

Sample Geometry Projects with Scratch

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Scratch is developed by the Lifelong Kindergarten group at the MIT Media Lab, with financial support from the National Science Foundation, Intel Foundation, and MIT Media Lab research consortia. Their web site <<http://scratch.mit.edu>> includes free downloads, tutorial and other help options, forum, and galleries for uploading projects to share internationally.

Math Connections Gallery URL: <http://scratch.mit.edu/galleries/134>

Drawing Polygons

NCTM Standard

In grades 3–5 all students should analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

- Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes.
- Classify two- and three-dimensional shapes according to their properties and develop definitions of classes of shapes such as triangles and pyramids.

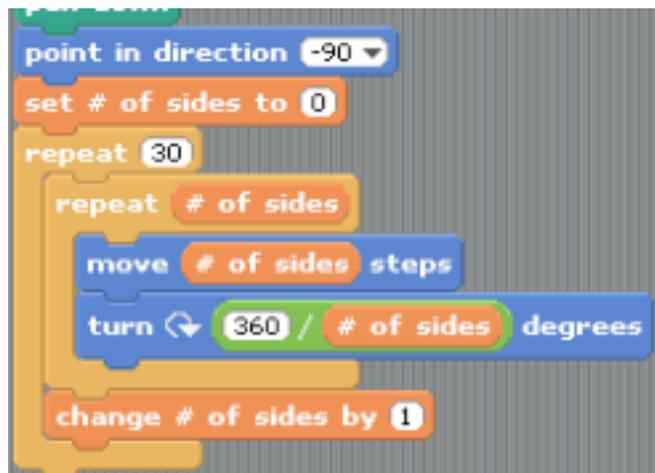
Project

1. Create a Scratch script which tells a sprite to draw each of the following shapes in succession.
triangle square pentagon
hexagon octagon

Concepts to explore

degrees
Internal vs external angles
difference between “turn” and “point in direction”
number of sides compared to number of angles
relationship between number of sides and the size of angles,
making a connection between the 360 degrees in a circle and the total number of degrees to turn in drawing each figure

2. Modify the script to use a variable for the side length and use it to also set the angle measurements.
3. Create a graphic art project which makes use of these concepts.



Coordinate Grids

NCTM Standard

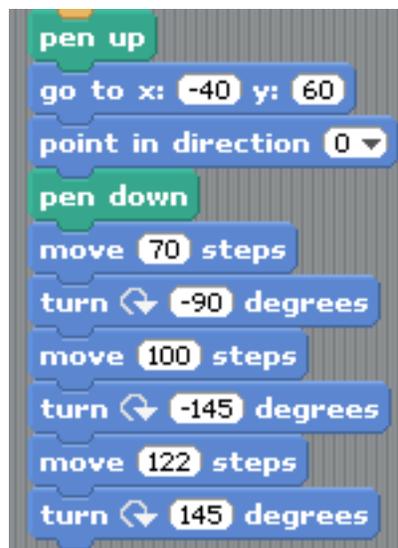
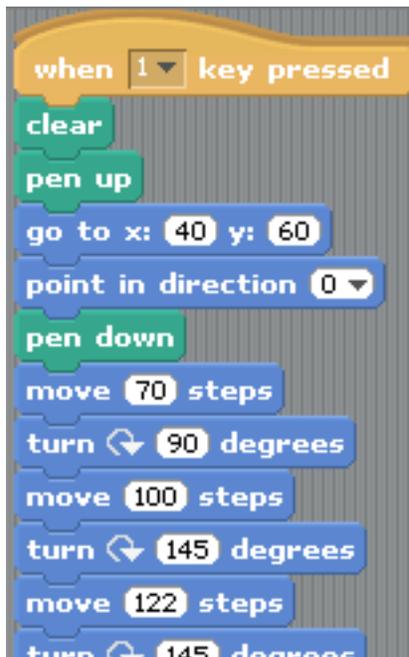
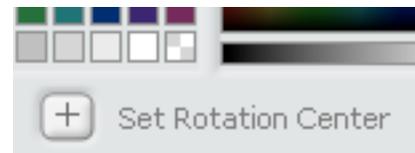
In grades 6–8 all students should:

- 1. Specify locations and describe spatial relationships using coordinate geometry and other representational systems*
 - use coordinate geometry to represent and examine the properties of geometric shapes;*
 - use coordinate geometry to examine special geometric shapes, such as regular polygons or those with pairs of parallel or perpendicular sides.*
- 2. Apply transformations and use symmetry to analyze mathematical situations*
 - describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling;*
 - examine the congruence, similarity, and line or rotational symmetry of objects using transformations.*

Projects

A. Write scripts which solve each of these challenges.

1. Create a Scratch sprite costume which places the x and y axis at the appropriate coordinates. [Align the “set rotation center” tool in the costume editor with (0,0), then use a *go to x:0, y:0* block to center it.]
2. Using the *go to x:?, y:?* block as a starting place, combine movements and turns to draw a regular triangle; a right triangle; a scalene triangle.
3. Make a mirror image drawing of the right triangle, across the y axis.



4. Make other images which turn and/or flip the original, each in a different quadrant.

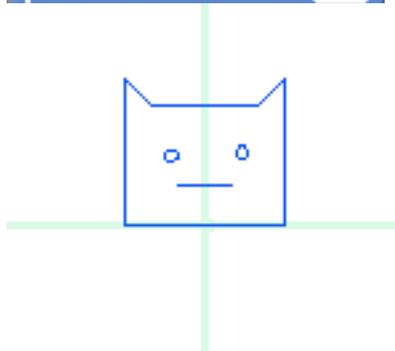
- B. Write a script that makes a simple line drawing. Write a script that enlarges or reduces the drawing using different scale factors. Explore what happens to the shape if the scale factor is applied to only the x or only the y coordinate. Are the resulting images still similar?

Basic shape

```

pen up
go to x: 30 y: 0
pen down
go to x: 30 y: 55
go to x: 20 y: 45
go to x: -20 y: 45
go to x: -30 y: 55
go to x: -30 y: 0
go to x: 30 y: 0
pen up
go to x: 10 y: 15
pen down
go to x: -10 y: 15
pen up
go to x: -15 y: 25
pen down
point in direction 0

```



```

when 2 key pressed
clear
pen up
go to x: scale factor * 30 y: 0
pen down
go to x: scale factor * 30 y: 55
go to x: scale factor * 20 y: 45
go to x: scale factor * -20 y: 45
go to x: scale factor * -30 y: 55
go to x: scale factor * -30 y: 0
go to x: scale factor * 30 y: 0
pen up
go to x: scale factor * 10 y: 15
pen down
go to x: scale factor * -10 y: 15
pen up
go to x: scale factor * -15 y: 25
pen down

```

