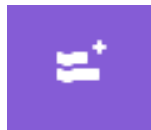# Draw shapes with Scratch

Prep

Let's start with the basics. Why on earth would you want to make shapes on Scratch? The main question is why wouldn't you want to make shapes on Scratch... Shapes are cool... maybe not as cool as LEGO or sweets or cabbage - is cabbage still cool?

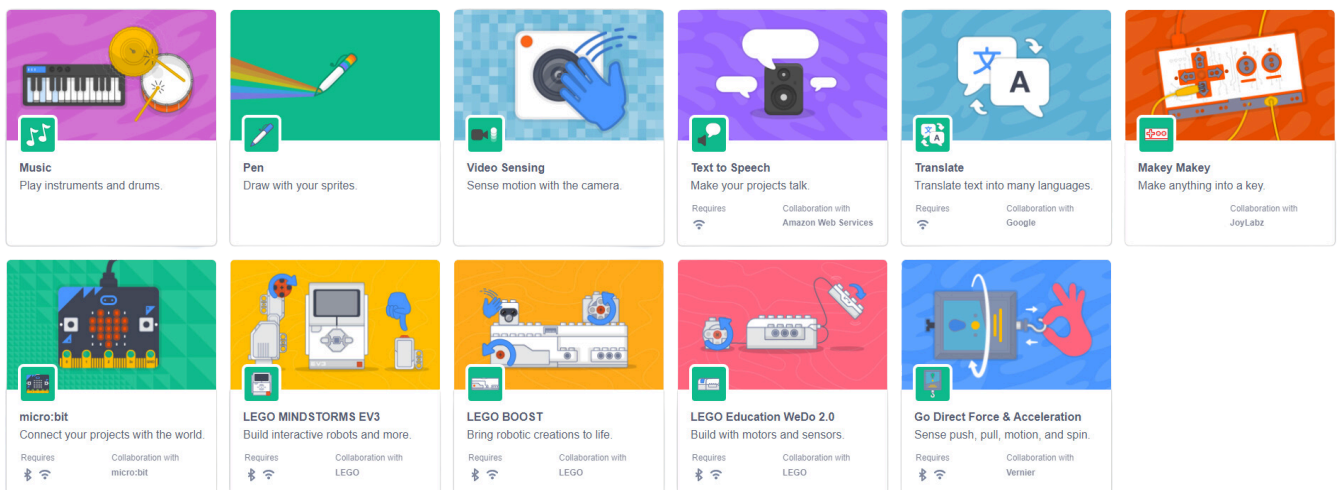Anyway - I'm getting distracted- shapes are cool and are even cooler when you make them in scratch.

Okay, so let's get prepared to actually be able to draw shapes.

To draw shapes we're going to need to make use of scratch extensions. These are like downloadable additional content you get for video games... but scratch extensions are better than downloadable additional content- they're free!

To get extensions click on the button underneath all the menu items on the left hand side of the screen.

This will open up a new menu for you to explore... it won't take long to explore as there's only 11 items on there. To draw shapes (and other things) we need to add the pen extension to Scratch, so click on the pen block.

Music	Pen	Video Sensing	Text to Speech	Translate	Makey Makey
Play instruments and drums.	Draw with your sprites.	Sense motion with the camera.	Make your projects talk.	Translate text into many languages.	Make anything into a key.
			Requires / Collaboration with Amazon Web Services	Requires / Collaboration with Google	Collaboration with JoyLabz

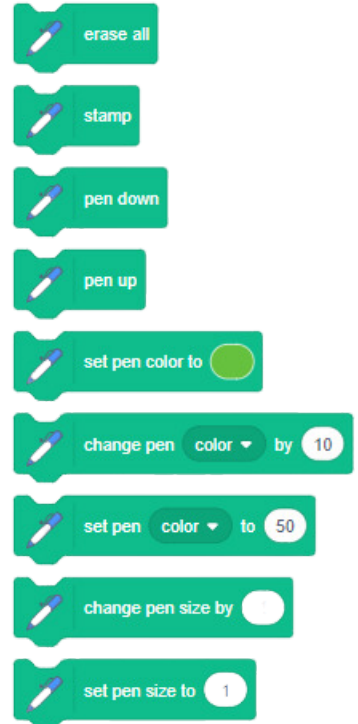| micro:bit	LEGO MINDSTORMS EV3	LEGO BOOST	LEGO Education WeDo 2.0	Go Direct Force & Acceleration
Connect your projects with the world.	Build interactive robots and more.	Bring robotic creations to life.	Build with motors and sensors.	Sense push, pull, motion, and spin.
Requires / Collaboration with micro:bit	Requires / Collaboration with LEGO	Requires / Collaboration with LEGO	Requires / Collaboration with LEGO	Requires / Collaboration with Vernier

Clicking on the pen block will add a new menu to your Scratch menu and it's this range of new tools we can use to draw some shapes!

How tempted were you to click on the music extension? I talk about the music extension in a different booklet so make sure you get a copy of that as well!

With this menu installed we're all set to make some shapes!

Pen

erase all

stamp

pen down

pen up

set pen color to

change pen color ▾ by 10

set pen color ▾ to 50

change pen size by

set pen size to 1

Make a CIRCLE

It's time to draw our first shape and we're starting with a good one… a circle!

To make a circle we only need a short piece of code.

STEP 1-

First, go to **events** and get a **When [green flag] clicked block.** This is going to be what kicks our code off. It's known as an input. To follow on, we best ensure there's nothing already drawn on our screen, so head to the **pen** menu and get an **erase-all** block. This does exactly what it sounds like on the tin… erases everything previously drawn. I would say it's good practice to get the habit of adding this block to your code… otherwise things get a little 2-year-old drawing ability very quickly.

To finish off this first step we are going to hide our sprite. They normally get in the way of our beautiful shapes. This hide command is quite useful for lots of other scratch projects, so another good one to remember!

The **hide command** can be found in the **looks** menu.

Let's put our first three code blocks together!
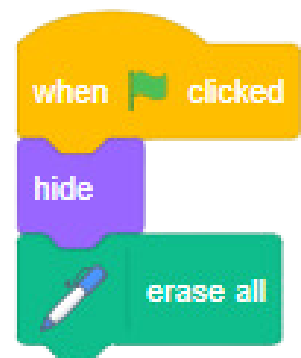
STEP 2-

Let's make sure our shape is drawn in the middle of the screen. If you're not aware, the game screen in the top right of Scratch works just like a graph- or Minecraft which is probably a more relevant example . From the left to the right of the screen is the X axis and top to bottom is the Y axis.
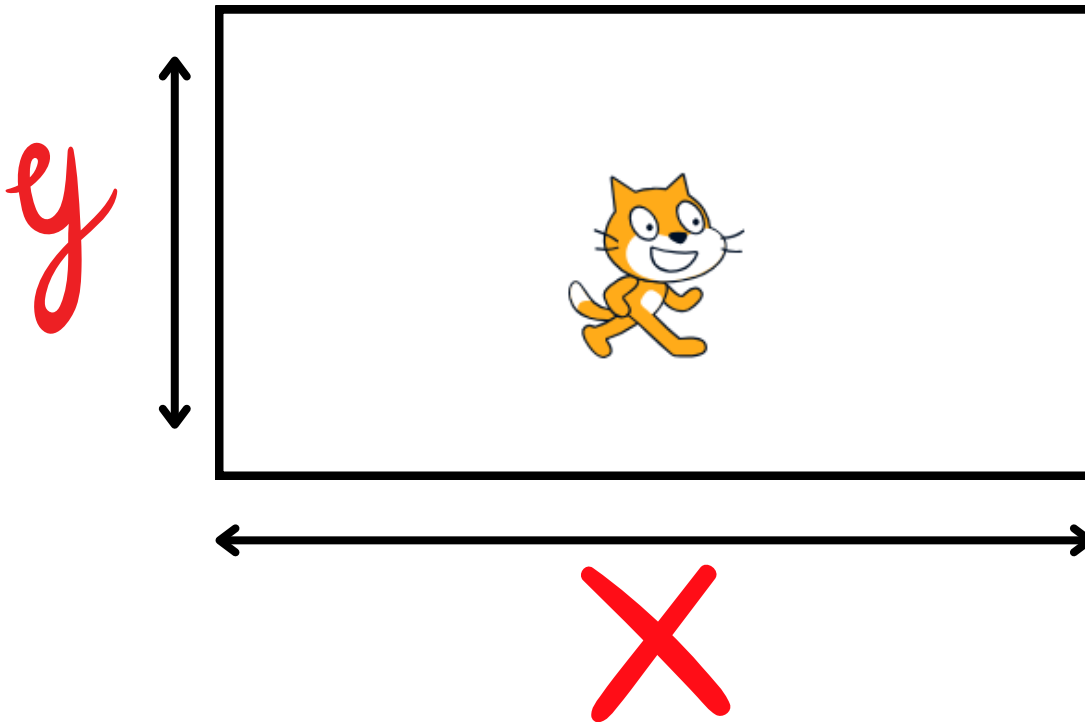
This means we can set X and Y coordinates on the game screen to decide where things will be. The absolute centre of the screen is X:0 Y:0 and it's this we need to add to our code, we want to draw our circle in the middle of the screen.

Go to the **motion** menu and select **go to x: y:** - they'll probably be numbers already set but you can click on them and change them both to 0.

We then need to put our pen to paper... well the sprites pen to paper and we'll find that in the **pen** menu and it's called **pen down.**

STEP 3-

Nearly there - I promise we'll have a circle on our screen before you know it.

We need the next piece of code we need to happen 360 times, so if it's all the same to you I think we'll use a repeat instruction instead... unless you want to write the code 360 times of course- I'll leave it up to you.

Go to the **control** menu and get a **repeat 10** block. Click on the 10 and change the number to **360.** This means whatever we put inside that code block will happen 360 times.

The thing we want to happen is for the invisible sprite to move **1 step** and then turn by **1 degree.**

Go to the **motion** menu **move 10 steps** is right at the top of the menu so change that 10 to a 1. The **turn left/right** is right underneath. You can choose which way you would like to turn. Change the number of the **turn block** to 1.

To finish off the code let's go to the **pen** menu and grab a **pen-up** command block which we're going to add right at the top of the code ... yes this is something I could have told you to do right at the start... but I didn't so get over it.

This is what our completed circle drawing code should look like.
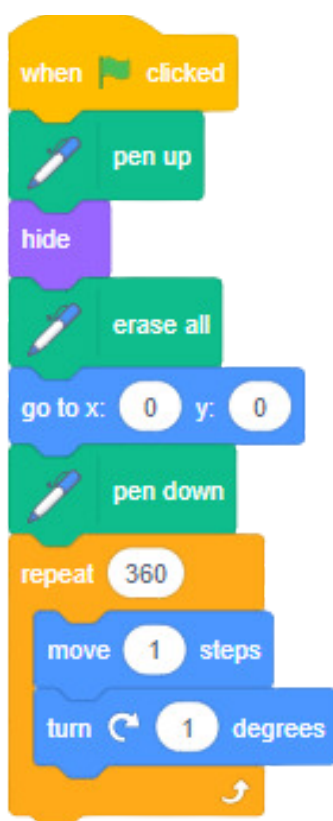
Click the **green flag** and watch in marvel as you see a circle being drawn in front of your very eyes.

Make a SQUARE

We can all agree that making the circle was cool... but I'm in the mood for a square. The good news is, if you're following these through in order we can just slightly edit the code we've already created which saves time, and effort and you have to read my appalling attempts to be funny and educational.

To make a square we need to change some numbers. The **repeat 360** needs to become a **4.** The move steps becomes **100** and the **turn** becomes **90.**
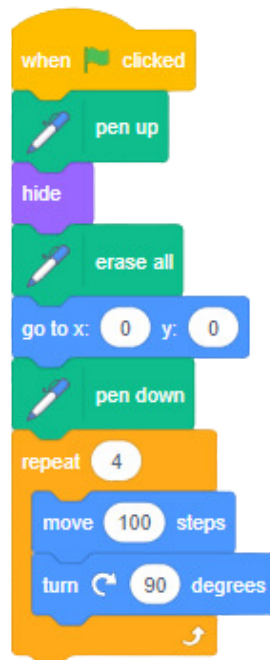
Click the green flag and you'll probably find that you get a square... but it's a diagonal. If you'd like your square to be standing up straight, rather than looking drunk and dangerously leaning... go to the **motion** menu and get the command **face in direction 90.** This will mean the invisible sprite will be facing to right when it starts.

Easy peasy square so easy!
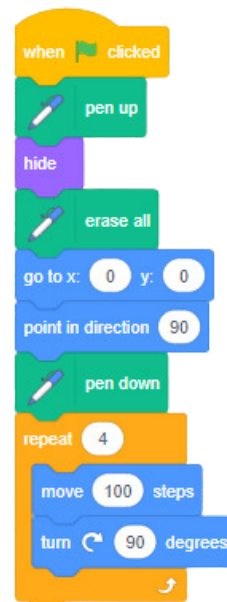
Make a
TRIANGLE

One more shape before we start making some more interesting patterns using shapes which you can use to show off your epic coding skills.

This time we're making a triangle.

A triangle has 3 sides so we need to **repeat 3** and the angle we want to turn is **120.** You can experiment with the **face direction** number to see which way up your triangle will be. But if you wanted with the point to the top make it **-90.**
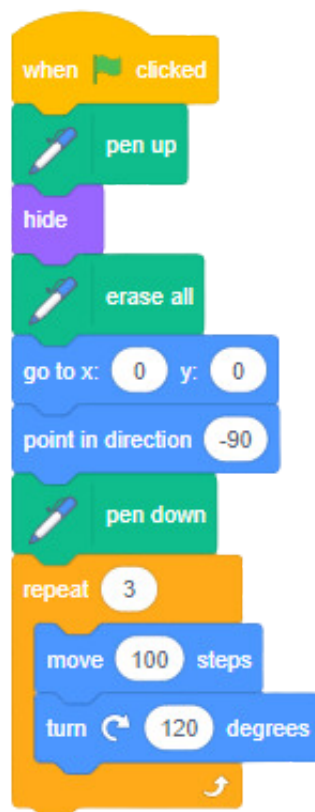
How does it WORK?

I know I promised that we'd make some more interesting patterns using shapes when we'd built a triangle but I want to let you in on a little secret that not many people realise. Normally, I'd encourage you to keep it a secret but you have my full permission to share this knowledge with everyone!

You can make endless shapes on Scratch… and by drawing. The secret to shape success (great alliteration there) is the number **360.**

As long as the answer you get when you times the **number of repeats** by **turn in direction degrees** is **360,** you can draw a shape.

repeats x degrees = 360

Let me prove it.

- We made a circle: **1x 360 = 360**
- We made a square: **4x90= 360**
- We made a triangle: **3x120=360**

With this new knowledge we can easily make any size shape we like. The only thing is, that the more sides we want our shape to have the smaller steps you'll have to take.

For example if when I make a 10-sided shape (A decagon) it doesn't work if the **move steps** is still at **100.** But reduce it **50** and it works everytime!

Decagon: **10x36=360**
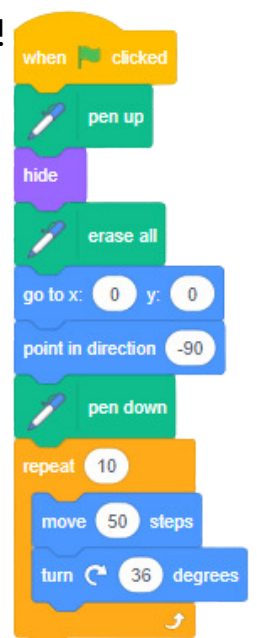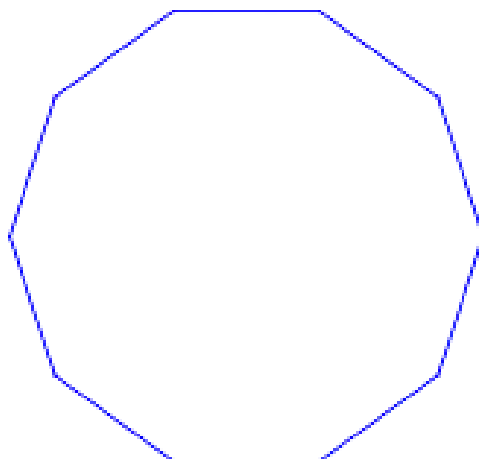
Have a go and see what the biggest shape you can make is. To be honest, when you get to silly high numbers, the turns are so small the shape starts to look like a circle again.

And don't worry about trying to work out the sums in your head. I still use a calculator to help me... It's what they were invented for!

Be sure to let me know what cool-sided shapes you make!

If you wanted some to try, then try and make a...

- Hexagon
- Pentagon
- Octogon

Right... let's make some patterns.

Pattern 1

To create some interesting patterns we are going to start adding a second **repeat** to the code. This will mean that our invisible sprite will draw a shape, move a little bit and then draw the shape again. I don't actually have names for these patterns so feel free to make up your own names as well.

The first shape we'll use is a square. So change your repeats to **repeat 4**, **move steps 50** and **turn 90.**

Once you've done that, go to the **control menu** and get a **repeat** block. We're going to place this around our current **repeat block**. Then go to **basic** get a **turn block** - for the purpose of this the same direction turn as you're already using then you want to make the numbers as below ... it's easier to show rather than tell on this occasion.
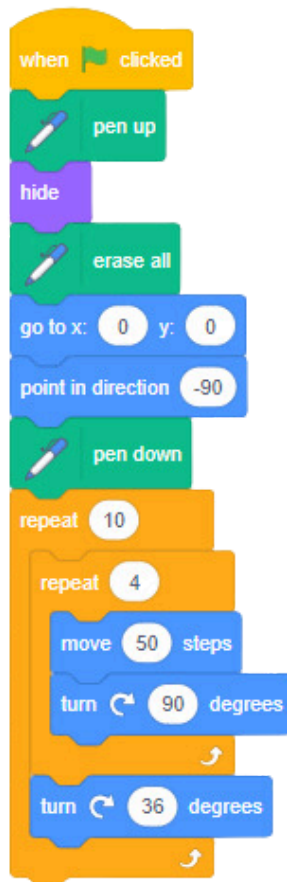

Press the **Green flag** and see what happens! I think this one is really cool.

Explanation

Okidokie, what is happening here?

We've now got two repeats and turns which both need to equal 360 to make a complete shape but this time instead of being just one shape... it's 2. The code is telling our sprite to draw a shape, move a little bit and draw the same shape again so it makes a pattern.

In this case 10x 36 = 360 and 4x90= 360
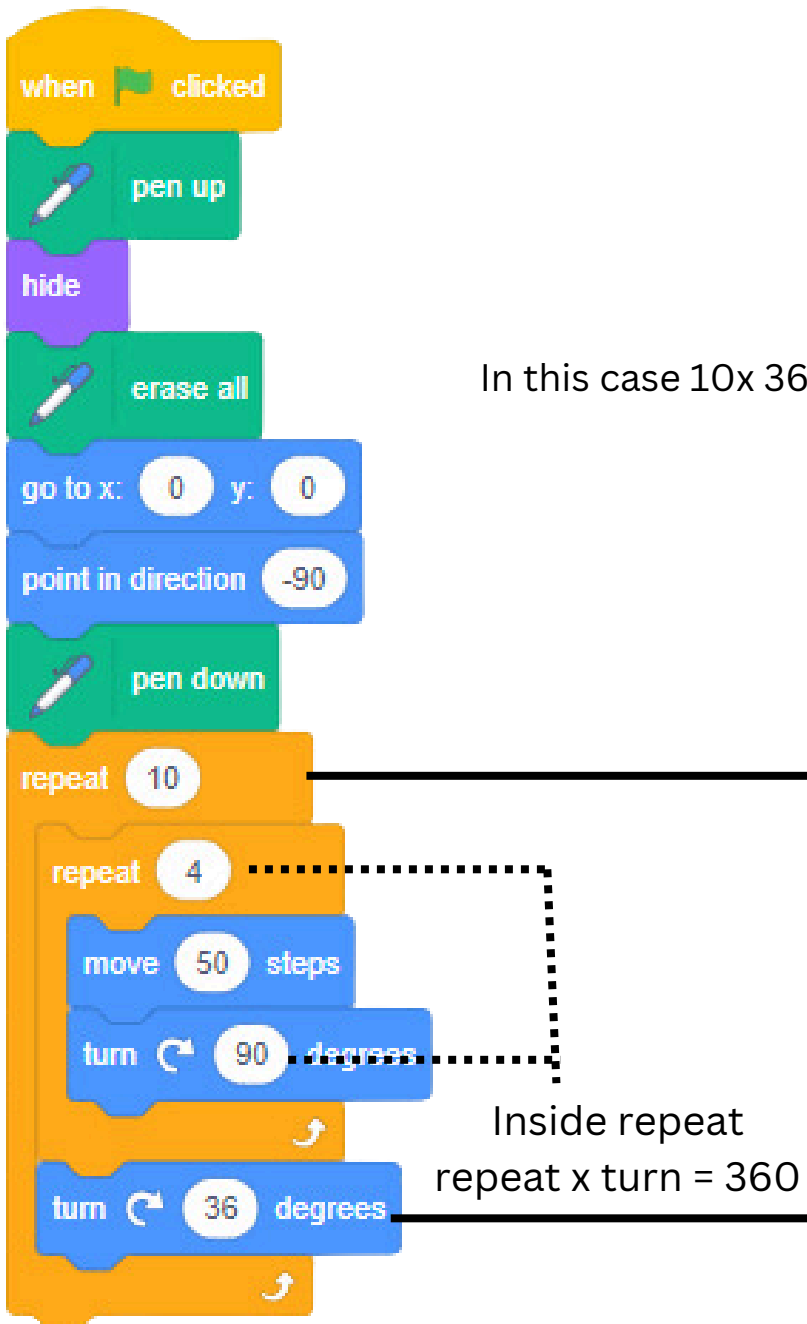
Inside repeat
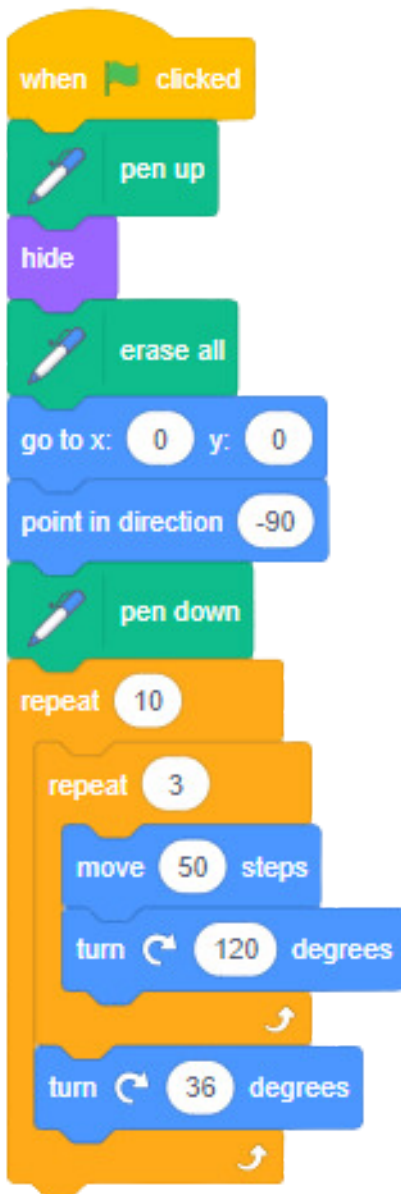repeat x turn = 360

Outside repeat
repeat x turn = 360

Pattern 2

Let's try again, but this time with a triangle. The 10 and 36 on the outside repeat stays the same but the numbers inside become **repeat 3** and **turn 120.**

We now have **10x36=360** on the outside repeat and **3x120=360** on the inside repeat.

So... the sprite will draw a triangle then turn right 36 degrees before drawing another triangle and will do that 10 times which means the drawing will have 10 triangles on.

Click the **green flag** and see what happens.

Pattern 3

For my last example, let's try a 5 sided shape!

So the **outside repeat** can stay as it is and we'll change the **inside repeat** numbers to **repeat 5** and **turn 72** which we know is correct because **5x72=360.**

So remember we have **10x36=360** and **5x72=360.** This code means we'll get 10 5 -5-sided shapes on our pattern. Though when you see the pattern it creates… they're not always easy to spot.

Play!

Often, the best way to find cool things is to experiment and play with the code.

Here are some things you could try.

- See what happens when the **outside repeat** doesn't add up to 360
- See what happens when the **inside repeat** doesn't add up to 360
- Change the amount of repeats the **outside repeat** does. (Maybe try a **repeat 4 turn 90??)**

Have a play and see what awesome shapes and patterns you can create!

Having this knowledge of building shapes in Scratch is going to help you move forward. We can use the pen tool to draw game boards and other such things as we develop more and more Scratch projects.

So whilst "making shapes" might not have sounded very interesting to begin with, hopefully, you can see how valuable the knowledge will be moving forward.