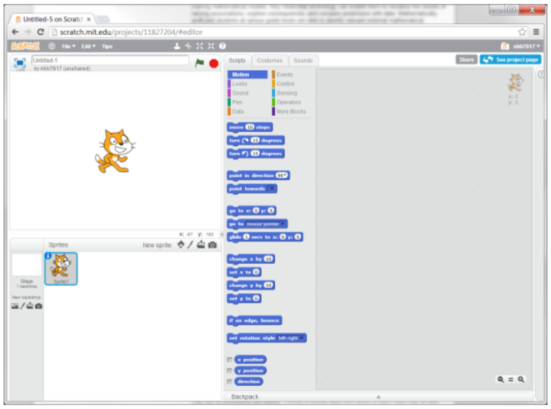
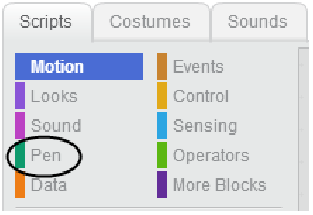
# Drawing a Triangle in Scratch

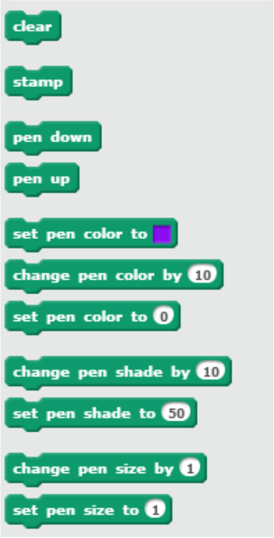
Open the scratch website: http://scratch.mit.edu. You should see a screen like this:



We are going to start by teaching Scratch Cat to draw. He can draw on the stage area using the Pen. Open the Pen palette by clicking on the word "Pen":



Now you should see the Pen blocks:



clear

stamp

pen down

pen up

set pen color to 🟪

change pen color by 10

set pen color to 0

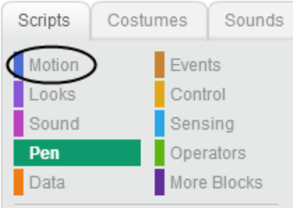
change pen shade by 10

set pen shade to 50

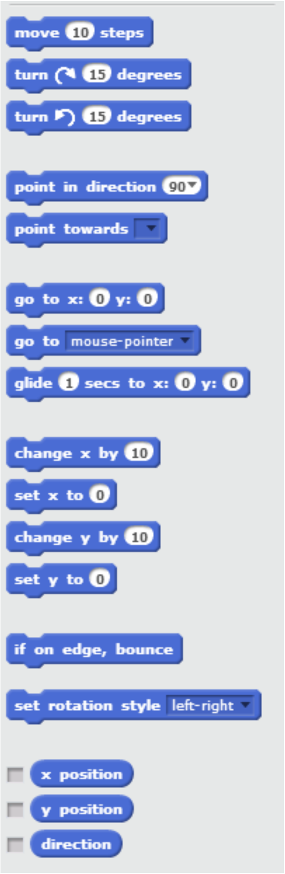
change pen size by 1

set pen size to 1

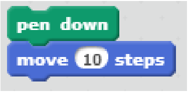
For Scratch Cat to draw, he must (just like us) put his pen down on the paper. We can tell him to do so with the Pen Down block: Drag the Pen Down block into the Scripts area. Then we need to move Scratch Cat, and as he moves he will draw a line. Open the Motion palette by clicking on the word “motion”.



Your palette should now contain the Motion blocks:

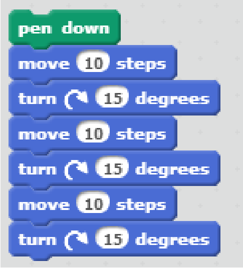


We’ll tell Scratch Cat to move with a block. This block tells Scratch Cat to move in the direction he is facing the number of steps displayed in the round socket in the middle of the block. Drag this block into the Script area and snap it to the pen down block. Your script should now look like this:



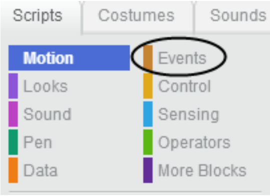
```
pen down
move 10 steps
```

Now, we need to make Scratch Cat turn to face a new direction. We can do this with the turn ↻ 15 degrees block. Drag this block to the Script area and snap it under our move 10 steps block. A triangle has three sides, so we need to turn and draw three times. Go ahead and add two more move 10 steps and turn ↻ 15 degrees blocks. Your script should now look like:

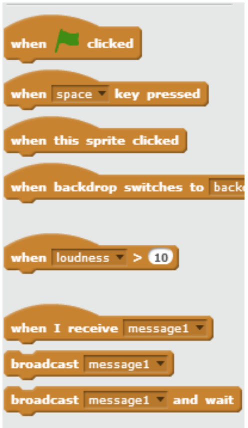


```
pen down
move 10 steps
turn ↻ 15 degrees
move 10 steps
turn ↻ 15 degrees
move 10 steps
turn ↻ 15 degrees
```

But we still need to tell Scratch Cat *when* to draw. Open the Events palette by clicking the word "Events":

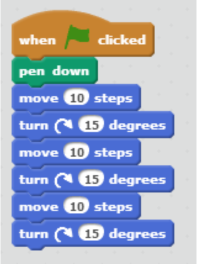


You should now see the Events palette:



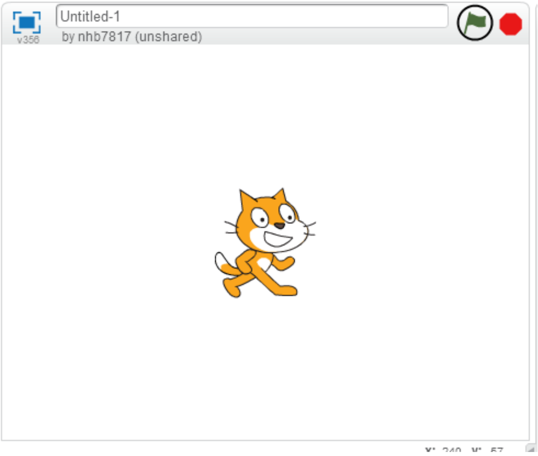
```
when ⚑ clicked
when space ▾ key pressed
when this sprite clicked
when backdrop switches to back
when loudness ▾ > 10
when I receive message1 ▾
broadcast message1 ▾
broadcast message1 ▾ and wait
```

We want our script to run when the ⚑ is clicked, so drag the when ⚑ clicked block to your scripts and snap it to the top of your script. It should now look like this:

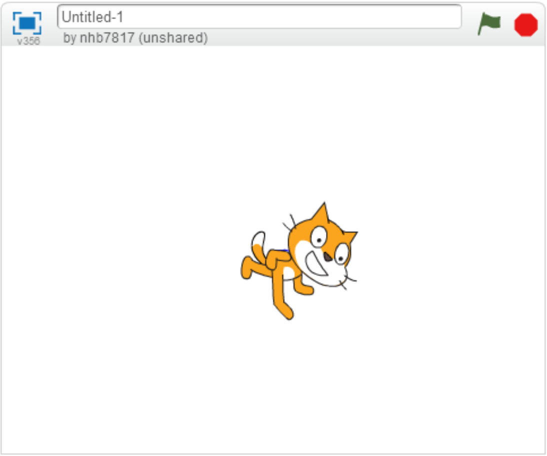


```
when ⚑ clicked
pen down
move 10 steps
turn ↻ 15 degrees
move 10 steps
turn ↻ 15 degrees
move 10 steps
turn ↻ 15 degrees
```

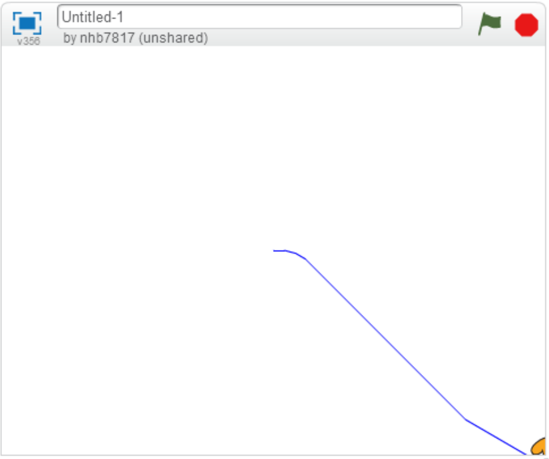
Now, when we click the ⚑ at the top of the Stage area, our script will run (the ⚑ works like the Play button on your DVD player – it runs the Scratch program, and the 🛑 stops it). Let's give it a try – click the ⚑ above the Stage area:



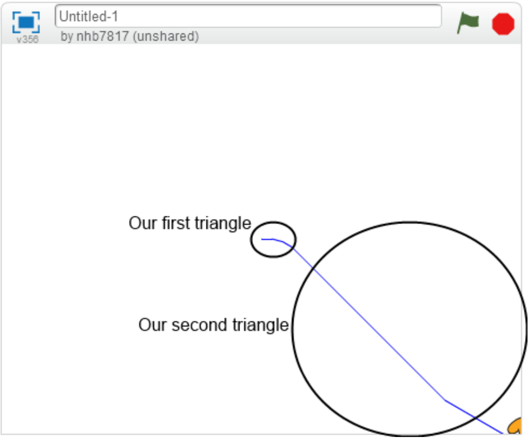
When you click the ⚑, Scratch Cat will move just like we told him:



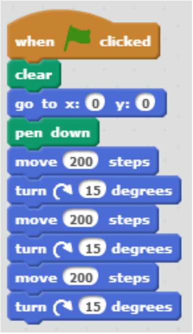
He also has drawn lines… but we can't see them, because he's covering them up. We need him to draw the shape bigger! Type a larger size into each of the move 10 steps blocks in your script – let's use 200! Then click the ⚑ again:



Hmm… not quite what we wanted, is it? We see both triangles we tried to draw:



But they aren't triangles. Also, Scratch Cat has run off the stage! Let's start to fix this by making sure Scratch Cat always starts in the same spot. We can add a go to x: 0 y: 0 block to the start of our script, just after the flag block (the go to x: 0 y: 0 block is found in the Motion palette, and x: 0, y: 0 is the center of the stage). We can also erase any lines we've drawn previously with the pen using the clear block (which is found in the Pen palette). Also add this to the beginning of the script:

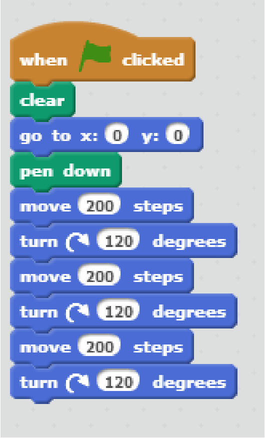


```
when [flag] clicked
clear
go to x: 0 y: 0
pen down
move 200 steps
turn ↻ 15 degrees
move 200 steps
turn ↻ 15 degrees
move 200 steps
turn ↻ 15 degrees
```

Now Scratch Cat will start in the center of the Stage, and all old lines will be erased, every time you click the ⚑. But the angle we tell Scratch Cat to turn is still wrong… try to figure out what the angle *should* be. You can type the value directly into your script's turn ↻ 15 degrees block. See if you can figure it out yourself before reading any more.

***Hint:*** *The total degrees you must turn to draw any closed shape is 360 degrees. So all of your turns should add up to 360 degrees.*

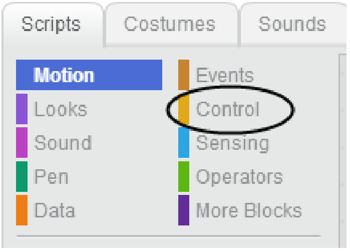
Hopefully you found that an angle of 120 degrees at each turn is needed to draw a triangle, giving us a final script of:

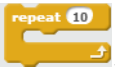


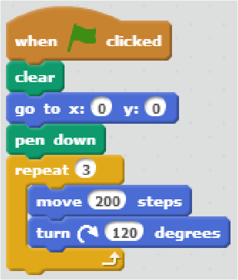
```
when ⚑ clicked
clear
go to x: 0 y: 0
pen down
move 200 steps
turn ↻ 120 degrees
move 200 steps
turn ↻ 120 degrees
move 200 steps
turn ↻ 120 degrees
```

But you may have noticed you use the pattern move 200 steps / turn ↻ 120 degrees three times. For a triangle this isn't a big deal, but what if we wanted to draw a decahedron (a ten-sided regular shape)? We'd have to snap together twenty blocks, and type our steps and degrees into each one. Wouldn't it be nice if we could tell Scratch Cat to simply do those steps ten times?

If we look at the Control palette (click the word "Control" to open it):



We see a block to do exactly that: . The block will repeat any sequence of blocks clamped inside itself, as many times as we type in the socket. So we can rewrite our triangle drawing script:



```
when [flag] clicked
clear
go to x: 0 y: 0
pen down
repeat 3
    move 200 steps
    turn ↻ 120 degrees
```

This does exactly what our previous script did, but see how much shorter it is?