**An angle** is a figure formed by two non collinear rays that have a common endpoint.

The common endpoint is called **the vertex**, and the two rays that make up the angle are called **the sides of the angle**.

There are several ways to name the angle.

|  |  |  |
| --- | --- | --- |
| $A$ $3$$B$$C$ | Use the vertex and a point from each side. | $$∠CBA and ∠ABC$$ |
| Use the vertex only. | $$∠B$$ |
| Use a number. | $$∠3$$ |

Angles are measured in units called degrees. The symbol for degree is °.

**Angles Measure Postulate**

|  |  |
| --- | --- |
| $R$$k$$D$$F$ | **For every angle, there is a unique positive number between 0 and 180 called the degree measure of the angle.** |
| $$m∠FDR=k$$ |
| $$0<k<180$$ |

**Protractor Postulate** Describes the relationship between angle measures and numbers.

|  |  |
| --- | --- |
| $ t$**°**$ A t° B$ | On a plane, given $ \vec{AB}$ and a number$ t$ between 0 and180, there is exactly one ray with endpoint $ A$ extending on each side of $\vec{AB}$such that the degree measure of the angle formed is $ t$ .A protractor can be used to approximate the measure of an angle. |

How to use the protractor:

1. Place the notch of the protractor at the vertex of the angle.

2. Place the edge of the protractor along a side of the angle so that the scale reads 0.

3. Read the angle size by reading the degree measure that corresponds to the second side of the angle.

**Types of Angles**

|  |  |  |  |
| --- | --- | --- | --- |
| **Acute Angle** | **Right Angle** | **Obtuse Angle** | **Straight Angle** |
| $$1$$ | $$ 2$$ | $$ 3$$ | $$4$$ |
| $$m∠1<90$$ | $$m∠2=90$$ | $$180>m∠3>90$$ | $$m∠4=180$$ |

**Sample Problem 1**: **Find the measure of each angle. Then classify each angle.**

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | https://lh6.googleusercontent.com/d3-Z8ZYWIAYnzZam0k-3jKFlLrIk1cWbXDKohgIE0AaQHE_iFku1j63EeRZeEY-lqgmCiTWhbR1Dx6UAwFE2JROY53czHWpWV_XkYEaJkzlPjiB76PB8K7So4h8ttc8730E1qeRl9oM$$ B$$$$ C D$$ | **b.** | https://lh6.googleusercontent.com/d3-Z8ZYWIAYnzZam0k-3jKFlLrIk1cWbXDKohgIE0AaQHE_iFku1j63EeRZeEY-lqgmCiTWhbR1Dx6UAwFE2JROY53czHWpWV_XkYEaJkzlPjiB76PB8K7So4h8ttc8730E1qeRl9oM$$ T$$$$ F H $$ |
|  | $$m∠DCB=45$$**Angle** $ DCB$ **measures 45°****Acute angle** |  | $$m∠FHT=135$$**Angle** $ FHT$ **measures** $135$ **°****Obtuse angle** |

**Sample Problem 2**: **Use a protractor to draw each angle. Then classify each angle.**

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | $$m∠COB=15$$ | **b.** | $$m∠HTR=150$$ |
|  | https://lh6.googleusercontent.com/d3-Z8ZYWIAYnzZam0k-3jKFlLrIk1cWbXDKohgIE0AaQHE_iFku1j63EeRZeEY-lqgmCiTWhbR1Dx6UAwFE2JROY53czHWpWV_XkYEaJkzlPjiB76PB8K7So4h8ttc8730E1qeRl9oM$$ B$$$$ O C$$ |  | https://lh6.googleusercontent.com/d3-Z8ZYWIAYnzZam0k-3jKFlLrIk1cWbXDKohgIE0AaQHE_iFku1j63EeRZeEY-lqgmCiTWhbR1Dx6UAwFE2JROY53czHWpWV_XkYEaJkzlPjiB76PB8K7So4h8ttc8730E1qeRl9oM$ R$$$ H T $$ |
|  | **Acute angle** |  | **Obtuse angle** |

**Angle Addition Postulate**

|  |  |
| --- | --- |
| $K$$ T$$L$$M$ | **If**$ T$ **is in the interior of** $∠KLM$ **, then the measure of** $∠KLM$ **is equal to the sum of the measures of** $∠MLT$ **and** $∠TLK$ **.** |
| $$m∠KLM =m∠MLT +m∠TLK$$ |

**Sample Problem 3**: **Find the indicated angle measures.**

|  |  |  |
| --- | --- | --- |
| **a.** | $$m∠RTD=39 m∠DTE=56 $$$m∠RTE=?$$$E $$$ D$$$ R T$$ | $$m∠RTD=39 m∠DTE=56 $$$$m∠RTE=?$$$$m∠RTE=m∠RTD+m∠DTE$$$$m∠RTE=39+56 $$$$m∠RTE=95$$ |
| **b.** | $$m∠LMA=164 m∠GMA=56 $$$$m∠LMG=?$$$ G$$ A$$ M L$  | $$m∠LMA=164 m∠GMA=56 $$$$m∠LMG=?$$$$m∠LMA=m∠LMG+m∠GMA$$$$m∠LMG=m∠LMA-m∠GMA $$$$m∠LMG=164-56$$$$m∠LMG=108$$ |

**The bisector of an angle** is the ray with its endpoint at the vertex of the angle extending into the interior of the

angle. The bisector separates the angle into two angles of equal measure.

**Sample Problem 4**: **Find the indicated angle measures.**

|  |  |  |
| --- | --- | --- |
| **a.** | **If** $ \vec{AC} $**bisects**$ ∠LAG$ **and** $m∠LAG=64$ **, find** $ m∠LAC$ **and** $ m∠CAG.$$ G C$$ $$ A L$  | $$m∠LAG=64 $$$$m∠LAC=? m∠CAG=? $$$$m∠LAG=m∠LAC+m∠CAG$$$$m∠LAC=m∠CAG$$$$m∠LAG=2\*m∠LAC $$$$m∠LAC=\frac{m∠LAG}{2}$$$$m∠LAC=\frac{64}{2}$$$m∠LAC=32 m∠CAG=32$ |
| **b.** | **If** $ \vec{TG} $**bisects**$ ∠PTD$ **and** $m∠PTG=26$ **, find** $ m∠PTD$ **and** $ m∠GTD.$$ D $$ $$ G$$ T P$  | $$m∠PTG=26 $$$$m∠PTD=? m∠GTD=? $$$$m∠GTD=m∠PTG$$$$m∠GTD=26$$$$m∠PTD=m∠PTG+m∠GTD$$$$m∠PTD=26+26$$$$m∠PTD=52$$ |