

Module 1c: Angles & their Measure

Math Practice(s):

- Use appropriate tools strategically
- Attend to precision

Learning Target(s):

- Identify, define, & draw representations of geometric objects using symbolic notation.
- Understand & apply the Angle Addition Postulate, & determine the measures of angles in a given diagram.

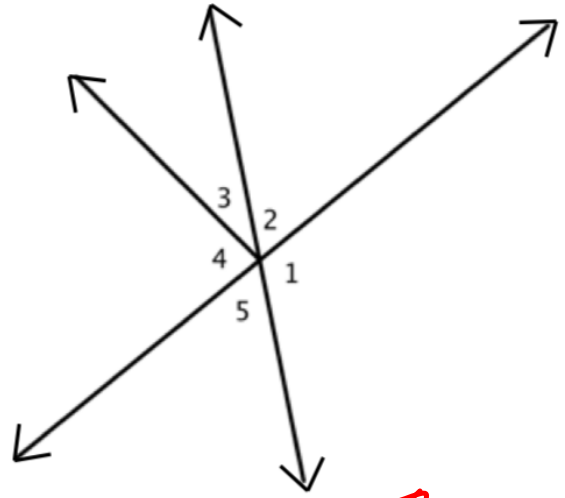
Homework:

HW #3: 1c #1-9

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Angles

1. The figure to the right contains 5 rays (part of a line containing 1 endpoint) and all the points on one side of the endpoint). These rays intersect at a common point forming the 5 angles that are labeled. Work with a partner to discuss the questions below and write down what you discussed.

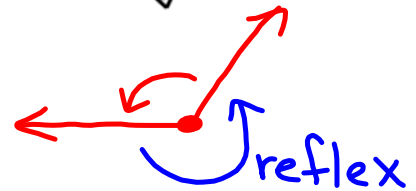


A. Which angle is the smallest? How do you know?

$\angle 3$, it is acute

B. Which angle is the biggest? How do you know?

$\angle 1$, it is obtuse



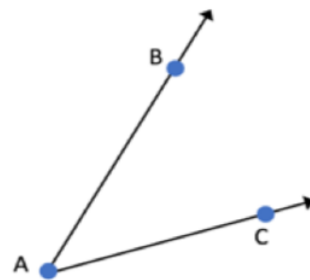
C. Do any angles look to be “the same”? What do you think is meant by “the same”?

$\angle 5 \cong \angle 2$, they appear to have the same measurement.

An **angle** is formed by two rays that share a common endpoint.

• When two rays, \overrightarrow{AB} and \overrightarrow{AC} , share the common endpoint, A, then we can name the angle formed either $\angle BAC$ or $\angle CAB$. **or $\angle A$.**

• The measure of an angle is indicated by $m\angle$.



3. Use a protractor to determine the measure of the 5 angles shown in the figure below.

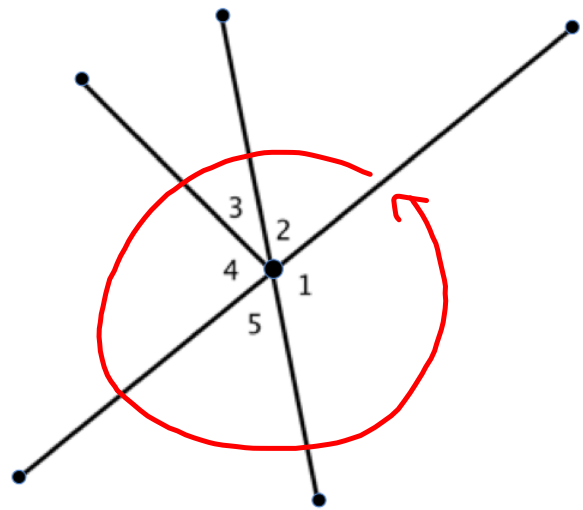
A. $m\angle 1 = \underline{118^\circ}$

B. $m\angle 2 = \underline{62^\circ}$

C. $m\angle 3 = \underline{34^\circ}$

D. $m\angle 4 = \underline{84^\circ}$

E. $m\angle 5 = \underline{62^\circ}$

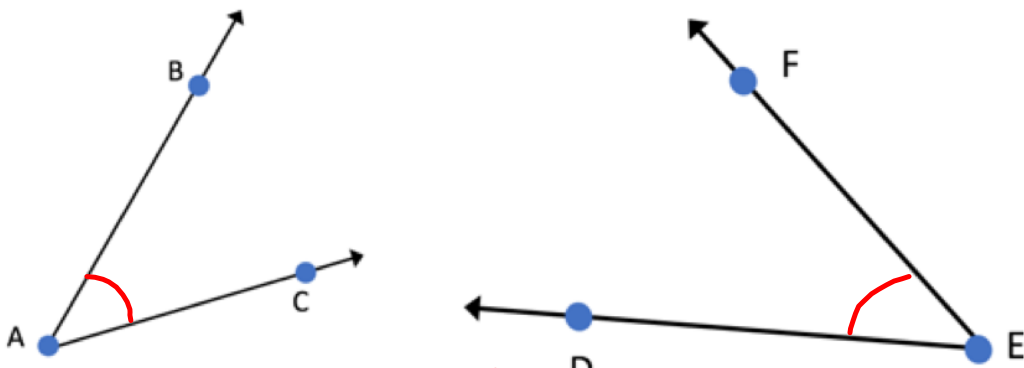


circle = 360°

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Two angles are **congruent** if they have the same angle measure.

- For example, if $m\angle BAC = m\angle DEF$, then $\angle BAC$ is congruent to $\angle DEF$
- Using symbols, we can write this relationship as $\angle BAC \cong \angle DEF$.



"arcs" show that \angle 's are \cong .

Are there any congruent angles in the diagram above?

Since $m\angle 2 = m\angle 5$,
 $\angle 2 \cong \angle 5$.

4. Working with a partner, in your own words write a definition of each type of angle listed in the table. Then, draw 2 different examples of each type of angle.

	Definition	Two Examples
Right Angle	An angle = to 90°	
Acute Angle	An angle smaller than 90°	
Obtuse Angle	An angle larger than 90° , but smaller than 180°	
Straight Angle	An angle = to 180°	

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Adjacent Angles and the Angle Addition Postulate

The exact measurements for the diagram are:

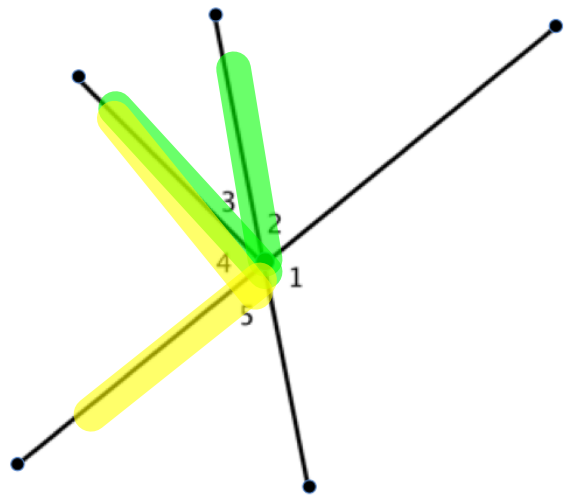
A. $m\angle 1 = \underline{118^\circ}$

B. $m\angle 2 = \underline{62^\circ}$

C. $m\angle 3 = \underline{36^\circ}$

D. $m\angle 4 = \underline{82^\circ}$

E. $m\angle 5 = \underline{62^\circ}$



Adjacent Angles are angles who share a common vertex and side.

List all pairs of adjacent angles.

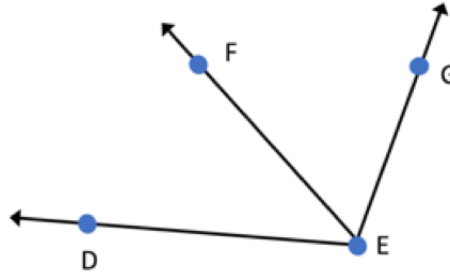
- $\angle 3 \text{ \& } \angle 4$
- $\angle 2 \text{ \& } \angle 3$
- $\angle 2 \text{ \& } \angle 1$
- $\angle 1 \text{ \& } \angle 5$
- $\angle 4 \text{ \& } \angle 5$

erase to show

The **Angle Addition Postulate** says that if $\angle DEF$ and $\angle FEG$ are adjacent angles, then

$$m\angle DEF + m\angle FEG = m\angle DEG.$$

- In other words, the measures of 2 adjacent angles have a sum that is equal to the measure of the bigger angle they create.



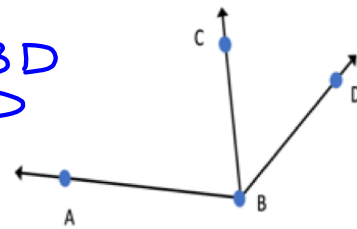
5. Use the following angles to answer the below questions about angle measures.

- A. If $m\angle ABC = 79.3^\circ$ and $m\angle CBD = 27.6^\circ$, what is $m\angle ABD$?

$$m\angle ABC + m\angle CBD = m\angle ABD$$

$$79.3 + 27.6 = m\angle ABD$$

$$m\angle ABD = 106.9^\circ$$



- B. If $m\angle ABC = 69.5^\circ$ and $m\angle ABD = 120^\circ$, what is $m\angle CBD$?

$$m\angle ABC + m\angle CBD = m\angle ABD$$

$$69.5 + m\angle CBD = 120$$

$$m\angle CBD = 50.5^\circ$$

- C. If $m\angle ABC = 2x$, $m\angle CBD = x$, and $m\angle ABD = 99$, what is $m\angle ABC$ and $m\angle CBD$?

$$m\angle ABC + m\angle CBD = m\angle ABD$$

$$2x + x = 99$$

$$3x = 99$$

$$x = 33$$

$$m\angle ABC = 2x \quad m\angle CBD = x$$

$$m\angle ABC = 2(33) \quad m\angle CBD = 33^\circ$$

$$m\angle ABC = 66^\circ$$

6. Write the definition for each the following and draw a diagram (including angle measures) that represents your definition.

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	Definition	Example
Complementary Angles	2 angles whose sum is 90°	<p>adj. comp.</p>
Supplementary Angles	2 angles whose sum is 180°	<p>adj. supp. \rightarrow linear pair</p>
Perpendicular Lines	2 lines that intersect to form right \angle s	<p>$GB \perp SP$</p>
Angle Bisector	A segment that divides an angle into two $\cong \angle$ s	<p>LP bisects $\angle GLS$ $\angle LGLP \cong \angle LPLS$</p>

7. Identify a relationship between the given angles, if any. Then, find the value of the variable.

A. *(adj. supp. or linear pair)*

$$m\angle GJK + m\angle HKJ = 180$$

$$119 + x = 180$$

$$\begin{array}{r} -119 \\ -119 \end{array}$$

$$\boxed{x = 61}$$

B. *(adj. comp.)*

$$m\angle LOM + m\angle MON = 90$$

$$3x + 6 + 48 = 90$$

$$3x + 54 = 90$$

$$\begin{array}{r} -54 \\ -54 \end{array}$$

$$\frac{3x = 36}{3 \quad 3}$$

$$\boxed{x = 12}$$

C. *(no relationship)*

$$m\angle PTQ + m\angle QTR + m\angle RTS = 180$$

$$5x + 4 + x - 2 + 3x + 7 = 180$$

$$9x + 9 = 180$$

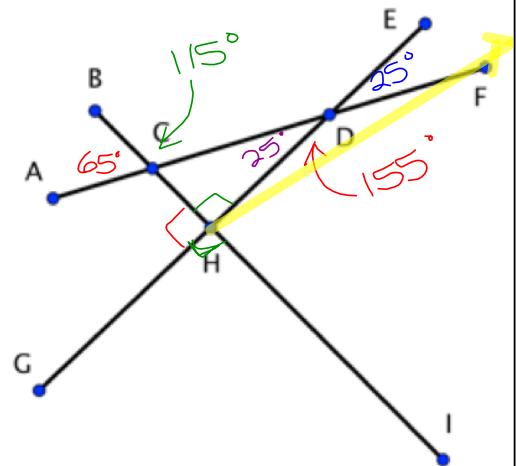
$$\begin{array}{r} -9 \\ -9 \end{array}$$

$$\frac{9x = 171}{9 \quad 9}$$

$$\boxed{x = 19}$$

Practice

7. In the diagram to the right, \overline{GE} and \overline{BI} are perpendicular to each other, $m\angle ACB = 65^\circ$ and $m\angle FDH = 155^\circ$. Determine the following angle measures.



A. $m\angle BCD = 115^\circ$
 $m\angle BCA + m\angle BCD = 180$

B. $m\angle GHI = 90^\circ$ $\overline{GE} \perp \overline{BI}$

C. $m\angle EDF = 25^\circ$
 $m\angle EDF + m\angle FDH = 180$

D. $m\angle CDH = 25^\circ$
 $m\angle CDH + m\angle FDH = 180$

E. $m\angle BHD = 90^\circ$ $\overline{GE} \perp \overline{BI}$

F. $m\angle DHI = 90^\circ$ $\overline{GE} \perp \overline{BI}$

G. In the diagram above, draw \overline{HF} . If $m\angle FHI$ is four times larger than $m\angle FHD$, what is $m\angle FHI$? Show or explain how you determined your answer.

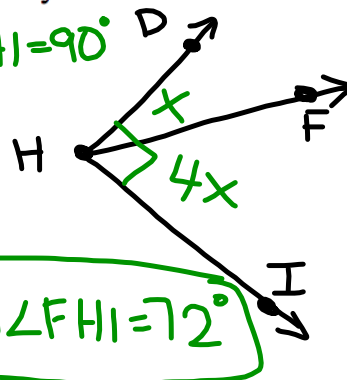
$(m\angle FHD)4 = m\angle FHI$

$m\angle DHI = 90^\circ$

$m\angle FHD + m\angle FHI = 90$

$x + 4x = 90$

$5x = 90 \rightarrow x = 18$



$m\angle FHI = 72^\circ$

H. Identify three pairs of adjacent angles.

Answers vary (here are a few)

$\angle ACB \text{ \& } \angle BCD$ $\angle IHD \text{ \& } \angle DHC$

$\angle GHC \text{ \& } \angle CHD$ $\angle EDF \text{ \& } \angle FDH$

I. Name the angle in the diagram that is adjacent and supplementary to $\angle ACH$.

$\angle ACB$ or $\angle HCD$

J. Name the angle in the diagram that is congruent, but NOT adjacent to $\angle GHI$.

$\angle CHD$