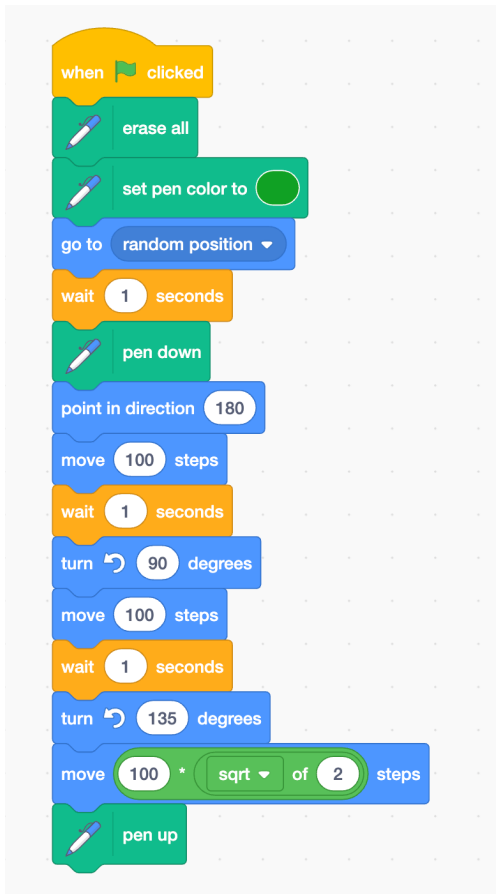


Coding Assignment #3 – Geometric Relationships

Learning Goals: apply coding skills to represent mathematical concepts and relationships related to geometry.

Success Criteria: be able to create a program using Scratch to calculate volume and surface area of various 3D shapes.

Task 1: Read this block of code. What do you think it does? Explain in detail then try it using the link to see if you are right.



What does the program do?

- Clears page
- Goes to a random position
- Draws a line of length 100 in the downward direction
- Draws a line straight to the right of length 100
- Turns through an angle of 135 degrees and draws a line of length $100\sqrt{2}$
- This program draws a right-angle triangle at a random position on the page.

Task 2: Write pseudocode that would tell a program how to calculate the missing side of a right triangle. Remember the *Pythagorean Theorem* $a^2 + b^2 = c^2$

Pseudo code:

- Create background that shows a right triangle
- Set all side lengths to zero
- Create a button for calculating missing leg
 - o When button is clicked:
 - Ask for known leg and store in variable
 - Ask for known hypotenuse and store in variable
 - Calculate missing leg value using $\sqrt{\text{hypotenuse}^2 - \text{leg}^2}$ and store in variable
 - Display all sides of the triangle in diagram
- Create a button for calculating missing hypotenuse
 - o When button is clicked:
 - Ask for first known leg and store in variable
 - Ask for second known leg and store in variable
 - Calculate hypotenuse using $\sqrt{\text{leg}^2 + \text{leg}^2}$ and store in variable
 - Display all sides of the triangle in diagram
- Have program reset when flag is clicked

Task 3: As a class, create a program in Scratch that solves for the missing side of a right triangle.

```
when clicked
  clear graphic effects
  show
  set leg_1 to 0
  set leg_2 to 0
  set hypotenuse to 0
  say Click the button for what you want to calculate for 3 seconds
  hide
```

} set sides to zero

Missing Leg Sprite

```
when this sprite clicked
  clear graphic effects
  set hypotenuse to 0
  set leg_1 to 0
  set leg_2 to 0
  ask What is the length of the known leg? and wait
  set leg_1 to answer
  ask What is the length of the hypotenuse? and wait
  set hypotenuse to answer
  say calculating missing leg... for 2 seconds
  set leg_2 to sqrt of hypotenuse * hypotenuse - leg_1 * leg_1
  say join join The length of the missing leg is leg_2 . Press a calculate button to try again. for 3 seconds
```

} clear values
get value for leg 1
get value for hypotenuse
calculate missing leg
state the answer

Missing Hypotenuse Sprite

```
when this sprite clicked
  clear graphic effects
  set hypotenuse to 0
  set leg_1 to 0
  set leg_2 to 0
  ask What is the length of the first known leg? and wait
  set leg_1 to answer
  ask What is the length of the second known leg? and wait
  set leg_2 to answer
  say Calculating hypotenuse... for 2 seconds
  set hypotenuse to sqrt of leg_1 * leg_1 + leg_2 * leg_2
  say join join The length of the hypotenuse is hypotenuse . Press a calculate button to try again. for 3 seconds
```

} clear values
get leg 1 value
get leg 2 value
calculate hypotenuse
display answer

Task 4: In groups, analyze this program that calculates the volume and surface area of a cone. Press 'See Inside' and analyze the code, sprites, and backdrops to get an idea of how it works.

<https://scratch.mit.edu/projects/788488500>

Task 5: Adapt the program from task 4 to be able to calculate the volume and surface area of rectangular prisms, spheres, triangular based prisms, cylinders, and cones. Start with pseudo code and share the link to your program with your teacher when you are done. The sphere section has been started for you.

Pseudo code: