apollo missions, this journey took 3 days)
  - To **Mars**: 4 months
  - To the **Sun**: 7 months
  - To **Jupiter**: 3 years
  - To **Neptune**: 18 years
- The fastest ever speed recorded for a human-made space craft was 153,000 mph for the Parker Space probe. (This did not carry any astronauts). Even at that speed, it would take **2 years to fly to Neptune**.



The Space X Falcon 9 rocket

# Beyond the Solar System

- Our nearest star is The Sun, which is **93 million miles away from Earth.**
- The journey time from the Earth to The Sun is about 7 months. (Light makes the journey in 8 minutes)
- Our next nearest star is called Proxima Centauri
- **Discuss with a partner or as a group:** How long do you think it would take to travel to Proxima Centauri?

Discuss



Proxima Centauri



# Beyond the Solar System

- Proxima Centauri is 25 trillion miles away from Earth! (**25,000,000,000,000 miles**)
- The journey time to Proxima Centauri at the speed of the Falcon 9 would be ...  
**168,000 years** ...
- Even if we travelled at the speed of the Parker Space probe, it would be over **18,000 years** to travel there!

Discuss



Proxima Centauri

# Watch: The Powers of Ten

- The 'Powers of Ten' is a famous video explanation of the true scale of our Solar System.
- Starting with a 1 metre circle on the ground in the Italian city of Venice, it moves further away from Earth. With each step away from Earth, **we are moving 10 times further away.**
- Watch here - <https://youtu.be/44cv416bKP4>.
- (Note: stop the video after 5 minutes if you wish, as the remainder of the video looks at the microscopic scale)

Watch



Image from 'The Powers of Ten'



# Thoughts on the universe:

- The universe is full of 'stuff', including galaxies containing many billions of stars of many different types, and planets (other 'solar systems') orbiting some of those stars.
- It is very probable that there is life elsewhere in the Universe, including other intelligent life.
- However, it is also highly possible that humans will never get to meet alien lifeforms, as the distances between stars and galaxies are so vast ...

Discuss

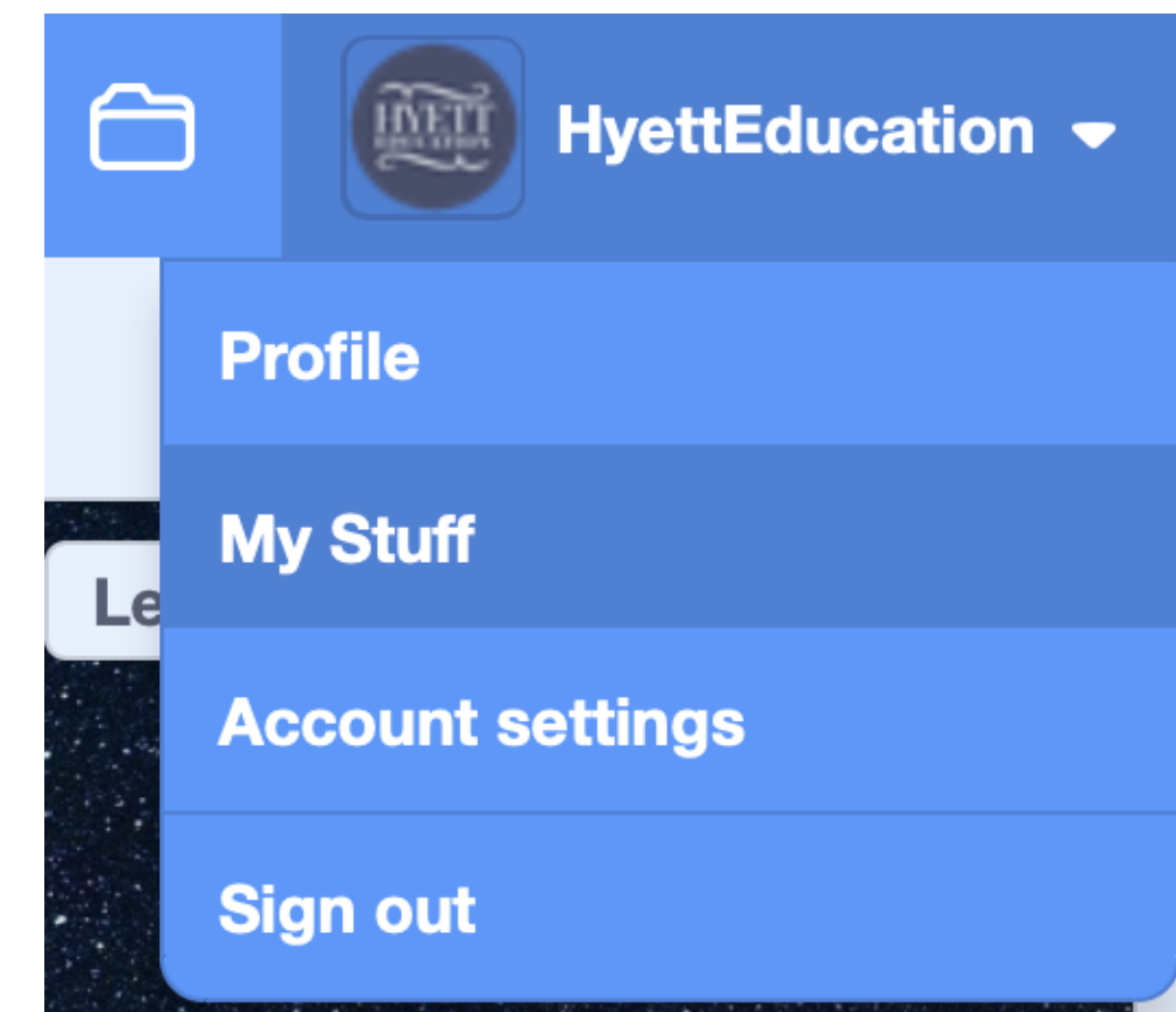


Image from 'The Powers of Ten'

# 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

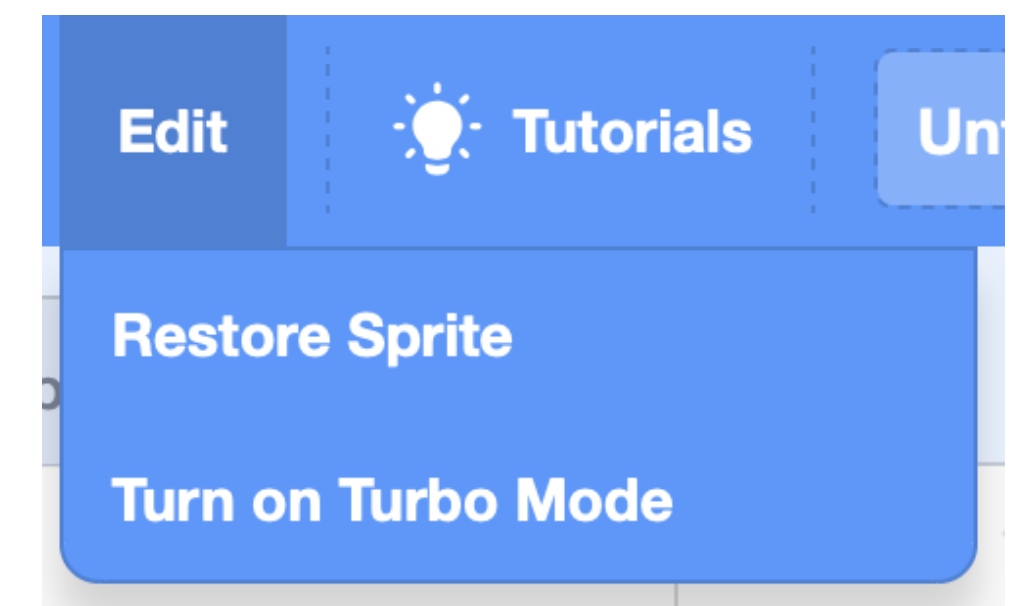




# Correcting mistakes

- If you make a mistake when using Scratch – e.g. by deleting pieces of code accidentally - 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**’.

Learn

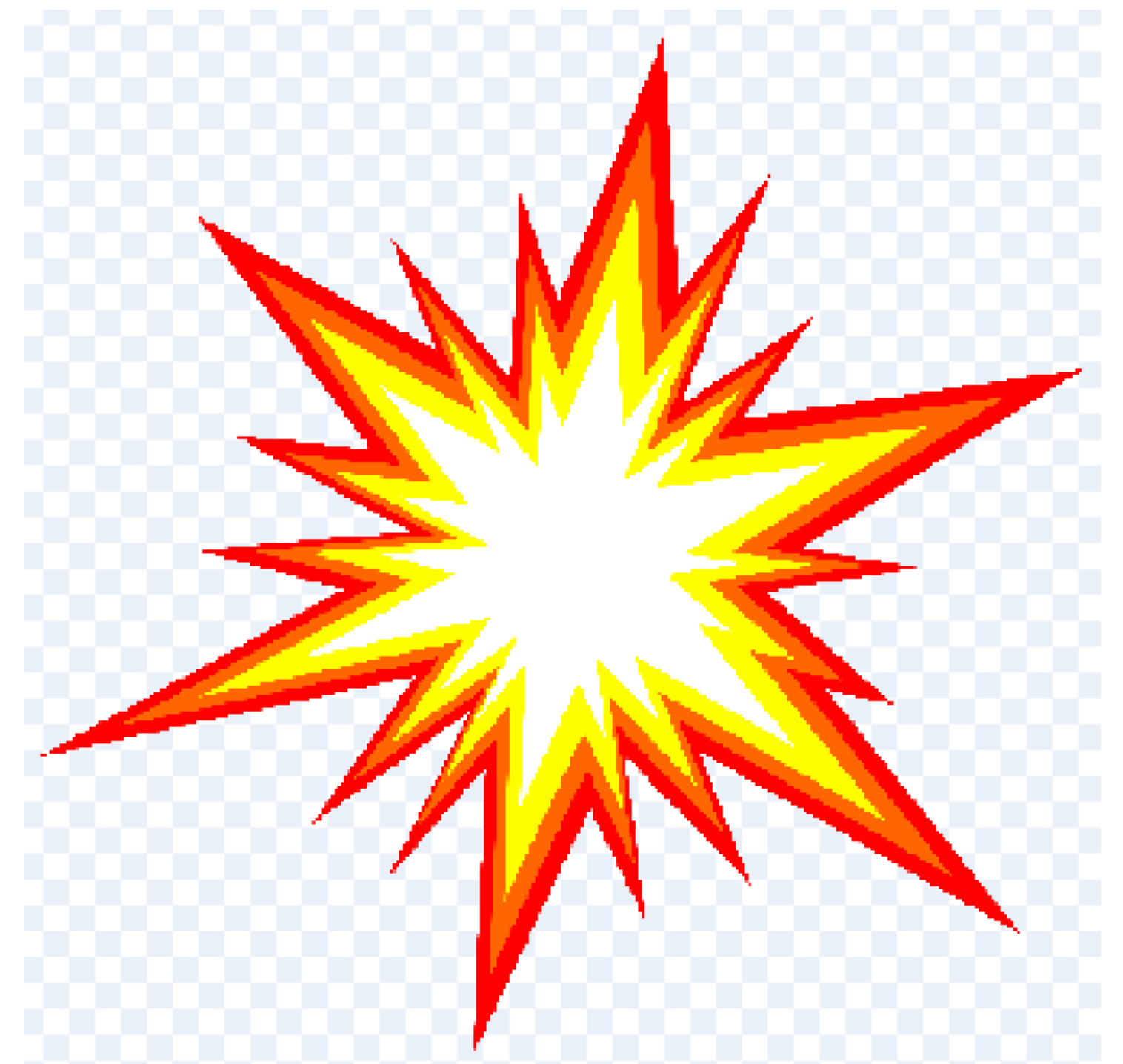


# Back to our program

Learn

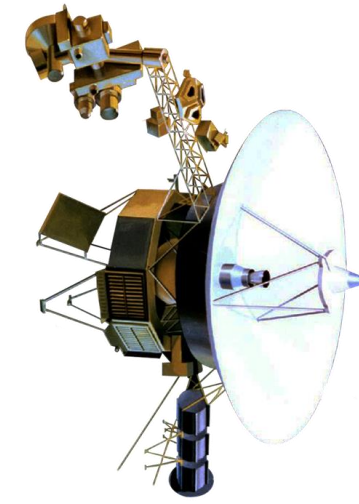
- We're going to learn how to create an explosion when the probe hits the edge of the stage.
- We will achieve this using **broadcast** and **when I receive** code blocks
- **Watch the video clip here -**  
<https://youtu.be/IMruEuZQ1rg>

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

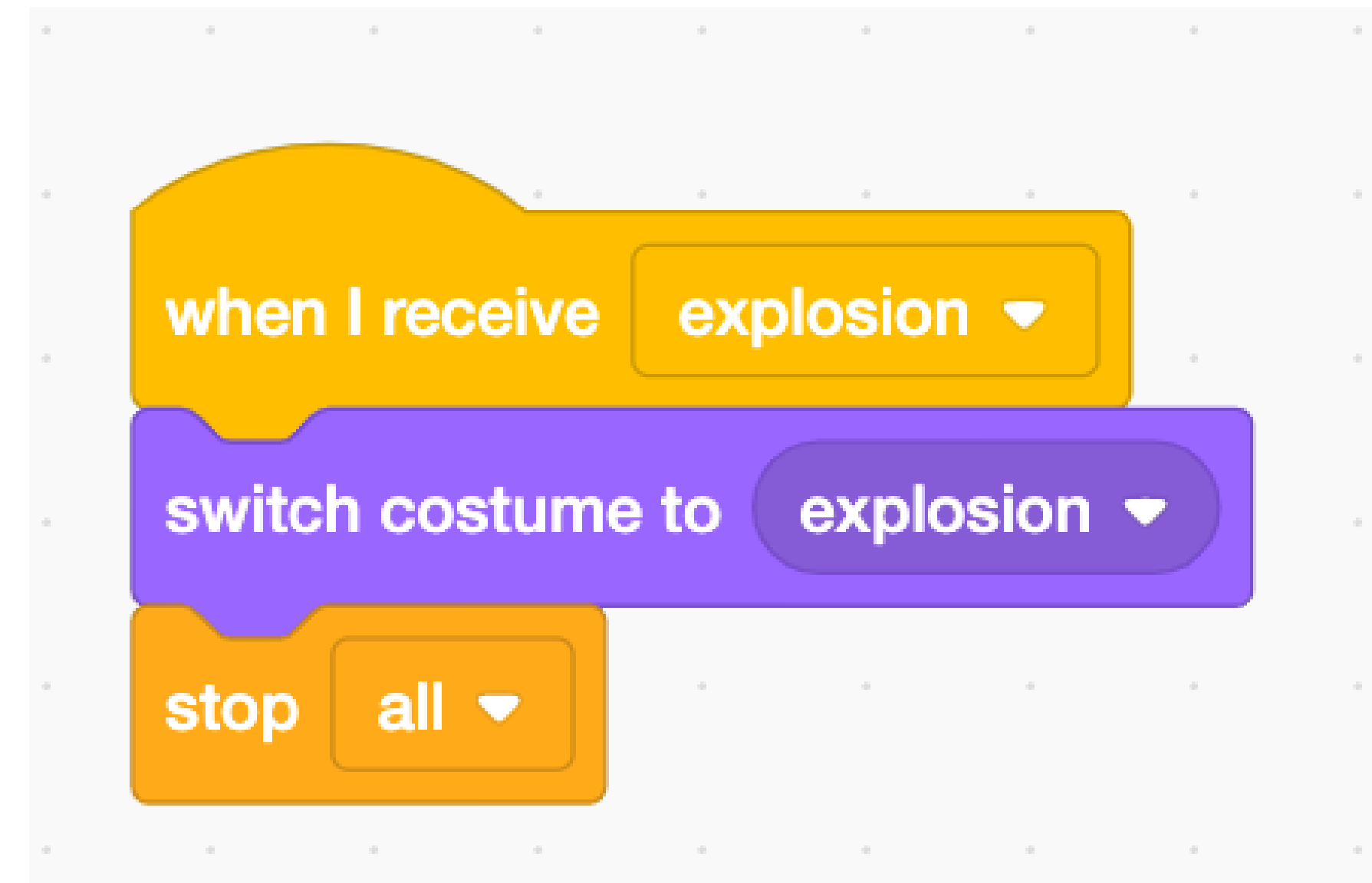
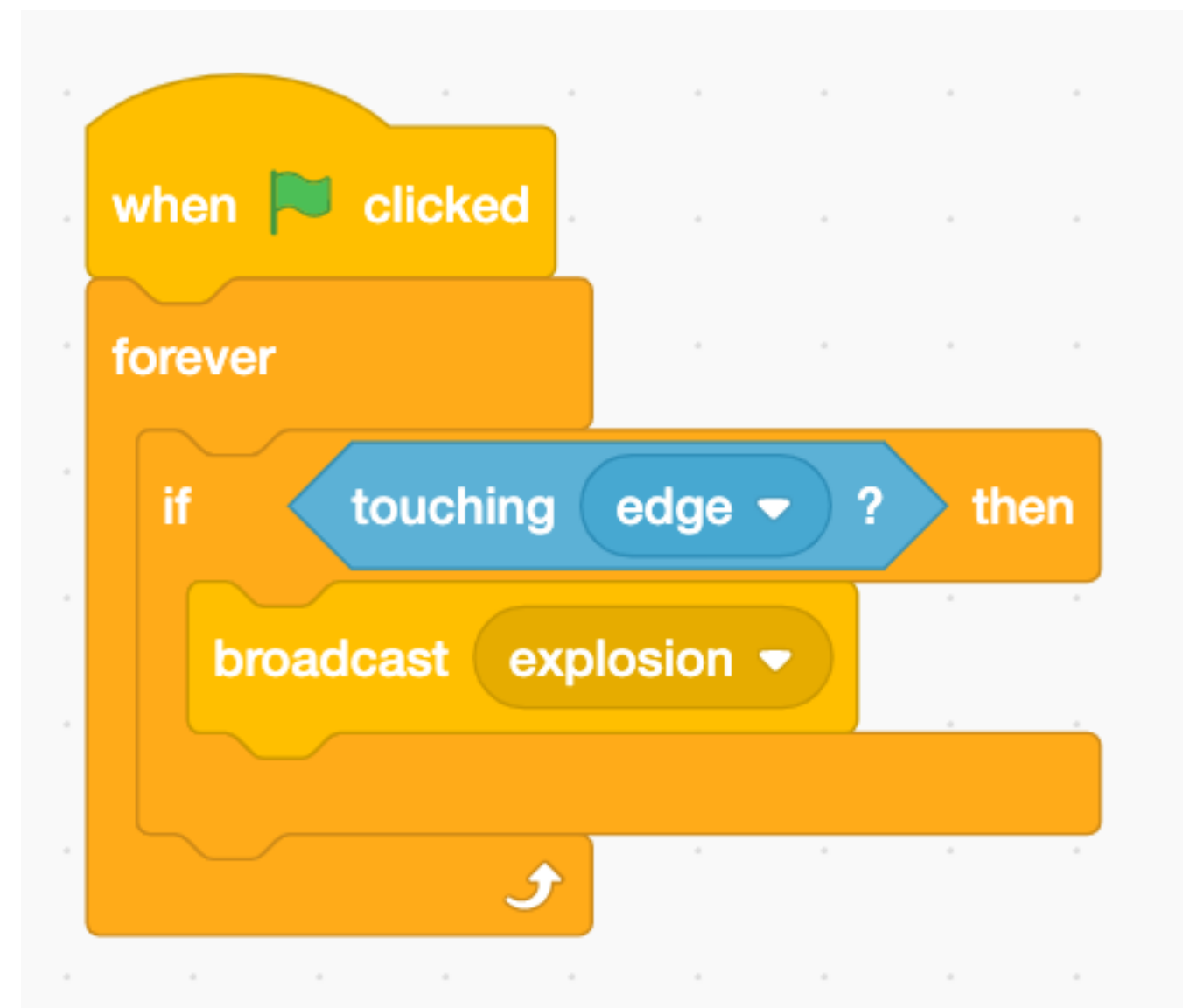




# The explosion algorithms



Learn



# What happens when the player completes all of the levels?

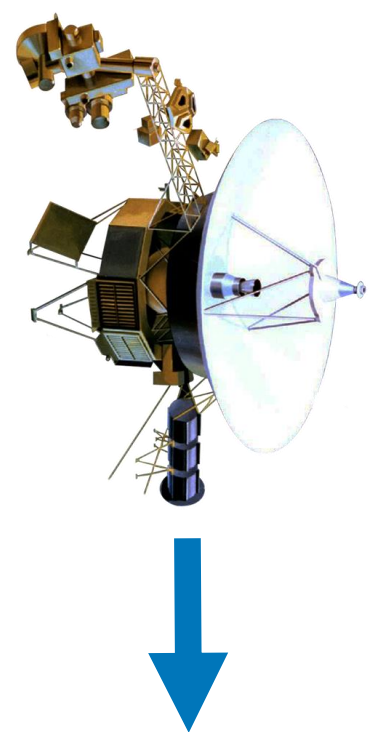
- At the moment, as long as the probe doesn't hit the edge of the stage, the game never ends!
- Watch the video here to find out how to change the stage background to a 'well done' message when the player has sent the probe successfully to all eight planets -

<https://youtu.be/PuEVDkZJGzc>

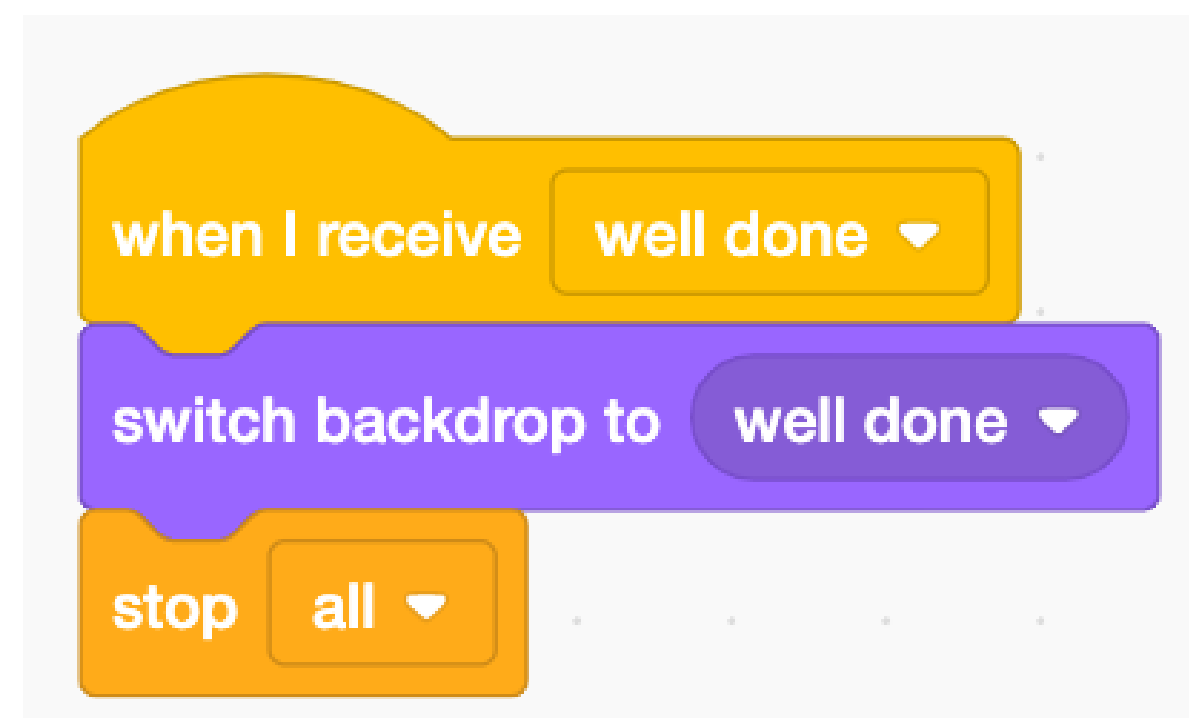
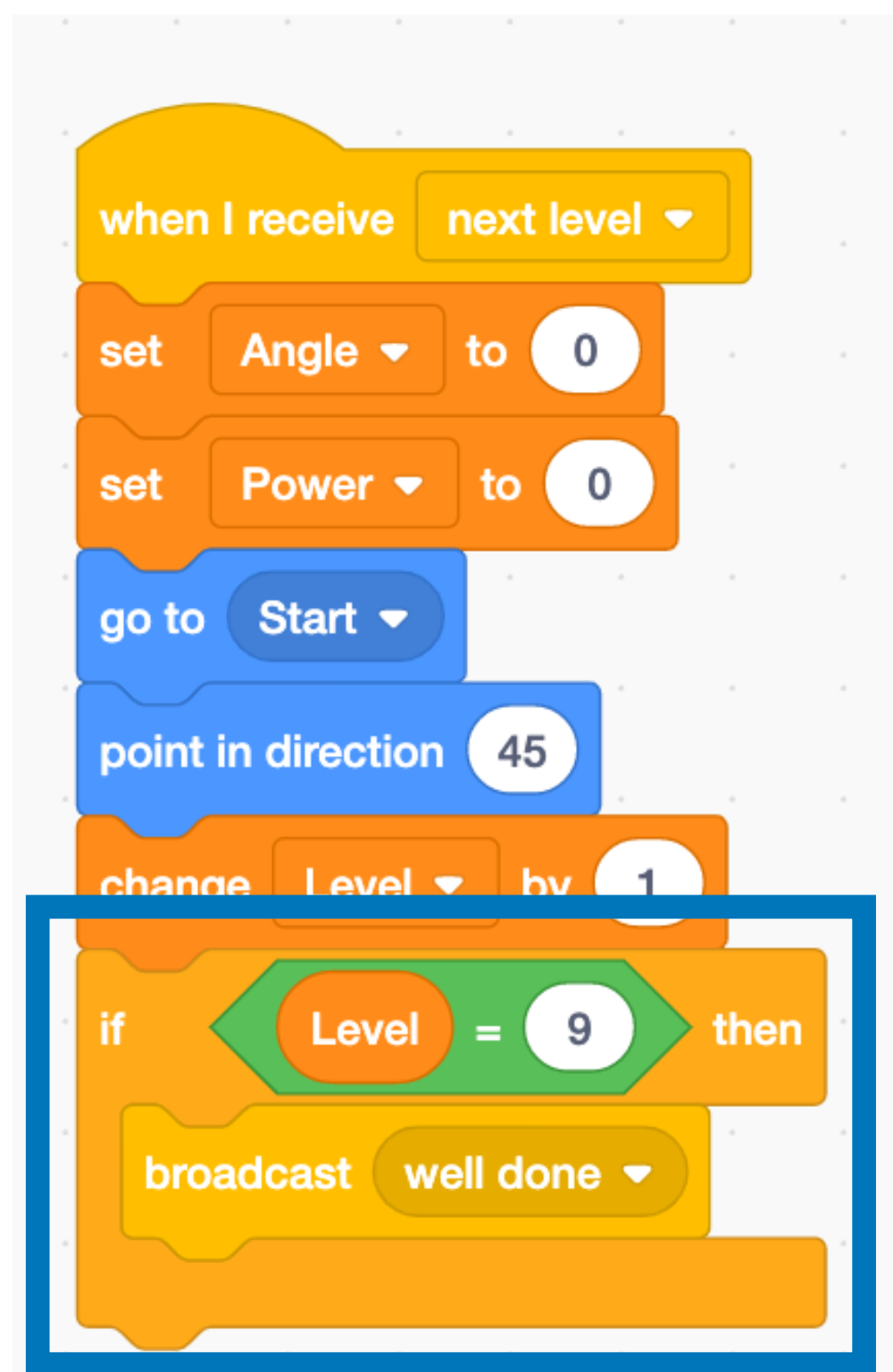
Learn

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





Backdrops



**Creating a  
well done  
message -  
algorithms**



# Adding a timer

Learn

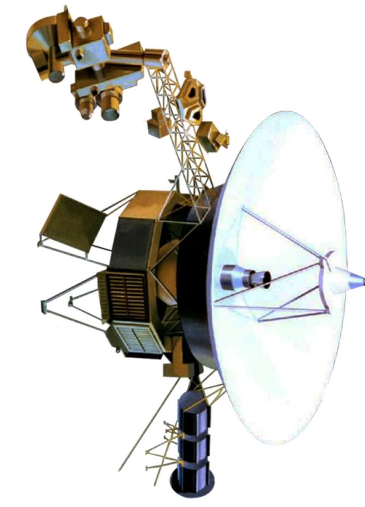
- Adding a timer allows players to compete against one another to see who can finish the game most quickly!
- Watch the video here to find out how to **create a timer** -

<https://youtu.be/tx0Ohc2m21A>

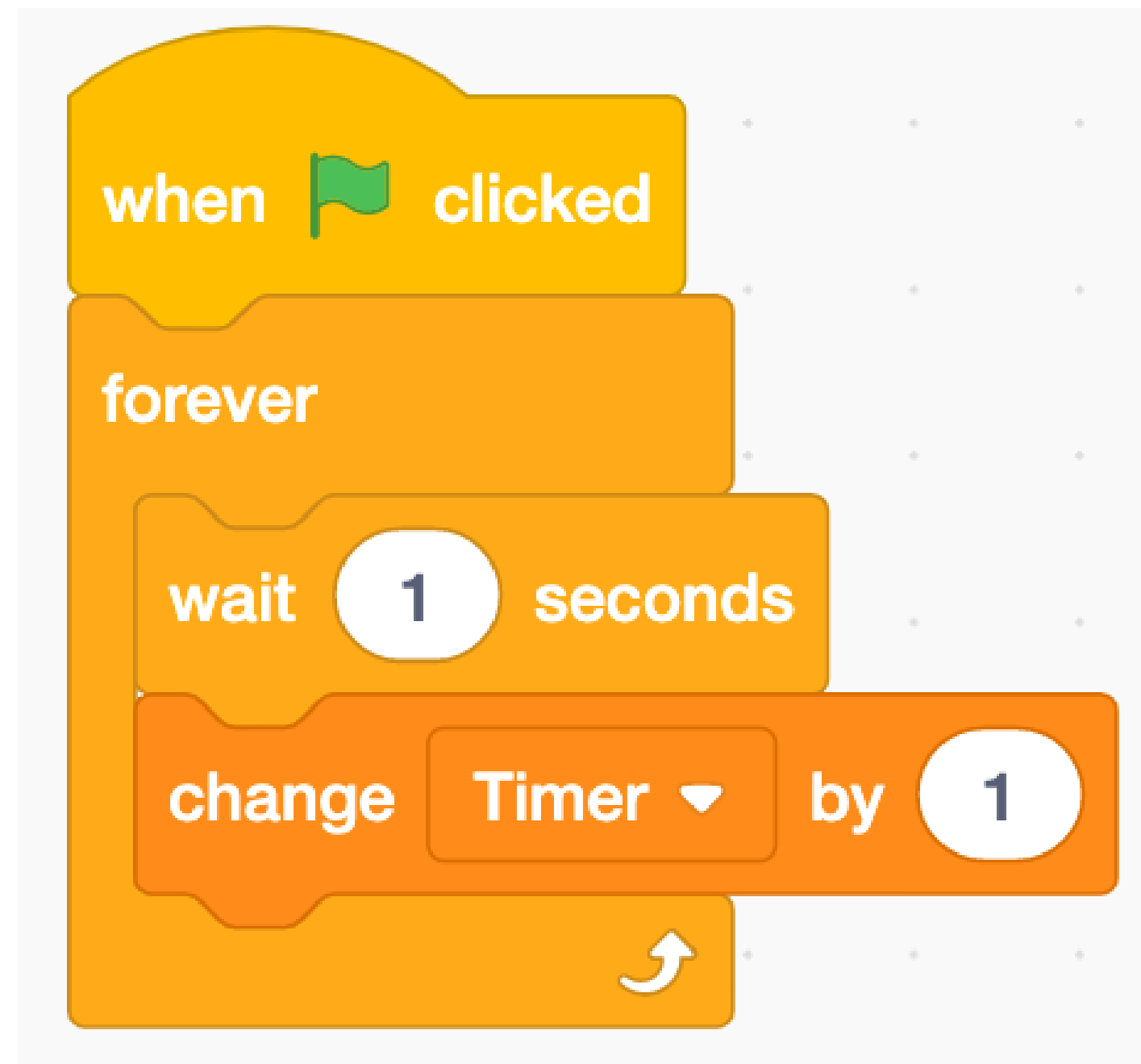
8. What happens to the timer as the game is played?



# Adding a timer algorithms



Learn



# What is wrong with many famous movie scenes set in outer space?

Discuss

- A famous movie scene - <https://youtu.be/5p0IP-FVG2I?t=2m13s>
- What is wrong with the science in this scene, especially when the planet explodes?





# What is wrong with many famous movie scenes set in outer space?

Discuss

- There is **no sound in space!**
- Sound requires a gas (like air), liquid, or solid to travel through, as sound travels by vibrating particles, which then vibrate their neighbouring particles, and so on.
- Outer space is an almost complete **vacuum** - there are very, very few particles. Therefore sound cannot travel through space. In the scene from 'Star Wars: A New Hope', the planet would have exploded in complete silence ...

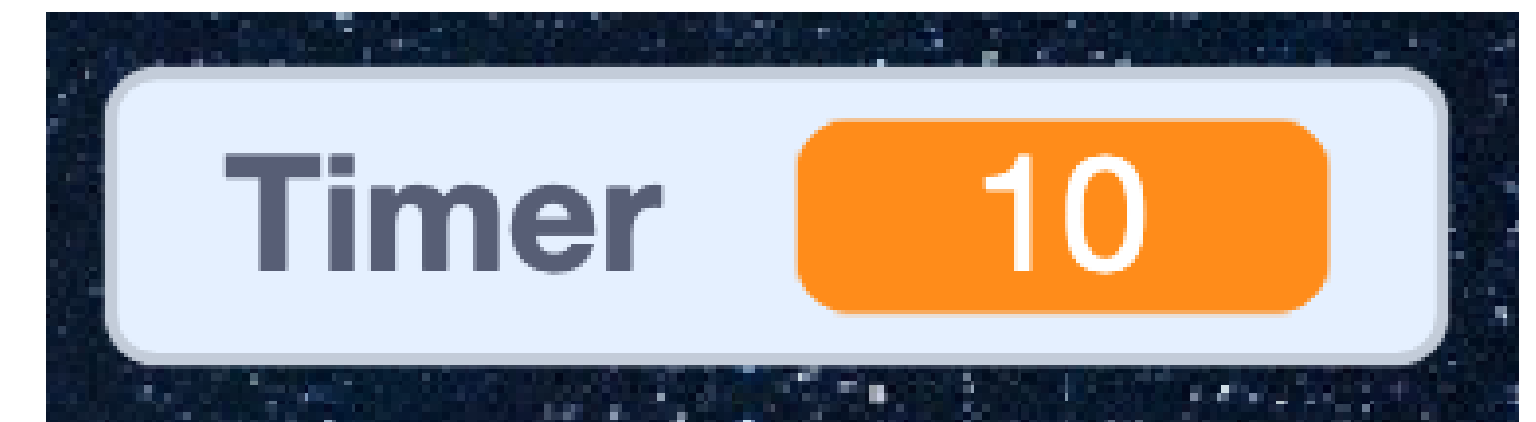


# Adding sound effects

- However ... we're going to add sound effects to make our game more fun to play!
- Watch the video here to find out how to add sound effects - <https://youtu.be/CGpscewDWj8>



Learn

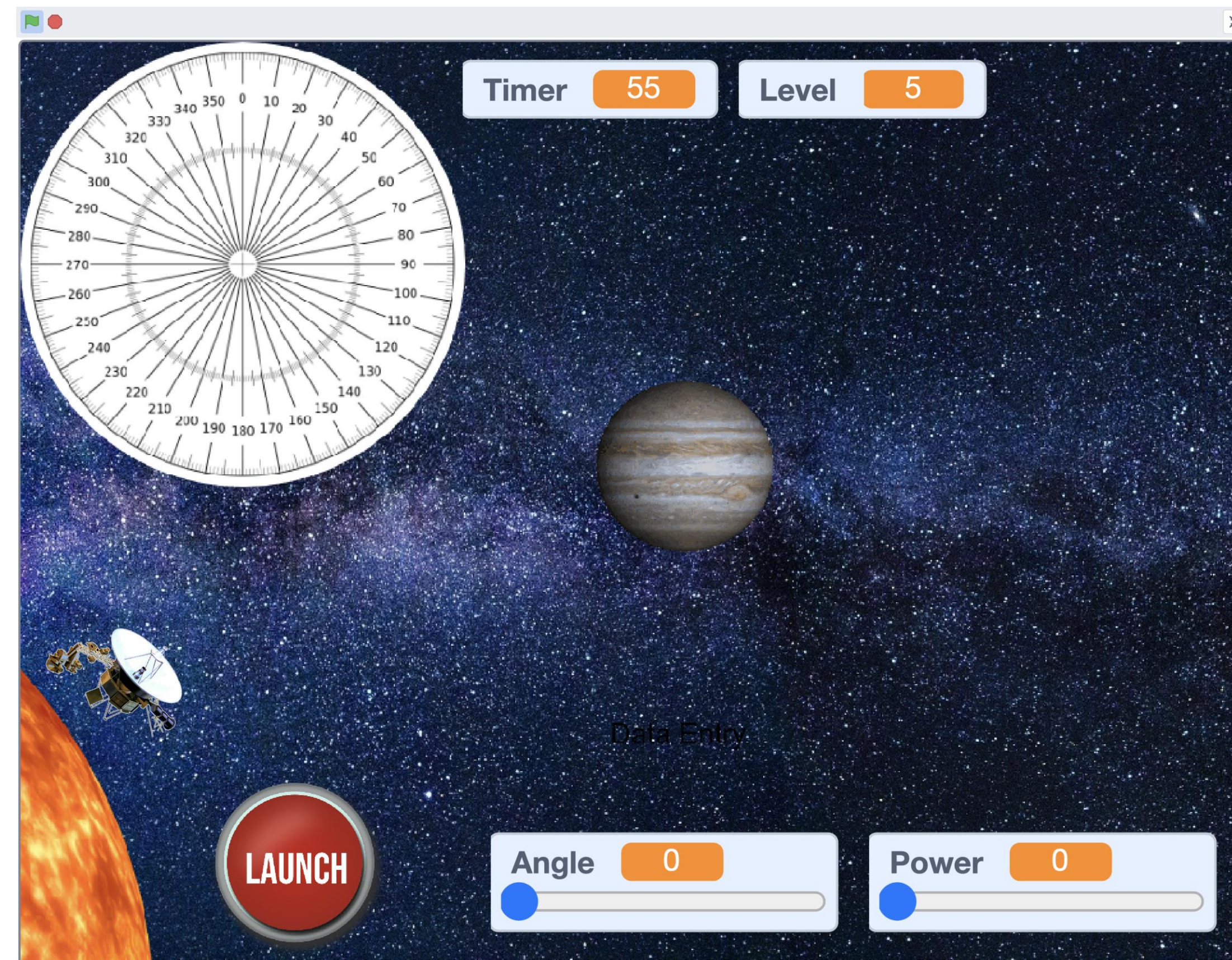


start sound Computer Beep ▼

play sound Explosion ▼ until done



# Testing and competing in your game!





Learn

**For reference, a completed version can be found  
at <https://scratch.mit.edu/projects/425127673>**

# Kahoot!

Learn

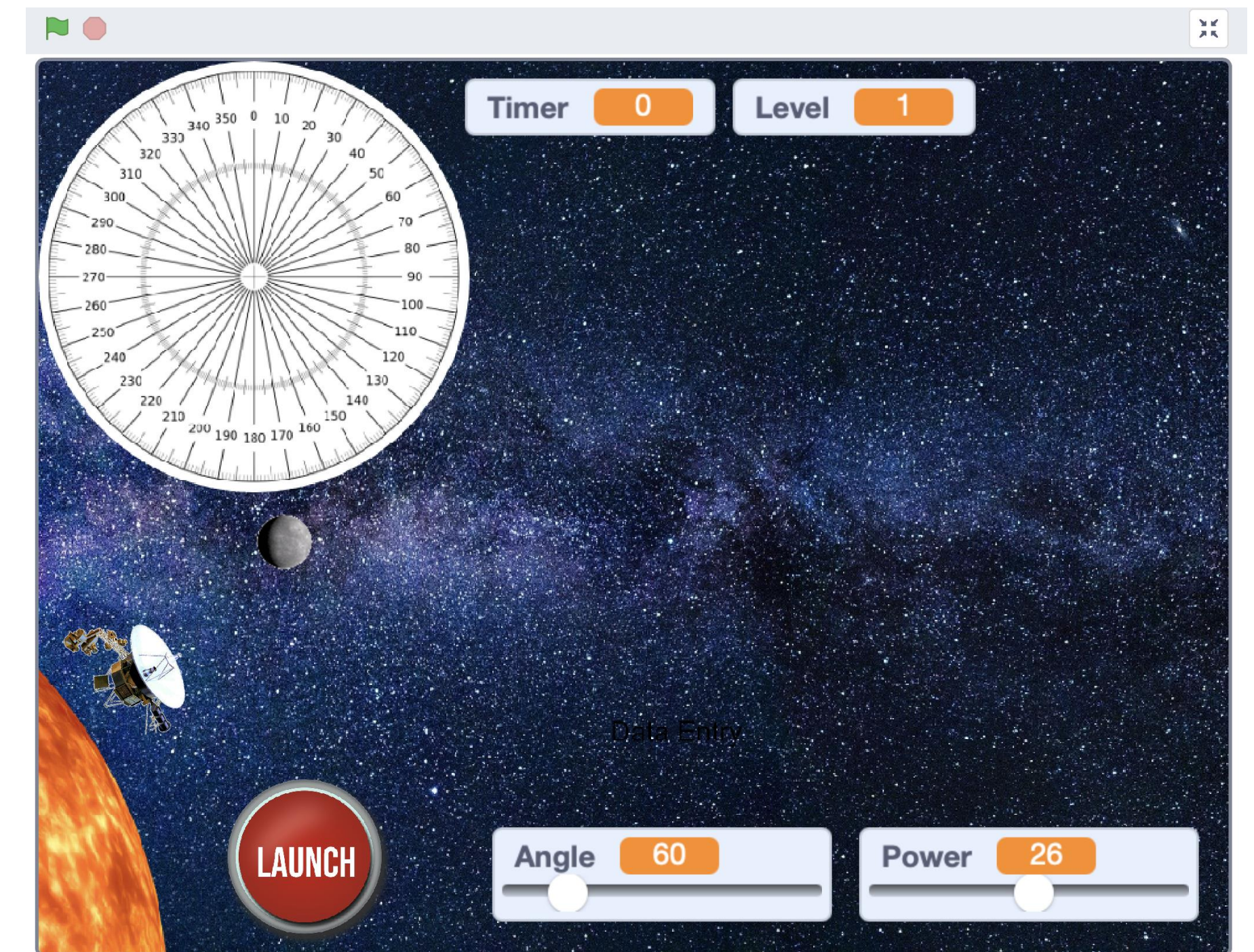
## Checking our knowledge and understanding

<https://create.kahoot.it/v2/share/raf-scratch-project-session-4/b85053b5-c3ca-4ee1-b697-2e539ae01aa8>



# Next time

- You'll consider the real-world challenges of sending humans to Mars.
- You'll be given a set of extension challenges to complete!
- Working more independently, can you add new features and gameplay elements to your game?





# Project credits

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For more free and exciting STEM resources go to [www.rafyouthstem.org.uk](http://www.rafyouthstem.org.uk).

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



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- 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.
- Still images from 'The Powers of Ten': <https://youtu.be/44cv416bKP4>.