C++ PolyAngle

Contents

Time required: 60 minutes

Java to C++

This tutorial idea comes from dead reckoning planning for a student robot project. We are going to create a C++ console program based on the Java assignment you completed earlier. The program allows you to enter the number of sides in a regular polygon, then calculate the interior and exterior angles.

The Math

Start with solving the problem, create the algorithm. An algorithm is process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.

Problem statement: Given the number of sides of a regular polygon, how do we calculate the interior and exterior angles? Let's do the math.

The sum of interior angles in a triangle is 180°. To find the sum of interior angles of a polygon, multiply the number of triangles in the polygon by 180°. The formula for calculating the sum of interior angles is (n - 2) x 180° where n is the number of sides. All the interior angles in a regular polygon are equal.

The formula for calculating the size of an interior angle is:

interior angle of a polygon = sum of interior angles ÷ number of sides.

The sum of exterior angles of a polygon is 360°.

The formula for calculating the size of an exterior angle is:

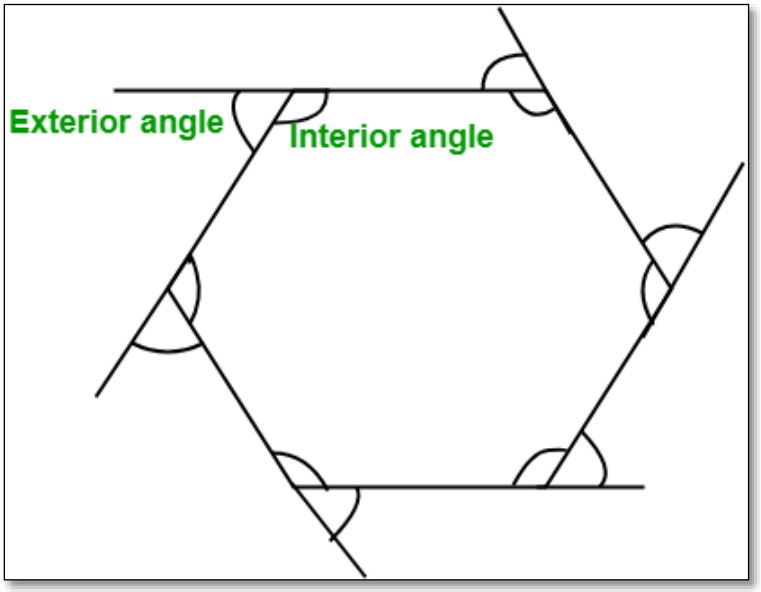
exterior angle of a polygon = 360 ÷ number of sides.

Interior Angle

The angle between two adjacent sides inside the polygon is known as the Interior angle.
Interior Angle = (n-2) x 180 / n

Exterior Angle

The angle formed by any side of a polygon and the extension of its adjacent side is known as the Exterior angle.
Exterior angle =360 / n



Pseudocode

The first step is a high-level look at the program. Think through what you want your program to do as if you were the user running your completed program.

```
Get the number of sides of a regular polygon from the user
Calculate the interior angle
Calculate the exterior angle
Display the results
```

Assignment 1: C++ PolyAngle CLI

Create a C++ console program to find interior and exterior angles of a regular polygon. Base this on the Java program you created earlier.

Use a parameterized method to calculate the angles.

NOTE: To print the degree symbol in C++:

```
'\370'
```

Example run:

```
------------------------------
|       PolyAngle in C++      |
------------------------------
Find the interior and exterior angles of a regular polygon
Enter number of sides >> 4
Interior angle: 90°
Exterior angle: 90°
```

Assignment 2: C++ PolyAngle CLI with Perimeter

In a separate method with two parameters, add a perimeter calculation to your PolyAngle program.

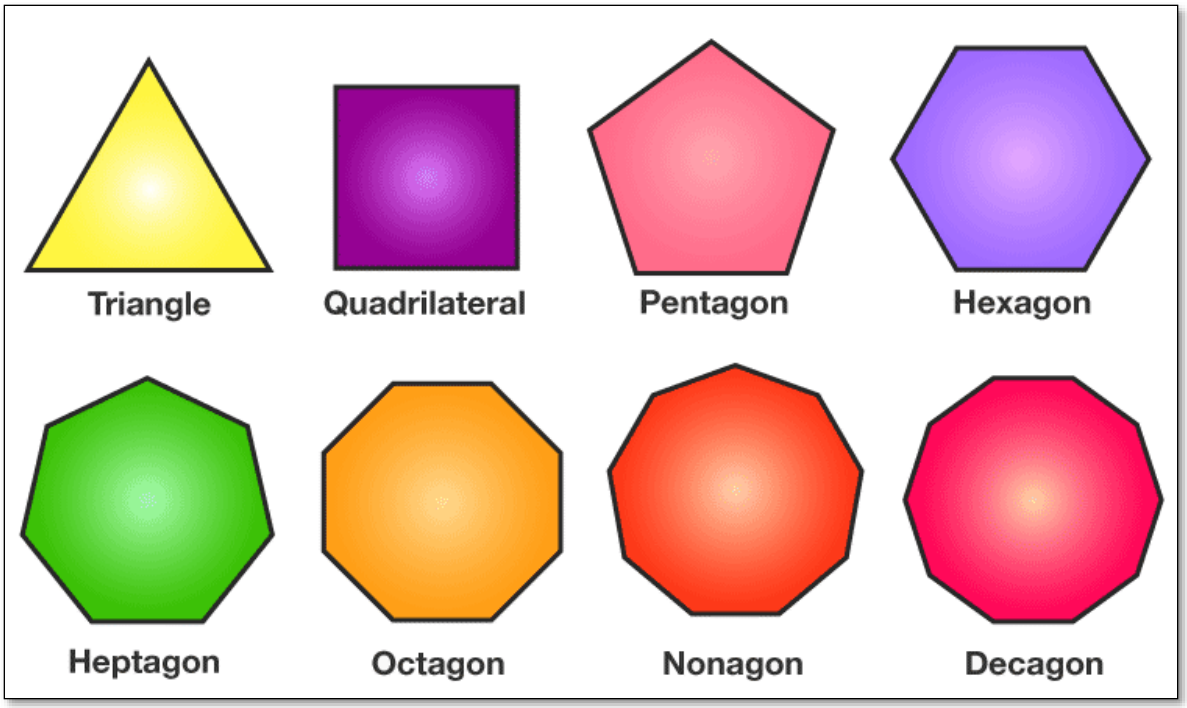
Example run:

```
------------------------------
|        PolyAngle in C++     |
------------------------------
Find the interior and exterior angles of a regular polygon
Enter number of sides >> 5
Find the perimeter of the polygon
Enter the length of a side in inches >> 12
Interior angle: 108°
Exterior angle: 72°
Perimeter: 60"
```

Assignment 3: Array for Tommy

This was inspired by a student extra credit activity.

If the user enters 3 sides, the program also outputs Triangle, 4-Square/Quadrilateral, etc.



You could create 8 separate variables. That is a lot of fooling around and not very efficient programming. It would be better to use a single C++ data structure, an Array if you can.

Example run:

```
--------------------------------
|         PolyAngle in C++     |
--------------------------------
Find the interior and exterior angles of a regular polygon
Enter number of sides >> 6
Find the perimeter of the polygon
Enter the length of a side in inches >> 6
Polygon name: Octagon
Interior angle: 120°
Exterior angle: 60°
Perimeter: 36"
```

Requirements

- Add to the PolyAngle program an Array with the names of the first 10 regular polygons.
- Use the Array to output the regular polygon name.

Assignment Submission

1. Attach all Java program files to the assignment.
2. Submit in Blackboard