

Ray

A set of points that is part of a line. It has one endpoint and extends infinitely in one direction.

Angle

A geometric figure made up of two rays with a common endpoint called a vertex

Vertex

A point common to both sides of an angle

Adjacent angle

An angle that shares a vertex and a common side with another angle

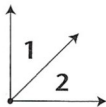
Geometric figures exist in many shapes and sizes. Two such figures are rays and angles. A **ray** is a set of points that is a part of a line. It has one endpoint and extends infinitely in one direction.

An **angle** is a geometric figure formed by two rays that share a common endpoint called the **vertex**.

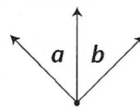
The symbol \angle is used to designate an angle. Any angle can be read or named two ways. The angle at the right can be named $\angle ABC$ or $\angle CBA$. Note that the vertex, B , is always the middle letter.

Angles are sometimes named by one letter or number.

$\angle 1$ and $\angle 2$



$\angle a$ and $\angle b$

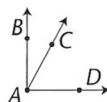


The basic unit of angle measure is the degree ($^\circ$).

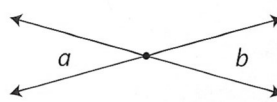
The measure of an angle is used to classify angles.

Measure (m) in degrees	Picture	Name of Angle
$0^\circ < m < 90^\circ$		acute
$m = 90^\circ$		right
$90^\circ < m < 180^\circ$		obtuse
$m = 180^\circ$		straight

Angles that share a common vertex and a common side are called **adjacent angles**.



$\angle BAC$ is adjacent to $\angle DAC$.



$\angle a$ is not adjacent to $\angle b$.

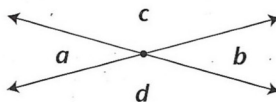
Vertical angles

Pairs of opposite angles formed by intersecting lines. Vertical angles have the same measure.

Complementary angles

Two angles whose sum of their measures is 90°

Vertical angles are opposite pairs of angles formed when two lines intersect.

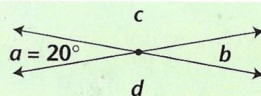


$\angle a$ and $\angle b$ are vertical angles. $\angle c$ and $\angle d$ are vertical angles.

It is possible to compute angle measures.

EXAMPLE 1

Given $m\angle a = 20^\circ$, find the measure (m) of $\angle b$, $\angle c$, and $\angle d$.



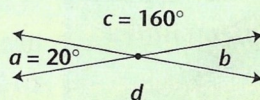
Step 1

Find the measure of $\angle c$. Recall that the measure of a straight angle is 180° . Since $\angle a$ and $\angle c$ are adjacent and form a straight angle, $m\angle a + m\angle c = 180^\circ$.

$$20^\circ + m\angle c = 180^\circ$$

$$m\angle c = 180^\circ - 20^\circ$$

$$m\angle c = 160^\circ$$



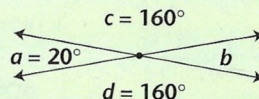
Step 2

Find the measure of $\angle d$. Since $\angle a$ and $\angle d$ are adjacent and form a straight angle, $m\angle a + m\angle d = 180^\circ$.

$$20^\circ + m\angle d = 180^\circ$$

$$m\angle d = 180^\circ - 20^\circ$$

$$m\angle d = 160^\circ$$



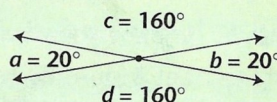
Step 3

Find the measure of $\angle b$. Since $\angle d$ and $\angle b$ are adjacent and form a straight angle, $m\angle d + m\angle b = 180^\circ$.

$$160^\circ + m\angle b = 180^\circ$$

$$m\angle b = 180^\circ - 160^\circ$$

$$m\angle b = 20^\circ$$

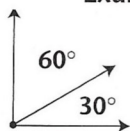


Recall that $\angle a$ and $\angle b$ are vertical angles. So are $\angle c$ and $\angle d$. Vertical angles have the same measure.

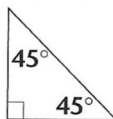
The measure of a circle is 360° .
The measure of a straight line is 180° .

If the sum of the measures of two angles is 90° , the angles are **complementary angles**. Angles do not have to be adjacent to be complementary.

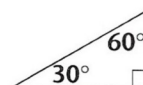
Examples of Complementary Angles



$$60^\circ + 30^\circ = 90^\circ$$



$$45^\circ + 45^\circ = 90^\circ$$

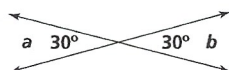
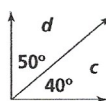
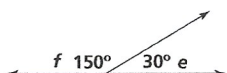


$$30^\circ + 60^\circ = 90^\circ$$

Angles and Angle Measure

EXAMPLE

Identify angle pairs.

 $\angle a$ and $\angle b$ are *vertical* angles. $\angle c$ and $\angle d$ are *complementary* angles. $\angle e$ and $\angle f$ are *supplementary* angles.

Directions Describe each pair of angles. Use one of the following words:
vertical, complementary, supplementary.

Diagram 1

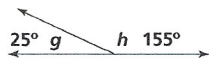
1. $\angle g$, $\angle h$ _____2. $\angle p$, $\angle q$ _____

Diagram 2



Diagram 3

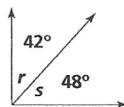
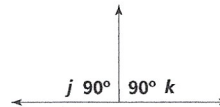
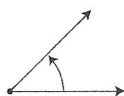
3. $\angle r$, $\angle s$ _____4. $\angle j$, $\angle k$ _____

Diagram 4

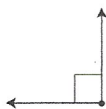
**EXAMPLE**Study these angles. The letter *m* stands for *measure of*.

Acute angle



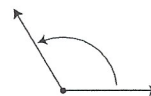
$0^\circ < m < 90^\circ$

Right angle



$m = 90^\circ$

Obtuse angle



$90^\circ < m < 180^\circ$

Directions Refer to diagrams 1–4 on this page and answer the questions.

5. Is $\angle g$ acute? _____8. Is $\angle j$ a right angle? _____6. Is $\angle r$ a right angle? _____9. Is $\angle k$ acute? _____7. Is $\angle h$ obtuse? _____10. Is $\angle s$ acute? _____