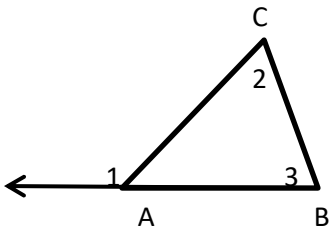
Segment and Angle Relationships – Intro to Geometry

By Angle	By Sides
Acute	Scalene
Obtuse	Isosceles
Right	Equilateral
Equiangular	
Triangle Sum Theorem	

Midpoint of a Segment
Bisect
Vertical Angles
Linear Pair
Complementary
Supplementary

1. What does the sum of the measures of the angle of a triangle equal?

2.



a. Find m<1 + m<CAB _____

b. Find m<2 + m<3 + m<CAB _____

c. Using parts a and b, what do you know about m<1 and m<2 + m<3?

_____

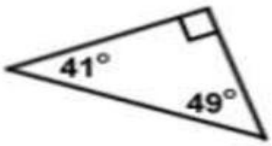
3.

a. Write the Pythagorean Theorem: _____

b. With what kind of triangle can you use the Pythagorean Theorem? _____

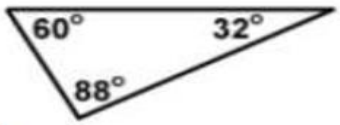
4. Classify each triangle as acute, right or obtuse:

a)



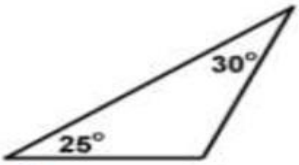
a)_____

b)



b)_____

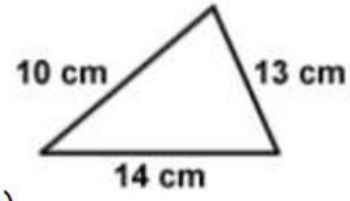
c)



c)_____

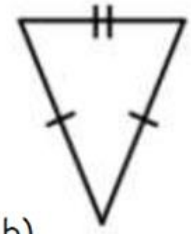
5. Classify each triangle as scalene, isosceles, or equilateral.

a)



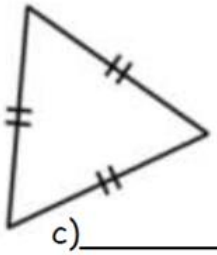
a)_____

b)



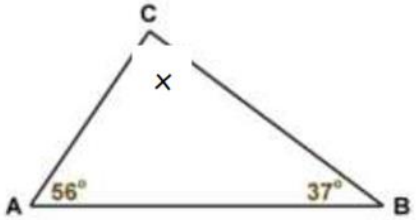
b)_____

c)

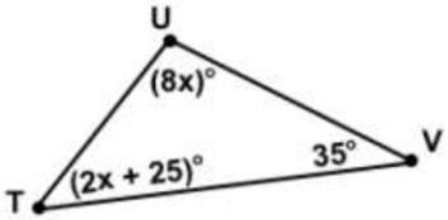


c)_____

6. Solve for x in each triangle:

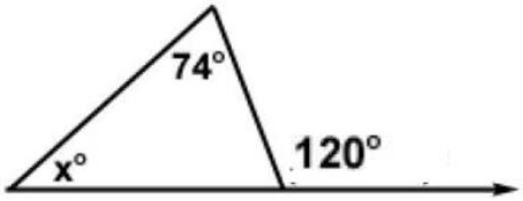


x = _____



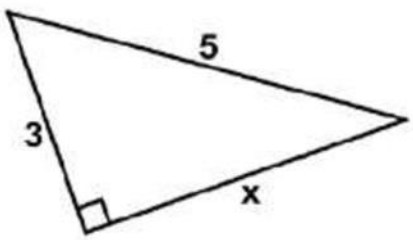
x = _____

7. Solve for x:

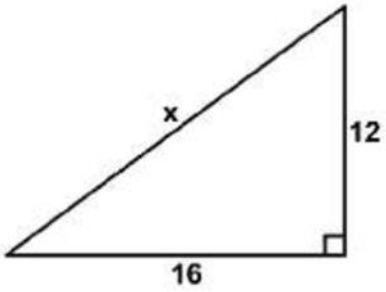


x = _____

8. Solve using Pythagorean Theorem



x = _____



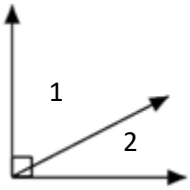
x = _____

For each problem: a) Draw and label a picture, b) Write an equation, and c) Solve for x.

9. If C is the midpoint of $\overline{AB}$, AC is 2x + 1, CB is 3x – 4, find x

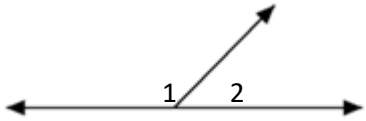
10. If T is the midpoint of $\overline{PQ}$, PT = 5x + 3, TQ = 7x -9, find x.

11. m<1 = 4x – 3 and m<2 = x + 8. Find x and m<2.



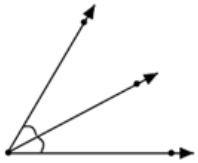
12. <5 and <6 are complementary. If m<5 = 8x – 6 and m<6 = 14x + 8, find x.

13. m<1 = 2x + 4 and m<2 = 6x + 20. Find x



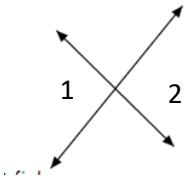
14. <3 and <4 are supplementary. m<3 = 12x – 15 and m<4 = 3x + 45. Find x

15. If $\overrightarrow{BX}$ bisects <ABC, m<ABX is 5x and <XBC = 3x + 10, find x.



16. If $\overrightarrow{KN}$ bisects <JKL, m<JKN = 4x – 16 and m<NKL = 2x + 6, find x.

17. If m<1 = x + 10 and m<2 = 4x – 35. Find x.

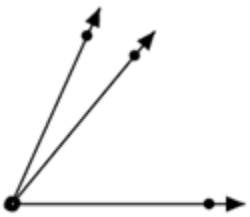


18. <3 and <4 are vertical angles. m<3 = 3x + 8 and m<4 = 5x – 20, find x.

19. Point S is between points D and T. If DT =60, DS = 2x – 8, and ST = 3x – 12, find x.

20. Point F is between points E and G. If EF = 4x – 20, FG = 2x + 30, and EG = 100, find x.

21. m<ADC is 5x – 20, m<ADB = x – 4, m<BDC = x + 5. Find x.

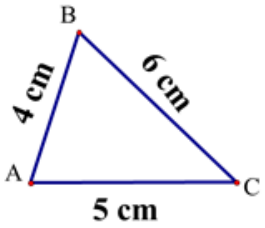


Honors Examples:

1. A is between B and C. BA = x^2, AC = 6x + 10, and BC = 17. Find x and the length of each segment.

2. L is between K and M. KL = $x^2 – 10$, LM = 5x + 4, and KM = $2x^2 – 42$. Find x.

Triangle Inequalities:

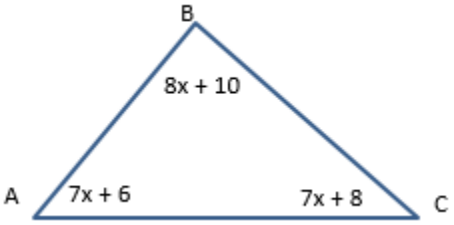


Triangle Set Up

***You should already know this:

- The smallest side is across from the smallest angle.
- The largest side is across from the largest side

Ex: List the sides in order from shortest to longest measure:



Triangle Inequality Theorem:

The sum of the lengths of any two sides of a triangle is greater than the length of the third side.

Ex: Determine if it is possible to draw a triangle with side measures 12, 11, 17.

Practice:

Can you draw a triangle using these lengths for the sides?

1. 5, 7, 9	2. 3, 4, 1	3. 5.2, 5.5, 10.1	4. 7, 7, 14

Finding the <u>range</u> of the third side given two sides:

- The 3rd side cannot be larger than the other two added together.
  - _____
- The sum of the 3rd side and the smallest side cannot be larger than the other side
  - _____

Ex: Given a triangle with sides of length 3 and 8, find the range of possible values for the third side.

Practice:

Given the 1st two sides, give the range for the 3rd side of an inequality.

1. 15 and 20	2. 22 and 34	3. 9 and 8

Practice

For each set of lengths, determine whether it is possible to draw a triangle with sides of the given measures. If possible, write yes. If not possible, write no.

1. 3, 4, 5 _____ 2. 4, 9, 5 _____ 3. 5, 6, 12 _____

4. 7, 3.5, 4.5 _____ 5. 4, 5, 8.5 _____ 6. .5, 1.2, .6 _____

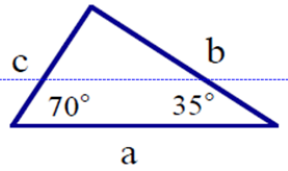
The lengths of two sides of a triangle are given. Find the two numbers that the third side must fall between.

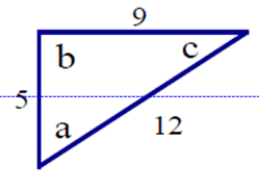
7. 3 and 8 _____ < x < _____ 8. 12 and 25 _____ < x < _____

9. 13 and 4 _____ < x < _____ 10. 13 and 21 _____ < x < _____

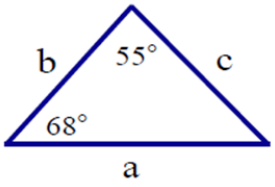
Arrange the letters in order from greatest to least.

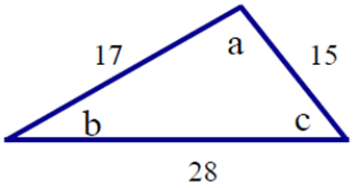
11. ___ > ___ > ___ 12. ___ > ___ > ___



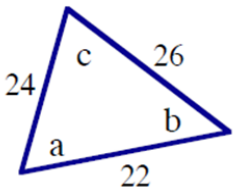


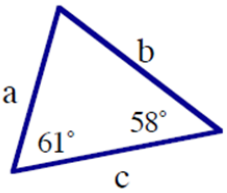
13. ___ > ___ > ___ 14. ___ > ___ > ___





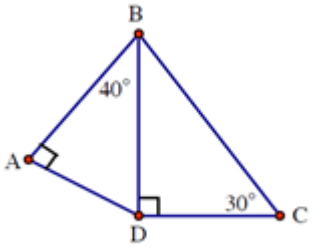
15. ___ > ___ > ___ 16. What conclusion can we draw from this triangle?





4. Name the shortest segment. _____

5. Name the longest segment. _____

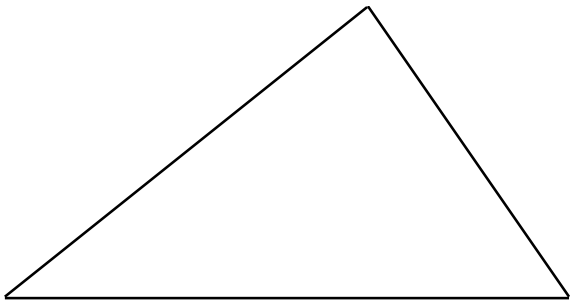


Special Segments in Triangles:

Altitudes, Medians, Angle Bisectors & Perpendicular Bisectors

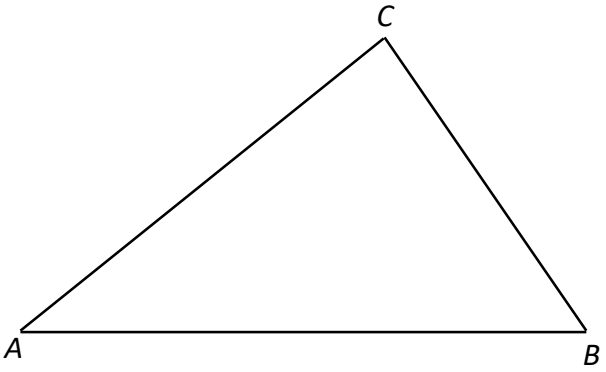
What is a median?

Measure the lengths of each side and sketch all three medians in the triangle below.



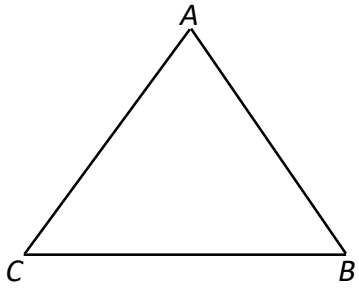
What is an angle bisector?

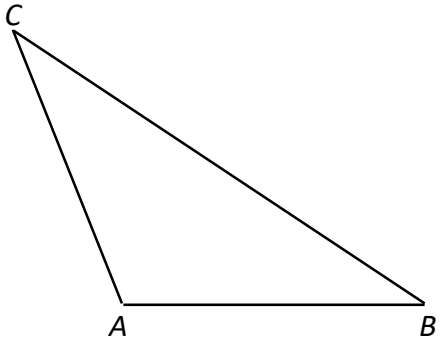
Sketch angle bisector $\overline{CD}$.

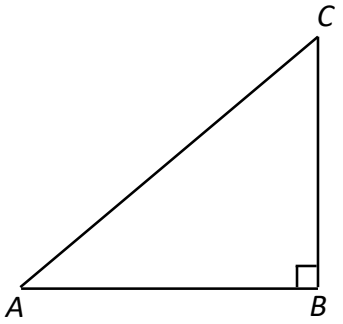


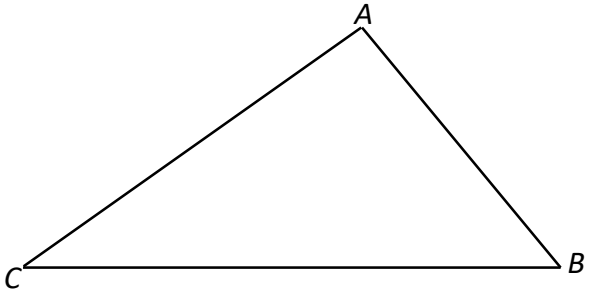
What is an altitude?

Sketch an altitude from vertex C to $\overline{AB}$ in each triangle below.



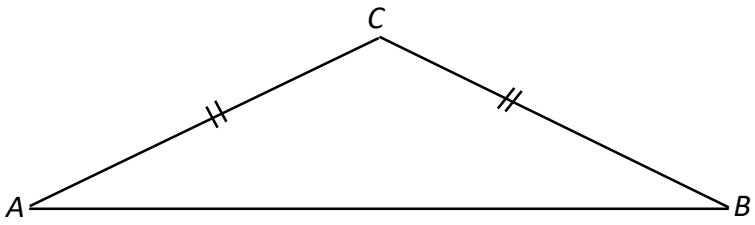


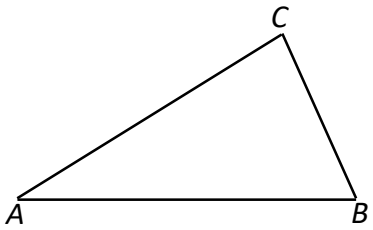




What is a perpendicular bisector?

Sketch the perpendicular bisector of $\overline{AB}$ in the triangles below.





ORGANIZER	Through Vertex	Through Midpoint	Forms right angle	Picture
Median				
Altitude				
Perpendicular Bisector				
Angle Bisector				
Midsegment				

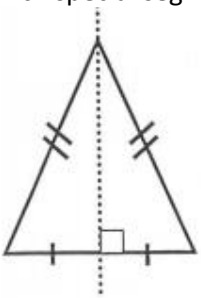
Example: Sketch a picture of each statement.

a) $\overline{AD}$ is an altitude of $\triangle ABC$	b) $\overline{AD}$ is an median of $\triangle ABC$
c) $\overline{DE}$ is a perpendicular bisector of $\triangle ABC$. E is between B and C.	

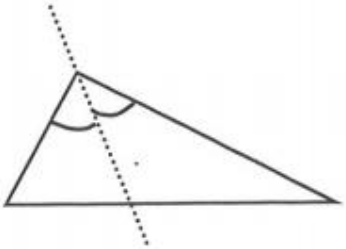
Examples: Determine which special segment is shown for each

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

1.



2.



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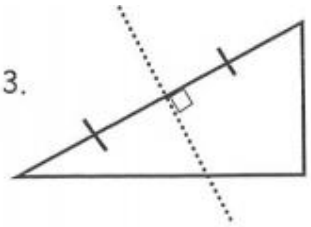

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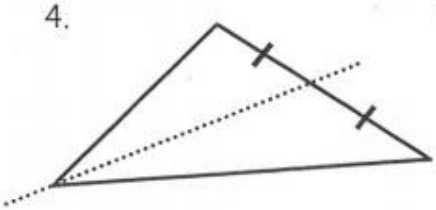

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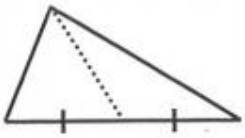

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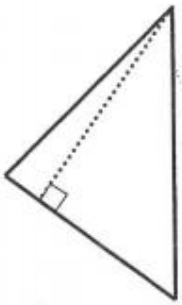

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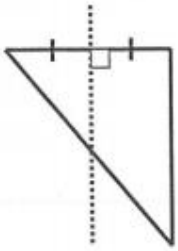
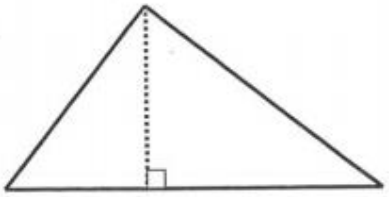
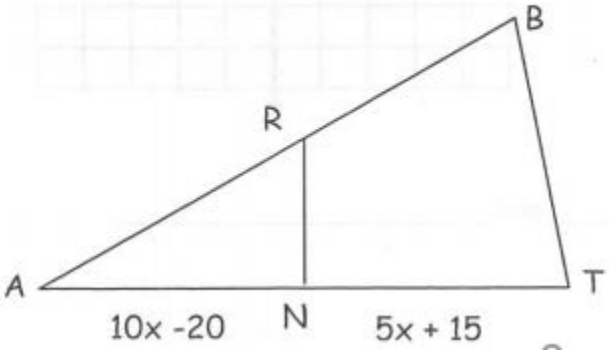


8.

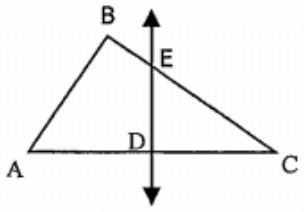
9.



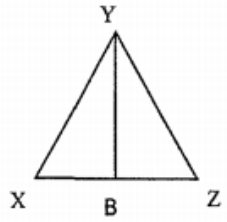
RN is the perpendicular bisector of AT. How would you find the value of x? What are the lengths of AN and NT?



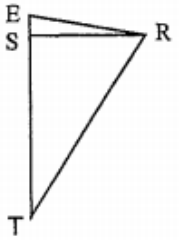
6) In ΔABC, $\overleftrightarrow{DE}$ is perpendicular bisector of $\overline{AC}$ with D on $\overline{AC}$. If $AD = 2y + 4$, $CD = y + 12$, and $m\angle EDC = 5(x - 12)°$. Find the value of x and y. Find length of $AD, DC,$ and, AC.



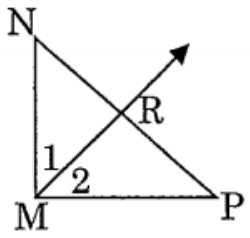
9) $\overline{YB}$ is an altitude of ΔXYZ, and $m\angle YBZ = (6x-6)°$. Find the value of x. What is the measure of $\angle YBZ$?



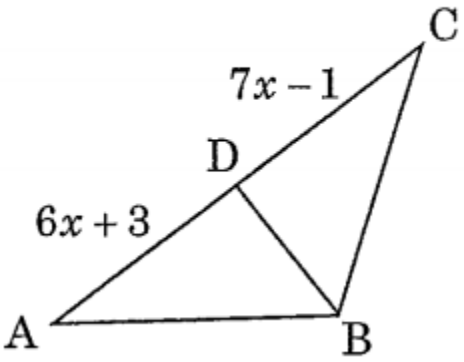
$\overline{RS}$ is an altitude of ΔRTE, $m\angle SRT = (4x-8)°$, and $m\angle STR = (6x+13)°$. Find the value of x.



2) $\overline{MR}$ is the angle bisector of $\angle NMP$. Find x if $m\angle 1 = 5x+8$ and $m\angle 2 = 8x-16$.



6) $\overline{BD}$ is a median. Find the x

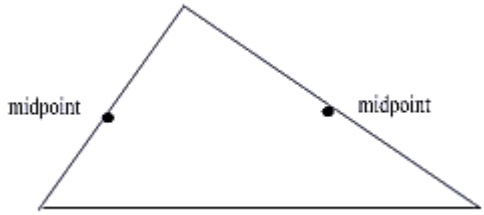


Mid-Segment, Isosceles Triangle Theorem, and Exterior Angle Theorem

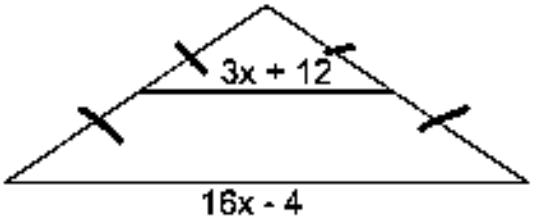
Mid-segment – _____

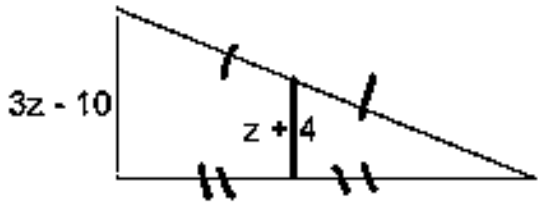
_____

_____

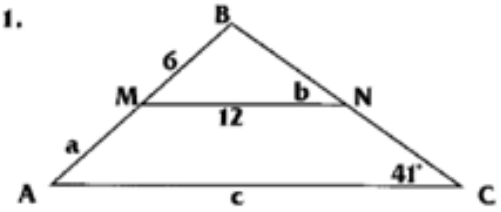


Examples:

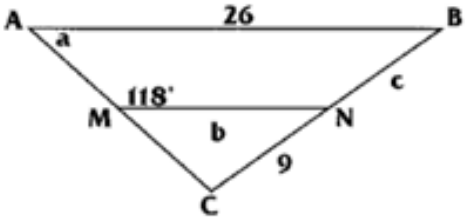




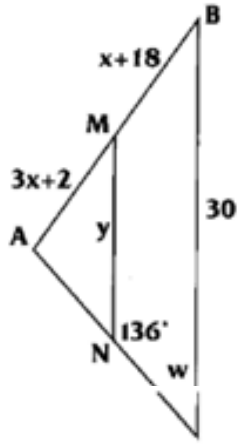
1.



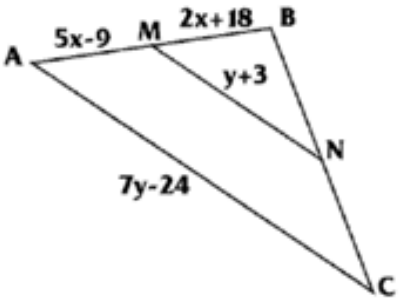
2.



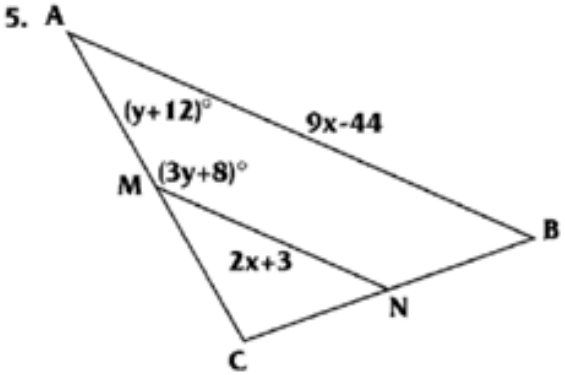
3.



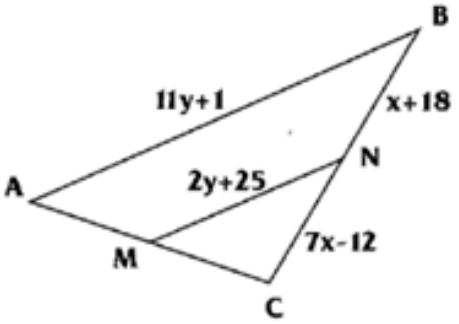
4.



5.

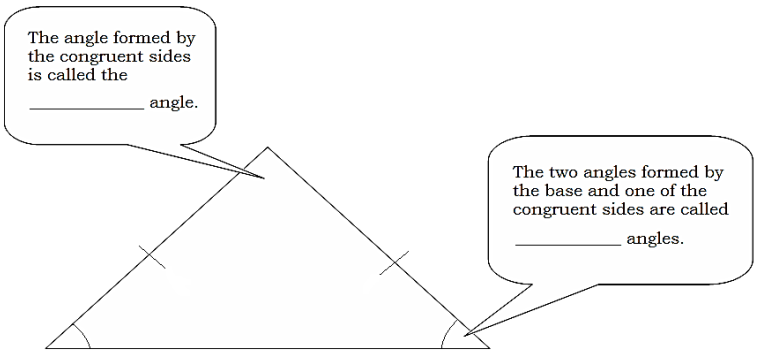


6.

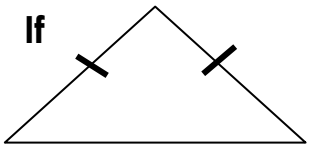
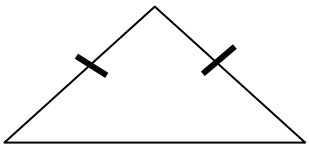


Isosceles Triangle: A triangle with 2 sides congruent sides.

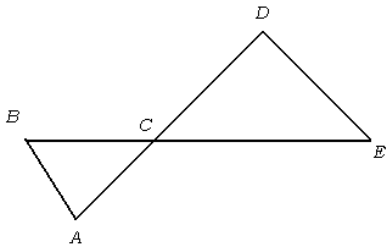
Example #1: label ΔBCD as isosceles with ∠C as the vertex angle. Find x and the measure of each side if BC = 2x + 4, BD = x + 2 and CD = 10.



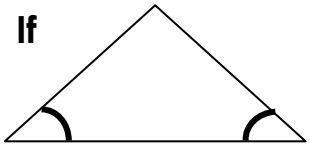
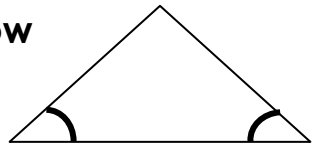
Isosceles Triangle Theorem: If two sides of a triangle are congruent, then the angles opposite those angles are congruent

If  **then you also know** 

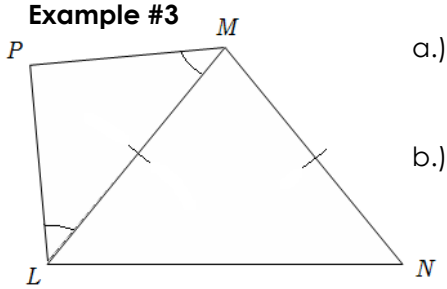
Example #2: If $\overline{DE} \cong \overline{CD}$, $\overline{BC} \cong \overline{AC}$, and $m\angle CDE = 120$, what is the measure of $\angle BAC$?



Theorem: If two angles of a triangle are congruent, then the sides opposite those angles are congruent

If  **then you also know** 

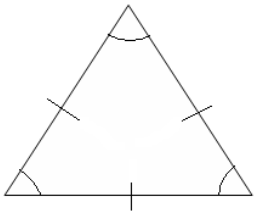
Example #3



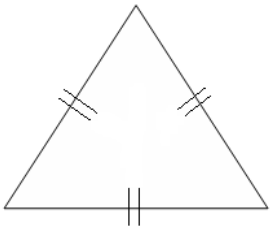
a.) Name all of the congruent angles.

b.) Name all of the congruent segments.

Corollary: A triangle is equilateral
if and only if it is equiangular.



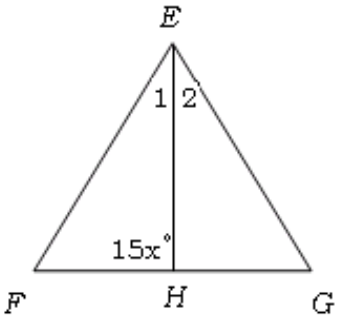
Corollary: Each angle of an equilateral triangle measures



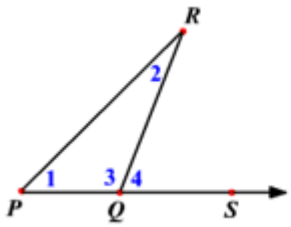
Example #4: ΔEFG is equilateral, and $\overline{EH}$ bisects $\angle E$.

a.) Find $m\angle 1$ and $m\angle 2$.

b.) Find x.



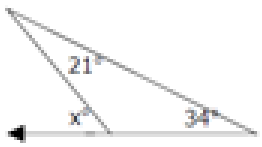
Exterior Angle Theorem :



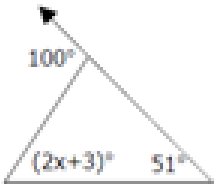
m<4 = m<1 + m<2

Solve for x:

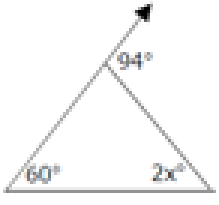
1. x = _____



2. x = _____

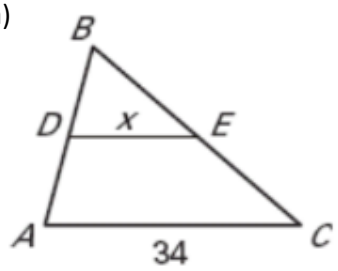


3. x = _____

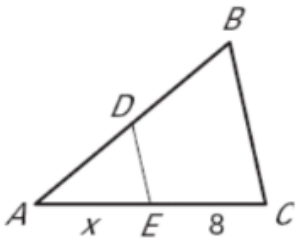


Example 1: $\overline{DE}$ **is a midsegment of** ΔABC**. Find the value of x.**

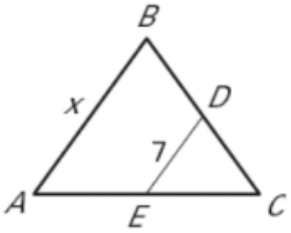
a)



b)

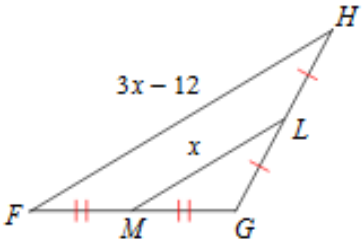


c)

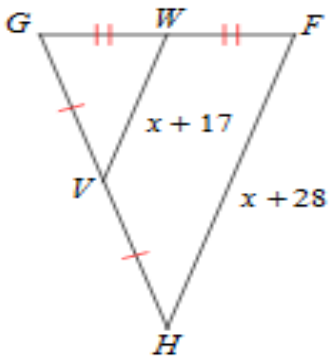


Examples:

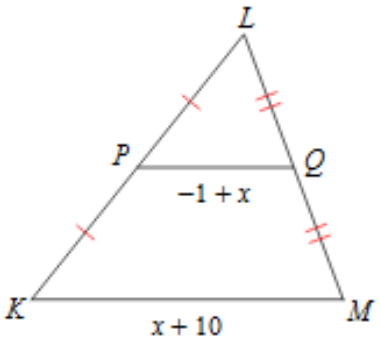
1)



2)



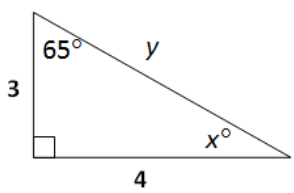
3)



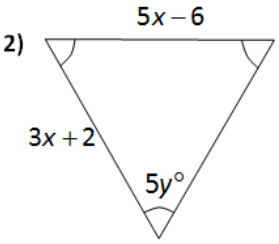
Find the value of x and y.

Find the value of x and y

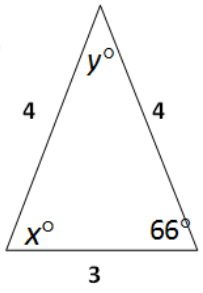
1)



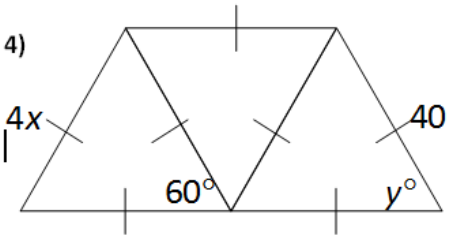
2)



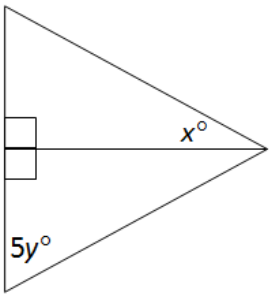
3)



4)

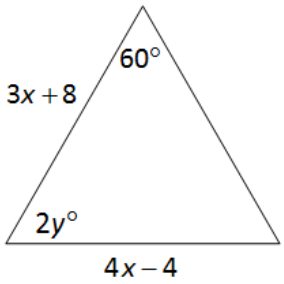


5) Equilateral Triangle



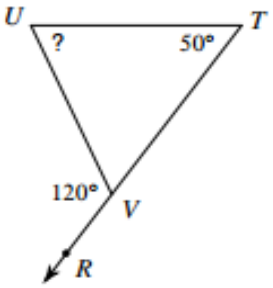
10

6) Equilateral Triangle

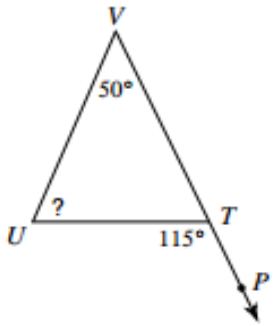


Find the measure of each angle indicated.

1)

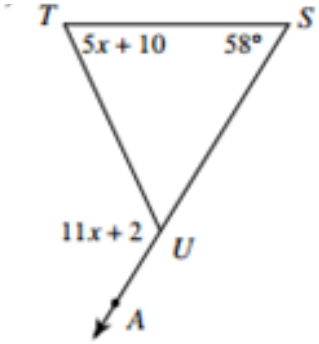


2)



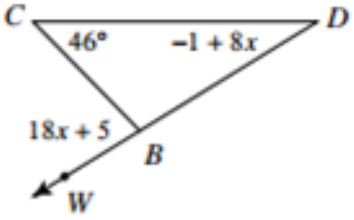
Solve for x.

3.



4.

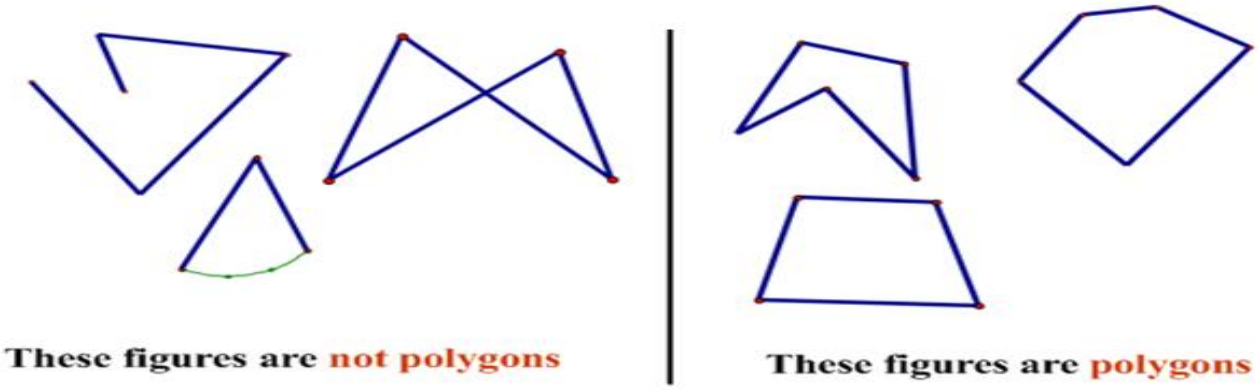
11)



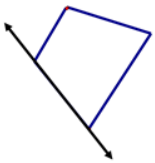
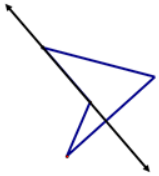
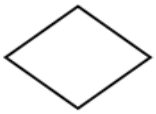
NC Math 2 Unit 2A Notes

Polygons

Definitions:
A closed figure formed by a finite number of coplanar segments so that each segment intersects exactly two others, but only at their endpoints.

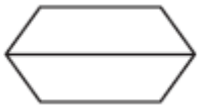


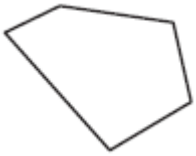
Classification of Polygon

Convex: does NOT cave in on itself	**Concave: does cave in on itself**	**Regular:** **A convex polygon in which all interior angles have the same measure and all sides are the same length**	**Irregular:** **Two sides (or two interior angles) are not congruent.**
			

Identify polygons

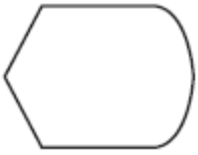
Tell whether the figure is a polygon and whether it is a concave polygon, convex polygon, or not a polygon.

a. 

b. 

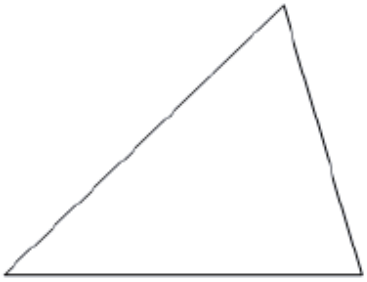
c. 

d. 

e. 

# of Sides	Name of Poly	# of Sides	Name of Poly	# of Sides	Name of Poly
3		6		9	
4		7		10	
5		8		12	

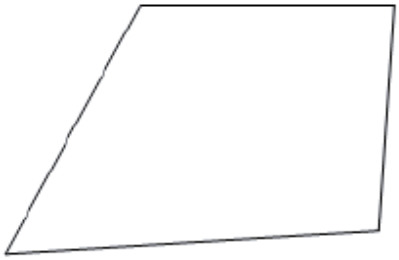
From one vertex in each polygon, draw diagonals to the nonconsecutive vertices. Use the triangles to find the sum of the interior angles of each polygon.



#sides=____

#triangles=____

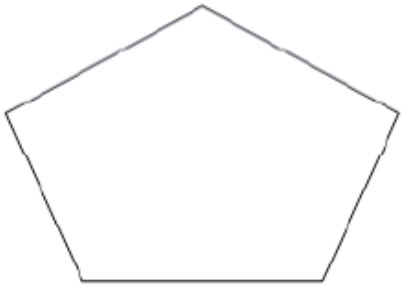
sum of interior angles=_____



#sides=____

#triangles=____

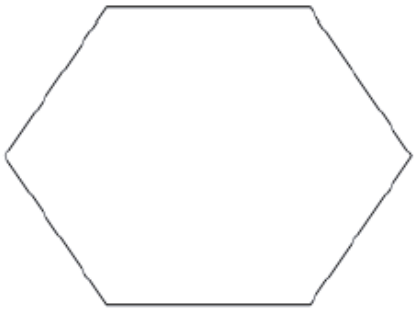
sum of interior angles=_____



#sides=____

#triangles=____

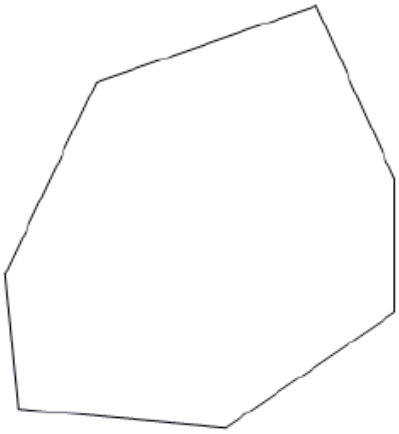
sum of interior angles=_____



#sides=____

#triangles=____

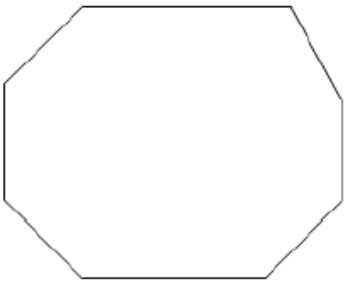
sum of interior angles=_____



#sides=____

#triangles=____

sum of interior angles=_____



#sides=____

#triangles=____

sum of interior angles=_____

POLYGON NAME	# of SIDES	# of TRIANGLES	SUM Of INT ∠S	EACH INT ∠ (regular)	SUM OF EXT ∠s	EACH EXT ∠ (regular)
TRIANGLE						
QUADRILATERAL						
PENTAGON						
HEXAGON						
HEPTAGON						
OCTAGON						
NONAGON						
DECAGON						
DODECAGON						
n-gon						

Summary of Convex Polygon Formulas:

Sum of Interior Angles	Measure of ONE Interior Angle	Sum of Exterior Angles	Measure of ONE Exterior Angle

Examples:

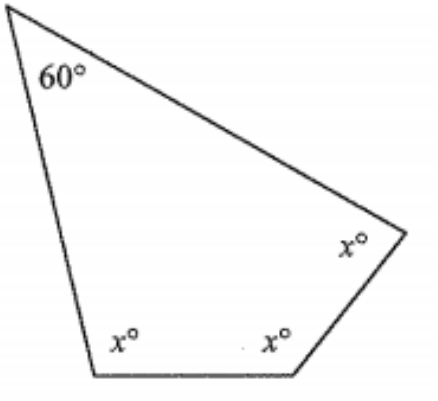
1. Sum of the measures of the interior angles of a 11-gon is

2. The measures of an exterior angle of a regular octagon is

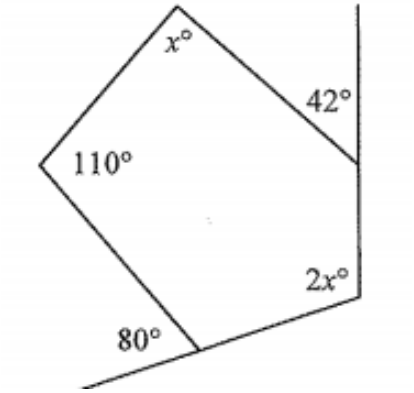
3. The number of sides of a regular polygon with exterior angles 72° is

4. The measure of an interior angle of a regular polygon with 30 sides

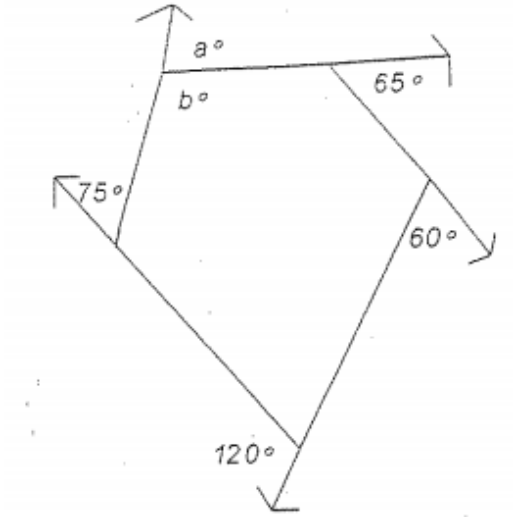
5. Find x.



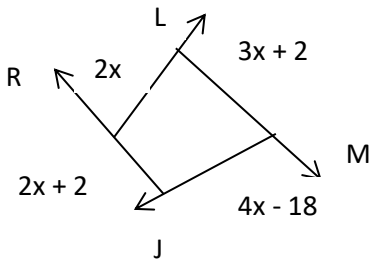
6. Find x.



7. Find a and b.



8. Find the measure of < RKL.



A. 34°
B. 68°
C. 86°
D. 148°