

Lesson 2.1 Angles & Congruence

Wednesday, September 23, 2026 11:14 PM

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Lesson 2.1
Angles an...

Lesson 2.1 Angles and Congruence

Workbook pages 61-66



Content Objective

Students identify and use angles,
angle parts, and special angle pairs.

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Florida's B.E.S.T. Standards for Mathematics

MA.912.GR.1.6

Solve mathematical and real-world problems involving congruence or similarity in two-dimensional figures.

MA.912.GR.5.1

Construct a copy of a segment or an angle.

MA.912.GR.5.2

Construct the bisector of a segment or an angle, including the perpendicular bisector of a line segment.

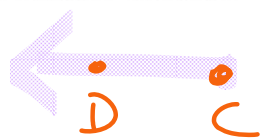
McGraw Hill | Angles and Congruence

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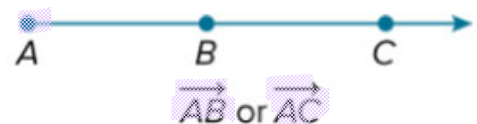
Learn Angles

Lines and portions of lines intersect to form angles.

A **ray** is the part of a line consisting of a point on the line, called the *endpoint of the ray*, together with all of the collinear points on one side of the endpoint.



Ray $\overrightarrow{CD}$



Rays are named by stating the endpoint first and then another point on the ray.



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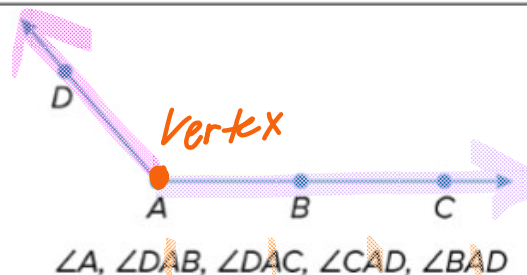
Learn Angles

Two collinear rays with a **Line** common endpoint are **opposite rays**. Opposite rays form a **straight angle**, which has a measure of **180°**.



$\overrightarrow{BA}$ and $\overrightarrow{AC}$ are opposite rays.

An **angle** is a pair of rays that have a common endpoint.
point A

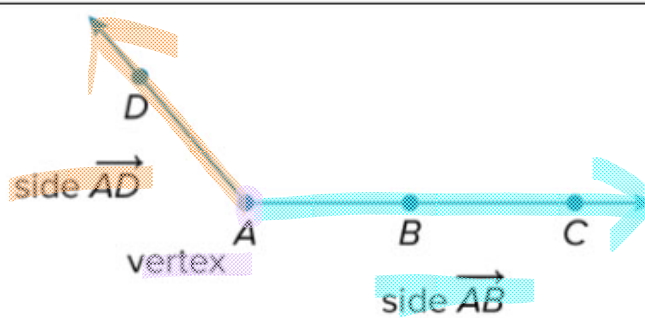


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Learn Angles

The rays are called **sides** of the angle. The common endpoint is the **vertex**.



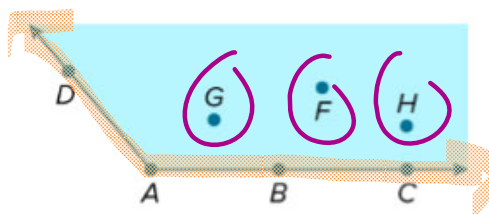
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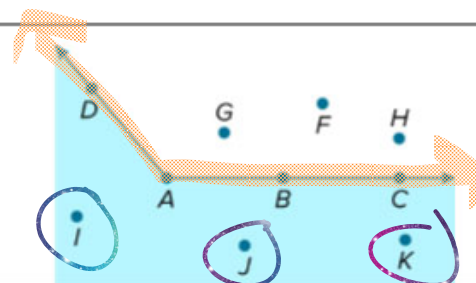
Learn Angles

An angle divides a plane into three distinct parts.

Points D , A , B , and C lie on the angle. Points G , F , and H lie in the **interior** of the angle. (inside)



Points I , J , and K lie in the **exterior** of the angle. (outside)



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Example 1 Identify Angles

Use the figure to identify the angles or parts of angles that satisfy each given condition.

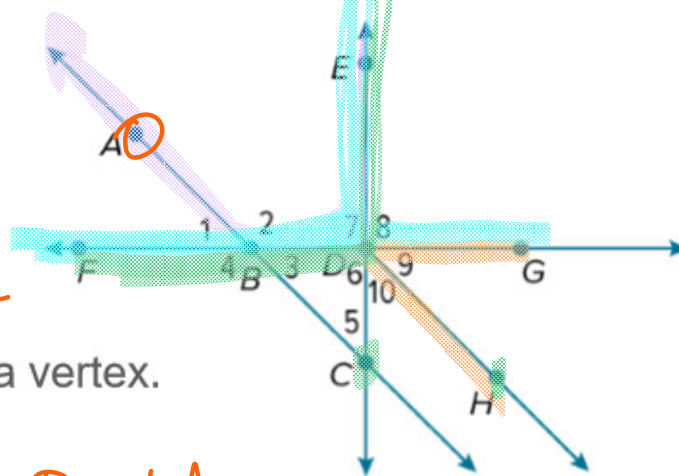
$\angle EDG$ $\angle EDB$ $\angle GDH$

a. Name all the angles that have D as a vertex.

b. Name the sides of $\angle 2$. $\overrightarrow{BA}$ $\overrightarrow{BD}$

c. Name a point in the interior of $\angle FDE$. Point A

d. Name all of the points in the exterior of $\angle FDE$. C



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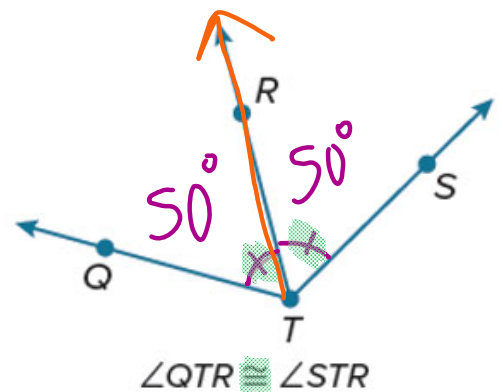
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Learn

Congruent Angles

The measure of an angle is the measure in degrees of the space between the sides of the angle. Angles that have the same measure are **congruent angles**. Congruent angles are indicated on the figure by a matching number of arcs.

$$\angle QTS = 100^\circ$$



$\vec{TR}$ bisects $\angle QTS$



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Learn

Congruent Angles

A ray or segment that divides an angle into two congruent angles is an **angle bisector**. You can create the angle bisector of any angle without knowing the measure of the angle.



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Example 2

Congruent Angles and Angle Bisectors

In the figure, $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays and $\overrightarrow{BD}$ bisects $\angle ABE$. If

$m\angle ABD = (4x + 14)^\circ$ and

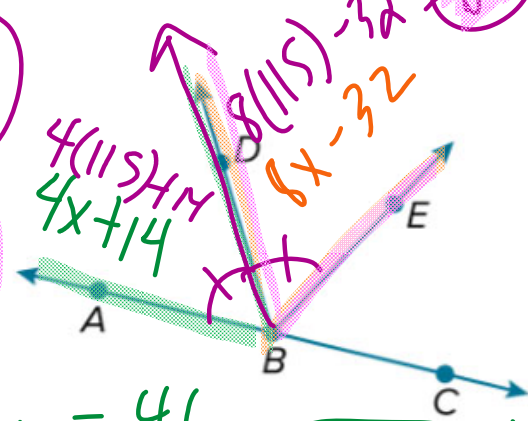
$m\angle DBE = (8x - 32)^\circ$, find $m\angle DBE$.

$$\begin{array}{r} 4x + 14 = 8x - 32 \\ -4x \quad -4x \\ \hline 14 = 4x - 32 \end{array}$$

$$\begin{array}{r} 14 = 4x - 32 \\ +32 \quad +32 \\ \hline 46 = 4x \end{array}$$

$$\frac{4x}{4} = \frac{46}{4}$$

$$x = 11.5$$



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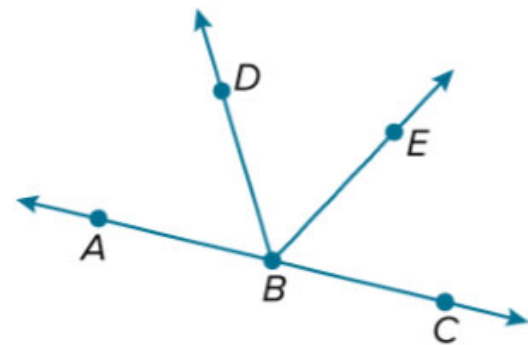
Example 2

Congruent Angles and Angle Bisectors

We can solve for this in two steps. First, solve for x . Then find $m\angle DBE$.

Step 1 Solve for x .

Because $\overrightarrow{BD}$ bisects $\angle ABE$, $\angle ABD \cong \angle DBE$. By the definition of congruence, the measures of these angles are equal.



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Example 2

Congruent Angles and Angle Bisectors

Check

In the figure, $\overrightarrow{KJ}$ and $\overrightarrow{KM}$ are opposite rays, and $\overrightarrow{KN}$ bisects $\angle JKL$. If $m\angle JKN = (8x - 13)^\circ$ and $m\angle NKL = (6x + 11)^\circ$, find $m\angle JKN$.

$$6x + 11 = 8x - 13$$

$$+13 \quad +13$$

$$6x + 24 = 8x$$

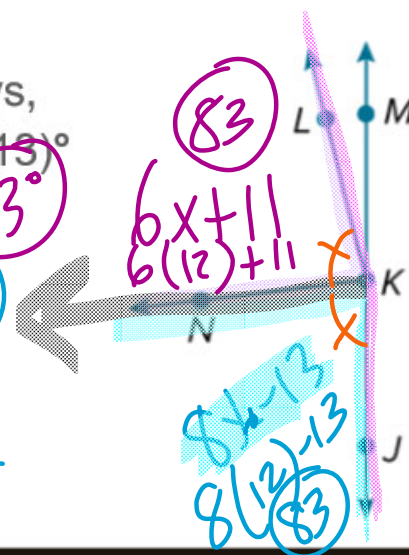
$$-6x \quad -6x$$

$$24 = 2x$$

$$\frac{24}{2} = \frac{2x}{2}$$

$$12 = x$$

$$12 = x$$



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Learn

Special Angle Pairs

Special Angle Pairs

Special Angle Pair Definition	Examples	Nonexamples
Adjacent angles are two angles that lie in the same plane, have a common vertex and a common side, but have no common interior points. (next to)	$\angle 1$ and $\angle 2$ are adjacent angles.	separate



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Learn

Special Angle Pairs

Special Angle Pairs

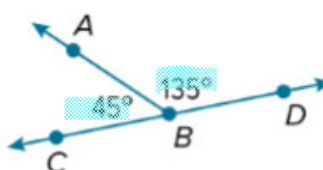
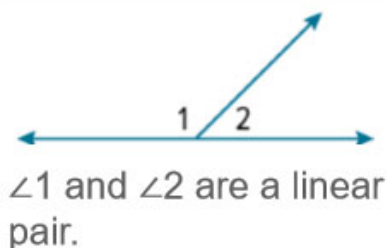
Special Angle Pair Definition

A **linear pair** is a pair of adjacent angles with noncommon sides that are **opposite rays**.

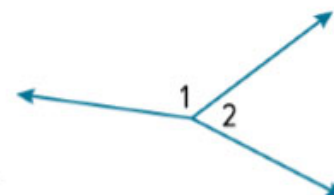
make a line

The sum of the angle measures is 180° .

Examples



Nonexamples



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Learn

Special Angle Pairs

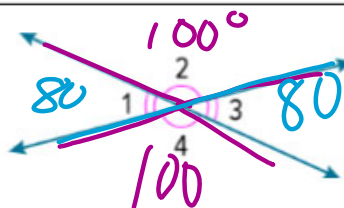
Special Angle Pairs

Special Angle Pair Definition

Vertical angles are the two nonadjacent angles formed by two intersecting lines.

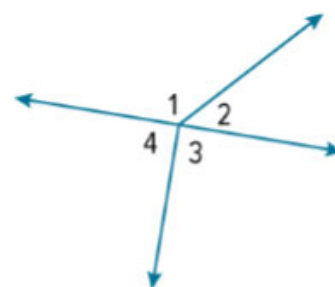
Vertical angles are **congruent**.

Examples



$\angle 1$ and $\angle 3$ are vertical angles. $\angle 2$ and $\angle 4$ are vertical angles.

Nonexamples



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Example 3

Vertical Angles and Angle Pairs

HOME DECOR The office lamp is made using two intersecting metal bars.

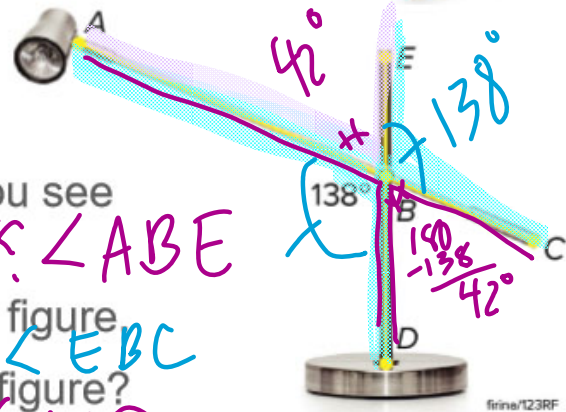
a. How many pairs of adjacent angles do you see in the figure? List two pairs.

b. Identify two pairs of vertical angles in the figure.

c. How many linear pairs do you see in the figure? List each pair.

d. Find $m\angle EBC$.

e. Find $m\angle ABE$.



$\angle ABD \neq \angle ABE$

$\angle ABD \neq \angle EBC$

$\angle DBC \neq \angle ABD$



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Example 3

Check Vertical Angles and Angle Pairs

PARK A city planner is designing a park. He wants to place two pathways that intersect near the center of the park. If $m\angle GED = 88^\circ$, identify the true statement(s).

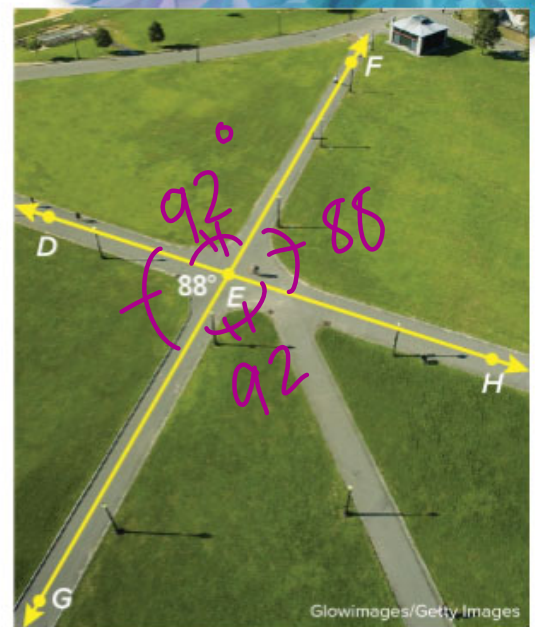
A. $m\angle DEF = 92^\circ$

B. $m\angle DEG = 92^\circ$

C. $m\angle FEH = 88^\circ$

D. $m\angle DEH = 92^\circ$

E. $m\angle GEH = 88^\circ$



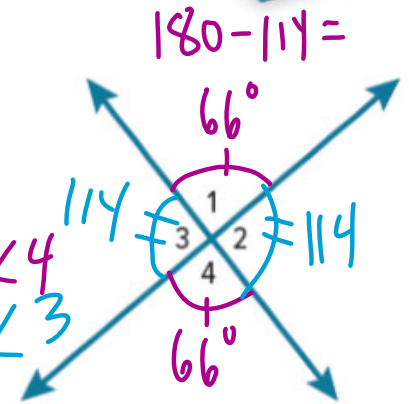
Students choose an option

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Exit Ticket

Use the figure.

1. $\angle 1$ and what other angle(s) are vertical angles?
2. $\angle 2$ and what other angle(s) are vertical angles?
3. $\angle 4$ is adjacent to what other angle(s)?
4. $\angle 1$ and what other angle(s) form a linear pair?
5. If $m\angle 2 = 114^\circ$, then what are $m\angle 1$, $m\angle 3$, and $m\angle 4$?



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