**Math 1312**
**Sections 1.2, 1.3, and 1.4**
**Informal Geometry and Measurement; Early Definitions and Postulates; Angles and Their Relationships**

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**Undefined Terms (set, point, line, plane)**

- A _____, which is represented as a dot, has location but not size.

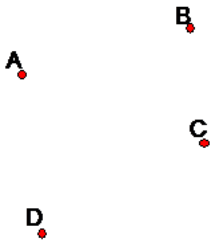
  We use upper case letters to name points.

- A _____ is an infinite set of points. Notation: $\overleftrightarrow{AB}$

  Given any 3 distinct points on the same line, they are said to be **collinear**.

  Notation: $A - X - B$

**Example 1:**



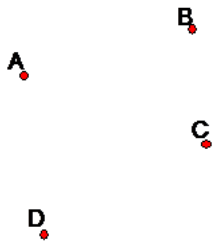

_____ is an unproved assumption.

**Postulate:** Through two distinct points there is exactly one line

**Postulate:** If two lines intersect, then they intersect at a point.

**Example:** How many lines can be drawn through

1. point *A*?
2. both points *A* and *B*?
3. all three points *A*, and *B*, and *C* ?
4. points *A*, and *B*, and *C* ?
5. Where do $\overleftrightarrow{BD}$ and $\overleftrightarrow{CD}$ intersect?



A _____ is part of a line. It consists of two distinct points and all points between them.

Notation: $\overline{AB}$, where $A$ and $B$ are the _____.

To **measure** segments we use rulers. Remember that there is a margin of error each time we use such a device.

**Ruler Postulate:** The measure of any line segment is a unique positive number.

Segments that have the same length are called _____. Notation: $\overline{AB} \cong \overline{CD}$

In diagrams, we use identical tick marks to indicate congruent segments.

**Segment-Addition Postulate:** If $X$ is a point of $\overline{AB}$ and $A - X - B$, then $AX + XB = AB$.

**Definition:** The _____ of a line segment is the point that separates the line segment into two congruent parts.

**Theorem:** The midpoint of a line segment is unique.

**Example:** $M$ is the midpoint of the segment $AB$. $AB = 3x + 24$ and $MB = 7x + 1$. Find $x$ and the length of the segment $AM$.

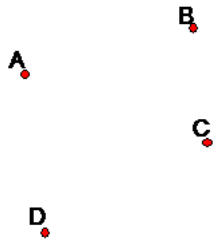
**Example:** $M$ is the midpoint of the segment $AB$. $AM = 3x + 4$ and $MB = x + 38$. Find $x$ and the length of the segment $AB$.

**Example:**
$M$ is the midpoint of the segment $AB$ and $N$ is the midpoint of the segment $BM$. Find $AB$, if $MN = 3$.

**Definition:** A _____ is made up of points and is straight. It begins at an endpoint and extends infinitely in one direction. Notation: $\overrightarrow{AB}$

_____ rays are two rays that share a common endpoint and their union is a straight line.

**Example:** Draw rays $\overrightarrow{AB}$ and $\overrightarrow{AD}$. Are they opposite rays?




**Definition:** An _____ is union of two rays that share a common endpoint.
Notation: $\angle ABC$

The common point is called the _____ of the angle.

The rays are called _____of the angle.

To **measure** angles we use a **protractor**. An angle's measure does not depend on the lengths of its sides.
Angles are measured in **degrees.** If the measure of an angle is 90. We write $m\angle ABC = 90^{\circ}$

_____ angles are angles that have the same measure.

**Example:** $\angle ABC \cong \angle PQR$ means $m\angle ABC = m\angle PQR$

**Angle - Addition Postulate:** If a point *D* lies in the interior (between the sides) of the angle $\angle ABC$ , then $m\angle ABD + m\angle DBC = m\angle ABC$.

**Draw a figure**

- An angle whose measures less than $90^\circ$ is an _____.
- An angle whose measures exactly $90^\circ$ is a _____.
- An angle whose measures exactly $180^\circ$ is a _____ .
- If an angle measures between $90^\circ$ and $180^\circ$ it is an _____.
- A _____ is one whose measure is between $180^\circ$ and $360^\circ$.

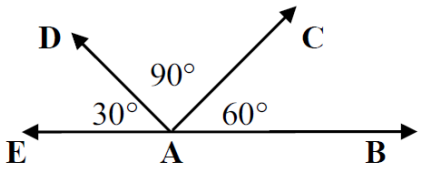
**Example:** Use the following figure to find

a) Straight angle

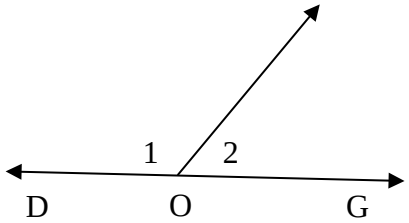
b) Right angle

c) Acute angle

d) Obtuse angle




**Example:** $\angle DOG$ is a straight angle. If the $m\angle 2 = 65^\circ$ what is $m\angle 1$ ?



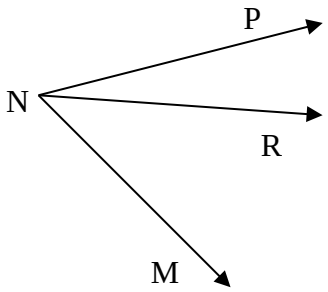

**Definitions:**

- The _____ of an angle is the ray that separates the given angle into two congruent angles.
- Two angles are _____ **angles** if the sum of their measures is $90^\circ$ . Each angle in the pair is known as the **complement** of the other angle.
- Two angles are _____ **angles** if the sum of their measures is $180^\circ$ . Each angle in the pair is known as the **supplement** of the other angle.

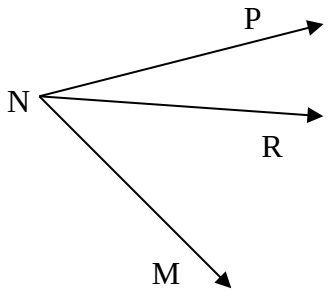
**Theorem:** There is one and only one angle bisector for any given angle.

**Examples:**

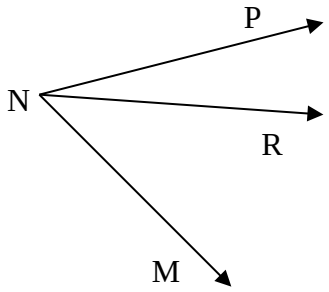
a) If $m\angle MNP = 76^\circ$ and $m\angle MNR = 47^\circ$, find $m\angle PNR$.




b) If $m\angle MNP = 76^\circ$ and $\overrightarrow{NR}$ bisects $\angle MNP$, find $m\angle PNR$.




c) Find $x$, if $m\angle PNR = 2x + 9$ and $m\angle RNM = 3x - 2$, and $m\angle PNM = 67^\circ$.




**More Examples:**

a) If $m\angle A = (2x)^\circ$, and $m\angle B = (x - 6)^\circ$, and $\angle A$ and $\angle B$ are complementary, find $x$ and the measure of each angle.

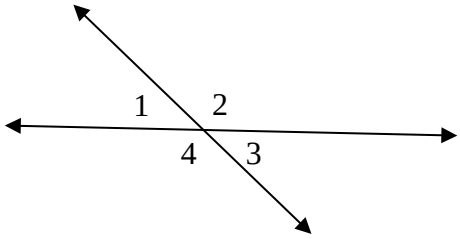
b) If $m\angle A = (2y - 9)^\circ$ and $m\angle B = (7y)^\circ$ the m $\angle$B = (7y)° $\angle A$ and $\angle B$ are supplementary, find $x$ and the measure of each angle.

**Definitions:**

- The two angles are _____ if they have a common vertex and a common side between them.
- When two straight lines intersect, the pairs of nonadjacent angles in opposite positions are known as _____ **angles**.

**Example:** List all the pairs of adjacent and vertical angles.

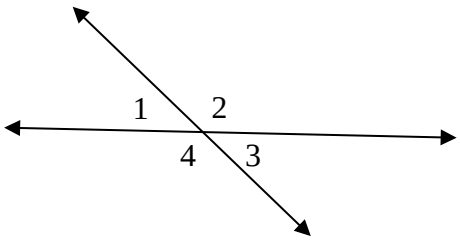
| **Adjacent** | **Vertical** |
|---|---|
| | |
| | |
| | |
| | |



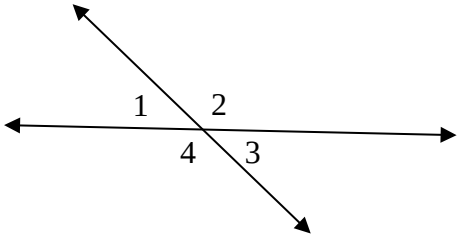

**Theorem:** Vertical angles are congruent.

**Examples:**

a) If $m\angle 4 = 97^\circ$, find the measures of all other angles.



b) If $m\angle 1 = (x + 8)^\circ$ and $m\angle 2 = (2x - 23)^\circ$, find $x$ and the measures of all four angles.




**Example:** Use the figure to find the measure of all the angles 1 -7.
Hint: $m\angle 3 + m\angle 5 + m\angle 6 = 180^\circ$.