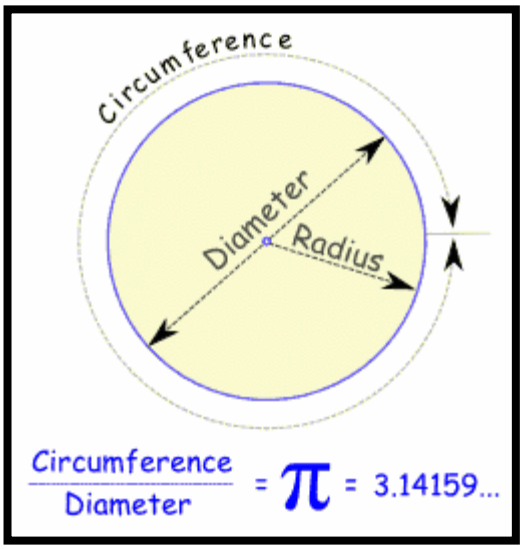
Study Guide for Geometry and Angle Measurement

1. Circles.

A) Know the center, radius, diameter, circumference, and pi. **B)** Know how to calculate the distances of radius, diameter, and circumference. **C)** Know how to get reasonable estimates.



Graphic from Math is Fun

- **Radius.** The **radius** is a straight line from the center to any point on the circle. The radius is one half of the diameter.

$$\mathbf{r} = \frac{1}{2}\,\mathbf{d}$$

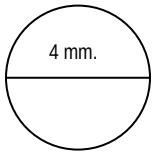
- **Diameter.** The **diameter** is the distance across the circle that passes through the center. The diameter is twice the distance of the radius.

$$\mathbf{d} = 2 \times \mathbf{r}$$

- **Circumference.** The **circumference** is the distance around the circle. For every circle large and small, if you divide the circumference by the diameter, you get a value that is called pi (π). Because the exact value of pi has a decimal value that goes on and on, when we do calculations to find circumference, we round pi to the nearest hundredth and use 3.14. $\pi = 3.14$

$$\mathbf{c} = \pi\,\mathbf{d}$$

$$\mathbf{c} = 3.14 \times \mathbf{d} \quad \text{(or)} \quad \mathbf{c} = 3.14 \times 2\,\mathbf{r}$$



For Example: To calculate the circumference of a circle with a diameter of 4 would be 4 x 3.14 = 12.56 mm.

- **Reasonable Estimates.** To get a **reasonable estimate** means to get a number that is "in the ballpark". It does not require an exact calculation using 3.14. To get a reasonable estimate use the number **3** for pi (3.14 rounded to the nearest whole number).

For Example: A ***reasonable estimate*** for the circumference of the circle with a diameter of 4 mm. would be 4 x 3 = 12 mm.

Online Resources

- http://www.coolmath.com/reference/circles-geometry.html
- http://www.mathgoodies.com/lessons/vol2/circumference.html
- http://www.bbc.co.uk/schools/ks3bitesize/maths/shape_and_space/circles_intro.shtml
- http://www.mathsisfun.com/geometry/circle.html

2. Lines.

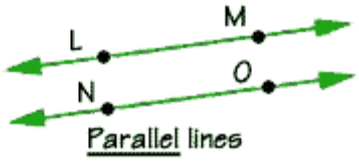
A) Know the line types. **B)** Know how they can be positioned relative to each other.

- **Lines.** A **line** is a group of points on a straight path that extends to infinity. Any two points on the line can be used to name it. This line is called line AB. ($\overleftrightarrow{AB}$)

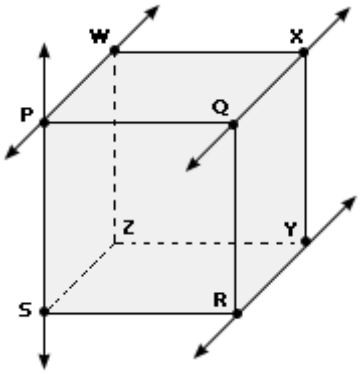
- **Line Segments.** A **line segment** is a part of a line that has two end points. The two end points of the line segment are used to name the line segment. This line segment is called segment XY. This line segment is called segment XY ($\overline{XY}$)

- **Rays.** A **ray** is part of a line. It has one end point and extends to infinity in one direction. A ray is named starting with its end point first and then any other point on the ray second. Both of these rays would be called ray ST ($\overrightarrow{ST}$)

- Two lines do not intersect when they are parallel lines or skew lines.
  - **Parallel Lines**.

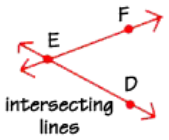


  - **Skew Lines.** Skew lines are on a different plane). In the example below, lines RY and PS are skew lines because they exist on a different plane.



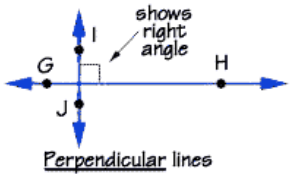
graphic by http://www.icoachmath.com

- **Intersect**. If two lines are not parallel or skew, they will intersect, or meet at a point.



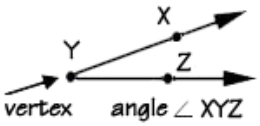
graphic by www.math.com

- **Perpendicular**. When lines intersect to form a right angle, those two lines are perpendicular to each other.



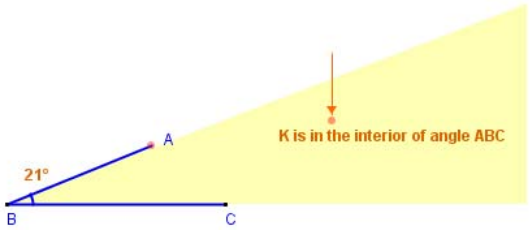
graphic by www.math.com

- **Angles** are formed when two rays have a common meeting point called a vertex.



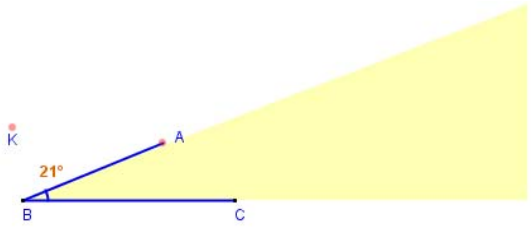
graphic by www.math.com

  - The **interior** of an angle is the area between the rays that make up the angle, and extends away from the vertex to infinity. In the example below, point K is in the interior of the angle.



graphic by www.mathopenref.com

  - The **exterior** of an angle is lays outside the interior. In the example below, point K is in the exterior of the angle.



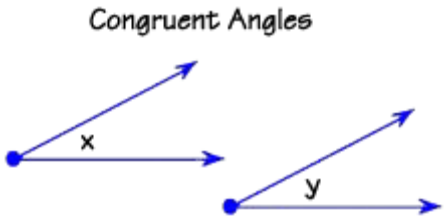
graphic by www.mathopenref.com

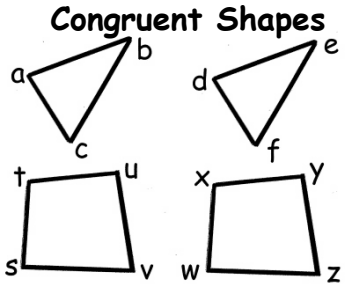
Online Resources

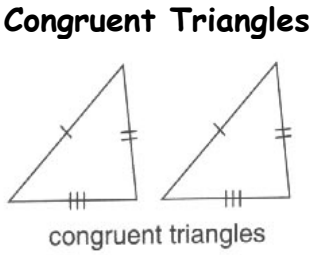
- http://www.learningwave.com/lwonline/geometry_section1/lessons/lines1.html
- http://www.learningwave.com/lwonline/geometry_section1/lessons/lines2.html
- http://www.math.com/school/subject3/lessons/S3U1L3GL.html
- http://www.icoachmath.com/SiteMap/SkewLines.html
- http://www.mathopenref.com
- http://www.bbc.co.uk/schools/ks3bitesize/maths/shape_and_space/parallels_1.shtml
- http://www.mcwdn.org/Geometry/Lines.html

3. Congruent Figures.

Congruent figures are figures with the same shape, size, and measurement.

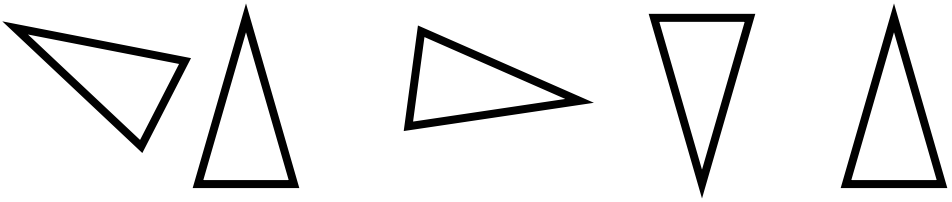






Congruent Triangles

The figures may have been flipped, rotated, translated, or reflected – but they are still the same size and shape!

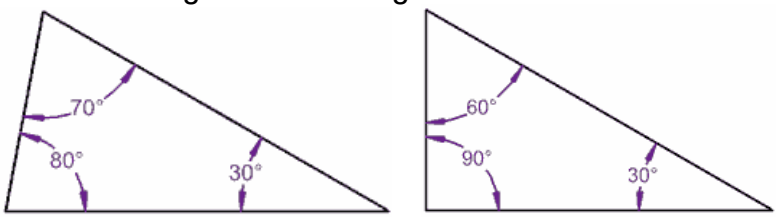


Online Resources

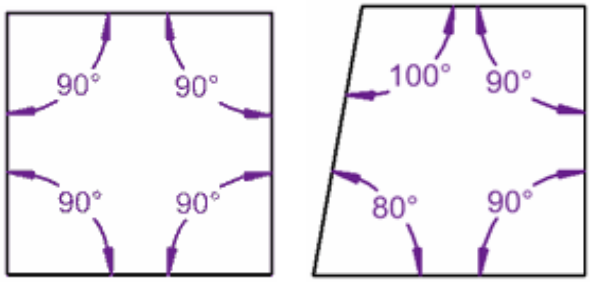
- http://www.coolmath4kids.com/congruent.html
- http://www.math.com/school/subject3/lessons/S3U3L1GL.html
- http://www.mathsisfun.com/geometry/congruent.html
- http://www.mathsisfun.com/geometry/transformations.html
- http://www.bbc.co.uk/schools/ks3bitesize/maths/shape_and_space/transformations_1_1.shtml

4. Sum of Interior Angles.

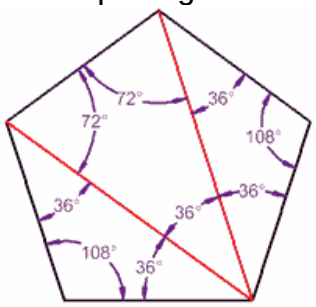
- The sum of the interior angles of all triangles is 180°.



- The sum of the interior angles of all quadrilaterals is 360°.



- The sum of the interior angles of all pentagons is 540°.

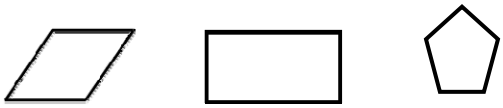


- Each time we add a side (triangle to quadrilateral, quadrilateral to pentagon, etc.), we add another 180° to the total.

Shape	Sides	Sum of Internal Angles	Shape
Triangle	3	180°	
Quadrilateral	4	360°	
Pentagon	5	540°	
Hexagon	6	720°	
Therefore, the general rule is:			
Any Polygon	**n**	(**n**-2) × 180°	

5. Regular Polygons

- **Regular Polygons**. In a regular polygon, all the sides are the same length and all the angles have the same measure. A square is an example of a regular polygon

Regular Polygons	Polygons that are NOT regular.
	

- If the shape is a regular polygon, you can get the measure of each angle by dividing the sum of the angles by the number of angles.

Shape	Sides	Sum of Internal Angles	Shape	If the shape is regular, each angle would be:
Triangle	3	180°		60°
Quadrilateral	4	360°		90°
Pentagon	5	540°		108°
Hexagon	6	720°		120°
Therefore, the general rule is:				
Any Polygon	**n**	(**n**-2) × 180°		(**n**-2) × 180° / **n**

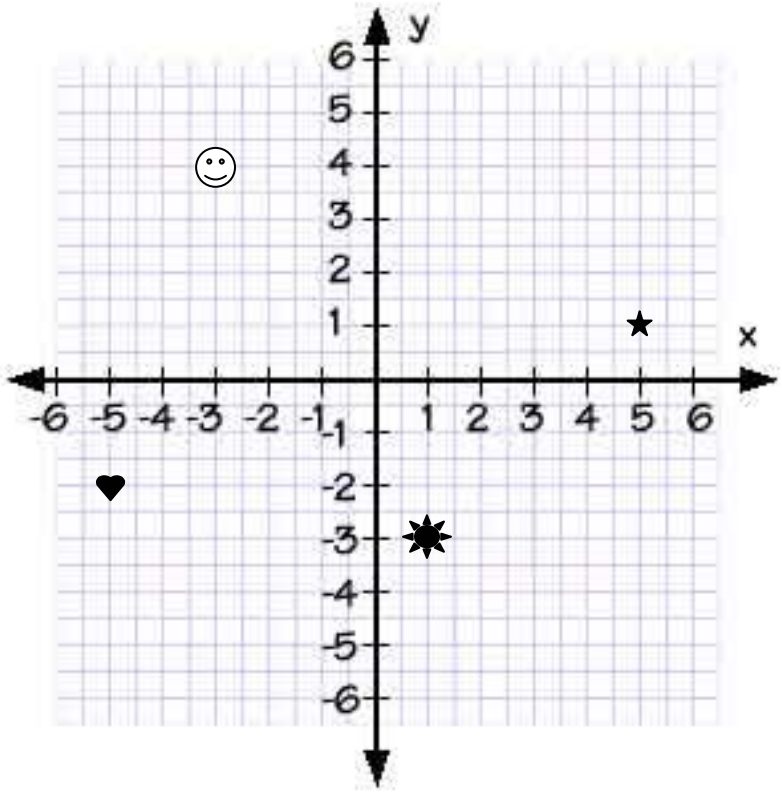
Online Resources

- http://www.coolmath.com/interior.htm
- http://www.mathsisfun.com/geometry/interior-angles-polygons.html

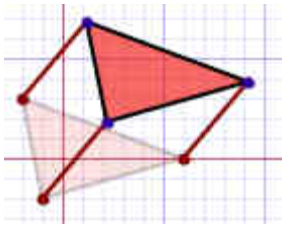
6. Coordinate Grids.

When an **ordered pair** is used to locate a point on a grid, the two numbers are called the '**coordinates**' of the point. The first number is its location on the horizontal axis ("over"), and the second number is its location on the vertical axis ("up" or "down").

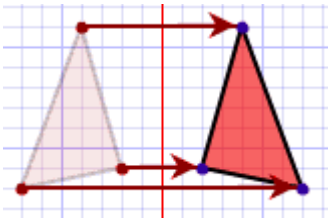
- ★ is located at (5, 1)
- ☺ is located at (-3, 4)
- ♥ is located at (-5, -2)
- ✹ is located at (1, -3



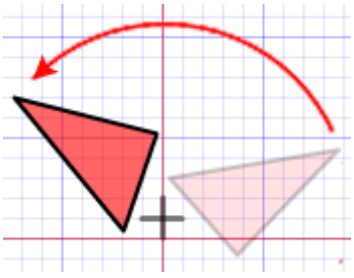
You can also plot transformations on coordinate grids.



translation



reflection



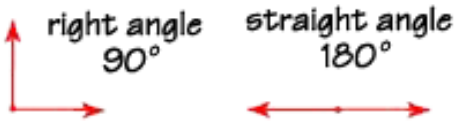
rotation

Online Resources

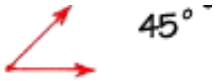
- http://www.bbc.co.uk/schools/ks2bitesize/maths/activities/grids.shtml
- http://www.oswego.org/ocsd-web/games/BillyBug/bugcoord.html
- http://www.funbrain.com/cgi-bin/co.cgi?A1=s&A2=2
- http://www.math.com/school/subject3/lessons/S3U1L2GL.html

7. Measuring angles.

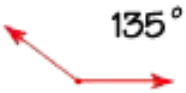
- When measuring angles, it is helpful to think about reasonable estimates first to make sure you are on the right track. Think about what you know:



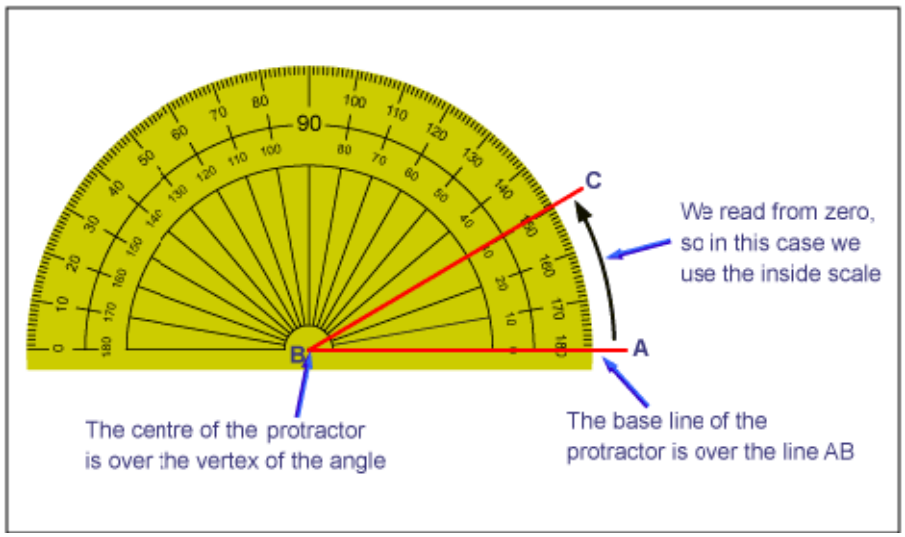
Look at the angle and ask yourself, is it more than 0° but less than 90°? About halfway in between? (45°).



Is the angle more than 90° but less than 180°? About halfway in between? (135°**)**



- When measuring angles, make sure that the center of the protractor is over the vertex (corner) of the angle and that the base line of the protractor is along one of the lines of the angle.



Graphic by http://www.bbc.co.uk/schools/ks3bitesize/maths/

- When you read the measurement, check to make sure that it makes sense with your estimate.

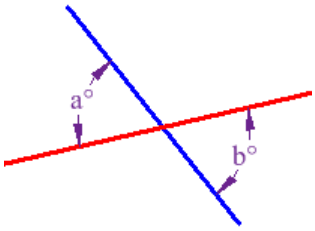
Online Resources

- http://www.kidport.com/Grade6/Math/MeasureGeo/MeasuringAngles.htm
- http://www.bbc.co.uk/schools/ks3bitesize/maths/shape_and_space/angles_1_4.shtml
- http://www.teachersfirst.com/getsource.cfm?id=7080
- http://www.math.com/school/subject3/lessons/S3U1L4GL.html

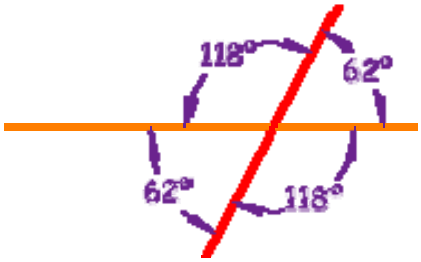
8. Measuring Angles in Intersecting Lines

When two straight lines cross, four angles are formed.

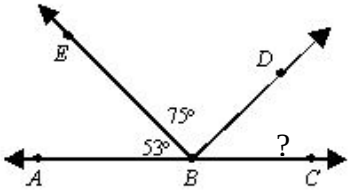
- **Opposite angles** (**vertical angles**) are equal. In the picture below, a = b, so if a = 70°, then b also equals 70°.

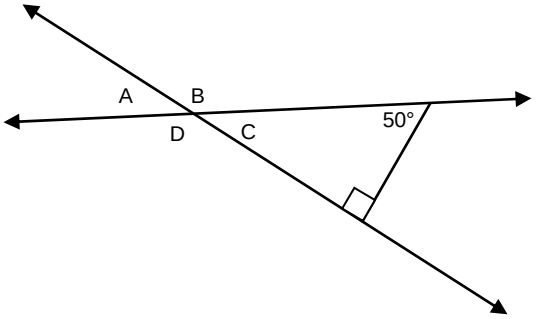


- **Adjacent angles** (neighboring angles that share a common side) combine to total 180° (a straight line).



- You can put all you know about right angles, straight lines, interior angles, and intersecting lines to get the measurements of unknown angles.





Online Resources

- http://www.math.com/school/subject3/lessons/S3U1L5DP.html
- http://www.bbc.co.uk/schools/ks3bitesize/maths/shape_and_space/parallels_1.shtml
- http://www.mathsisfun.com/geometry/parallel-lines.html
- http://www.mathhomeworkhotline.com/angles.html
- http://www.learningwave.com/.../lessons/lines2.html
- http://www.mathopenref.com/transversal.html
- http://www.math10.com/en/tests/angles/angles-test.html