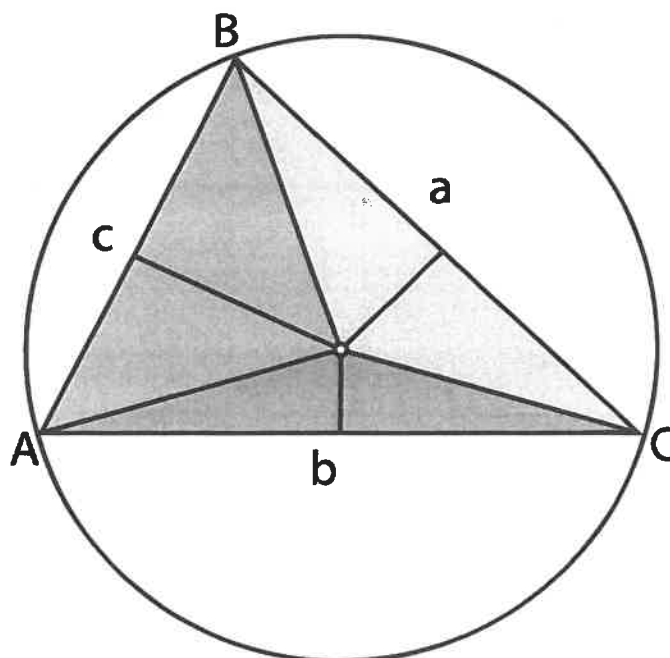


Unit 4: More Triangles!

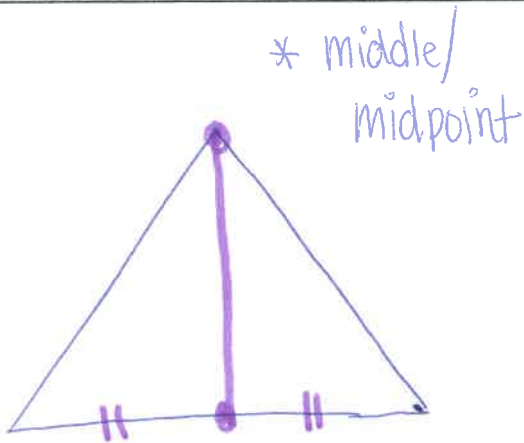
		<i>Initial Score</i>	<i>Updated Score</i>
1	I can identify and calculate with special segments in a triangle.	<input type="text"/>	<input type="text"/>
2	I can list sides & angles of a triangle in order from least to greatest.	<input type="text"/>	<input type="text"/>
3	I can identify side lengths that will form a triangle.	<input type="text"/>	<input type="text"/>



①

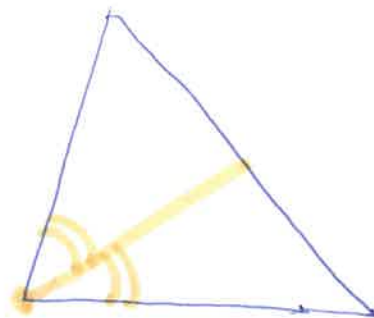
Vocabulary:

Median



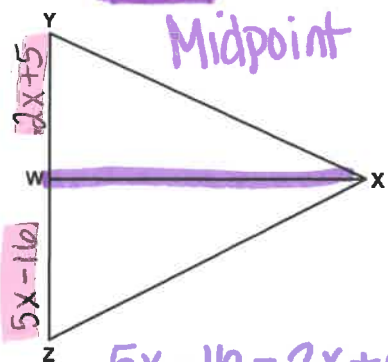
Splits side into equal parts

Angle Bisector



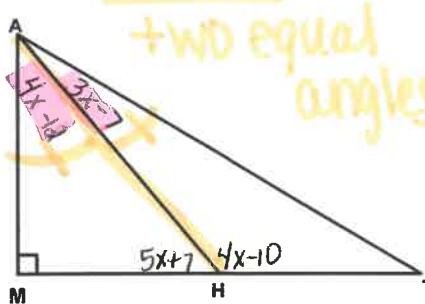
Splits corner angle into equal parts

Given: \overline{XW} is a median. Find the value of x and y .



$$\begin{aligned}
 5x - 10 &= 2x + 5 \\
 -2x &\quad -2x \\
 \hline
 3x - 10 &= 5 \\
 +10 &\quad +10 \\
 \hline
 3x &= 21 \\
 \frac{3x}{3} &= \frac{21}{3} \quad \boxed{x = 7}
 \end{aligned}$$

Given: \overline{AH} is an angle bisector. Find the value of x

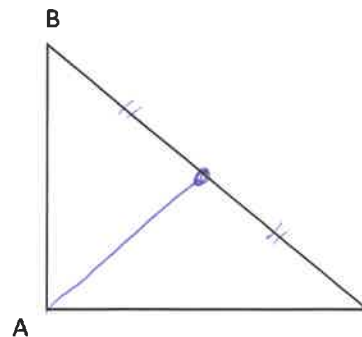
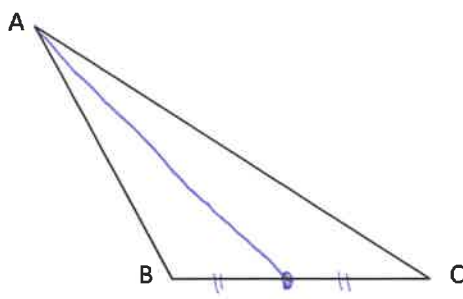
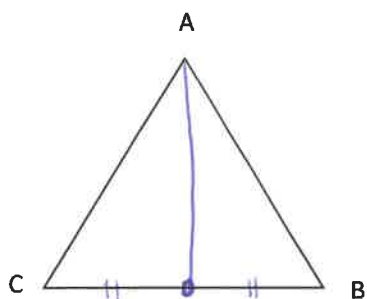


$$\begin{aligned}
 4x - 12 &= 3x - 7 \\
 -3x &\quad -3x \\
 \hline
 x - 12 &= -7 \\
 +12 &\quad +12 \\
 \hline
 x &= 5 \quad \boxed{x = 5}
 \end{aligned}$$

Vocabulary Practice

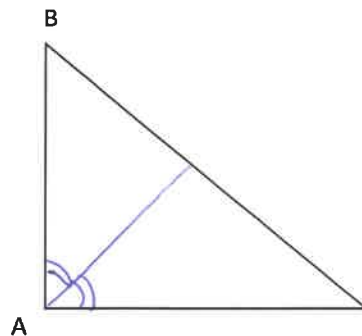
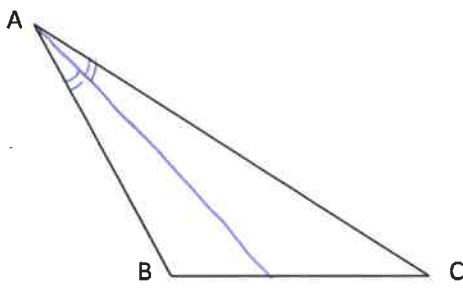
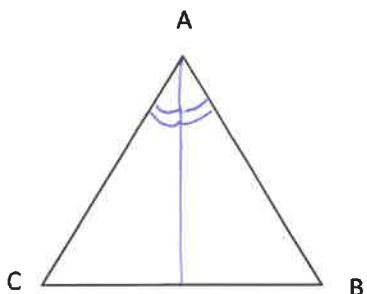
1. Describe what a **median** does: Connects the angle to the midpoint of the other side

Draw a **median** from $\angle A$ to \overline{BC} :



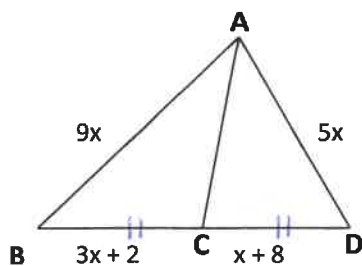
2. Describe what an **angle bisector** does: divides the angle into two equal angles

Draw an **angle bisector** from $\angle A$ to \overline{BC} :



Find each indicated measure.

1. \overline{AC} is a median. Find the value of x



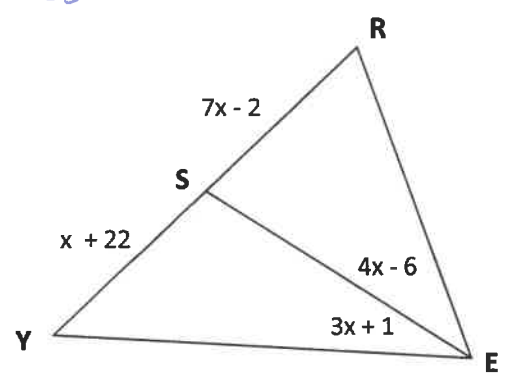
$$3x + 2 = x + 8$$

$$2x = 6$$

$$x = 3$$

3

2. \overline{OS} is an angle bisector. Find: x and $m\angle YES$

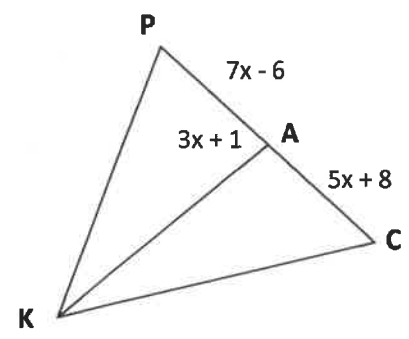


$$4x - 6 = 3x + 1$$

$$x = 7$$

$$m\angle YES = 22^\circ$$

3. \overline{KA} is a median. Find the value of x and AC .



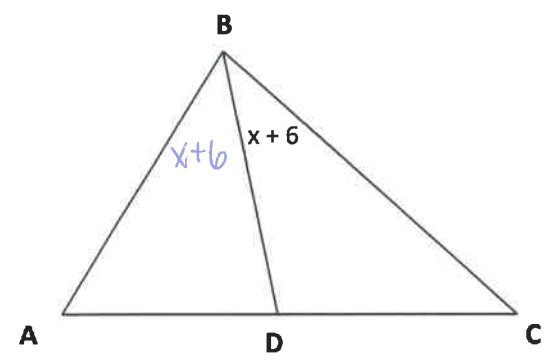
$$7x - 6 = 5x + 8$$

$$2x = 14$$

$$x = 7$$

$$AC = 43$$

4. \overline{BD} is an angle bisector and $\angle B = 4x - 6$. Find the value of x and $m\angle DBC$



$$x + 6 + x + 6 = 4x - 6$$

$$2x + 12 = 4x - 6$$

$$18 = 2x$$

$$9 = x$$

$$m\angle DBC = 15^\circ$$



7

Sides and Angles:

Investigation

1- Using a straight edge, draw a scalene triangle ABC in the space below

2- Measure each side and measure each angle of the triangle and record the measures in the tables below.

Side	Measure
AB	
BC	
AC	

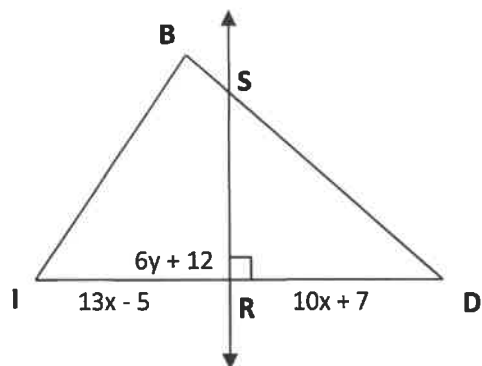
Angle	Measure
$\angle A$	
$\angle B$	
$\angle C$	

3- List the sides in decreasing order. (Write the longest side first and the shortest side last).

4- List the angles in decreasing order. (Write the largest angle first and the shortest angle last).

5- Write a conjecture (conclusion) about the relationship you notice between the measure of sides of a triangle and the measures of the angles opposite those sides.

4. \overline{SR} is a perpendicular bisector. Find the value of x and y .



$$13x - 5 = 10x + 7$$

$$3x = 12$$

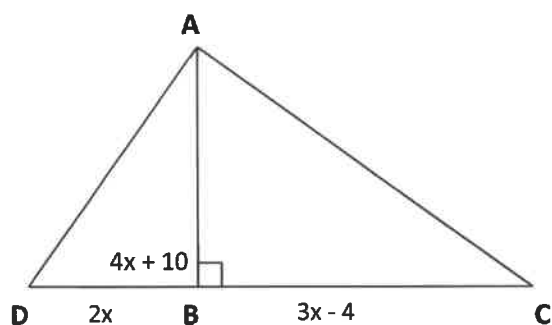
$$x = 4$$

$$6y + 12 = 90$$

$$6y = 78$$

$$y = 13$$

5. \overline{AB} is an altitude. Find the value of x .

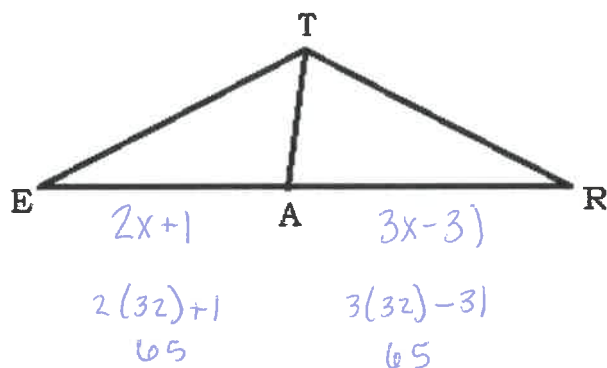


$$4x + 10 = 90$$

$$4x = 80$$

$$x = 20$$

6. \overline{TA} is a median. with $AE = 2x + 1$ and $AR = 3x - 31$. Find the value of x and ER .

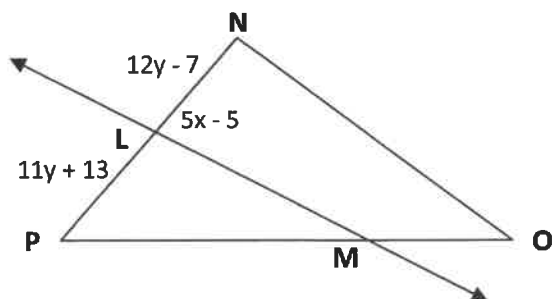


$$2x + 1 = 3x - 31$$

$$32 = x$$

$$ER = 130$$

7. \overline{LM} is a perpendicular bisector. Find the value of x and y



$$12y - 7 = 11y + 13$$

$$y = 20$$

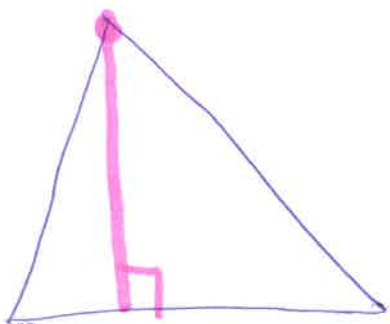
$$5x - 5 = 90$$

$$5x = 95$$

$$x = 19$$

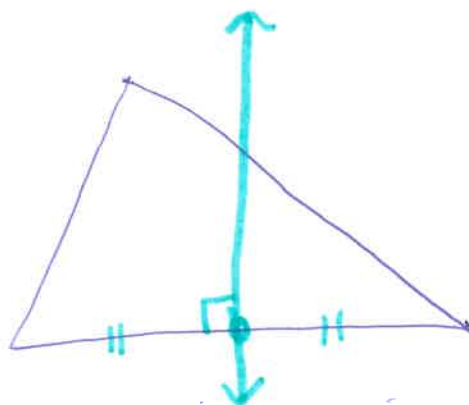


Altitude



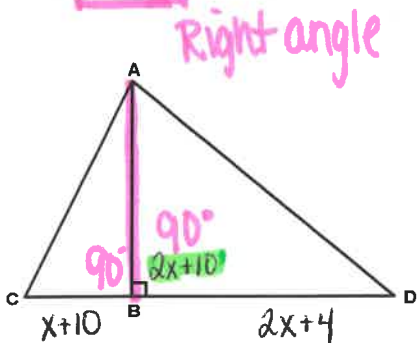
meets the side at a right angle

Perpendicular Bisector



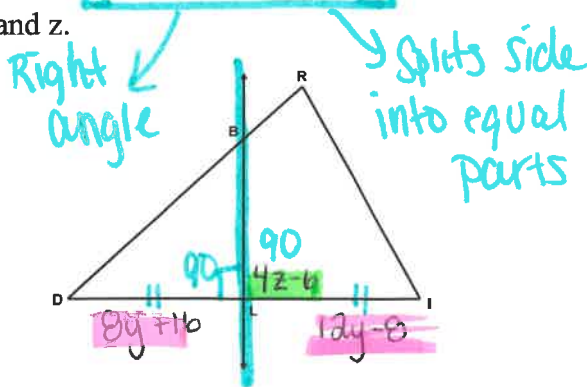
- 1) meets the side at a right angle
- 2) splits side into equal parts

Given \overline{AB} is an altitude. Find the value of x .



$$\begin{aligned}
 2x + 10 &= 90 \\
 -10 &\quad -10 \\
 \hline
 2x &= 80 \\
 \frac{2x}{2} &= \frac{80}{2} \\
 \boxed{x = 40}
 \end{aligned}$$

Given: \overline{BL} is a perpendicular bisector. Find the value of y and z .



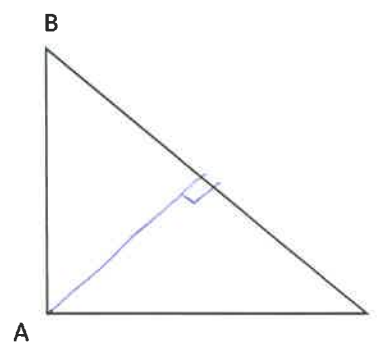
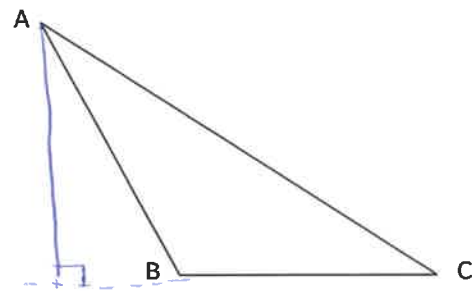
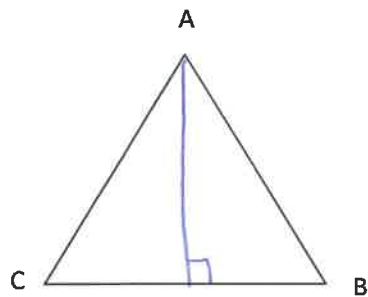
$$\begin{aligned}
 4z - 6 &= 90 \\
 +6 &\quad +6 \\
 \hline
 4z &= 96 \\
 \boxed{z = 24}
 \end{aligned}$$

$$\begin{aligned}
 8y + 16 &= 12y - 8 \\
 -8y &\quad -8y \\
 \hline
 16 &= 4y - 8 \\
 +8 &\quad +8 \\
 \hline
 24 &= 4y \\
 \frac{24}{4} &= \frac{4y}{4} \\
 \boxed{y = 6}
 \end{aligned}$$

Vocabulary Practice Day 2:

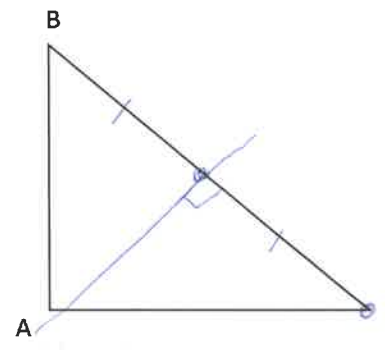
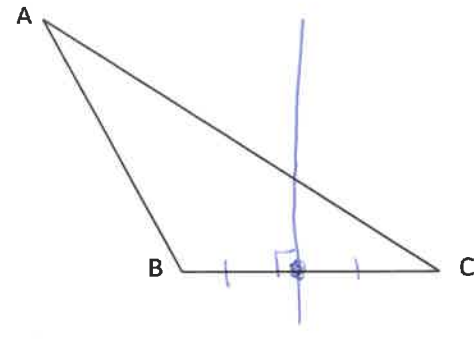
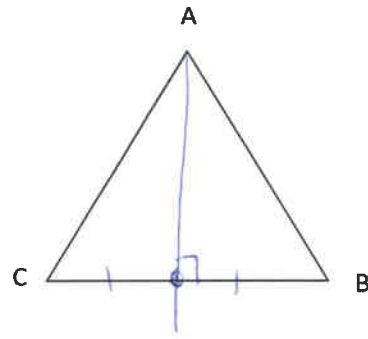
1. Describe what an **altitude** does: connects the angle to the opposite side with a right angle (90°)

Draw an **altitude** from $\angle A$ to \overline{BC} :



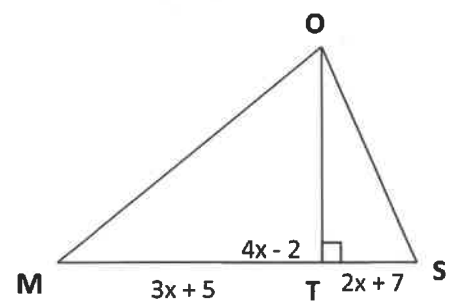
2. Describe what a **perpendicular bisector** does: passes through the midpoint of a side at a right angle (90°)

Draw a **perpendicular bisector** through \overline{BC} :



Find each indicated measure.

3. \overline{OT} is an altitude. Find the value of x



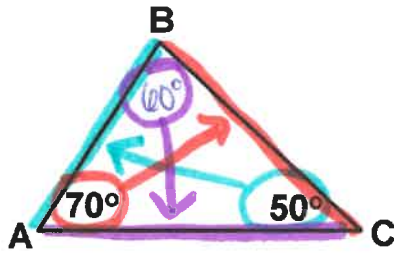
$4x - 2 = 90$
 $4x = 92$
 $x = 23$

* Across from the shortest side is the smallest angle

* Across from the longest side is the largest angle

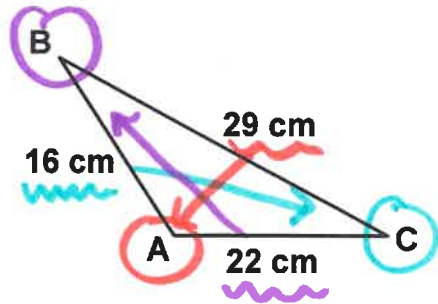
Examples:

List the sides from shortest to longest.



\overline{AB} \overline{AC} \overline{BC}

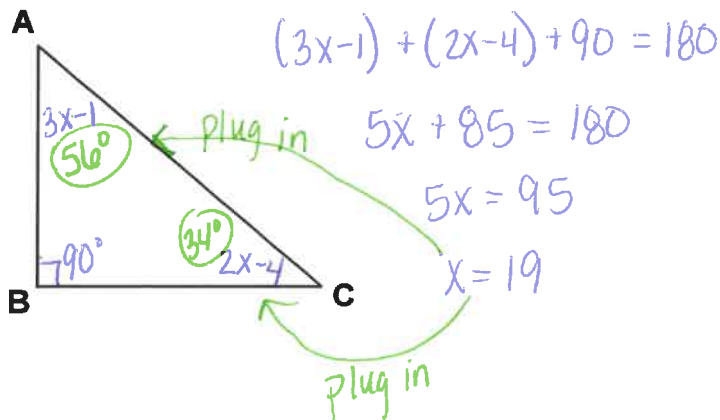
List the angles in order.



$\angle C$ $\angle B$ $\angle A$

Find the value of x, then substitute this value into each expression. List the angles and sides in order from least to greatest (small to big).

Given: $m\angle A = 3x-1$, $m\angle B = 90^\circ$, $m\angle C = 2x-4$.



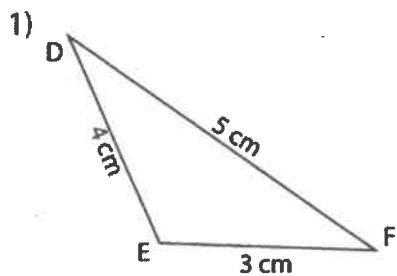
$x = 19$

Angles: $\angle C$ $\angle A$ $\angle B$

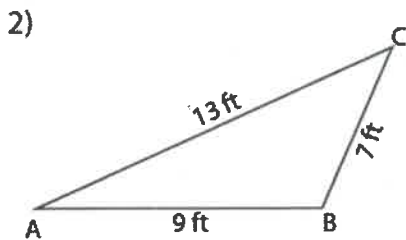
Sides: \overline{AB} \overline{BC} \overline{AC}

9

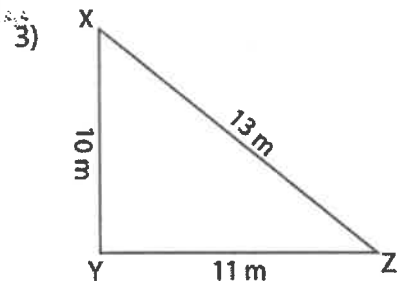
Sides and Angles Practice:



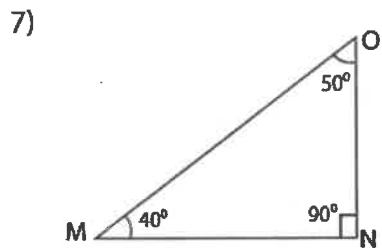
Largest angle = $\angle E$
 Smallest angle = $\angle D$



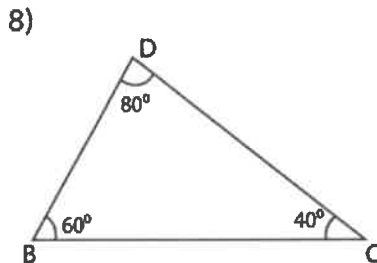
Largest angle = $\angle B$
 Smallest angle = $\angle A$



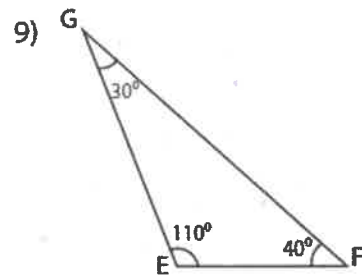
Largest angle = $\angle Y$
 Smallest angle = $\angle Z$



Longest side = \overline{MO}
 Shortest side = \overline{NO}



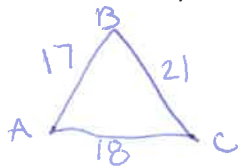
Longest side = \overline{BC}
 Shortest side = \overline{BD}



Longest side = \overline{GF}
 Shortest side = \overline{GE}

Name the angles of $\triangle ABC$ from smallest to the largest. (draw a picture)

1. $\overline{AB} = 17, \overline{BC} = 21, \overline{AC} = 18$



$\angle C, \angle B, \angle A$

List the sides of $\triangle ABC$ from the longest to shortest. (draw a picture)

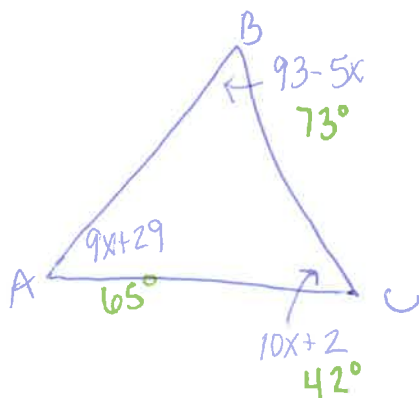
2. $m\angle A = 46^\circ, m\angle B = 30^\circ$



$\overline{AB}, \overline{BC}, \overline{AC}$

Find the value of x and list the side of $\triangle ABC$ in order from shortest to longest. (draw a picture)

3. $m\angle A = (9x + 29)^\circ, m\angle B = (93 - 5x)^\circ, m\angle C = (10x + 2)^\circ$



$$9x + 29 + 93 - 5x + 10x + 2 = 180$$

$$14x + 124 = 180$$

$$14x = 56$$

$$x = 4$$

$\overline{AB}, \overline{BC}, \overline{AC}$



Triangle Inequality Theorem:

Investigation

In the bag in front of you, you will find six pieces cut into 1, 2, 3, 4, 5, and 6 inch segments. Picking up any three segments at random, test whether or not they form a triangle. Record your results below.

Side 1 length	Side 2 length	Side 3 length	Triangle Formed? (Yes or No)

- Pick a row of measurements that **did** form a triangle. Using that information, complete each inequality statement below by circling the correct symbol.

Side 1 + Side 2 < = > Side 3

Side 1 + Side 3 < = > Side 2

Side 2 + Side 3 < = > Side 1

- Pick a row of measurements that **did not** form a triangle. Using that information, complete each inequality statement below by circling the correct symbol.

Side 1 + Side 2 < = > Side 3

Side 1 + Side 3 < = > Side 2

Side 2 + Side 3 < = > Side 1

- Write a conjecture (conclusion) about the sum of the lengths of two sides of a triangle compared to the length of the third side.

Triangle inequality Theorem:

To make a triangle, any two sides must add up to be bigger than the third side.

Greater than

" > "

Examples:

Determine whether it is possible to draw a triangle with sides of the given measures. Write yes or no. Explain your answer.

1. 15, 12, 9

$$15 + 12 > 9 \quad \text{yes}$$

27 > 9

$$15 + 9 > 12 \quad \text{yes}$$

24 > 12

$$12 + 9 > 15 \quad \text{yes}$$

21 > 15

Yes

2. 23, 16, 7

$$23 + 16 > 7 \quad \text{yes}$$

39 > 7

$$23 + 7 > 16 \quad \text{yes}$$

30 > 16

$$16 + 7 > 23 \quad \text{NO}$$

23 > 23

No

3. 20, 10, 9

* Check two shortest sides *

$$10 + 9 > 20$$

19 > 20

No

4. 8.5, 6.5, 13.5

$$8.5 + 6.5 > 13.5$$

15 > 13.5

Yes

The measures of two sides of a triangle are given. Between what two numbers must the measure of the third fall?

1. 9 and 15



$$9 + x > 15$$

-9 -9

$$x > 6$$

$$9 + 15 > x$$

$$24 > x$$

$$x + 15 > 9$$

-15 -15

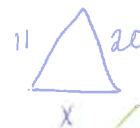
$$x > -6$$

No negative sides

$$6 < x < 24$$

Between 6 & 24

2. 11 and 20



$$11 + x > 20$$

-11 -11

$$x > 9$$

$$20 + x > 11$$

-20 -20

$$x > -9$$

No negative sides

$$20 + 11 > x$$

$$31 > x$$

$$9 < x < 31$$

Between 9 & 31

Triangle Inequality Practice:

Decide whether each set of numbers is a triangle.

1. 15, 12, 9

$$12 + 9 > 15$$

$$21 > 15$$

yes

2. 23, 16, 7

$$16 + 7 > 23$$

$$23 > 23$$

NO

3. 20, 10, 9

$$10 + 9 > 20$$

$$19 > 20$$

NO

4. 47, 28, 70

$$47 + 28 > 70$$

$$76 > 70$$

yes

5. 28, 41, 13

$$28 + 13 > 41$$

$$41 > 41$$

NO

6. 5, 10, 15

$$5 + 10 > 15$$

$$15 > 15$$

NO

7. 9, 40, 41

$$9 + 40 > 41$$

$$49 > 41$$

yes

8. 1.2, 2.2, 14.3

$$1.2 + 2.2 > 14.3$$

$$3.4 > 14.3$$

NO

9. 6, 9, 16

$$6 + 9 > 16$$

$$15 > 16$$

NO

The measures of two sides of a triangle are given. Between what two numbers must the measure of the third fall?

1. 23 and 14



~~$$23 + x > 14$$~~

~~$$x > -9$$~~

$$23 + 14 > x$$

$$37 > x$$

$$x + 14 > 23$$

$$x > 9$$

$9 < x < 37$

2. 5 and 8



$$5 + x > 8$$

$$x > 3$$

$$5 + 8 > x$$

$$13 > x$$

~~$$x + 8 > 5$$~~

~~$$x > -3$$~~

$3 < x < 13$

3. 22 and 34



$$22 + x > 34$$

$$x > 12$$

$$22 + 34 > x$$

$$56 > x$$

~~$$x + 34 > 22$$~~

~~$$x > -12$$~~

$12 < x < 56$

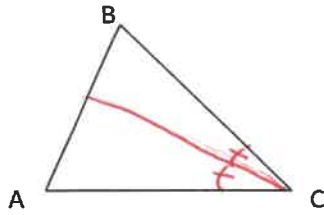


13

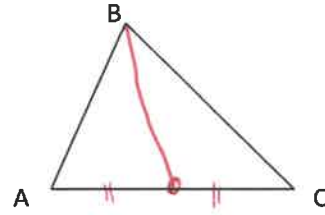
Unit 4: More Triangles Review

1. Draw each indicated segment. Your measurements do not have to be accurate, but you must draw the required tickmarks.

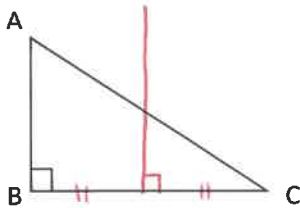
Draw an angle bisector from $\angle C$



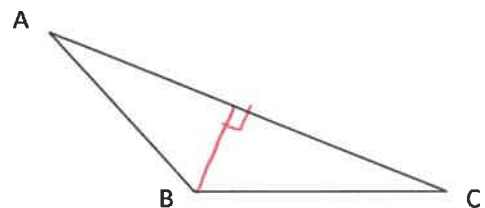
Draw a median from $\angle B$



Draw the perpendicular bisector of \overline{BC} .



Draw an altitude from $\angle B$.



2. What is the difference between perpendicular bisector and altitude?

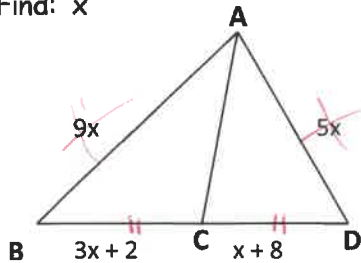
A perpendicular bisector has a \perp and splits the side equally, whereas an altitude only has a \perp .

Find each indicated measure.

3. Given: \overline{AC} is a median

\rightarrow midpoint

Find: x



$$3x + 2 = x + 8$$

$$2x = 6$$

$$x = 3$$

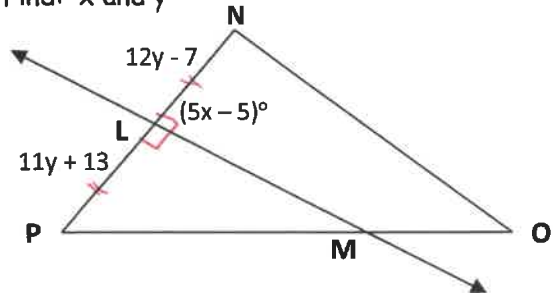
Find each indicated measure.

4. Given: \overline{LM} is a perpendicular bisector

\leftarrow equal parts

\rightarrow right angle

Find: x and y



$$11y + 13 = 12y - 7$$

$$y = 20$$

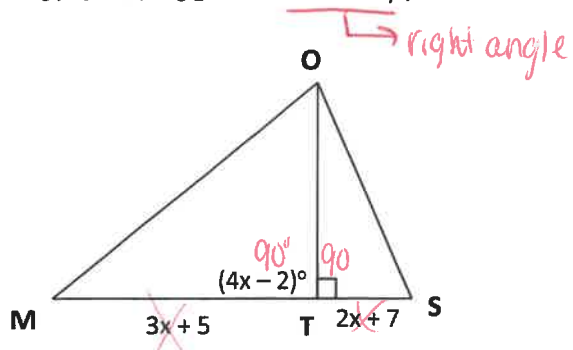
$$5x - 5 = 90$$

$$5x = 95$$

$$x = 19$$

Find each indicated measure.

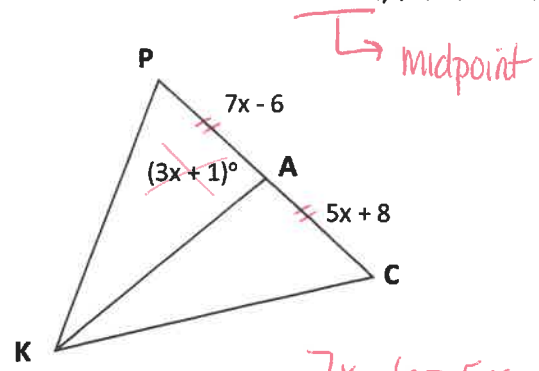
5. Given: \overline{OT} is an altitude, find the value of x



$4x - 2 = 90$
 $4x = 92$
 $x = 23$

Find each indicated measure.

6. Given: \overline{KA} is a median, find the value of x



$7x - 6 = 5x + 8$
 $2x = 14$
 $x = 7$

7. Name each segment represented in the figure to the right.

Name a median of the figure.

\overline{AD}

Name an altitude of the figure.

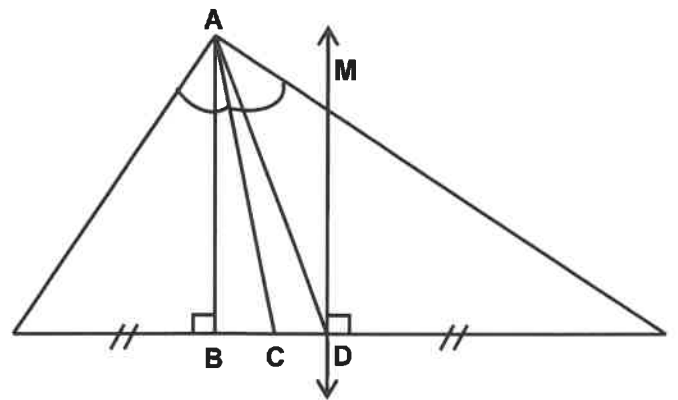
\overline{AB}

Name an angle bisector of the figure.

\overline{AC}

Name a perpendicular bisector of the figure.

\overleftrightarrow{MD}

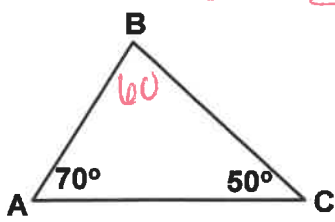


8. Determine whether it is possible to draw a triangle with sides of the given measures. Write yes or no.

- a) 3, 4, 7
 $3 + 4 \stackrel{?}{>} 7$
 NO $7 > 7 \parallel$
- c) 11, 9, 22
 $11 + 9 \stackrel{?}{>} 22$
 NO $20 > 22 \parallel$

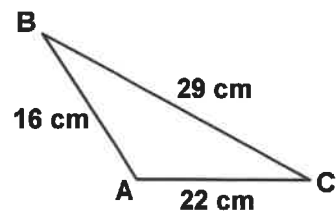
- b) 6, 9, 10
 yes $6 + 9 > 10 \checkmark$
 $15 > 10$
- d) 8, 9, 16
 yes $8 + 9 > 16 \checkmark$
 $17 > 16 \checkmark$

9. List the sides from shortest to longest.



$\overline{AB}, \overline{AC}, \overline{BC}$

10. List the angles in order from least to greatest.



$\angle C, \angle B, \angle A$



Name: _____

Unit 4 Reflection

What skills went well in this unit? Circle all the skills that you were successful with on the test.

Identifying special segments in a triangle

Calculating with special segments in a triangle

Ranking sides and angles in order

Identifying sides that form a triangle.

What were you most proud of in this unit?

Organization

Completion of practice problems (HW)

Participation

Positive attitude

Showing growth and/or maintaining

Other: _____

Looking at the skills above. What skills do you still need more practice with moving forward (use both columns)?

Action plan: