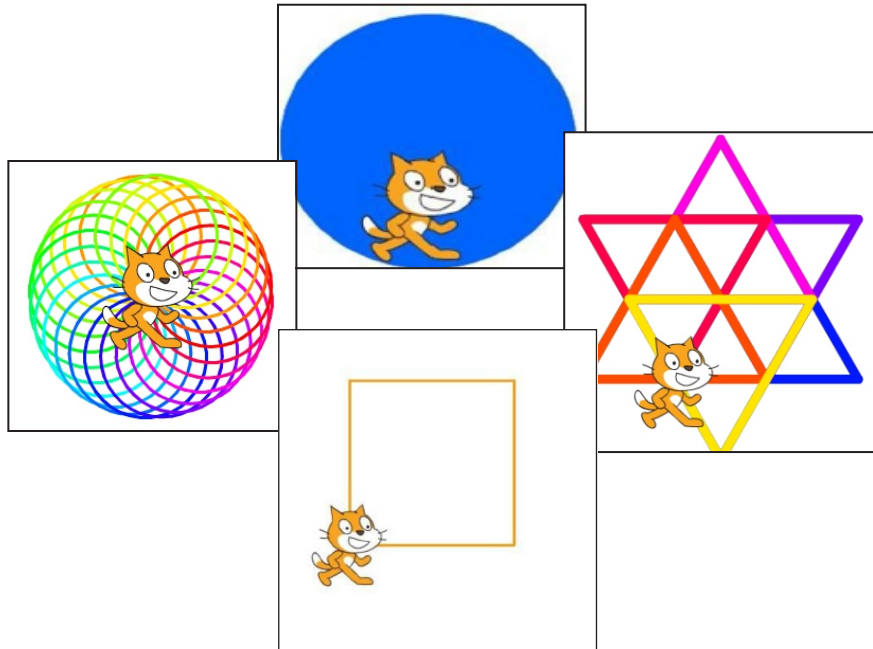


Chapter 3



Scratchy Draw

After completing this chapter you will be able to know how to use the Pen Blocks and make the sprite:

- draw line(s), square, triangle and octagon;
- draw circle and with an art;
- fill the circle and then by coloring the Scratch stage; and
- clone the cat.

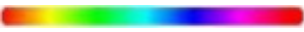
Make the Cat Draw

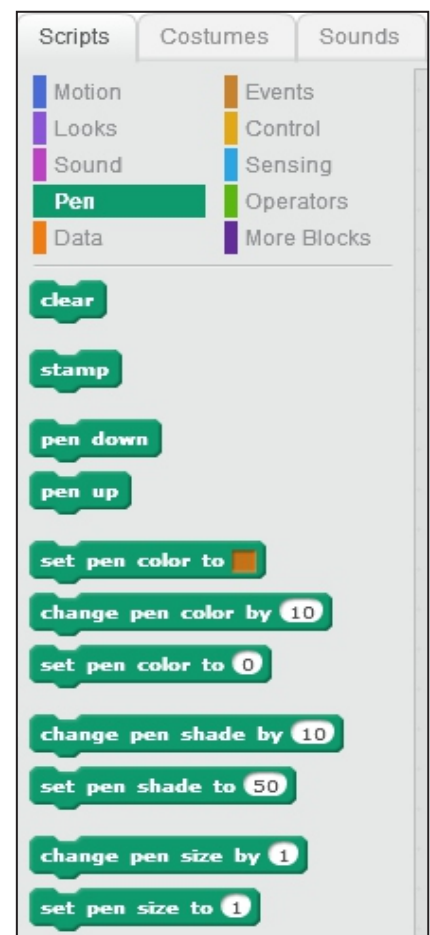
With each chapter, you gain more knowledge about Scratch. You learn about more blocks of code and how to use them. This chapter focuses on the blocks in the Pen category. With these, you can write scripts that draw designs on the stage automatically. The blocks of code in this category are green and they perform different actions like drawing, changing the pen size and color, creating a copy of the sprite, and removing all marks previously created by the pen or stamp on the stage. After investigating how the various Pen blocks of code work, you'll practice using them in some example scripts.

Pen Blocks

The blocks in the Pen category (see Figure 3-1) of the blocks palette enable you to draw on the stage and control the pen of the Scratch program. With these blocks, you can also set and change the color and width of the pen. Let's take a closer look at what each of the Pen category's blocks do before putting them to work in some example scripts.

The **clear** block removes all marks made previously by the pen or stamp on the stage. Think of it as your eraser, but a thorough one that erases all marks at once. The **stamp** block creates a copy of the current sprite and stamps this image on the stage. In other words, it performs the same action as the tool bar's (**Duplicate**) icon. When you draw with a real pen on a sheet of paper, you must perform three distinct actions: you first press the pen to the paper, you move it to create a mark, and then you lift the pen off the paper when you're finished. In Scratch, you use a combination of Pen and Motion blocks to accomplish the same three tasks. The **pen down** block performs the same action as pressing your pen to the paper; the pen is on the stage and ready to draw. The pen will draw a trail wherever the sprite goes on the stage. The pen follows the movements of the sprite. If the sprite moves in a square pattern and the **pen down** block is activated, for example, the pen will draw a square on the stage. When you're done drawing, you use the **pen up** block to lift the pen from the stage. Any motions performed after this block in a script will reposition the sprite, but will not draw a mark. When you're ready to draw again, simply snap on another **pen down** block. Scratch offers several code blocks that enable you to customize the color that your pen draws with as well. For example, the **set pen color to** block sets the color of the pen. To set the color, click in the color box in the block. Your cursor will change into a pointing finger image, which you can use to then click and choose any color that's visible in the Scratch interface. Alternatively, you can set the pen color to a specific numeric value using the **set pen color to 0** block. Scratch offers 200 different colors, which are numbered from 0 (left end) to 199 (right end) along the color spectrum

. Using this same numbered spectrum, the **change pen color by 10** block changes the pen color by the specified increment compared to the current color. Positive numbers shift the color toward the right in the spectrum, while negative numbers shift the specified amount to the left. You can also control the shade of each of Scratch's 200 colors. The **set pen shade to 50** block sets the shade of the pen color. A pen shade of 0 is completely black, a pen shade of 100 is completely white, and a pen shade of 50 is the pure color. Values between 0 and 50 mix the color with black. Values between 50 and 100 mix the color with white. If the value is greater than 100, it alternates every 100; so 100 to 200 goes white to black, and 200 to 300 goes black to white. Thus, changing the shade by 200 or any multiple of 200 will have no effect. For example, let's say that you are using the color green.



Setting the shade to 50 is the pure color. If you want a lighter shade of green, you modify the number in the block to a value between 50 and 100, which mixes the pure color with white and creates a lighter shade. This **change pen shade by 10** block changes the shade of the pen color by the specified increment. So for example, if the pen color is green, you can change the value of this block and thereby change the shade of green. Finally, you can easily change the width of the line that the pen draws with two additional blocks. The **set pen size to 1** block enables you to set the width of the line that the pen draws. The specified value is equal to the width of the line that the pen draws; for example, a value of 3 means that the width of the line that the pen draws is equal to three pixels. The value can range from 0 to 255. The **change pen size by 1** block increases (positive values) or decreases (negative values) the width of the line that the pen draws by the specified number of pixels.

Activities







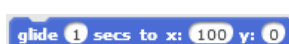

It's time to put the pen to the stage and start drawing. The following examples demonstrate how you can use the Pen blocks of code in scripts to draw several different shapes and apply various effects.

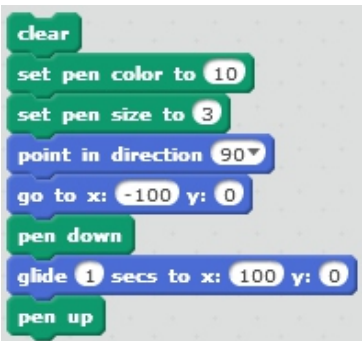
Activity 3-1: How to Draw a Line

This activity teaches you how to draw a line in Scratch. From the blocks palette, drag the blocks from the Pen and Motion categories to the scripts area and snap them together to create Script 3-1.

The **clear** block clears the stage by removing all marks previously made by the pen or stamp. The next block sets the pen color and the third block sets the width of the line that the pen draws. As you remember from Chapter 2, the **point in direction 90** block set to 90 degrees makes the sprite face to the right and the **go to x: -100 y: 0** block moves the sprite to the specified coordinates of (-100, 0). The **pen down** block means that the sprite is ready to draw; wherever the sprite moves, the pen will draw a line. The next block makes the sprite glide for 1 second to coordinates (100, 0). The **pen up** block essentially lifts the pen from the stage; so if the sprite moves, the pen will not draw. To activate the script, just click it. Watch the sprite draw a horizontal line (see Figure 3-2) from (-100, 0) to (100, 0). **Table 3-1** lists the blocks and describes the actions used in this activity.

Table 3-1. Code Blocks in How to Draw a Line

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen color to 10.
	Set the pen size to 3.
	Make the sprite face to the right.
	Move the sprite to coordinates (-100, 0).
	The pen is on the stage and is ready to draw.
	Make the sprite glide for 1 second to coordinates (100, 0). Because the pen down block was previously used, the pen will draw a trail wherever the sprite moves.
	The pen is off the stage and cannot draw.



Script 3-1. Draw a line

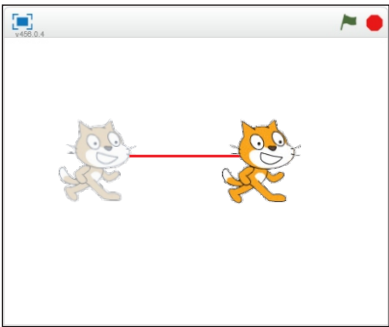


Figure 3-2. Result of Script 3-1

Activity 3-2: How to Draw Lines

Take a look at Script 3-2. Based on what you learned in the last activity, can you figure out what this one does without creating and running it?

The first three blocks of code are the same as Script 3-1. They clear the stage, remove all previous marks, set the pen color, and set the pen size. This time, the forth block sets the rotation style of the sprite so that it can rotate in all directions, 360 degrees. The `point in direction 90` block then makes the sprite face to the right. The next block moves the sprite to coordinates, (-100, -100). The `pen down` block means that the sprite will draw wherever it moves until the scripts reach the `pen up` block.

The next block makes the sprite glide for 1 second to coordinates (100, -100), so the sprite draws a line from (-100, -100) to (100, -100). The next blocks make the sprite face upward, and then it glides for another 1 second to coordinates (100, 100) drawing a line as it moves (see Figure 3-3). The final block lifts the pen from the stage so that it will not draw anymore. **Table 3-2** lists the blocks and describes the actions used in this activity.

```
clear
set pen color to 10
set pen size to 3
set rotation style all around
point in direction 90
go to x: -100 y: -100
pen down
glide 1 secs to x: 100 y: -100
point in direction 0
glide 1 secs to x: 100 y: 100
pen up
```

Script 3-2. Draw lines

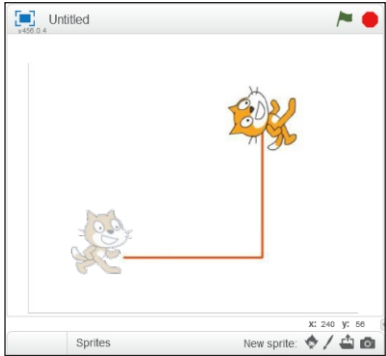


Figure 3-3. Result of Script 3-2

Table 3-2. Code Blocks in How to Draw Lines

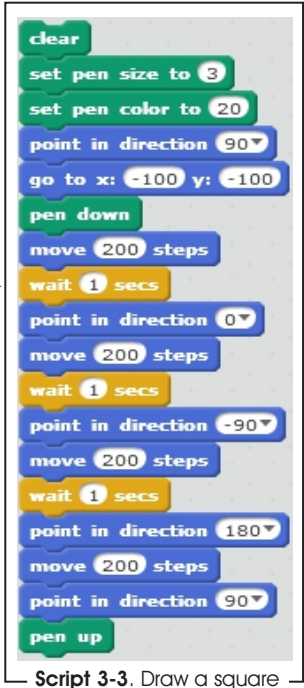
Blocks	Actions
<code>clear</code>	Remove all marks previously made by the pen or stamp.
<code>set pen color to 10</code>	Set the pen color to 10.
<code>set pen size to 3</code>	Set the pen size to 3.
<code>set rotation style all around</code>	Set the rotation style of the sprite so that it can rotate all around its axis.
<code>point in direction 90</code>	Make the sprite face to the right.
<code>go to x: -100 y: -100</code>	Move the sprite to the position where X = -100 and Y = -100.
<code>pen down</code>	The pen is on the stage and is ready to draw.
<code>glide 1 secs to x: 100 y: -100</code>	Make the sprite glide for 1 second to coordinates (100, -100). Wherever the sprite moves, the pen will draw a trail.
<code>point in direction 0</code>	Make the sprite face up.
<code>glide 1 secs to x: 100 y: 100</code>	Make the sprite glide for 1 second to coordinates (100, 100). Wherever the sprite moves, the pen will draw a trail.
<code>pen up</code>	The pen is off the stage and cannot draw.

Activity 3-3: How to Draw a Square

Remember a good way to learn any programming language, including Scratch, is to look at the script and try to figure out what it does. Many of the blocks in Script 3-3 will be familiar. Using the `move 200 steps` block enables you to move the pen a desired distance without needing to figure out the specific coordinates.

The three first blocks of code of this script remove all previous marks from the stage and set the pen's size and color. The next two blocks face the sprite to the right and moves it to coordinates (–100, –100). The `pen down` block means that the pen is ready to draw. The `move 200 steps` block moves the sprite 200 pixels in the direction that it's facing. Because the pen is down, the pen will draw wherever the sprite moves. The next block pauses the script for 1 second. The `point in direction 0°` block faces the sprite up and the next block moves it 200 pixels up. After another 1 second pause, the sprite's direction is set to –90 degrees to face the sprite to the left and the sprite moves 200 pixels to the left. After another 1-second wait and direction change, the sprite moves 200 pixels downward.

The last `point in direction 90°` block faces the sprite to the right again before the pen is lifted up, meaning that the sprite is done drawing. Click the script to run it. In the previous chapter, Script 3-7 made the sprite move in a square pattern. This script uses a slightly different technique to make the sprite move in a square pattern, and because the `pen down` block is used, the pen will draw wherever the sprite moves. Because the sprite moves in a square pattern, the pen draws a square (see Figure 3-4). **Table 3-3** lists the blocks and describes the actions used in this activity.



Script 3-3. Draw a square

The script consists of the following blocks in order: `clear`, `set pen size to 3`, `set pen color to 20`, `point in direction 90°`, `go to x: -100 y: -100`, `pen down`, `move 200 steps`, `wait 1 secs`, `point in direction 0°`, `move 200 steps`, `wait 1 secs`, `point in direction -90°`, `move 200 steps`, `wait 1 secs`, `point in direction 180°`, `move 200 steps`, `point in direction 90°`, and `pen up`.

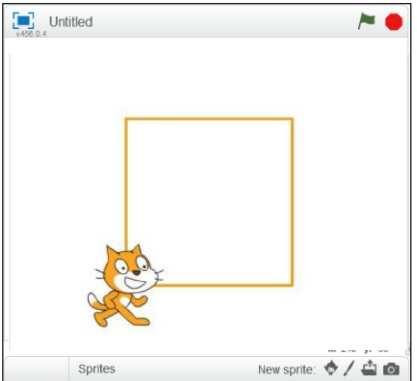


Table 3-3. Code Blocks in How to Draw a Square

Blocks	Actions
<code>clear</code>	Remove all marks previously made by the pen or stamp.
<code>set pen size to 3</code>	Set the pen size to 3.
<code>set pen color to 20</code>	Set the pen color to 20.
<code>point in direction 90°</code>	Make the sprite face to the right.
<code>go to x: -100 y: -100</code>	Move the sprite to coordinates (–100, –100).
<code>pen down</code>	The pen is on the stage and is ready to draw.
<code>move 200 steps</code>	Move the sprite 200 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
<code>wait 1 secs</code>	The script waits 1 second. No actions are performed for 1 second.
<code>point in direction 0°</code>	Make the sprite face up.
<code>move 200 steps</code>	Move the sprite 200 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.



The script waits 1 second. No actions are performed for 1 second.

Make the sprite face to the left.

Move the sprite 200 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.

The script waits 1 second. No actions are performed for 1 second.

Make the sprite face down.

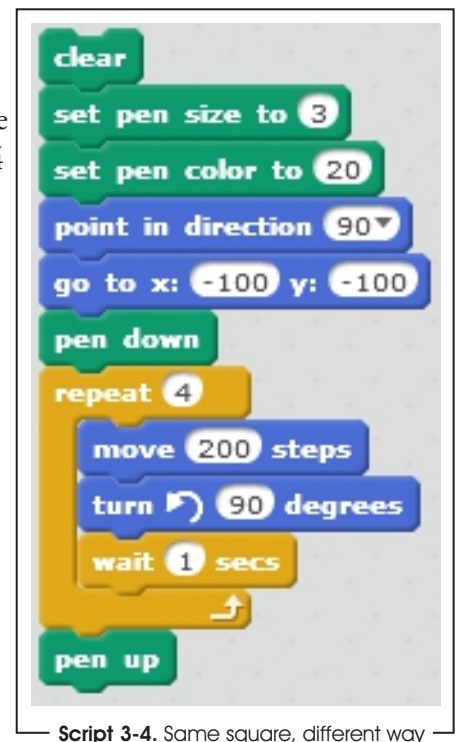
Move the sprite 200 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.

Make the sprite face to the right.

The pen is off the stage and cannot draw.

Activity 3-4: Same Square, Different Way

Remember that you can create multiple scripts in the same scripts area per project, but if you want to have one project for each script, you can go to the File menu and choose New to create a new project for your script. Script 3-4 produces the same result as Script 3-3, which is to draw a square, but it uses a **repeat 4** block like Script 2-7 did. The actions that repeat in Script 3-3 are move the sprite, make the sprite face a certain direction, and wait 1 second. You'll snap the blocks for those three within the C block to repeat them, as shown in Script 3-4. The first three blocks of code of this script remove all previous marks from the stage and set the pen's size and color. The next two block face the sprite to the right and move it to coordinates (-100, -100). The **pen down** block means that the pen is ready to draw. Next is the **repeat 4** block that will repeat the blocks within it four times. The blocks within it move the sprite 200 pixels in the direction that it's facing, rotate the sprite 90 degrees counterclockwise, and pauses the script for 1 second. The last block stops the pen from drawing. Notice how this script is shorter than Script 3-3, although they produce the same result, which is a square. Remember, if you have repeating actions in a script, try putting them in a repeat block to create a shorter and more efficient script. **Table 3-4** lists the blocks and describes the actions used in this activity.



Script 3-4. Same square, different way

Table 3-4. Code Blocks in Same Square, Different Way

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen size to 3.
	Set the pen color to 20.
	Make the sprite face to the right.



Move the sprite to coordinates (–100, –100).

The pen is on the stage and is ready to draw.

Repeat the actions represented by the blocks within this block four times.

Move the sprite 200 pixels in the direction that it’s facing. Wherever the sprite moves, the pen will draw a trail.

Turn the sprite counterclockwise 90degrees.

The script waits 1 second. No actions are performed for 1 second.

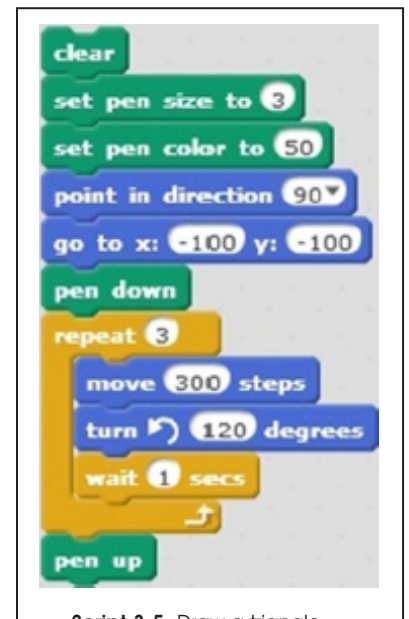
The pen is off the stage and cannot draw.

Activity 3-5: How to Draw a Triangle

Drawing a triangle uses the same concepts as drawing a square. The main differences are the number of steps and the angle of the direction change. Drag and snap together the blocks for Script 3-5 to see how it works.

The first three blocks of code in this script remove all previous marks from the stage and set the pen’s size and color. The next two blocks face the sprite to the right and move it to coordinates (–100, –100). The **pen down** block means that wherever the sprite moves next, the pen will draw a trail. The **repeat 3** block repeats the action within it three times. Those actions are to move the sprite 300 pixels in the direction that it’s facing, turn the sprite 120 degrees counterclockwise, and pause the script for 1 second. The pen will draw three lines, each one in a different direction (as shown in Figure 3-5). The last block tells the sprite that it is done drawing.

Remember, you can always change the size and color of the pen by simply changing the value in the blocks. Give it a try and see how the width and color of the lines change. **Table 3-5** lists the blocks and describes the actions used in this activity.



Script 3-5. Draw a triangle

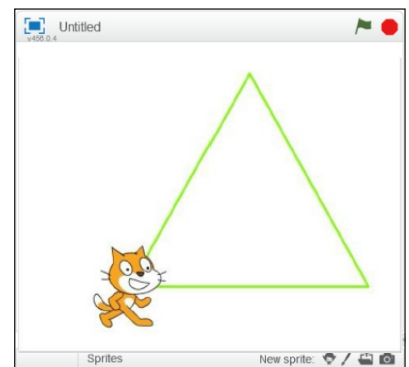



Figure 3-5. Result of Script 4-4

Table 3-5. Code Blocks in How to Draw a Triangle

Blocks	Actions
	Remove all marks previously made by the pen or stamp.



Set the pen size to 3.

Set the pen color to 50.

Make the sprite face to the right.

Move the sprite to coordinates (–100, –100).

The pen is on the stage and is ready to draw.

Repeat the actions represented by the blocks within this block three times.

Move the sprite 300 pixels in the direction that it’s facing. Wherever the sprite moves, the pen will draw a trail.

Move the sprite 300 pixels in the direction that it’s facing. Wherever the sprite moves, the pen will draw a trail.

The script waits 1 second. No actions are performed for 1 second.

The pen is off the stage and cannot draw.

Activity 3-6: How to Draw an Octagon


You have learned how to draw a line, a square, and a triangle. By increasing the repeats to 8 and changing the turn angle to 45 degrees, you can draw an octagon by using the same technique. In Script 3-6, the first three blocks of code again remove all previous marks from the stage and set the pen’s size and color. The next two blocks face the sprite to the right and move it to coordinates (–50, –100).

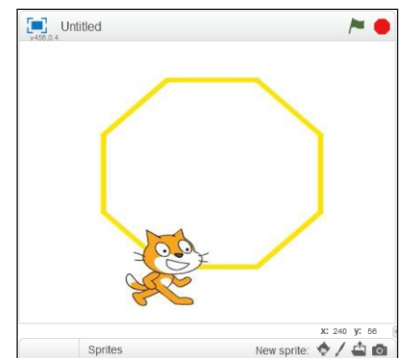
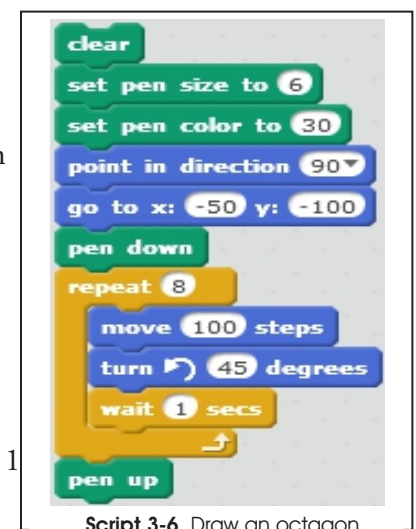
The **pen down** block means that the pen is ready to start drawing. Within the C block, the sequence of actions repeats eight times: the sprite moves 100 pixels in the direction that it’s facing, rotates 45 degrees counterclockwise, and pauses for 1 second.

So the script draws a 100-pixel line eight times with each line at a 45-degree angle to the previous one. The last block of code stops the pen from drawing. Now, click the script to activate it and watch it draw an octagon (see Figure 3-6). If you change the number of steps that the sprite moves, you can make the octagon smaller or bigger.

Remember, you can always change the pen size and color, as well. **Table 3-6** lists the blocks and describes the actions used in this activity.

Table 3-6. Code Blocks in How to Draw an Octagon

Blocks	Actions
	Remove all marks previously made by the pen or stamp.





Set the pen size to 6.

Set the pen color to 30.

Make the sprite face to the right.

Move the sprite to coordinates (–50, –100).

The pen is on the stage and is ready to draw.

Repeat the actions represented by the blocks within this block eight times.

Move the sprite 100 pixels in the direction that it’s facing. Wherever the sprite moves, the pen will draw a trail.


Turn the sprite counterclockwise 45 degrees.

The script waits 1 second. No actions are performed for 1 second.

The pen is off the stage and cannot draw.

Activity 3-7: How to Draw a Circle

Although it doesn’t appear to have straight sides, you can draw a circle using the same technique as you did for a triangle, square, and octagon. Again, the key is in the number of repeats and the angle of the sprite’s turn. A full circle is composed of 360 degrees. Therefore, if you change the pen’s direction by 10 degrees 36 times, you’ll draw a full circle ($36 \times 10 = 360$). Drag and snap the blocks for Script 3-7 to see how this works.

The first five blocks of code clear all previous marks from the stage, set the pen’s color and size, move the sprite to its starting position of (0, –100), and make the sprite face to the right. The next block pauses the whole script for 1 second, and then the pen is ready to draw. The  block will repeat the sequence of actions within it 36 times: move the sprite 20 pixels in the direction that it’s facing, and then rotate the sprite 10 degrees counterclockwise. The last stops the pen from drawing anymore. Click the script to activate it and watch Scratch draw a circle (see Figure 3-7). **Table 3-7** lists the blocks and describes the actions used in this activity.

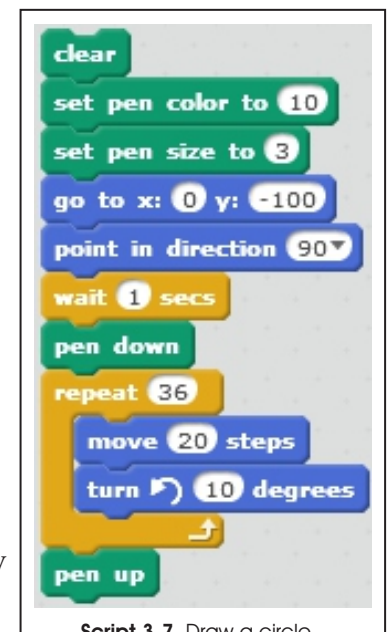






Table 3-7. Code Blocks in How to Draw a Circle

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen color to 10.
	Set the pen size to 3.
	Move the sprite to coordinates (0, –100).

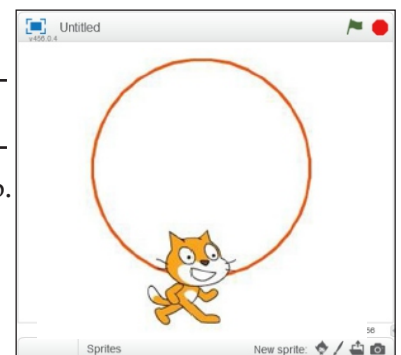


Figure 3-7. Result of Script 4-7
Chapter 3 Scratchy Draw



Make the sprite face to the right.

The script waits 1 second. No actions are performed for 1 second.

The pen is on the stage and is ready to draw.

Repeat the actions represented by the blocks within this block 36 times.



Move the sprite 20 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.

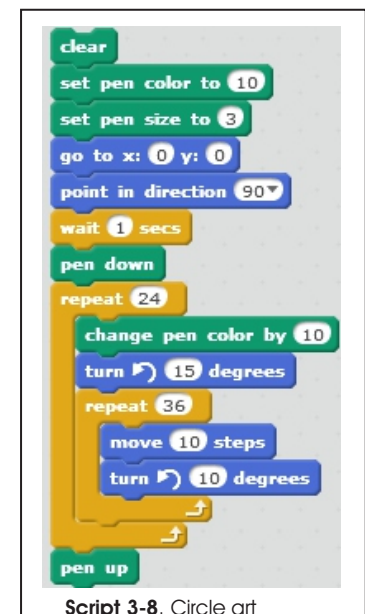
Turn the sprite counterclockwise 10 degrees.

The pen is off the stage and cannot draw.

Activity 3-8: Circle Art

Now that you have learned how to draw some basic shapes, it's time to create some art. Script 3-8 draws 24 circles of different colors by putting one C block inside another.

As you drag the blocks into place, you'll notice Script 3-8 starts with a familiar pattern. The first five blocks of code clear all previous marks from the stage, set the pen's color and size, move the sprite to its starting position of (0, 0), and make the sprite face to the right. The next block pauses the whole script for 1 second, and then the pen is ready to draw. The script then enters the first  block to perform its sequence of instructions. Inside, the first the action is to change the pen color's value by 10. The next block rotates the sprite 15 degrees counterclockwise. Then the script moves to the inner repeat  block. This block performs the sequence of instructions inside it (move and draw 10 steps, then turn 10 degrees) 36 times before looping back to repeat the beginning of the sequence in the outer C block. So, each of the 24 times that it repeats the outer repeat block, Scratch changes the pen color, rotates the sprite, and then draws a circle using the inner repeat block's instructions. The last block, which is outside both repeating blocks, instructs the pen to stop drawing. Click the script to see the beautiful art that it creates (see Figure 3-8). It will draw 24 circles, each with a different color and each starting at the same location (0, 0), but with the sprite facing a different direction because it rotates around its axis. If you don't see the sprite rotate on the stage, set its rotation style to all around. **Table 3-8** lists the blocks and describes the actions used in this activity.



Script 3-8. Circle art

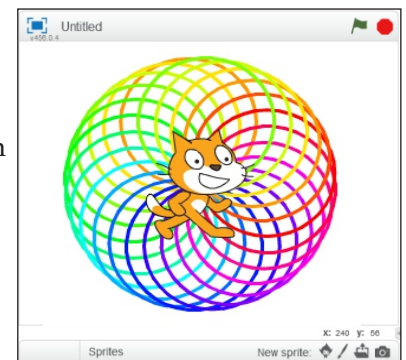




Figure 3-8. Circle art

Table 3-8. Code Blocks in Circle Art

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen color to 10.



Set the pen size to 3.

Move the sprite to the center of the stage.

Make the sprite face to the right.

The script waits 1 second. No actions are performed for 1 second.

The pen is on the stage and is ready to draw.

Repeat the actions represented by the blocks within this block 24 times.

Change the pen color by 10.

Turn the sprite counterclockwise 15 degrees.

Repeat the actions represented by the blocks within this block 36 times.

Move the sprite 10 pixels in the direction that it's facing. Wherever the sprite moves the pen will draw a trail.




Turn the sprite counterclockwise 10 degrees.

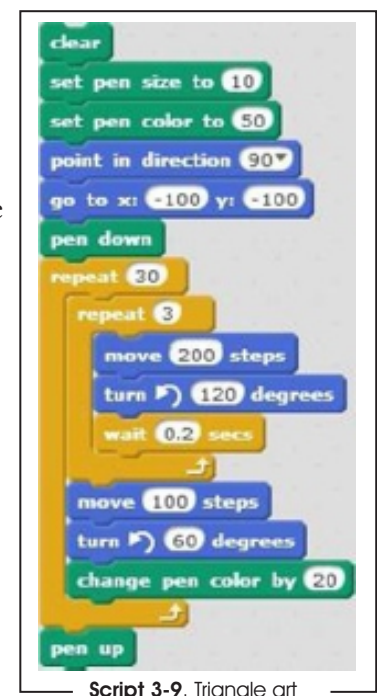
The pen is off the stage and cannot draw.

Activity 3-9: Triangle Art

Using Script 3-8's same basic technique of a repeat block within a repeat block, you can create art with triangles. See if you can figure out what happens in Script 3-9 before creating and running it. Remember, the script sends instructions to the sprite, starting from the top to the bottom, and performs all the instructions and repeats of the inner repeat block before moving on to the next instruction in the outer repeat block.

The first five blocks of code clear all previous marks from the stage, set the pen's size and color, make the sprite face to the right, and move the sprite to its starting position of $(-100, -100)$. The next block signals the pen to draw. Next, the action moves into the outer repeat block. The first block inside is the start of the inner repeat block, so Scratch begins the instructions inside it and repeats them three times to draw the three sides of a triangle, pausing 0.2 seconds at the end of each sequence.

After completing the inner  block, the script moves the sprite 100 pixels in the direction that it's facing, rotates the sprite 60 degrees counterclockwise, and changes the pen color. One repeat of the sequence of actions within the outer repeat block is then complete, so the script loops back to the start of the  block until all 30 repeats are complete. When they are, the  block stops the pen from drawing. So, this script draws a triangle 30 times, and each triangle will be in a different position and a different color. Why in a different position? Because at the end of each repeat, the script moves the sprite 100 pixels and rotates it 60 degrees counterclockwise before drawing a new triangle (see Figure 3-9). **Table 3-9** lists the blocks and describes the actions used in this activity.



Script 3-9. Triangle art

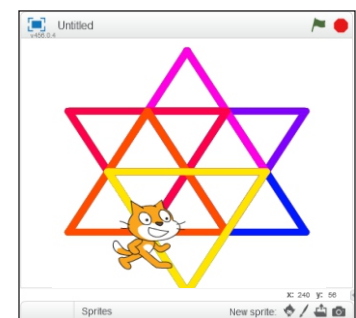






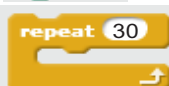
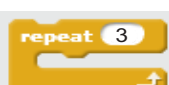









Figure 3-9. Result of Script 3-9





Table 3-9. Code Blocks in Triangle Art

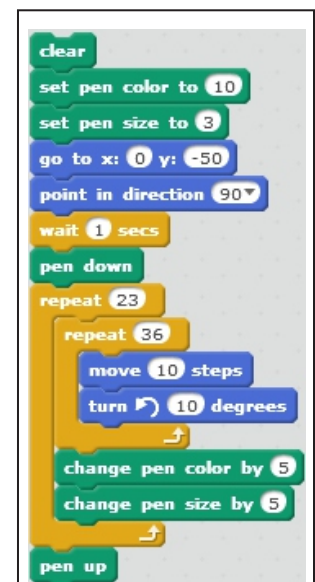
Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen color to 10.
	Set the pen size to 50.
	Make the sprite face to the right.
	Move the sprite to coordinates (–100, –100).
	The pen is on the stage and is ready to draw.
	Repeat the actions represented by the blocks within this block 30 times.
	Repeat the actions represented by the blocks within this block three times.
	Move the sprite 200 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
	Turn the sprite counterclockwise 120 degrees.
	The script waits 0.2 seconds. No actions are performed for 0.2 seconds.
	Move the sprite 100 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
	Turn the sprite counterclockwise 60 degrees.
	Change the pen color by 20.
	The pen is off the stage and cannot draw.

Activity 3-10: Fill the Circle

Using a similar technique to Script 3-9, Script 3-10 draws a circle 23 times, but each time, it changes the pen color and increases the pen size.

You should be very familiar with the first seven blocks of code from the previous scripts in this chapter. The first clears the stage by removing all marks made by the pen or stamp; the next two set the pen's color and size; the next pair move the sprite to (0, –50) and face it to the right; the script pauses; and then the pen is made ready to draw. Now wherever the sprite moves, the pen will draw a trail.

Next, the action enters the outer  block. The first instruction in its sequence is the inner  block, which draws a circle using 36 repeats of the  and  blocks. After the final repeat of the inner repeat block, the action exits to the last two blocks of the outer repeat block, which



Script 3-10. Fill the circle








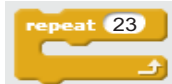
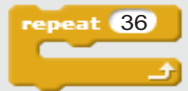





increment the pen's color by 10 and increase its size by 5. Next, the script loops back to the start of the outer repeat block to repeat the sequence. After 23 repeats of drawing a circle, and then changing the pen size and color, the script exits the outer repeat block (see Figure 3-10).

The last block lifts the pen to signal that it is done drawing. **Table 3-10** lists the blocks and describes the actions used in this activity.



Figure 3-10. Result of Script 3-10

Table 3-10. Code Blocks in Fill the Circle

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen color to 10.
	Set the pen size to 3.
	Move the sprite to coordinates (0, -50).
	Make the sprite face to the right.
	The script waits 1 second. No actions are performed for 1 second.
	The pen is on the stage and is ready to draw.
	Repeat the actions represented by the blocks within this block 23 times.
	Repeat the actions represented by the blocks within this block 36 times.
	Move the sprite 10 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
	Turn the sprite counterclockwise 10 degrees.
	Change the pen color by 5.
	Change the pen size by 5.
	The pen is off the stage and cannot draw.

Activity 3-11: Color the Stage

Script 3-11 makes the sprite draw a line while moving from left to right on the stage. When the sprite reaches the edge of the stage, it bounces in the opposite direction from where it was traveling, moves up 10 pixels, changes the line color, and then repeats the actions. The result is a stage covered in different colored lines from left to right. The blocks you use should all be familiar. Before you check the script or Table 3-11, which blocks would you use and how would you arrange them? Script 3-11 starts with four familiar blocks of code. The first clears the stage by removing all marks made by the pen or stamp, the next two set the pen's color and size and color, and the next faces the sprite to the right. When you snap in the `set rotation style left-right` block, be sure to choose left-right from the pull-down menu to restrict the sprite to face only left or right. The next two blocks move the sprite to the location with coordinates (0, -100) and signals the pen to draw a trail wherever the sprite moves.

The following repeat block repeats the sequence of instructions within it 100 times. The first action is to move the sprite 300 pixels in the direction that it's facing. The second block bounces the sprite back in the opposite direction from where it was traveling. The next block increases the pen's color number by 10. The last block in the sequence increases the Y coordinate by 10 pixels, and then the sequence loops back to the beginning of the repeat block and repeats. After 100 repeats, the action exits the repeat block and the last block of code at the bottom of the script disables the pen from drawing. Click the script to activate it and watch the screen fill (see Figure 3-11). **Table 3-11** lists the blocks and describes the actions used in this activity.

Table 3-11. Code Blocks in Color the Stage

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Set the pen size to 20.
	Set the pen color to 50.
	Make the sprite face to the right.
	Set the rotation style of the sprite so that it can only turn left or right.
	Move the sprite to coordinates (0, -100).
	The pen is on the stage and is ready to draw.
	Repeat the actions represented by the blocks within this block 100 times.
	Move the sprite 300 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
	If the sprite reaches the edge of the stage, bounce in the opposite direction.
	Change the pen color by 10.
	Add 10 to the current value of the Y coordinate and move the sprite to that new Y coordinate.
	The pen is off the stage and cannot draw.

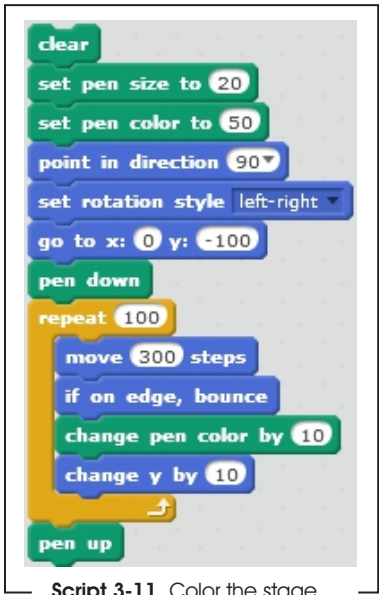



Figure 3-11. Result of Script 3-11

Activity 3-12: Clone the Cat

In this activity, you'll send the cat stamping around the stage—literally. The Pen category's **stamp** block of code does the same as the  (Duplicate) icon in the tool bar; it creates an exact copy of the sprite on the stage. Drag and snap the indicated blocks to create Script 3-12. The first block clears the stage of all marks made by the pen or stamp. The next pair of blocks move the sprite to the location (–150, 0) and makes the sprite face to the right. The block creates a copy of the sprite. The next block pauses the script for 1 second, and then the copy moves 100 pixels in the direction that it's facing.

The next three blocks stamp a copy of the sprite on the stage, pause the script for 1 second, and move the copy another 100 pixels in the direction that it's facing. The next block stamps another image of the sprite at that new location, the script pauses again for 1 second, and finally the last block moves the copy 100 pixels again in the direction that it's facing. You may also notice several sequences of repeated blocks in the script. How could you write this script more efficiently?

If you guessed using a block to contain the stamp, wait, and then move the sequence of blocks, you were right! Remember, you can modify all the scripts shown in this book. Change the values in the blocks of code and modify them to your liking. **Table 3-12** lists the blocks and describes the actions used in this activity.



Script 3-12. Clone the cat

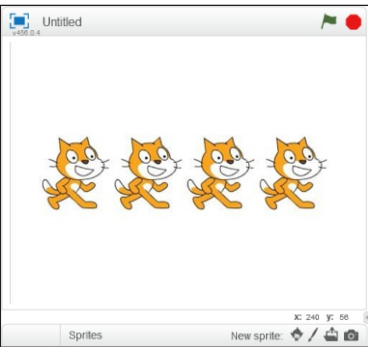








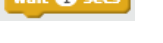





Figure 3-12. Result of Script 4-12

Table 3-12. Code Blocks in Clone the Cat

Blocks	Actions
	Remove all marks previously made by the pen or stamp.
	Move the sprite to coordinates (–150, 0).
	Make the sprite face to the right.
	Create an image of the sprite and stamp this image on the stage.
	The script waits 1 second. No actions are performed for 1 second.
	Move the sprite 100 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
	Create an image of the sprite and stamp this image on the stage.
	The script waits 1 second. No actions are performed for 1 second.
	Move the sprite 100 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.
	Create an image of the sprite and stamp this image on the stage.
	The script waits 1 second. No actions are performed for 1 second.
	Move the sprite 100 pixels in the direction that it's facing. Wherever the sprite moves, the pen will draw a trail.

Summary

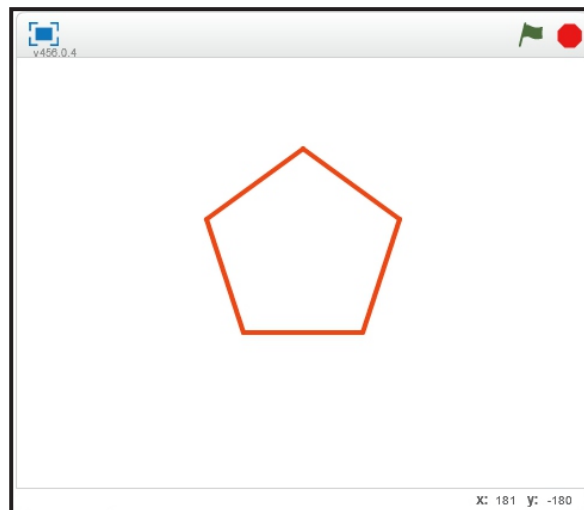
With each chapter, you learn more about Scratch. In this chapter, you learned about the Pen blocks of code and tried creating several example scripts that make use of Pen blocks as well as reinforcing lessons from previous chapters. The scripts taught you several new techniques, like how to draw and change the pen size and color. The next chapter focuses on the Looks blocks of code. These blocks change the appearance of the sprite, and you'll learn several different techniques.

Snap Script

a Short hands-on activity

1. Create a script that draws a blue pentagon. (It will help to remember that a pentagon has five sides and its five angles add up to 360 degrees.)

Output:



2. Create a script that draws three squares of equal size, but each in a different color, side by side, on the stage.

Output:

