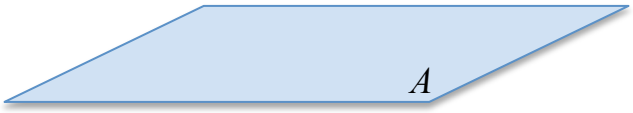
Geometry
Points, Lines, and Planes
YAY MATH!

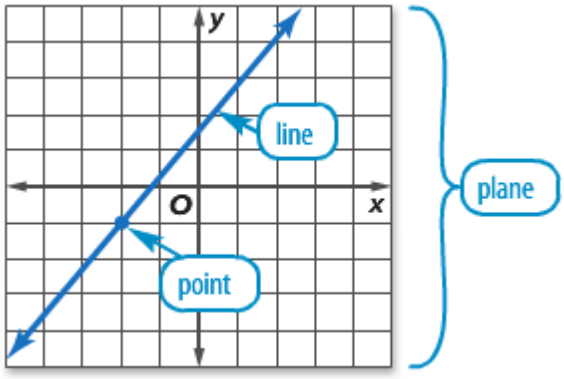
The introduces these new concepts exercises. Print this sheet and work along with us!

Representation of a point… then a line… then a plane:

Draw a line on plane *A*, then through plane *A*



Points, Lines, and Planes classwork

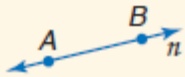


Undefined Terms in Geometry:

- **Point**: A particular location. Points have no size.

  - A point is named by _____.

- **Line**: Lines extend indefinitely and have neither thickness nor width.



  - Please name the line above in three ways.

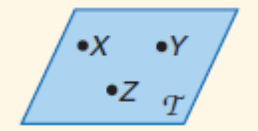
    1) _____

    2) _____

    3) _____

  - **Collinear**: points on the _____ line

- **Plane**: A flat surface that extends indefinitely in all directions and having no thickness.



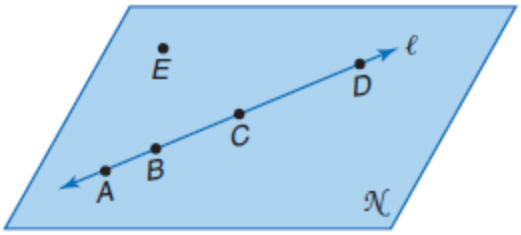
  - Named in one of two ways.

    1) _____

    2) _____

  - **Coplanar** : points on the _____

Ex #1: Use the figure to name each of the following.



a) A line containing point *A*

b) A plane containing point *C*

c) A point collinear with points *A* and *C*.

Ex #2: Name the geometric shape modeled by each object.

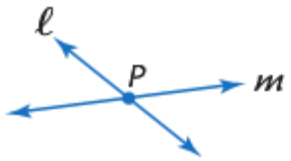
a) a 10×12 patio

b) a telephone wire

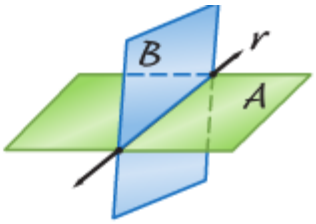
c) a star in the sky

Intersections of Lines and Planes:

The ***intersection*** of two geometric figures is the set of all points they have in common.



P represents the intersection of lines ℓ and m.



Line r represents the intersection of planes A and B.

Ex#3: Draw a figure of a plane with one line on the plane and a second line intersecting both plane and the first line.

Ex #4: Draw and label a figure for each relationship.

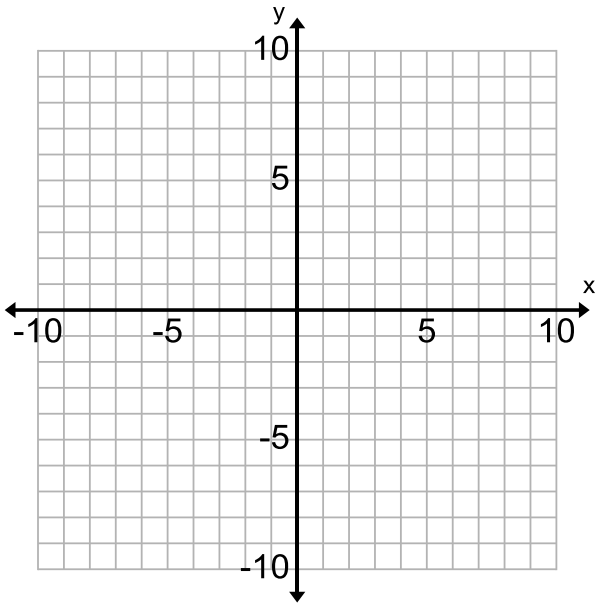
a) Lines $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at point *P*.

b) $\overleftrightarrow{TU}$ lies in plane *Q* and contains point *R*.

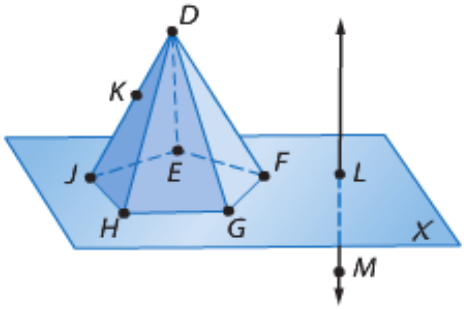
Ex#5: Draw a figure on the graph below.

a) $\overleftrightarrow{QR}$ on a coordinate plane contains $Q(-2, 4)$ and $R(4, -4)$. Add point T so that T is collinear with these points.

b) Add any point S that is non-collinear with these points.



Ex#6: Refer to the figure below to answer the following questions.



a) How many planes are pictured in the figure?

b) Name three colinear points.

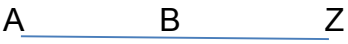
c) Name the intersection of plane HDG and plane X.

d) At what point does line LM and plane X intersect?

e) Where do lines JH and DG intersect?

Geometry
Linear Measure
YAY MATH!

The video covers the following exercises. Print this sheet and work along!



What does “congruent” mean?

Find the variable and ST if S is between R and T.

RS = 2x
ST = 3x
RT = 25

Linear Measure classwork

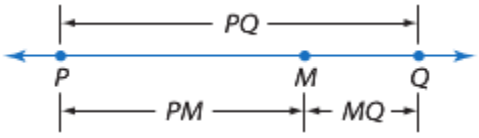
What is or is not above a pair of letters is meaningful in geometry!

Line $\overleftrightarrow{AB}$

Segment $\overline{AB}$

Measure AB (distance between points A & B)

- **Betweenness**



Example: Point M is between points P & Q only if P, Q, and M are collinear.

Create an equation with the line segments above: ____ + ____ = _____

Ex #1: Find y and QP if P is between Q and R, $QP = 2y$, $QR = 3y + 1$, and $PR = 21$.

Ex #2: Find x and BC if B is between A and C, $AC = 4x - 12$, $AB = x$, and $BC = 2x + 3$

YayMath.org

Algebra – Distance Formula

The video covers the following exercises. Please print this sheet and work along!

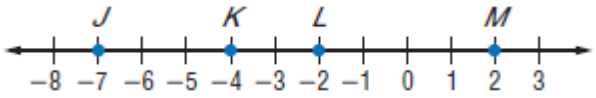
Please find the distance between (5, -1) and (11, 7).

Please find the distance between (2, 2) and (5, -1).

Please find the value of ‘a’, for the points (4, 7) and (a, 3), when the distance between the points is 5.

Distance classwork

Ex #1: Use the number line to find each measure



a) KM b) JM

c) KL d) JL

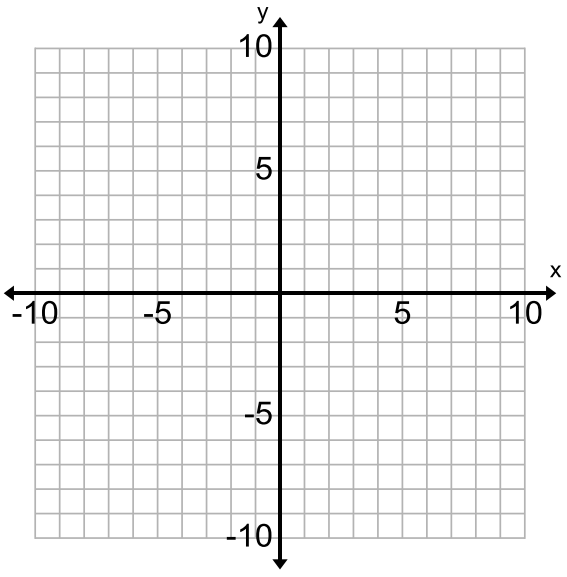
Notice how the space between the points is technically the **difference** between the numbers?

On a Coordinate Plane

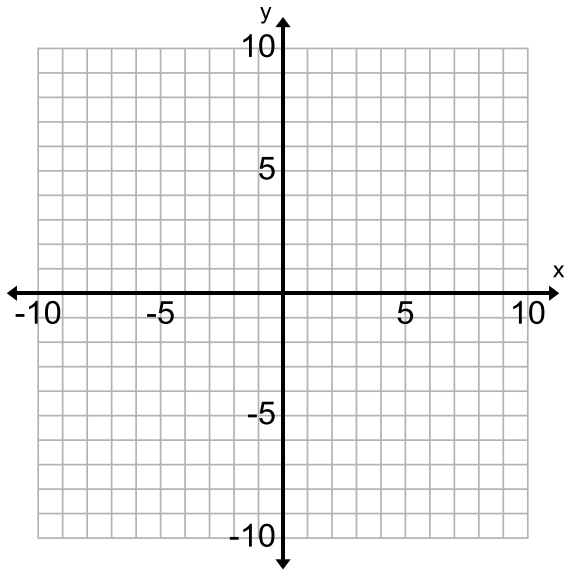
- Method 1 – Pythagorean Theorem
  - Graph points
  - $a^2 + b^2 = c^2$
- Method 2 – Distance formula $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Ex #2: Use the Pythagorean Theorem to find the distance between each pair of points.

a) $R(5, 1)$, $S(-3, -3)$



b) $E(-4, 1)$, $F(3, -1)$



Ex #3: Use the Distance Formula to find the distance between each pair of points.

a) $D(-5, 6)$, $E(8, -4)$

b) $G(2, 0)$, $H(8, 6)$

c) $J(0, 0)$, $K(6, 8)$

d) $K(6, 8)$, $J(0, 0)$

Did you notice that problems c) and d) were the same points in reverse? This means that the distance between J and K **is the same as the distance** between K and J.

In other words, it doesn't matter what point is used for x1 and y1. That's good news!

Also think about this: the formula *squares* the difference. Isn't it true that:

$$8 - 5 \neq 5 - 8$$

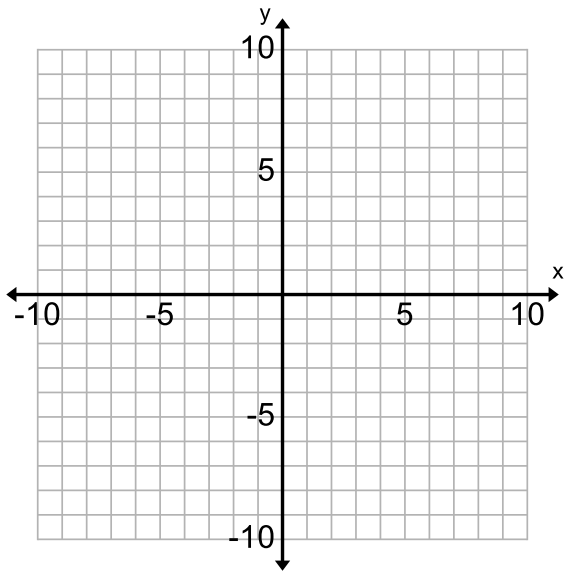
But

$$(8 - 5)^2 = (5 - 8)^2$$

Geometry
Midpoint
YAY MATH!

The video introduces these new concepts. Print this sheet and work along with us!

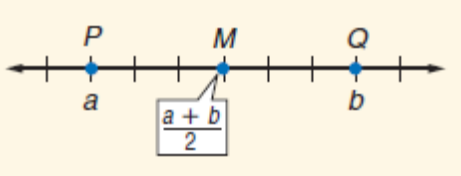
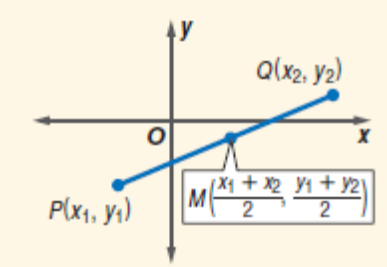
What is the midpoint of (2,5) and (-4,-3)?



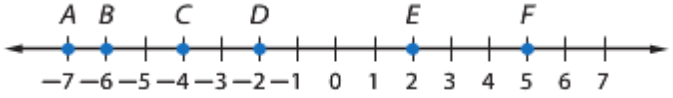
B is the midpoint of AC.

A (-1,6)
B (3,4)
C ?

Midpoint classwork

Definition of Midpoint	The midpoint between two points is their "average" x and y values. That would make sense, because the average is right in the middle!
Midpoint Formulas	1. On a number line $\frac{a+b}{2}$  2. On a coordinate plane $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ 

Ex #1: Use the number line below to find the middle, or "average" of each measure.



a) *AD* b) *BE* c) *FA*

Ex #2: Find the coordinates of the midpoint of a segment having the given endpoints.

a) *J*(-1, 2), *K*(6, 1) b) *A*(5, 12), *B*(-4, 8)

Ex #3: Find the coordinates of *X* if *Y*(-1, 6) is the midpoint of $\overline{XZ}$ and *Z* has coordinates (2, 8).

Geometry
Angle Measure
YAY MATH!

The video introduces these new concepts. Print this sheet and work along with us!

Please draw the angles seen in the video, label it, and name it in various ways.

Suppose _____ is an angle bisector. Mark the two equal angles in your sketch.

Solving for x:

Acute angle:

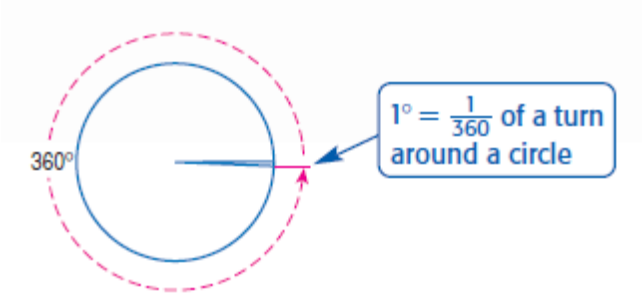
Right angle:

Obtuse angle:

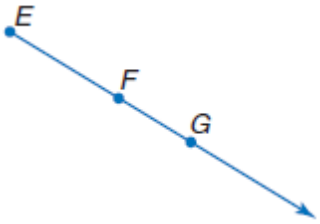
What is the basic difference between “equal” and “congruent” ?

Angle Measure classwork

- ***Degree***: $\frac{1}{360}$ of a turn around a circle



- ***Ray***: part of a line
    - It has one endpoint and extends indefinitely in one direction.
    - Rays are named stating the endpoint first then any other point on the ray.



Please name 2 different rays: _____ & _____

- ***Opposite rays***: two rays extending from a common point on a line

- ***Angle***: a figure consisting of two noncollinear _____ with a common_____
    - *Vertex* – the common_____ of the rays of an angle
    - *Sides* – the _____ forming an angle

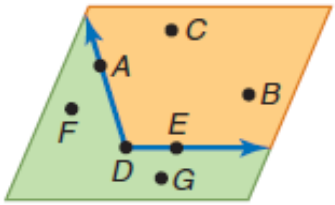
Angles:

An angle separates a plane into three distinct parts

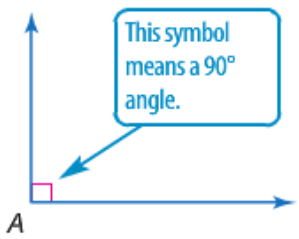
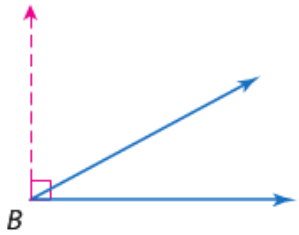
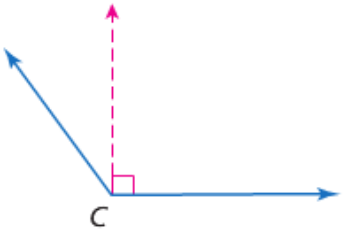
- *Interior*
- *Exterior*
- The angle itself

Naming angles

- Use a single _____ or _____
- Triplet of _____ (center letter is the vertex) if there is any possible ambiguity regarding angle to which you refer.



KeyConcept Classify Angles

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

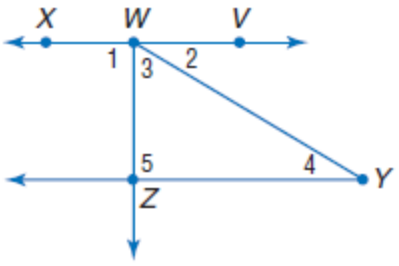
Ex #2: Use the figure to answer the following.

a) Name all the angles that have W as a vertex.

b) Name the sides of $\angle 1$.

c) Write another name for $\angle WYZ$.

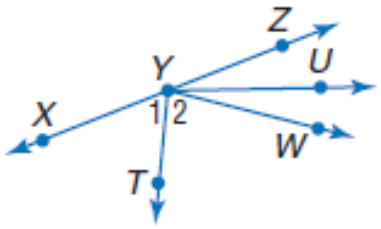
d) Name a pair of opposite rays.



- ***Congruent angles***: angles that have the same measure.
    - Arcs on the figure indicate which angles are congruent.
    - If $m\angle ABC = m\angle DEF$, then it is said that $\angle ABC \cong \angle DEF$.

- ***Angle bisector*****:** a ray that divides an angle into _____ is called an angle bisector.

Ex #3: In the figure, $\overrightarrow{YX}$ and $\overrightarrow{YZ}$ are opposite rays.
$\overrightarrow{YU}$ bisects $\angle ZYW$
$\overrightarrow{YT}$ bisects $\angle XYW$.



a) If $m\angle 1 = 5x + 10$ and $m\angle 2 = 8x - 23$, find $m\angle 2$.

b) If $m\angle WYZ = 82$ and $m\angle ZYU = 4r + 25$, find *r.*

c) If $\angle ZYW$ is a right angle and $m\angle ZYU = 13a - 7$, find *a*.

Geometry
Angle Relationships
YAY MATH!

Students will be able to complete the following problems after watching the video:

Vocabulary:

Adjacent angles –

Linear pair –

Supplementary angles –

Complementary angles –

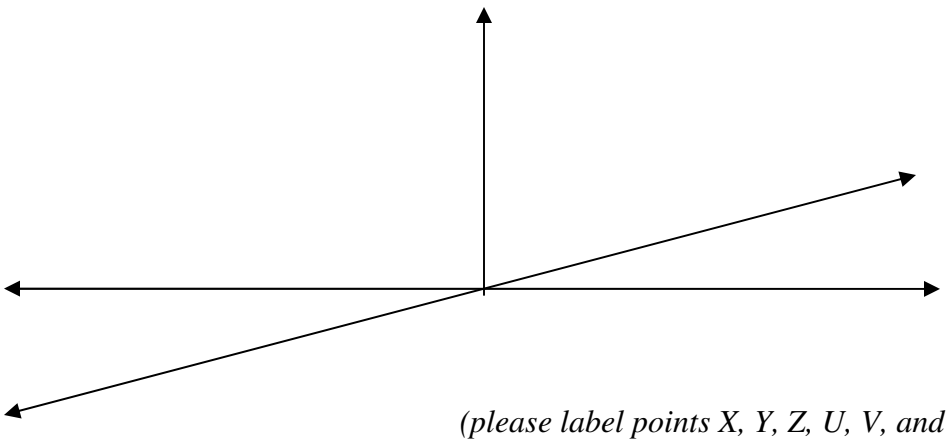
Acute angle –

Obtuse angle –

Vertical angles –

$\angle WZV = 2x - 3$
$\angle VZU = 3x - 7$
$\angle WZV =$

$\angle VZU = 3x - 7$
$\angle UZY = 6x - 2$
$\angle UZY =$



(please label points X, Y, Z, U, V, and W from video)

Angle Relationships classwork

- ***Adjacent angles****:* angles in a plane that have a common _____and a common _____, but no common interior points. Please draw an example:

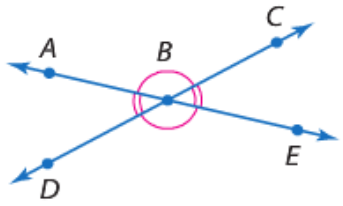
- ***Linear pair***: adjacent angles whose non-common sides are opposites rays. Please draw an example:

- ***Vertical angles***: two nonadjacent angles formed by two intersecting lines. Please draw an example:

KeyConcept Angle Pair Relationships

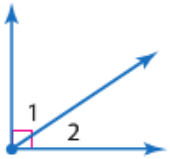
Vertical angles are congruent.

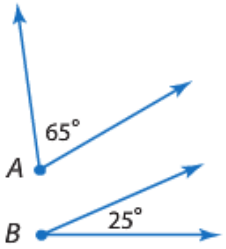
Examples $\angle ABC \cong \angle DBE$ and $\angle ABD \cong \angle CBE$



Complementary angles are two angles with measures that have a sum of 90.

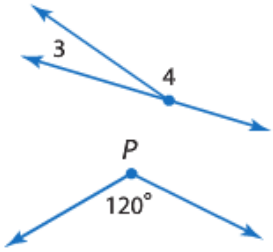
Examples $\angle 1$ and $\angle 2$ are complementary.
$\angle A$ is complementary to $\angle B$.

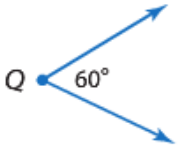




Supplementary angles are two angles with measures that have a sum of 180.

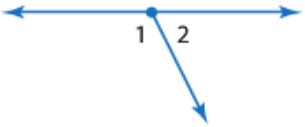
Examples $\angle 3$ and $\angle 4$ are supplementary.
$\angle P$ and $\angle Q$ are supplementary.





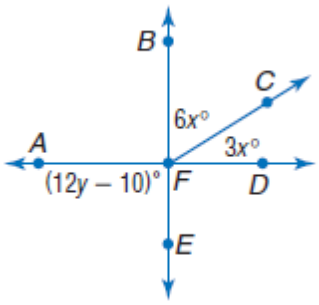
The angles in a linear pair are supplementary.

Example $m\angle 1 + m\angle 2 = 180$



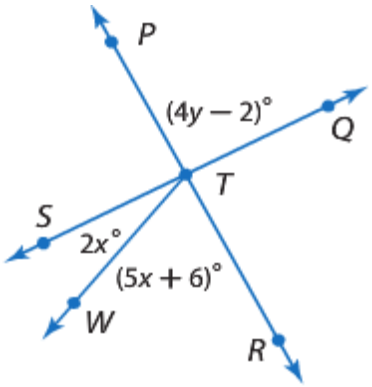
Ex #1: Find the measures of two complementary angles if the difference in the measures of the two angles is 12.

Ex #2: Find *x* and *y* so that $\overrightarrow{BE}$ and $\overrightarrow{AD}$ are perpendicular.



Perpendicular Lines: lines that intersect to form right angles. The symbol is: ⊥

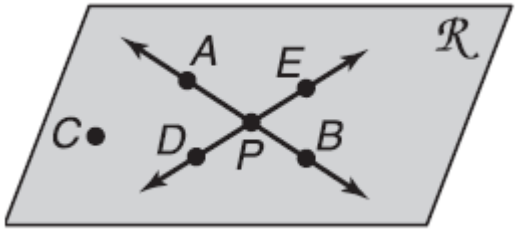
Ex#3: Find x and y so that $\overleftrightarrow{PR}$ and $\overleftrightarrow{SQ}$ are perpendicular.



Geometry
Chapter 1 Practice Test

Name _____
Date _____ Period _____

Refer the following figure for problems 1 - 5.



1) Name a point that is collinear with points *D* and *P*. 1) _____

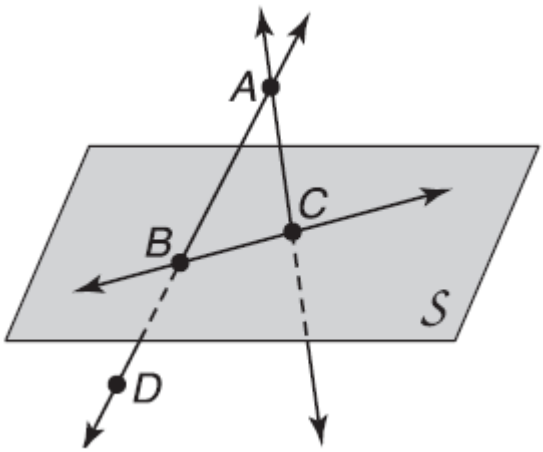
2) Name a point that is noncollinear with points *A* and *B*. 2) _____

3) What is another name for plane *R*? 3) _____

4) What is another name for $\overrightarrow{BP}$? 4) _____

5) What is the intersection of $\overleftrightarrow{AB}$ and $\overleftrightarrow{DE}$? 5) _____

Refer the following figure for problems 6 - 9.



6) What is the intersection of plane *S* and $\overleftrightarrow{BC}$? 6) _____

7) What is the intersection of plane *S* and $\overleftrightarrow{AD}$? 7) _____

8) Name three points that are coplanar. 8) _____

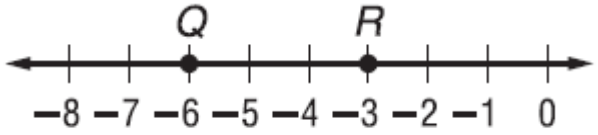
9) Are points *A*, *B*, and *C* coplanar? 9) _____

Use the following information for numbers 10 and 11.
Point G is between points H and K, $HG = x + 2$, $GK = 4x$, and $HK = 8x - 7$

10) Find the value of x. 10) _____

11) Find the length of HK. 11) _____

Use the number line for problems 12 & 13.



12) Find the midpoint of $\overline{QR}$ 12) _____

13) Find the measure of QR. 13) _____

Use the points $A(2,2)$ and $B(7,4)$ for problems 14 & 15.

14) Find the coordinates of the midpoint of AB. 14) _____

15) Find the distance between A and B. *Answers can be left in radical form or a decimal rounded to the nearest tenth place.* 15) _____

---

16) $Y(-2,2)$ is the midpoint of $\overline{XZ}$. If Z has coordinates (2, 8), find the coordinates for X. 16) _____

Determine whether each statement is true or false.

17) Any three points are coplanar. 17) _____

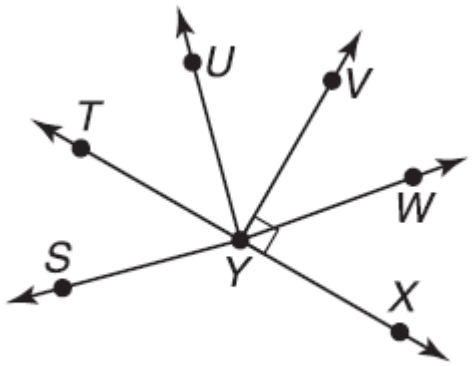
18) An acute angle has no complement. 18) _____

19) All adjacent angles are congruent. 19) _____

20) All vertical angles are congruent. 20) _____

21) If D is between M and T, then $MD = DT + MT$. 21) _____

Refer to the following figure for problems 22 – 30.



22) Name a pair of vertical angles. 22) _____

23) Name the angle that is complementary to $\angle VYW$. 23) _____

24) Name a right angle. 24) _____

25) Name a linear pair. 25) _____

26) Is $\overline{VY} \perp \overline{TX}$? 26) _____

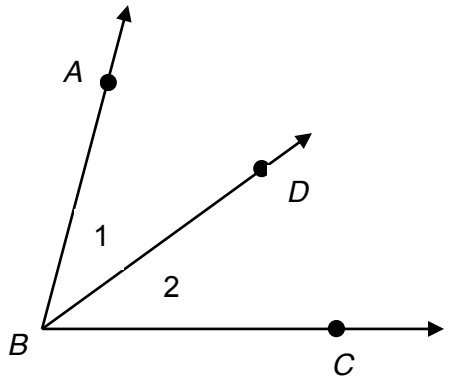
27) Name the sides of $\angle SYT$. 27) _____

28) Name the vertex of $\angle TYW$. 28) _____

29) Name a pair of opposite rays. 29) _____

30) If $m\angle VYW = 4x + 8$, $m\angle WYX = 6x + 2$, find the value of x. 30) _____

Refer to the following figure for problems 31 – 34.



31) Find the value of x if $m\angle ABC = 7x$, $m\angle 1 = 2x + 5$, & $m\angle 2 = 3x - 1$. 31) _____

32) If $\overrightarrow{BD}$ bisects $\angle ABC$, $m\angle ABD = 5x - 10$ & $m\angle DBC = 3x + 8$, find $m\angle ABC$. 32) _____

33) If $\angle ABC$ is a right angle, then what type of angle is $\angle ABD$? 33) _____

34) If $\angle ABC$ is a right angle and $\overrightarrow{BD}$ bisects $\angle ABC$, what is $m\angle ABD$? 34) _____

---

35) Find the measures of two supplementary angles if the measure of one angle is five times its supplement. 35) _____