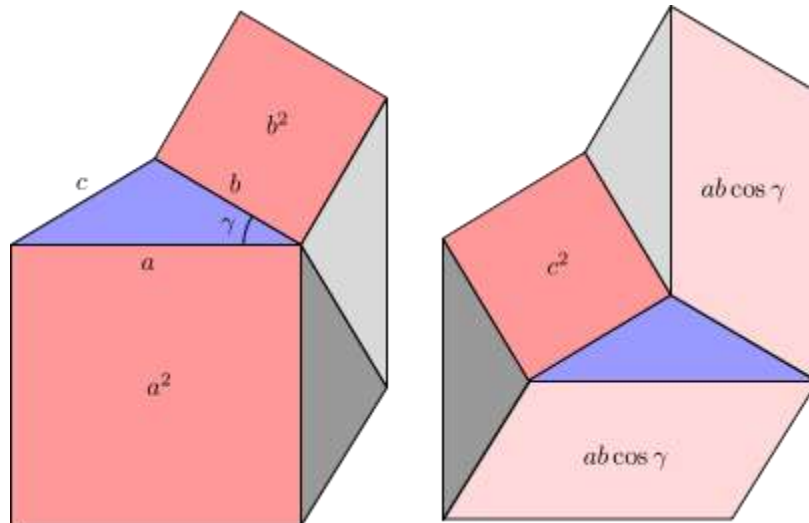


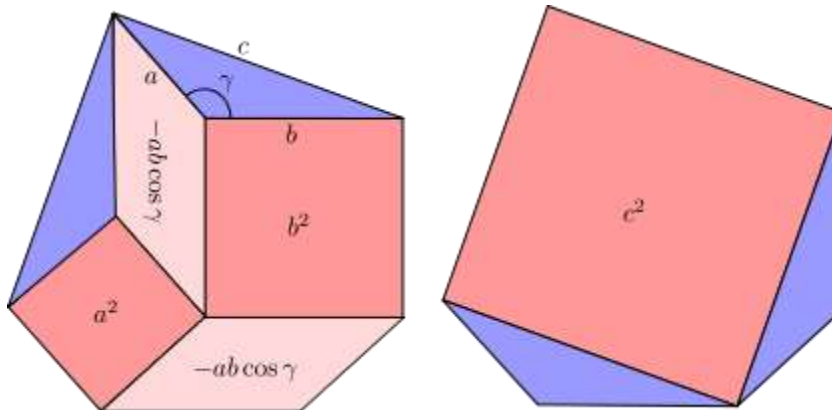
CS Pi Day Project:

Overview:

- A triangle is drawn on the screen
 - The user is able to move any of the triangle's vertices
 - Whenever the triangle is drawn, the lengths of its sides and sizes of its angles will be displayed
 - The user will also be able to select an angle, and be shown a geometric proof of the law of cosines (used to calculate the individual angles). The proof is as follows:
 - *Acute angle*



- *Obtuse Angle*



Diagrams taken from: http://en.wikipedia.org/wiki/Law_of_cosines

In either case, the area of the two heptagons is equal, giving the equations:

$$a^2 + b^2 + 3A_{tri} = c^2 + 2ab \cos \gamma + 3A_{tri}$$

$$a^2 + b^2 - 2ab \cos \gamma + 2A_{tri} = c^2 + 2A_{tri}$$

These can be arranged to the law of cosines formula:

$$a^2 + b^2 - 2ab \cos \gamma = c^2$$

Implementation:

Point Class:

- Variables:
 - Stores X,Y coordinate
- Functions:
 - Calculates the distance between itself and another point object
 - Calculates the slope of the line segment connecting it with another point
 - Calculates the point at the end of a line segment which is a given distance away, and at a given slope.

Polygon Class:

- Variables:
 - Point array
 - Size
- Functions:
 - Allocates an array of n points, where n is an unsigned integer parameter to the constructor
 - Provides public read-only access to its size.
 - Provides public read-only access to its points.
 - Provides protected read/write access to its points.
 - Provides a function which translates all points in the polygon by the given x and y value.

Triangle Class:

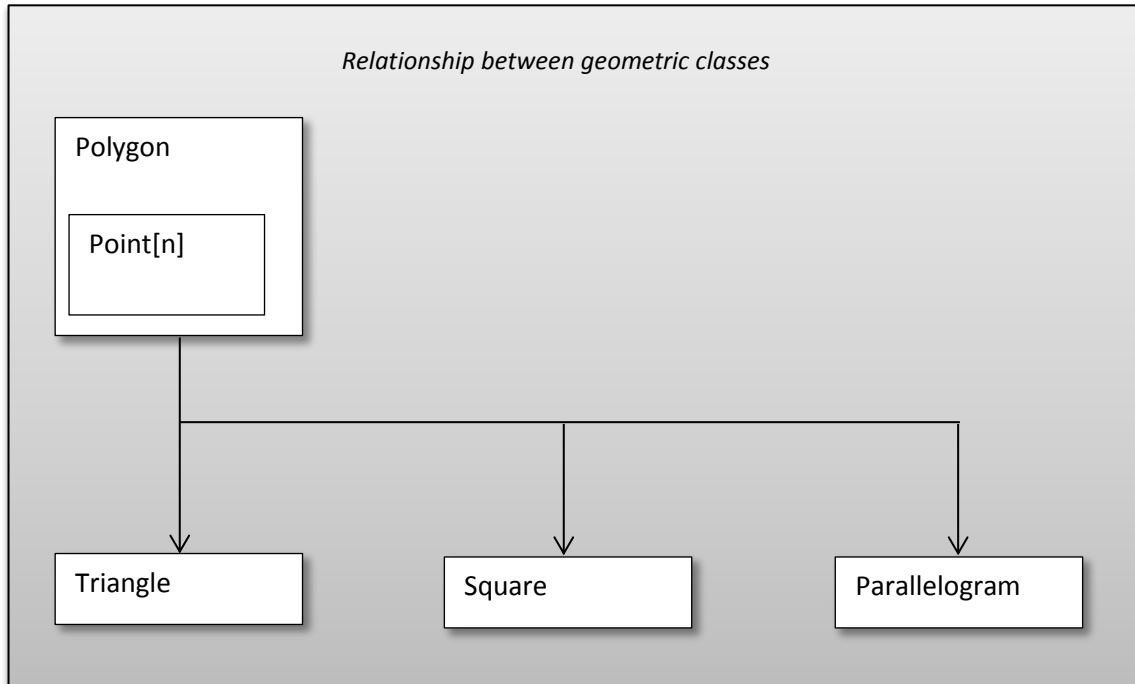
- Inherits: Polygon
- Functions:
 - Constructs a triangle from three points ($p1, p2, p3$) passed as arguments to its constructor.
 - Calculates the angle at a given point

Square Class:

- Inherits: Polygon
- Functions:
 - Constructs a square given three points ($p1, p2, p3$), where the point $p2$ is enclosed by $p1$ and $p3$.

Parallelogram Class:

- Inherits: Polygon
- Functions:
 - Constructs a parallelogram given three points ($p1, p2, p3$), where the point $p2$ is enclosed by $p1$ and $p3$.



ScreenPolygon Class:

- Variables:
 - Color
 - Scale
 - Polygon pointer
 - Draw function
- Functions:
 - Stores Polygon p , where p is a polygon passed to the constructor.
 - Provides public read/write access to color
 - Provides public read/write access to scale
 - Provides public read-only access to polygon
 - Provides protected read/write access to polygon
 - Provides a method to invoke the draw function on the ScreenPolygon, and provides public read/write access to this method.

Proof Class:

- Variables:
 - ScreenPolygon array
 - Number of ScreenPolygons
 - Outline ScreenPolygon
 - Minimum X
 - Minimum Y
 - Maximum X
 - Maximum Y
 - Height
 - Width
- Functions:
 - Allocates array of n ScreenPolygons, where n is an unsigned integer passed to the constructor
 - Creates a ScreenPolygon with m points, where m is an unsigned integer passed to the constructor.
 - Provides public read-only access to the polygons which form its heptagon
 - Provides public read-only access to the perimeter of the heptagon
 - Provides public read-only access to the minimum X value of the outline's points
 - Provides public read-only access to the maximum X value of the outline's points
 - Provides public read-only access to the minimum Y value of the outline's points
 - Provides public read-only access to the maximum Y value of the outline's points
 - Provides public read-only access to the width of the rectangle inscribed by the heptagon
 - Provides public read-only access to the height of the rectangle inscribed by the heptagon
 - Provides protected read/write access to the polygon array
 - Provides protected read/write access to the outline polygon

LeftAcute Class:

- Inherits: Proof
- Functions:
 - Generates the necessary ScreenPolygons to form the left-hand part of the diagram for the acute case of the law of cosines proof using Triangle t and the angle at the point represented by index i of the triangle.

RightAcute Class:

- Inherits: Proof
- Functions:
 - Generates the necessary ScreenPolygons to form the right-hand part of the diagram for the acute case of the law of cosines proof using Triangle t and the angle at the point represented by index i of the triangle.

LeftObtuse Class:

- Inherits: Proof
- Functions:
 - Generates the necessary ScreenPolygons to form the left-hand part of the diagram for the obtuse case of the law of cosines proof using Triangle t and the angle at the point represented by index i of the triangle.

RightObtuse Class:

- Inherits: Proof
- Functions:
 - Generates the necessary ScreenPolygons to form the right-hand part of the diagram for the obtuse case of the law of cosines proof using Triangle t and the angle at the point represented by index i of the triangle.

