How to install on a Raspberry Pi

Because the Raspberry Pi uses a slightly older Python version, there is a special version of Graft for it.

Here's how to get it:

Open a terminal window by clicking the black icon with a ">" symbol on it at the top near the left.

First we need to install a couple of things Graft needs, so type this, then press Enter:

```
sudo apt install python3-attr at-spi2-core
```

If you want to be able to make animated GIFs, install one more thing:

```
sudo apt install imagemagick
```

To download Graft and switch to the Raspberry Pi version, type in these commands, pressing Enter after each line.

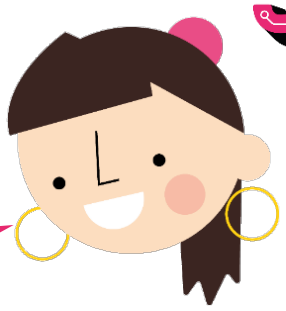
```
git clone https://github.com/andybalaam/graft.git
cd graft
git checkout raspberry-pi
```

Now, you should be able to run Graft just like on another computer, for example, like this:

```
./graft 'd+=10 S()'
```

RASPBERRY JAM

TELL A STORY BY MAKING ANIMATIONS WITH CODE!



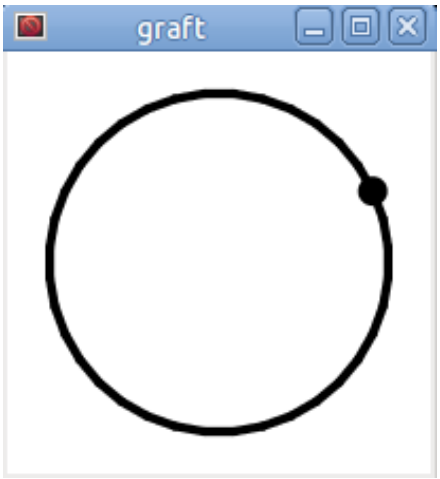
We're going to tell the story of an Astronaut called Poppy

Getting started

1 Start LXTerminal by clicking its icon at the top of the screen:

2 Change into the graft directory by typing `cd graft` then pressing Enter.

3 Let's start by showing Poppy in orbit around her home planet, Willow. To tell graft to draw a circle, type: `./graft 'S() d+=10'` graft should draw something like this:



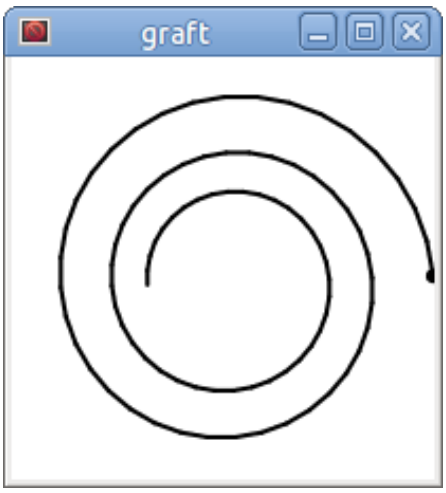
S() means "step forward"

Your program repeats over and over again

Poppy is orbiting, and ready for her mission!

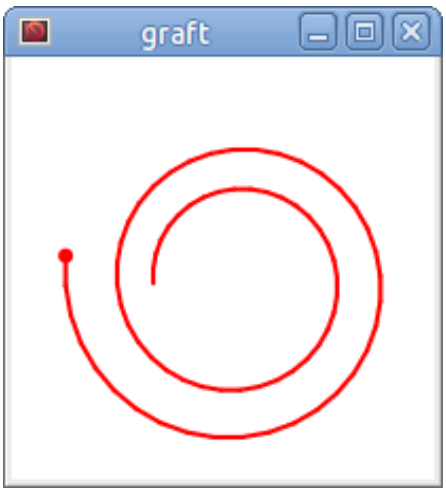
Ready for lift-off!

4 When Poppy fires her rockets, her spaceship spirals off into space. Draw a spiral by typing
`./graft 'S() d+=10 s*=1.01'`
You should see this:



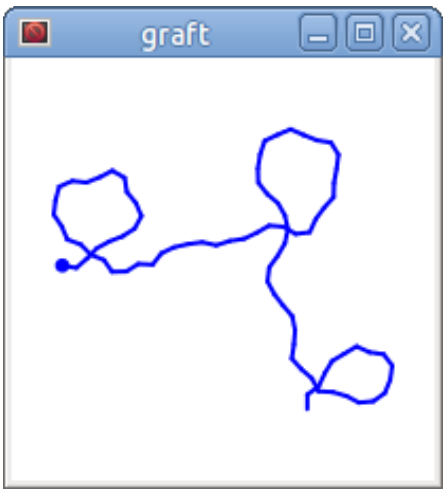
d+=10 means "turn 10°"

5 Actually, when her rockets fire the spaceship turns red! Try adding `r=100` at the beginning, so the whole line looks like:
`./graft 'r=100 S() d+=10 s*=1.01'`



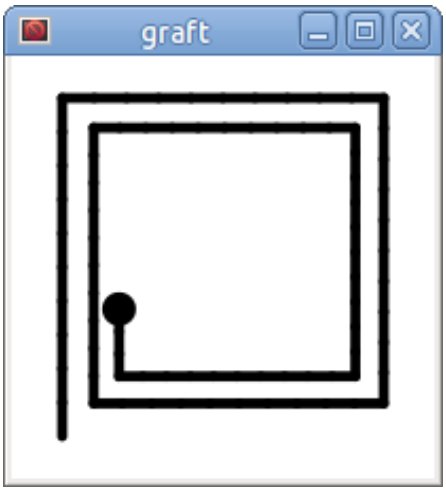
S*=1.01 means "make the steps bigger"

6 Poppy is searching for her friend Alfie. She's wandering all over space looking for him:
`./graft 'b=100 S() d+=10+R()*5'`



b=100 means "go blue"

Where is Alfie?



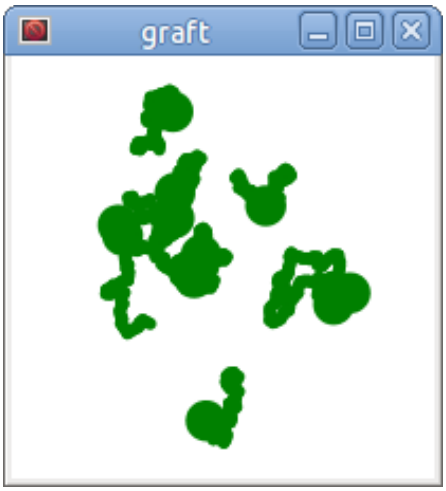
7 Alfie is a robot. He is confused:

```
./graft 'T(10,S) d+=90 s*=0.95'
```

T means “do this several times”

8 Oh no! The planet where Alfie is stuck is full of strange worms!

```
./graft 's=1 g=50 T(10,F) ^ S() d+=10+R()*10'
```



^ means “start repeating here”

R() means “random number”

9 Poppy comes in to land:

```
./graft 'r=100 S() d+=10 s*=0.95'
```

F() means “split into two lines”, so T(10,F) means “split into 10 lines”

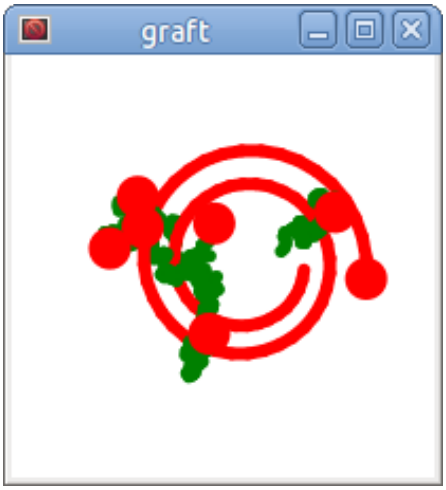
{ and } make a block of code (a function)

Escape!

10 Alfie jumps in the ship and Poppy flies away!

```
./graft 's=1 T(6,F) ^ S() If(f==6,{r=100 g=0 d+=10 s*=1.01},
{g=50 r=0 d+=10+R()*10})'
```

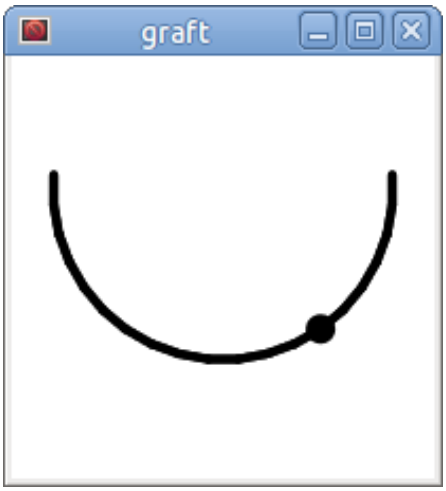
"If" runs one block or another, depending on something else



11 Alfie is very relieved!

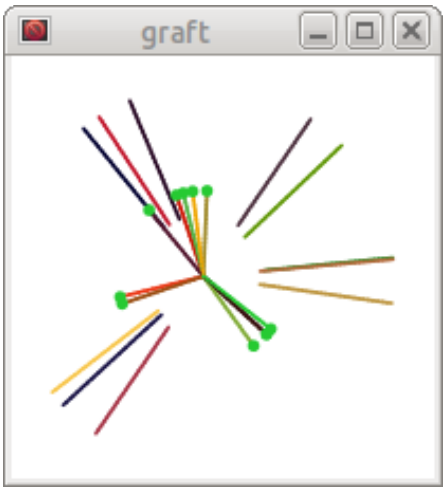
```
./graft 's=10 d=180 T(19,{S() d-=10}) s=-10 d=0 T(19,
{S() d+=10})'
```

Here we use T to run a block several times



12 When they get home, everyone celebrates with fireworks!

```
./graft 's=4 T(10,F) ^ d=36*R() x=0 y=0 r=R()*10 g=R()*8 b=R()*3
T(40,S)'
```



Poppy saved the day!

Additional

13

Try re-running on of the the animations above, but put `z=20` at the beginning (after the first ‘ character).
Now try `z=1`. What does z do?

14

Change the colours of your favourite animation, changing how much red, green and blue colour there is by adding something like this:
`r=50 b=25 g=90`

Challenge

15

Can you write your own program to draw a rectangle? Start with the square program (number ❼) and try adapting it.

16

This program makes a pretty animation:
`./graft 'F() S() d+=10+R()'`
Can you understand how it works? Remember: “F()” means “split into 2 lines”.

17

Which animation did you like best? Try adapting it to make it even better. If you’re looking for ideas, try reading the graft README file!

You can find out more about graft at https://github.com/andybalaam/graft - if you make a good animation, create an issue to tell us about it!