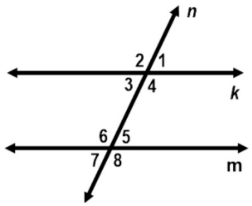
1. Alternate Exterior Angles Proof: *Complete the proof by filling in the missing reasons*

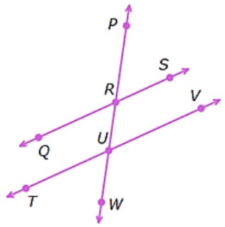
Given: line m || line k **Prove**: ∠2 ≅ ∠8

Statements	Reasons
1. line m || line k	1. Given
2. ∠2 ≅ ∠6	2. corresp
3. ∠6 ≅ ∠8	3. vert
4. ∠2 ≅ ∠8	4. Trans.



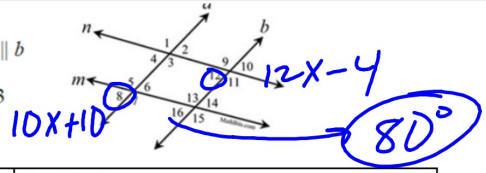
2. **Given:** $\overleftrightarrow{QS} \parallel \overleftrightarrow{TV}$ **Prove:** $m\angle PRQ + m\angle TUW = 180°$

Statements	Justifications
$\overleftrightarrow{QS} \parallel \overleftrightarrow{TV}$	Given
$\angle TUW \cong \angle QRU$	corresp ∠s
$m\angle PRQ + m\angle QRU = 180°$	∠
$m\angle PRQ + m\angle TUW = 180°$	subst.



3. Given: $m \parallel n$ and $a \parallel b$

Prove: $\angle 3 \cong \angle 13$



Statements	Justifications
$m \parallel n$ and $a \parallel b$	Given
$m\angle 3 + m\angle 12 = 180°$	SSI
$m\angle 12 + m\angle 13 = 180°$	+ m∠13 SSI
$m\angle 3 + m\angle 12 = m\angle 12$	Transitive Property
$m\angle 3 = m\angle 13$	Subtraction Property
$\angle 3 \cong \angle 13$	Definition of Congruence

4. In the diagram for #3, $m\angle 8 = 10x + 10$ and $m\angle 12 = 12x - 4$, what is $m\angle 16$?

$10x + 10 = 12x - 4$

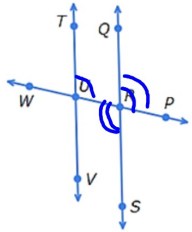
$10 = 2x - 4$

$14 = 2x$

$x = 7$

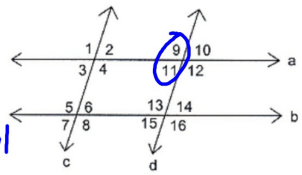
5. **Given:** $\angle SRU \cong \angle RUT$ **Prove:** $\overleftrightarrow{QS} \parallel \overleftrightarrow{TV}$

Statements	Justifications
$\angle SRU \cong \angle RUT$	Given
$\angle PRQ \cong \angle SRU$	vert. ∠s
$\angle RUT \cong \angle PRQ$	Trans.
$\overleftrightarrow{QS} \parallel \overleftrightarrow{TV}$	Corresp ∠s



6. **Given:** $a \parallel b$ **Prove:** $\angle 9$ and $\angle 14$ are supplementary

Statements	Justifications
$a \parallel b$	Given
$m\angle 9 + m\angle 11 = 180°$	Def of Suppl $\angle$s.
$\angle 11 \cong \angle 14$	Alternate Interior Angles
$m\angle 9 + m\angle 14 = 180°$	Subst
$\angle 9$ & $\angle 14$ are Suppl	LP

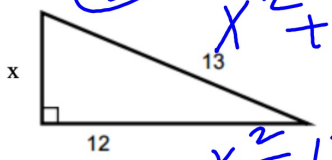


Find each missing side.

1. x = 5

$a^2+b^2=c^2$

$x^2+12^2=13^2$



$x^2=13^2-12^2$

$x^2=169-144$

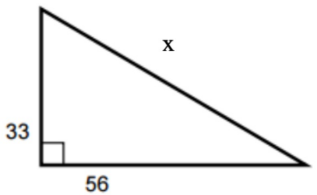
$x^2=25$

2. x = 85

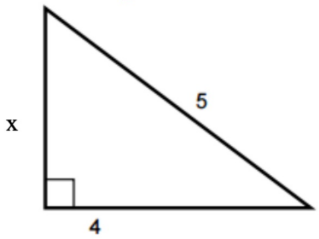
$13^2+84^2=x^2$

$7225=x^2$

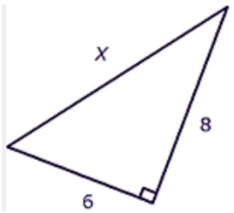
3. x = 65



4. x = 3



5. x = 10

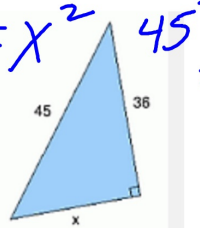


6. x = 27

$64+36=x^2$

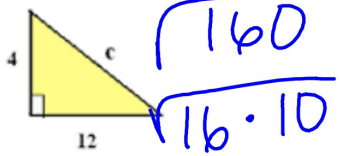
$45^2=36^2$

$=x^2$



Find each missing length. If necessary, leave your answer in simplest radical form.

7. c = $4\sqrt{10}$

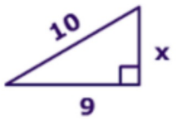


$16+144$

$\sqrt{160}$

$\sqrt{16 \cdot 10}$

8. x = $\sqrt{19}$

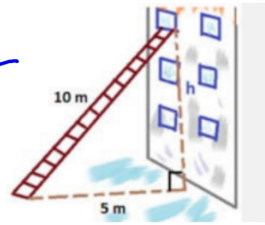


$\sqrt{19}$

4
9
16
25
36
49

9. A ladder is leaning against a building, as show to the right. How high up the building does the ladder rise? Leave your answer in simplest radical form.

h = $5\sqrt{3}$



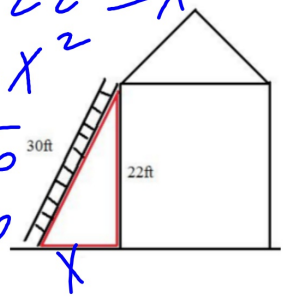
$10^2 - 5^2$

$\sqrt{75}$

$\sqrt{25 \cdot 3}$

10. A ladder is leaning against a building, as shown to the right. How far is the base of the ladder from the building? Leave your answer in simplest radical form.

Distance = $4\sqrt{26}$



$30^2 - 22^2 = x^2$

$416 = x^2$

$x = \sqrt{416}$

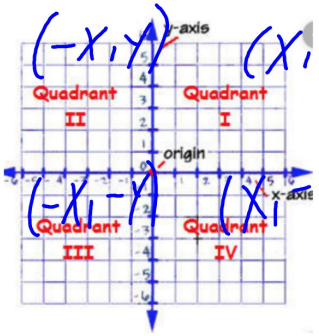
$\sqrt{16 \cdot 26}$

H. Geometry Topic 14: The Coordinate Plane

Objective 1: Finding Distance on the Coordinate Plane

Recall that a point is a dot and a line is a series of points. In coordinate geometry, you describe a point by an ordered pair (x, y) called the location of the point.

Review of the Coordinate Plane



$(-x, y)$ (x, y)

$(-x, -y)$ (x, y)

The distance between two points on the same horizontal or vertical line can be found quite easily by just count units However, to find the distance of two points that are not on the same horizontal or vertical line, you must use the distance formula.

The Distance Formula

The distance d between two points A(x_1, y_1) and B(x_2, y_2) is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

*The distance formula is a derivation of the Pythagorean Theorem.

Example 1: Find the distance between each pair of points to the nearest tenth.

A) T(5, 2) and R(-4, -1)

$x_1 y_1 \quad x_2 y_2$

$$d = \sqrt{(5 - -4)^2 + (2 - -1)^2}$$

$$d = \sqrt{81 + 9}$$

$$= \sqrt{90} \approx 9.5$$

B) A(1, -3) and B(-4, 4)

$x_1 y_1 \quad x_2 y_2$

$$d = \sqrt{74}$$

$$= 8.6$$

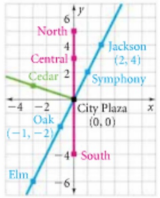
C) In either of the above examples, does it matter which point is first? Explain.

NO

$(5 - 3)^2$

$(3 - 5)^2$

Example 2: Each morning Juanita takes the "Blue Line" subway from Oak Station to Jackson Station. As the map below shows, Oak Station is 1 mile west and 2 miles south of City Plaza. Jackson Station is 2 miles east and 4 miles north of City Plaza.



A) Find the distance Juanita travels between Oak Station and Jackson Station.

(-1, -2) (2, 4) $d = 6.7$ mi

B) Find the distance between Elm Station and Symphony Station.

(-3, -6) (1, 2) $d \approx 8.9$ mi

C) Maple Station is located 6 miles west and 2 miles north of City Plaza. Find the distance between Cedar Station and Maple Station.

M (-6, 2)

C (-3, 1)

$\sqrt{10}$

$d \approx 3.2$ mi

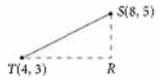
Objective 2: The Midpoint of a Segment

To find the coordinate of the mid of a segment on a number line, find the _____ or _____ of the coordinates of the endpoints. Recall that a midpoint is literally a *middle point.*

The midpoint of $\overline{AB}$ is $\overline{AM} = \overline{MB}$

We can extend this process to find the coordinates of the midpoint of a segment that is in the coordinate plane.

$$m = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$



Study the diagram of $\overline{TS}$ with endpoints T(4, 3) and S(8, 5). Can you find the midpoint of $\overline{TS}$ using the idea from the previous page?

$M_{\overline{TS}} = (6, 4)$

$\left(\frac{4+8}{2}, \frac{3+5}{2}\right)$

The Midpoint Formula

The coordinates of the midpoint M of $\overline{AB}$ with endpoints A(x_1, y_1) and B(x_2, y_2) are:

$$M_{\overline{AB}} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

Example 3: Find the midpoint of each segment given the endpoints.

A) Given that Q(3, 5) and S(7, -9), find the midpoint of $\overline{QS}$.

$M_{\overline{QS}} = (5, -2)$

B) Find the coordinates of the midpoint of $\overline{XY}$ with endpoints X(2, -5) and Y(6, 13).

$M_{\overline{XY}} = (4, 4)$

The next example shows how to find one of the endpoints if given an endpoint and the midpoint.

Example 4:

A) The midpoint of $\overline{AB}$ is M(3, 4). One of the endpoints is A(-3, -2). Find the coordinates of B.

Method 1: use the midpoint formula **Method 2: use algebra**

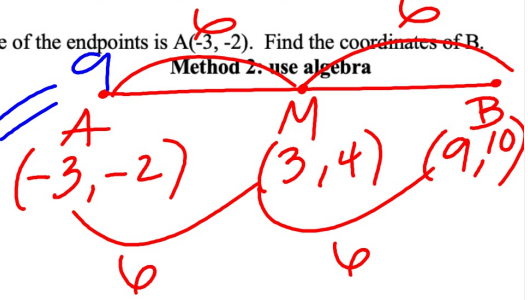
$3 = \frac{-3 + x}{2}$

$6 = -3 + x$

$4 = \frac{-2 + y}{2}$

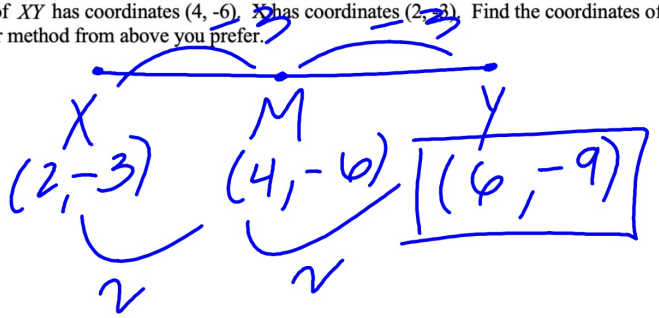
$8 = -2 + y$

$y = 10$



(9, 10)

B) The midpoint of $\overline{XY}$ has coordinates (4, -6). X has coordinates (2, -3). Find the coordinates of Y. Use whichever method from above you prefer.



Hwk #36 - Distance & Midpoint Practice Worksheet