

Module 2

Drawing Shapes and Repeating

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Think Like a Computer

In Module 1 you learned about algorithms. Algorithms are sets of instructions that solve a problem.

We also learned that humans can interpret instructions in a different way to computers.

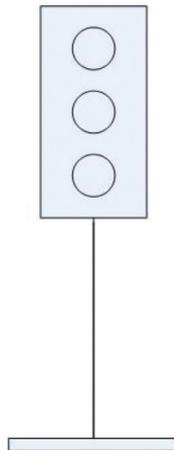
Computers work by following lists of instructions, and they do exactly what the instructions say, even if they are incorrect or nonsensical!!



Try out some exercises that will help you understand how to think like a computer by creating algorithms. You will execute the algorithms to test how well they work and make any modifications that are needed to improve the algorithm.

Exercises

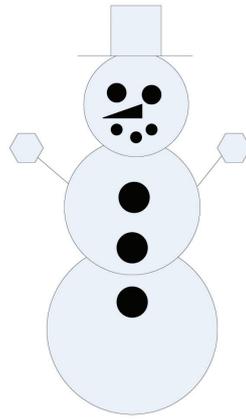
1



Describe how to draw this picture above using written instructions only in the box below.

Read out your instructions to a friend who can't see the picture. Check how closely the picture drawn by your friend matches the picture above.

2

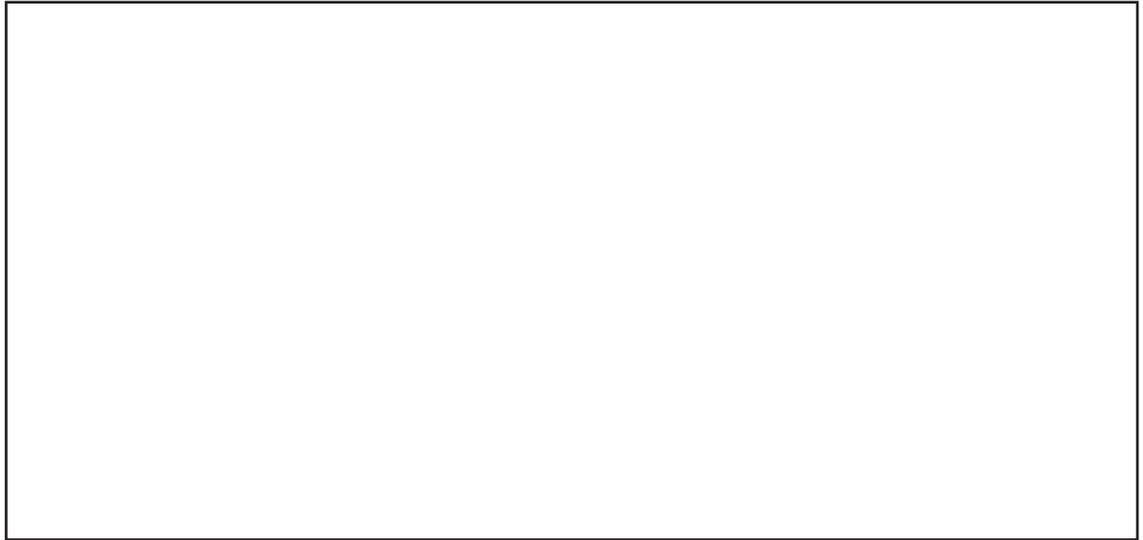


Describe how to draw this picture above using written instructions only in the box below. You should make some improvements based on your experience from exercise 1.

Read out your instructions to a friend who can't see the picture. Check how closely the picture drawn by your friend matches the picture above. Were there any improvements made from exercise 1?

3 Follow the instructions in this algorithm to draw something in the first box below.

1. Draw a rectangle.
2. From the centre of the rectangle's uppermost longer side, draw a straight line upwards perpendicular to the rectangle. This straight line should be the same length as the longer side of the rectangle.
3. Draw a right-angled triangle on the right hand-side of the perpendicular line.
4. Draw another triangle on the left hand-side of the perpendicular line. This triangle should be a mirror image of the triangle drawn in step 3.
5. On the top of the page, draw three stars.



Does your picture match the one from the solutions section?

Write a new version of the algorithm including improvements in the box below.



Could You Repeat That Please?

A computer can perform repetitive tasks efficiently. The code written below in Scratch will draw a square. In the script a loop will repeat the steps of drawing each side of the square and rotate to draw the next side of the square.

The image shows a Scratch script on a grid background. The script consists of the following blocks from top to bottom:

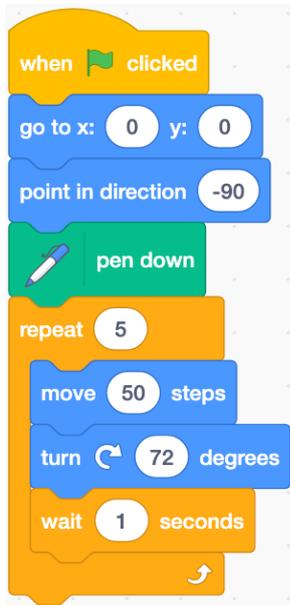
- when green flag clicked** (yellow)
- hide** (purple)
- point in direction 90** (blue)
- erase all** (green)
- pen up** (green)
- set pen color to pick random 1 to 100** (green)
- go to x: 0 y: 0** (blue)
- pen down** (green)
- repeat 4** (orange) loop containing:
 - move 100 steps** (blue)
 - turn 90 degrees** (blue)
 - wait 1 seconds** (orange)

Green callout boxes provide the following explanations:

- Points to the **hide** block: "This hides the sprite before drawing of the square begins"
- Points to the **erase all** block: "This clears the stage"
- Points to the **pen up** block: "This lifts the pen"
- Points to the **set pen color to pick random 1 to 100** block: "The pick random command sets the colour of the pen for drawing the square to any random number between 1 and 100. 1 = red colour and 100 = blue colour."
- Points to the **go to x: 0 y: 0** block: "This tells you at what position on the stage the drawing will start."
- Points to the **repeat 4** loop: "This is the repeat loop that draws the square"
- Points to the **pen down** block: "This lowers the pen so drawing can begin"

Exercises

1 In the box provided, explain what each line of code does. What does this code draw?

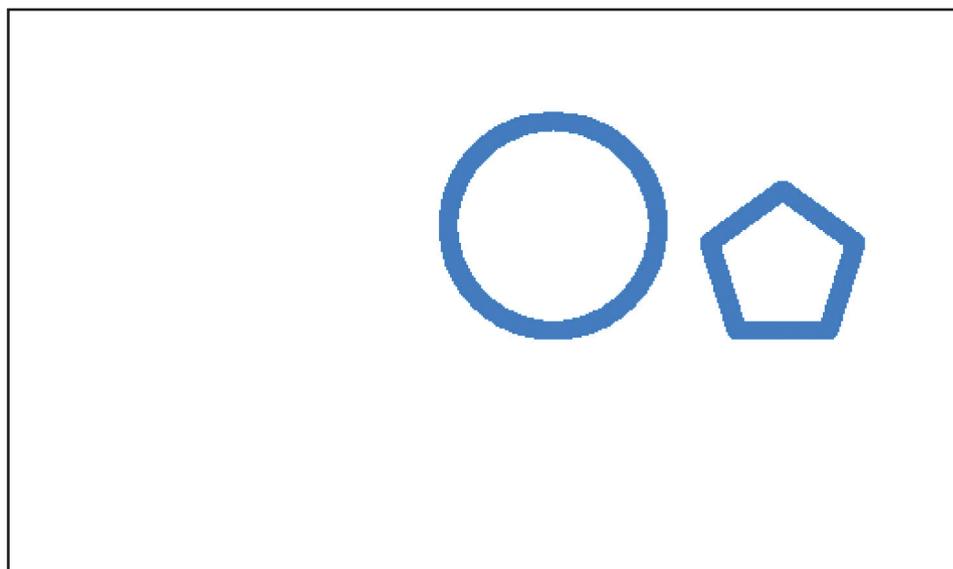


```
when green flag clicked
  go to x: 0 y: 0
  point in direction -90
  pen down
  repeat 5
    move 50 steps
    turn 72 degrees
    wait 1 seconds
```



2 Use Scratch to write the script. Does it match what you have described in the box?

Use Scratch to draw a circle and pentagon side by side on the stage as shown in the image below.



Over and Over Again

We learned in the previous section that a loop can be used by computers to perform repetitive tasks efficiently.

Use Scratch to write the script below to draw 4 different shapes 5 times. It uses a loop inside a loop also known as a nested loop.

```
when clicked
hide
erase all
pen up **
set pen size to 10
go to x: -180 y: 60
point in direction -90
pen down
repeat 5
  repeat 3
    move 50 steps
    turn 120 degrees
  pen up **
  change x by 100
  pen down
  repeat 5
    move 50 steps
    turn 72 degrees
  pen up **
  change x by 120
  pen down
  repeat 6
    move 50 steps
    turn 60 degrees
  pen up **
  change x by 100
  pen down
  repeat 360
    move 1 steps
    turn 1 degrees
  pen up **
  change x by -320
  change y by -50
  set pen color to pick random 1 to 100
  pen down
```

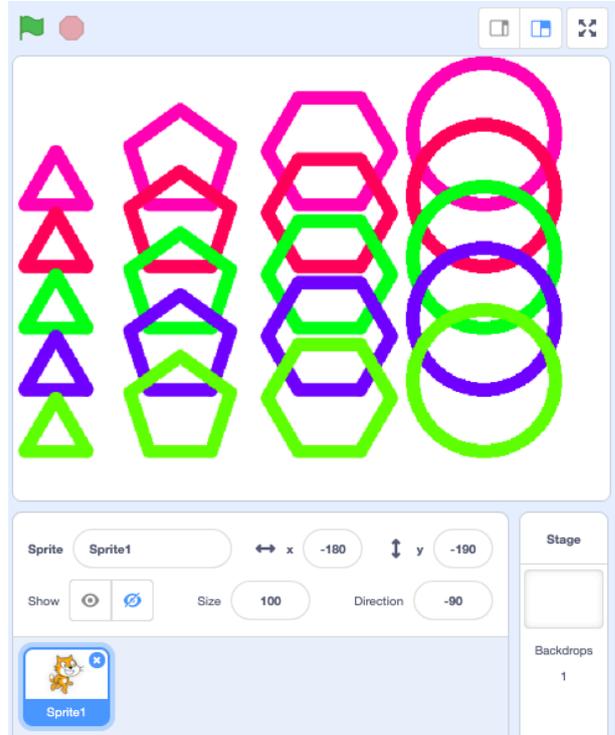
This loop repeats all the instructions inside it so that the shapes are drawn 5 times

These repeat loops draw a triangle, a pentagon, a hexagon, and a circle

**Note that the pen up command is used before the x/y position changed so that the pen can move to a new location before drawing again.

This changes the x and y value so that the set of 5 shapes are drawn in a different location each time

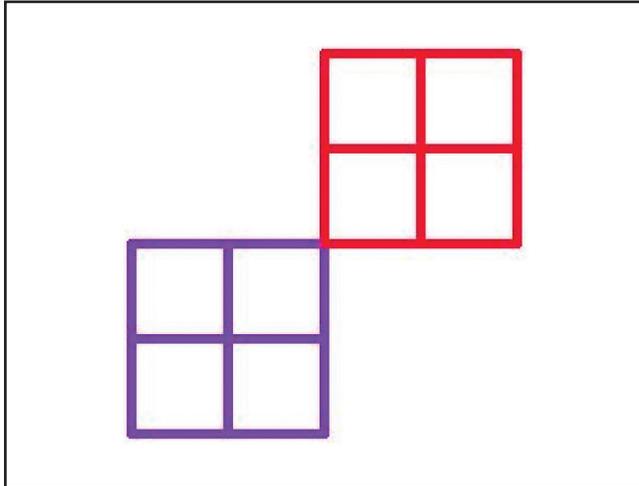
This changes the colour of the pen so that each set of shapes is drawn in a different random colour.



Exercises

- ① Use Scratch to draw the shape on the stage as shown in the image below.

Hint: You can draw this shape by using a loop to draw 4 sides of a square, inside a loop to draw 4 squares, contained in a loop to draw the 4 square patterns twice.

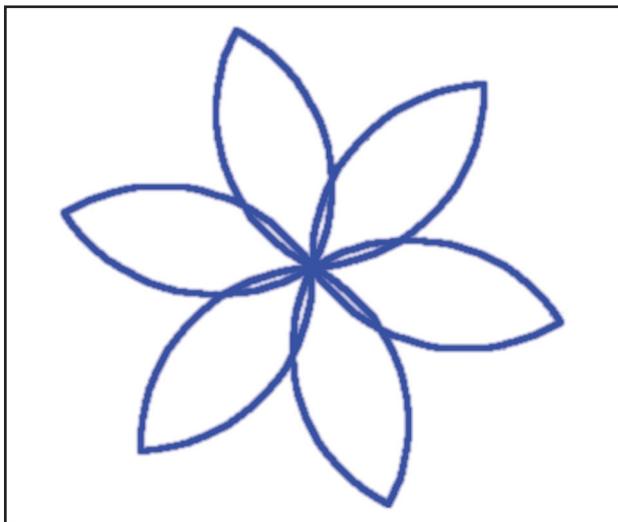


Draw 4 shape pattern 2 times

Draw squares 4 times

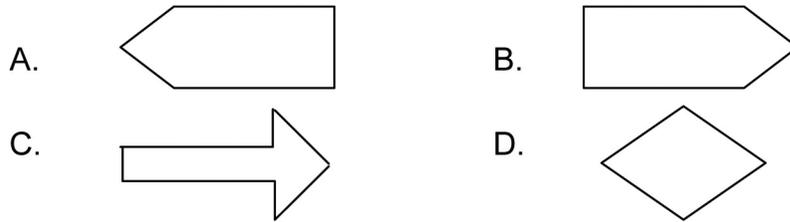
Draw 4 lines to make a square

- ② Use Scratch to draw the shape on the stage as shown in the image below.



End of Module Quiz

- 1 Identify the shape that is described by this algorithm. "Put your pen on paper. Face right . Move 2cm. Face up. Move 0.5cm. Rotate right by 135 degrees. Move 1 cm. Rotate right by 90 degrees. Move 1 cm. Face up. Move 0.5cm. Face left. Move 2cm. Face up. Move 0.45cm."

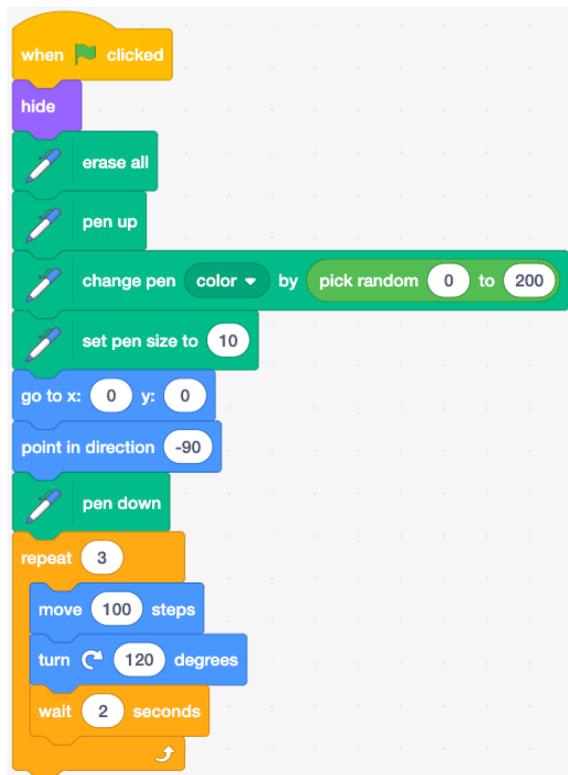


- 2 Which of the items listed below is not a good reason for software testing?

- A. It helps you find bugs in your program.
- B. To make sure your program does what you expect.
- C. It helps to see if other people can understand and use your program easily.
- D. It helps you to find new costumes for a sprite.

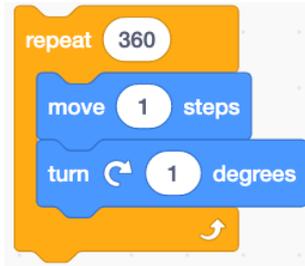
- 3 What does this script do?

- A. It draws a Square
- B. It draws a Hexagon
- C. It draws a Triangle
- D. It draws a Circle

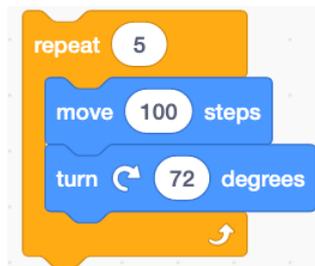


4 Which one of these loops will draw a circle?

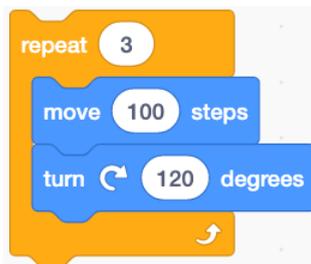
A.



B.



C.



D.

