## Things to make and do

Space coding challenge

Join the European Space Agency and the Raspberry Pi Foundation for their Astro Pi Challenge: Mission Zero. These coding activities will get you started.

Space adventure

Make your way through space and avoiding crashing into the asteroids. Follow the code to see where your spacecraft will land (answers on page 58).

Start in the top left corner of the grid and follow the code to see where you end up.

(0,0)
(1,0)
(1,1)
(1,2)
(1,3) (2,3) (3,3) (4,3)
(4,2)
(4,1)
(4,0) (5,0) (6,0)
(6,1)
(6,2)
(6,3)
(6,4) (5,4)
(5,5)
(5,6) (4,6) (3,6) (2,6)
(2,7)
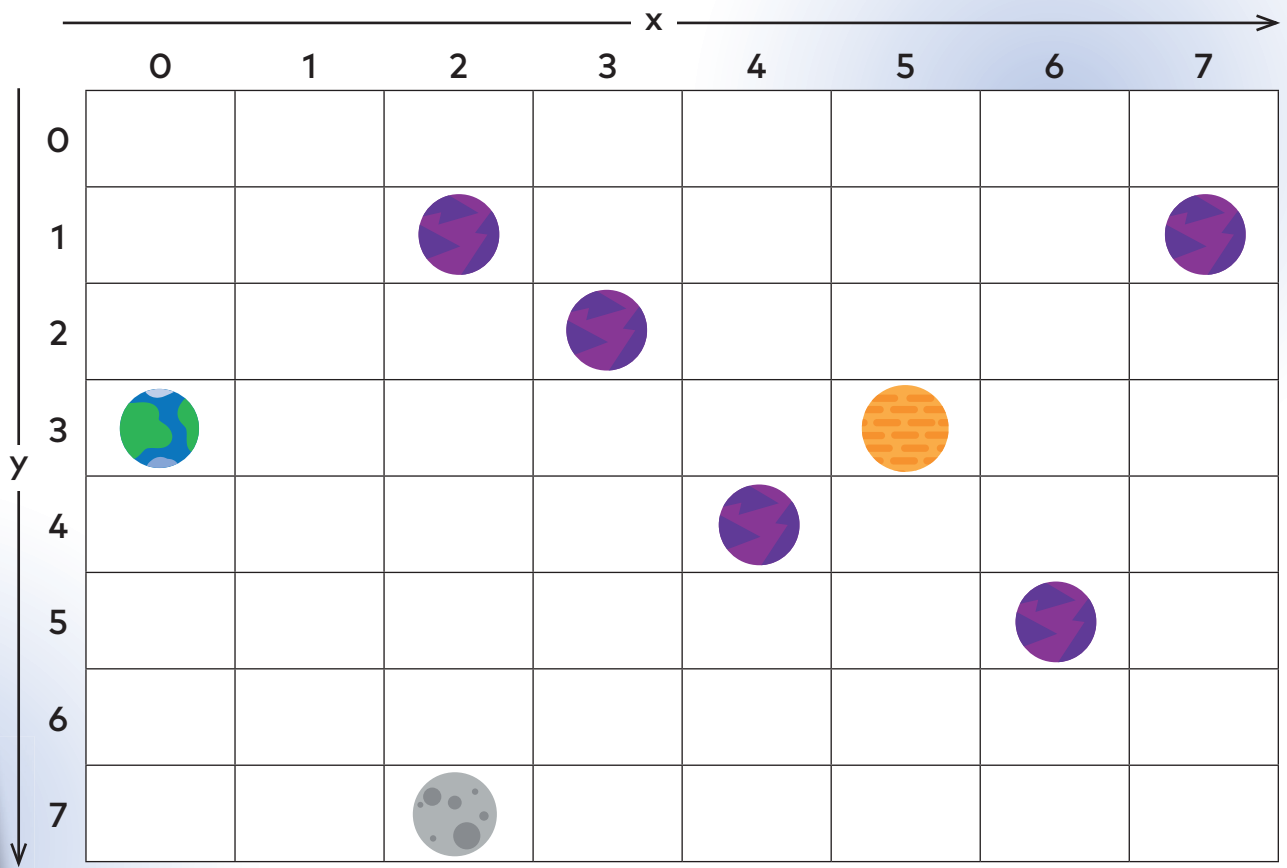
TOP TIP
The first number in the code is the x axis (across), and the second number is the y axis (down).

How does it work?

Computers use the same coordinates as old-fashioned television sets. To display an image, a beam would trace horizontal lines starting at the top left on the screen, travelling left to right and scanning from top to bottom. The most common size of computer screen today contains 1,049,088 pixels. That's 10,491 copies of the 7×7 pixel grid above, scrunched into a single screen.

Test your reaction time

Take this coding challenge with astronaut Tim Peake and put your reflexes to the test.

1 Go to rpf.io/astronaut-rt to open the starter project in Scratch.

2 Build the code (right) by selecting blocks from the colour-coded menus on the left-hand side of the screen and dragging them onto the blank stage in the centre. Check each line carefully.

3 It's time to test your project. Run the code by pressing the green flag and follow Major Tim's instructions. He will work out your reaction time.

4 Add new code blocks to your project to find out how far the International Space Station (ISS) would have travelled in the time it took you to react.

5 You will need to make a new variable for the first coding block. Name it "kilometres". Join the new code (bottom right) to the end of your program and press the green flag to run the project.

How does it work?

Astronauts are trained intensively to speed up their reflexes and to be prepared for all eventualities. They might need to react quickly to debris or space junk that could damage their spacecraft or the International Space Station.

Code blocks:

```
when [flag] clicked

say [Hello, British ESA Astronaut Tim Peake here. Let's test your reaction times?] for (2) seconds

wait (1) seconds

say [Press the spacebar when I say "GO!"]

wait (pick random (1) to (10)) seconds

say [GO!]

reset timer

wait until <key (space ▼) pressed>

say (join [Your reaction time was] (join (timer) [ seconds]))
```

```
set (Kilometres ▼) to (timer * 7.66)

wait (2) seconds

say (join (join [In that time the ISS travels about] (round (kilometres))) [ kilometres.])
```

Tim Peake

European Astro Pi Challenge

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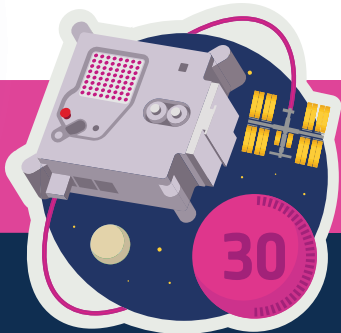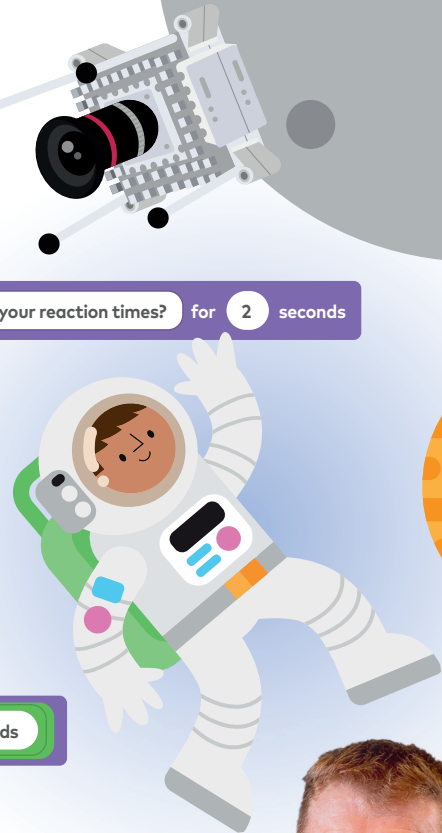
The European Astro Pi Challenge is a joint project by the European Space Agency and the Raspberry Pi Foundation. It offers students and young people the amazing opportunity to conduct scientific investigations in space by writing computer programs that run on Raspberry Pi computers on board the International Space Station. Your mission is first to write a simple program that will display a message, a picture and a humidity reading on the Astro Pi Computer. Participants also get the chance to vote for their favourite name for the Astro Pi Computers. You don't need any coding experience and there are step-by-step instructions online.

Go to astro-pi.org to find out how you or your class can take part. Raspberry Pi · esa