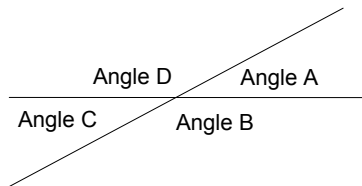


Trig for Animation

What is trig?

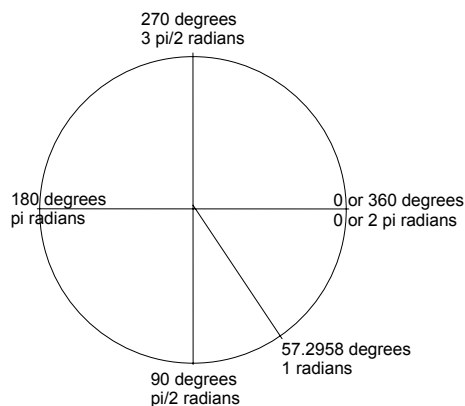
- Trig is the **study of triangles** and the relationship of their sides and angles. (Almost all of the trig that you will see deals with right triangles.)
 - Angles
 - Radians and degrees
 - Flash's coordinate system
 - Triangle sides

Angles



- The shape formed by **two intersecting lines** or the space in between those lines.
- Actually, two lines may form **four angles**.

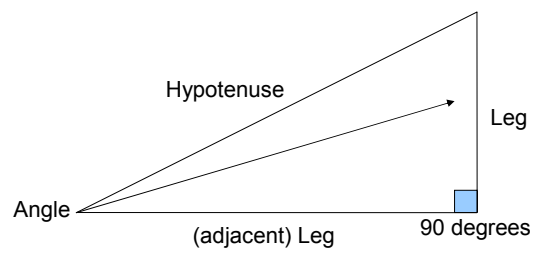
Radians and degrees



- 2 major systems for measuring angles are **degrees and radians**.
- A circle (360 degrees) measures 2π (π)
- (like it or not)
ActionScript uses radians
 - **radians = degrees * $\text{Math.PI} / 180$**
 - **degrees = radians * $180 / \text{Math.PI}$**

Flash's Coordinate System

Triangle Sides

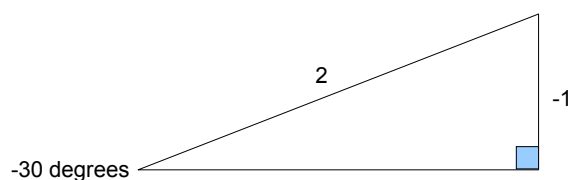


Trig Functions

- Sine
- Cosine
- Tangent
- Arcsine and arccosine
- Arctangent

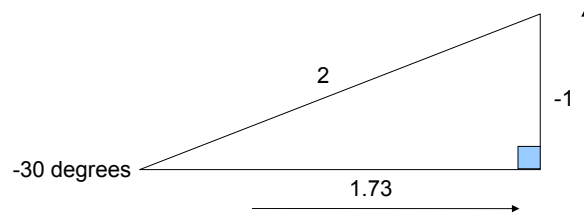
Sine

- The ratio of the angle's opposite leg to the hypotenuse
- ActionScript: `Math.sin(angle)`
- `trace(Math.sin(-30 * Math.PI / 180));`



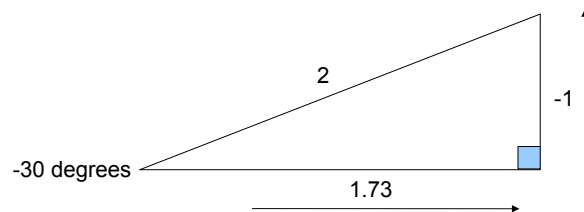
Cosine

- The ratio of the adjacent leg of an angle to the hypotenuse
- ActionScript: `Math.cos(angle)`
- `trace(Math.cos(-30 * Math.PI / 180));`



Tangent

- The ratio of the opposite leg to the adjacent leg.
- ActionScript: `Math.tan(angle)`
- `trace(Math.tan(-30 * Math.PI / 180));`
- You will get `-0.577350269...`



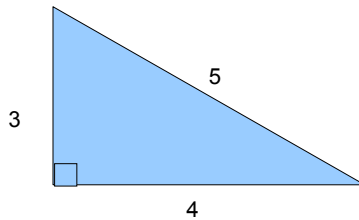
Arcsine, arccosine, arctangent

- All these do the reverse of sine, cosine, and tangent. **You feed in the ratio, you get back an angle (in radians).**
- `trace(Math.asin(0.5) * 180 / Math.PI);`
- `trace(Math.acos(0.865) * 180 / Math.PI);`
- `trace(Math.atan(0.577) * 180 / Math.PI);`

Angles in four quadrants

Pythagorean Theorem

- The sum of the squares of the two legs of a right triangle is equal to the square of the hypotenuse.
- The most common use of the Pythagorean Theorem in Flash is to find the distance between 2 objects. (on the lab)



Application: Lab

- Rotation
- Waves
- Smooth up and down motion
- Linear vertical motion
- Pulsing motion
- Waves with 2 angles
- Waves with drawing API
- Distance between 2 points