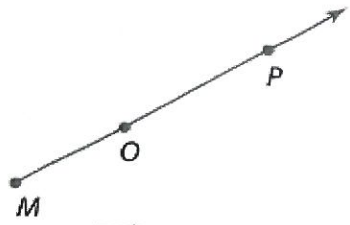
Name KEY Date _____ Period _____

Lesson 1.4. Notes Angle Measures

1 Measure and Classify Angles A **ray** is a part of a line. It has one endpoint and extends indefinitely in one direction. Rays are named by stating the endpoint first and then any other point on the ray. The ray shown cannot be named as $\overrightarrow{OM}$ because O is not the endpoint of the ray.

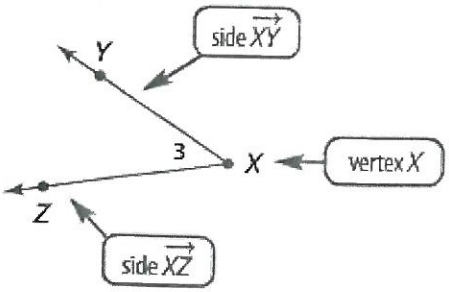


ray MP, $\overrightarrow{MP}$, ray MO, or $\overrightarrow{MO}$

If you choose a point on a line, that point determines exactly two rays called **opposite rays**. Since both rays share a common endpoint, opposite rays are collinear

$\overrightarrow{JH}$ and $\overrightarrow{JK}$ are opposite rays.

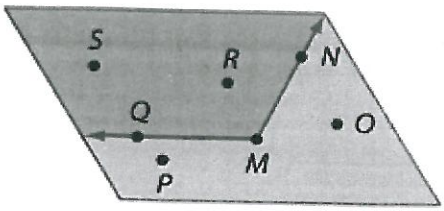
An **angle** is formed by two *noncollinear* rays that have a common endpoint. The rays are called **sides** of the angle. The common endpoint is the **vertex**.



When naming angles using three letters, the vertex must be the second of the three letters. You can name an angle using a single letter only when there is exactly one angle located at that vertex. The angle shown can be named as $\angle X$, $\angle YXZ$, $\angle ZXY$, or $\angle 3$.

An angle divides a plane into three distinct parts.

- Points Q, M, and N lie on the angle.
- Points S and R lie in the **interior** of the angle.
- Points P and O lie in the **exterior** of the angle.

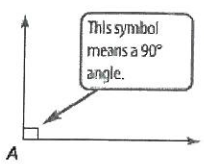
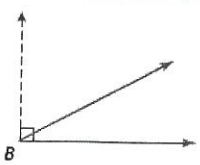
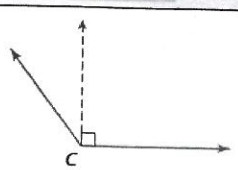


ReadingMath

Straight Angle Opposite rays with the same vertex form a *straight angle*. Its measure is 180. Unless otherwise specified in this book, however, the term *angle* means a nonstraight angle.

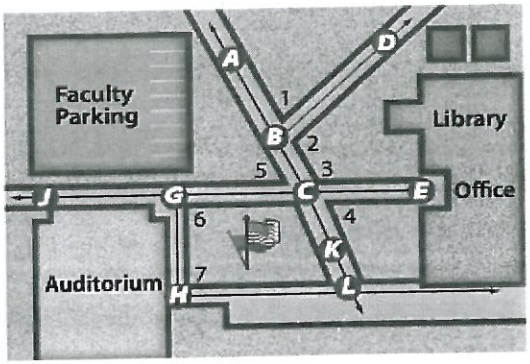
Angles can be classified by their measures as shown below.

KeyConcept Classify Angles

right angle	acute angle	obtuse angle
		
$m\angle A = 90$	$m\angle B < 90$	$180 > m\angle C > 90$

Angles and Their Parts

MAPS **Use the map of a high school shown.**



a. Name all angles that have *B* as a vertex.

∠1, ∠ABD, and ∠2 or ∠DBC

b. Name the sides of ∠3.

$\overrightarrow{CA}$ and $\overline{CE}$ or $\overrightarrow{CB}$ and $\overline{CE}$

c. What is another name for ∠*GHL*?

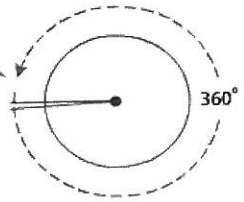
∠7, ∠H or ∠LHG

d. Name a point in the interior of ∠*DBK*.

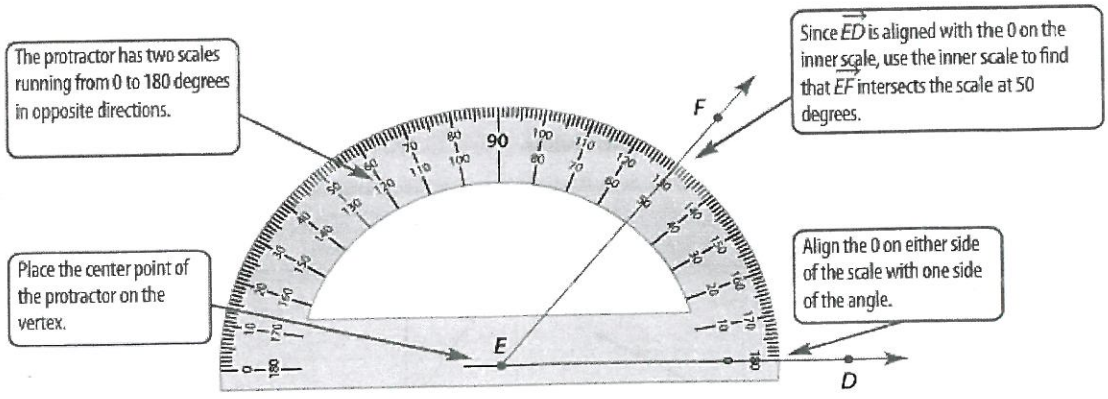
Point E.

Angles are measured in units called degrees. The **degree** results from dividing the distance around a circle into 360 parts.

$1° = \frac{1}{360}$ of a turn around a circle.

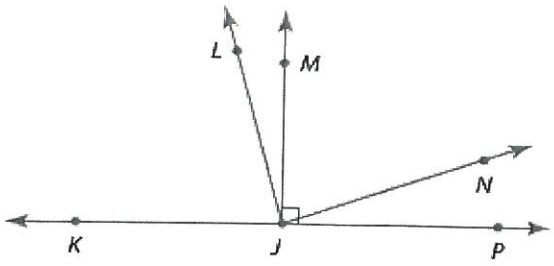


To measure an angle, you can use a *protractor*. Angle *DEF* below is a 50 degree (50°) angle. We say that the *degree measure* of ∠*DEF* is 50, or $m\angle DEF = 50$.



Measure and Classify Angles

Copy the diagram below, and extend each ray. Classify each angle as *right*, *acute*, or *obtuse*. Then use a protractor to measure the angle to the nearest degree.



a. $\angle MJP$

$\angle MJP$ is marked as a right angle, so, $m\angle MJP = 90^\circ$

b. $\angle LJP$

Point L on angle $\angle LJP$ lies on the exterior of right angle $\angle MJP$, so, $\angle LJP$ is an obtuse angle. Use your protractor to measure $m\angle LJP = 105^\circ$

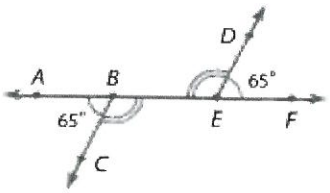
c. $\angle NJP$

Point N on angle $\angle NJP$ lies on the interior of right angle $\angle MJP$, so $\angle NJP$ is an acute angle.

Use protractor $m\angle NJP = 20^\circ$

2 Congruent Angles Just as segments that have the same measure are congruent segments, angles that have the same measure are *congruent angles*.

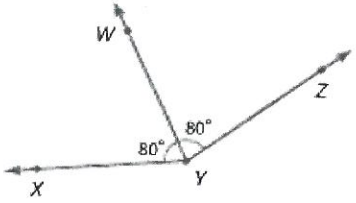
In the figure, since $m\angle ABC = m\angle FED$, then $\angle ABC \cong \angle FED$. Matching numbers of arcs on a figure also indicate congruent angles, so $\angle CBE \cong \angle DEB$.



You can produce an angle congruent to a given angle using a construction.

StudyTip
Segments A line segment can also bisect an angle.

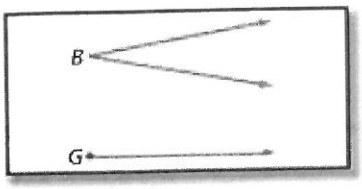
A ray that divides an angle into two congruent angles is called an **angle bisector**. If $\overrightarrow{YW}$ is the angle bisector of $\angle XYZ$, then point W lies in the interior of $\angle XYZ$ and $\angle XYW \cong \angle WYZ$.



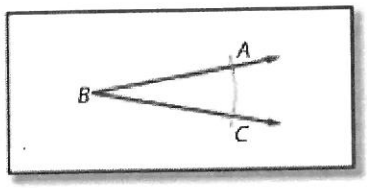
Just as with segments, when a line, segment, or ray divides an angle into smaller angles, the sum of the measures of the smaller angles equals the measure of the largest angle. So in the figure, $m\angle XYW + m\angle WYZ = m\angle XYZ$.

Construction Copy an Angle

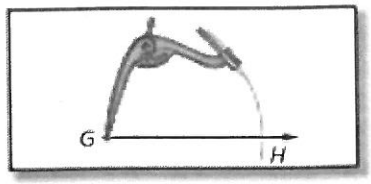
Step 1 Draw an angle like $\angle B$ on your paper. Use a straightedge to draw a ray on your paper. Label its endpoint G.



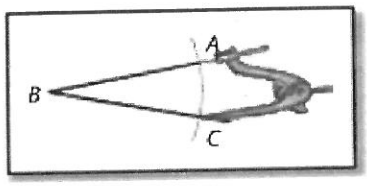
Step 2 Place the tip of the compass at point B and draw a large arc that intersects both sides of $\angle B$. Label the points of intersection A and C.



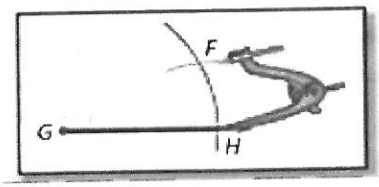
Step 3 Using the same compass setting, put the compass at point G and draw a large arc that starts above the ray and intersects the ray. Label the point of intersection H.



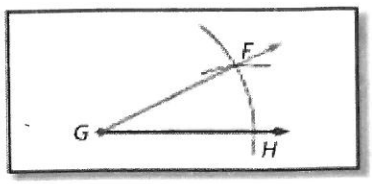
Step 4 Place the point of your compass on C and adjust so that the pencil tip is on A.



Step 5 Without changing the setting, place the compass at point H and draw an arc to intersect the larger arc you drew in Step 4. Label the point of intersection F.



Step 6 Use a straightedge to draw $\overrightarrow{GF}$. $\angle ABC \cong \angle FGH$



Follow all the steps above and draw angle FGH which has same measure with angle B below.

ALL PARTS NEED TO BE COMPLETED! SHOW WORK! NO WORK = 0 GRADE!!!

KEEP THIS NOTES IN YOUR BINDER. IF YOU LOOSE IT = 0 GRADE!!!