Lunar Lander

1 The starter project has some scripts to get you going. Three of these provide new blocks to use;
- **thrust** updates the rockets speed when the thruster is firing
- **touchdown** decides if the rocket has landed safely
- **lose** makes an animation when the rocket crashes

There is also a **repeat until** loop that will contain most of the changes you will make.
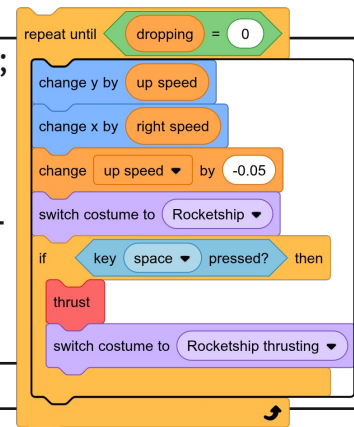
thrust

touchdown

lose

2 The movement of the rocket is controlled by two variables; **up speed** and **right speed.**
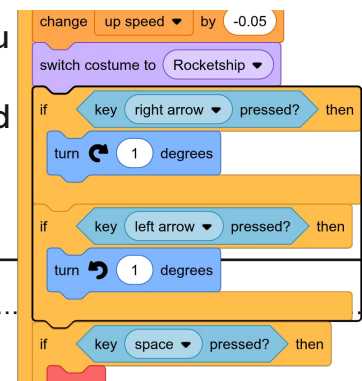- **up speed** changes to make the rocket fall with gravity
- The strength of gravity is set by the number **-0.05** - you can try changing this to make gravity stronger or weaker
- The space bar is used to fire the thruster

```
repeat until < dropping = 0 >
  change y by (up speed)
  change x by (right speed)
  change (up speed ▼) by (-0.05)
  switch costume to (Rocketship ▼)
  if < key (space ▼) pressed? > then
    thrust
  switch costume to (Rocketship thrusting ▼)
```

3 You will notice that then landing pad moves to a different place each time you click the green flag so you need to move the rocket sideways as well as up and down. To do this you can turn the rocket left and right.
- The script needs to detect when the **left arrow** and **right arrow** are pressed
- The **1** in the **turn** blocks control how quickly the rocket can spin so you can try changing this value

```
  change (up speed ▼) by (-0.05)
  switch costume to (Rocketship ▼)
  if < key (right arrow ▼) pressed? > then
    turn ↻ (1) degrees
  if < key (left arrow ▼) pressed? > then
    turn ↺ (1) degrees
  if < key (space ▼) pressed? > then
    thrust
```
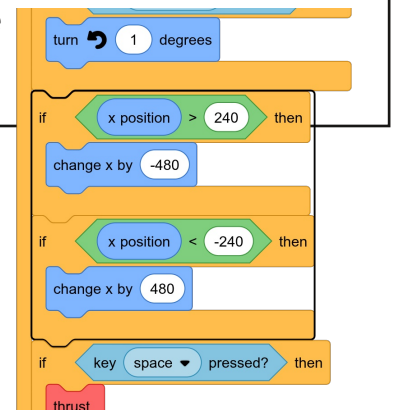
thrust

For the curious ... (optional)
Inside the **thrust** block are two clever maths helpers called **sine** (sin) and **cosine** (cos). They look at the rocket's direction and work out:
- How much of the thrust should move the rocket up
- How much of the thrust should move the rocket sideways

This means when you tilt the rocket, the thrust tilts too - just like a real rocket!

4 You might have noticed that you can fly the rocket off the side of the screen. Lets make it come back on the other side.


```
turn ↺ 1 degrees

if  x position > 240  then
  change x by -480

  if  x position < -240  then
    change x by 480

    if  key space ▼ pressed?  then
      thrust
```
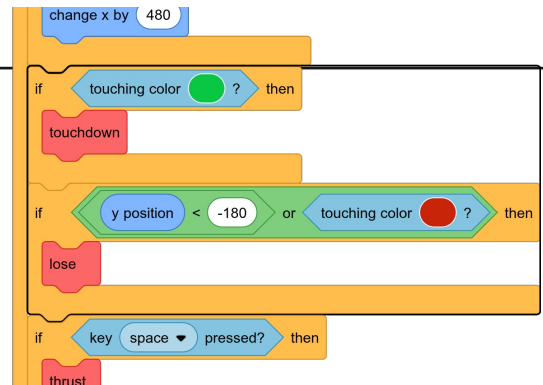
5 Now to land the rocket ... or crash!
- If the rocket touches the right colour (green) then call **touchdown**
- If the rocket touches the red edges of the landing pad, or falls too far down, then call **lose**

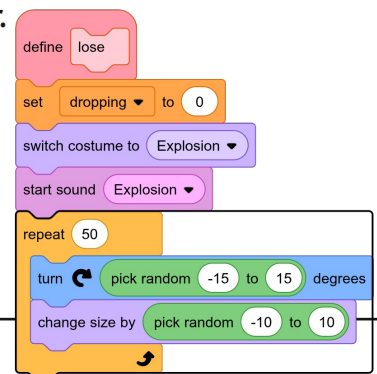Make sure you use the colour picker to get the right colours for the **touching color** blocks.

```
change x by 480

if  touching color 🟢 ?  then
  touchdown

if  y position < -180  or  touching color 🔴 ?  then
  lose

if  key space ▼ pressed?  then
  thrust
```

6 Finally, lets animate the crash to make it look a bit better. Note that these changes need to be made in the **lose block.**
After the costume has changed to the crash create a **repeat 50** loop and each time in the loop;
- Make the sprite bigger or smaller by a random amount
- Turn the sprite by a random amount

```
define lose
set dropping ▼ to 0
switch costume to Explosion ▼
start sound Explosion ▼
repeat 50
  turn ↻ pick random -15 to 15 degrees
  change size by pick random -10 to 10
```

7 What can you add to the game? Here are some ideas;
- Give the rocket a limited amount of fuel and, when it runs out, you cannot thrust any more.
- Add some obstacles that you need to avoid. These can be moving obstacles, such as flying asteroids, or stationary, such as buildings.
- Have multiple levels, so each time you land it gets a bit harder next time. You can make it harder in various ways such as a smaller landing pad, less fuel or more obstacles.
- Something else from your own imagination!