Geometry
Unit 1: Basic Geometry

Name_____

Helpful Vocabulary
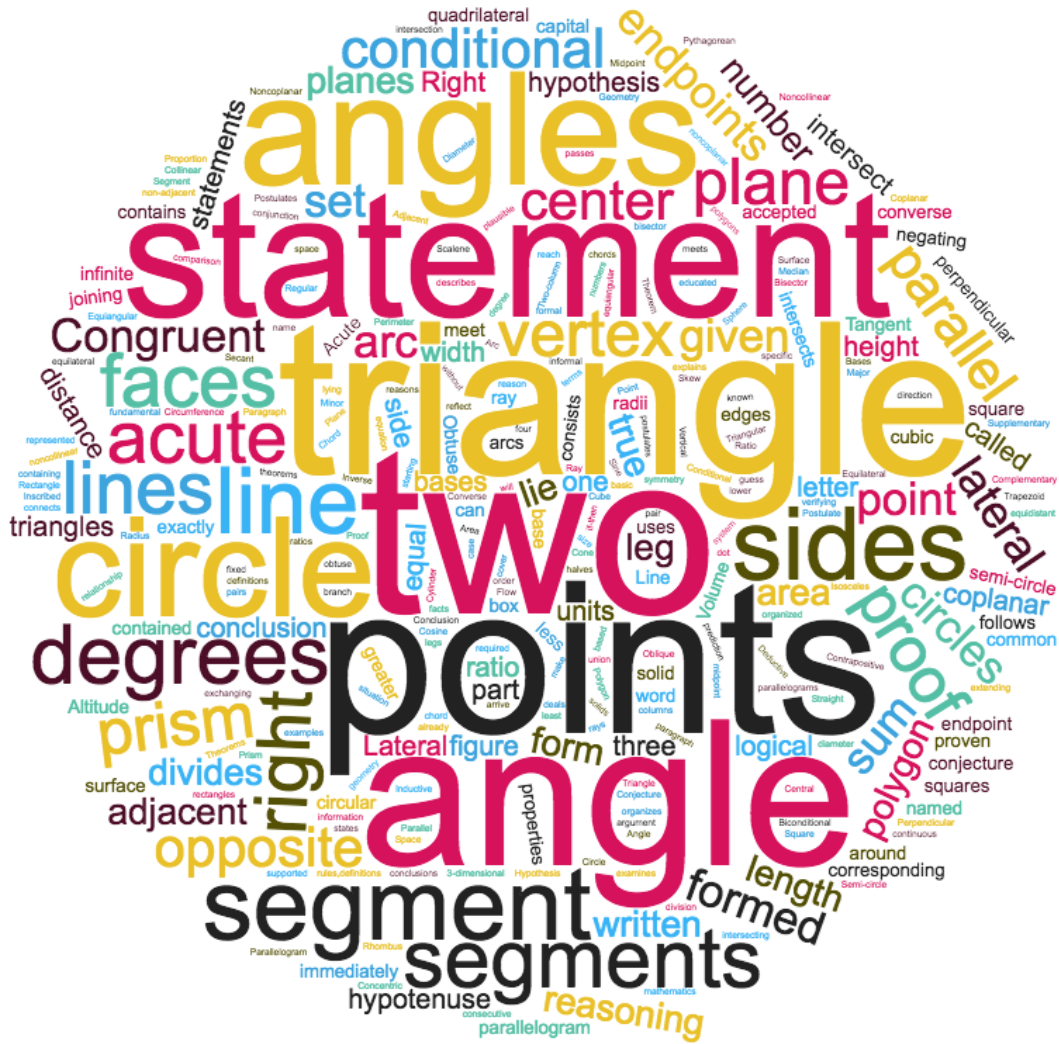
Word	Definition/Explanation	Examples/Helpful Tips
Collinear Points	Points that lie on the same line	

Frequently Used Geometric Notations

Geometric Symbol	Interpretation	Example
	Angle	
	Triangle	
	Point	
	Line	
	Line Segment	
	The Measure Of	
	Ray	
	Parallel	
	Perpendicular	
	Congruent	
	Similar	

Geometric Labeling

Figure	Examples of Labeling	Non-Examples of Labeling
Lines Segments Rays		
Angles		
Closed Figures		

Classifying Angles

Acute	Right	Obtuse	Straight

Labeling Angles and Sides of Triangles
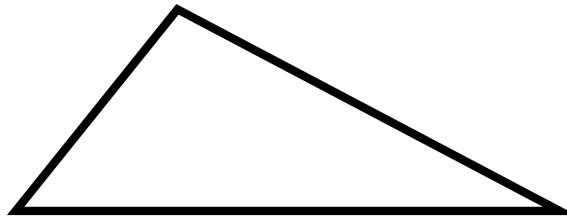
Labeling Congruent Angles and Sides
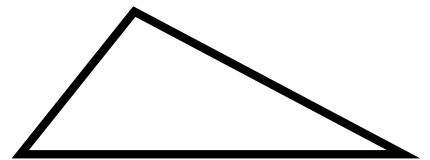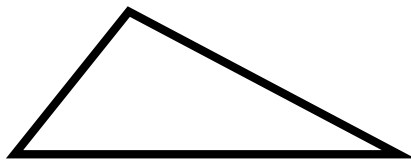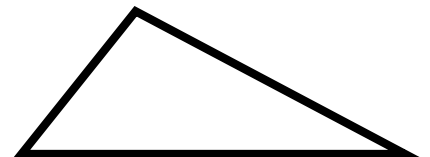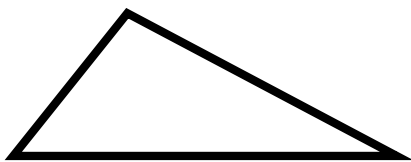
Classifying Triangles

Acute	Right	Obtuse
Equilateral/Equiangular	Isosceles	Scalene

Angles of Triangles

Practice

1.	2.	3.
m∠C = _____	m∠C = _____	x = _____
B 60° 65° A C	B 48° A C	2x - 2 x + 5

4.	5.	6.
x = _____ m∠A = _____	x = _____ m∠B = _____	x = _____
B 68° 3x - 3 2x A C	B 4x 3x 2x A C	x x x

7.	8. If the measures of the angles of a triangle are represented by 3x, 5x - 20 and 4x + 10. Find the measures of the three angles.
x = _____	
3x - 17 x + 40 2x - 5	

9. The measure of the largest angle in a triangle is 4 times the measure of the second largest angle. The smallest angle is 10°. What are the measures of all the angles?

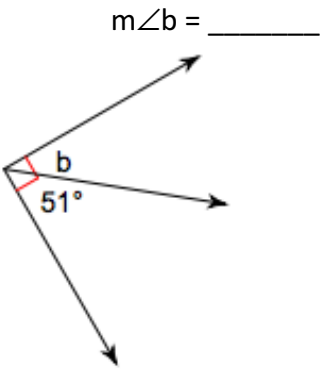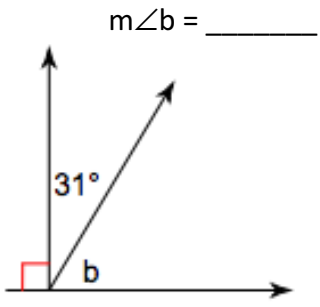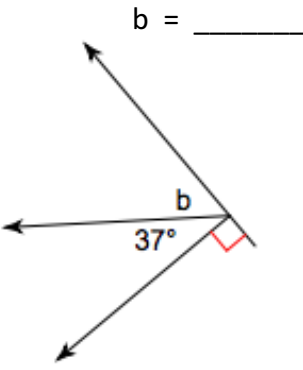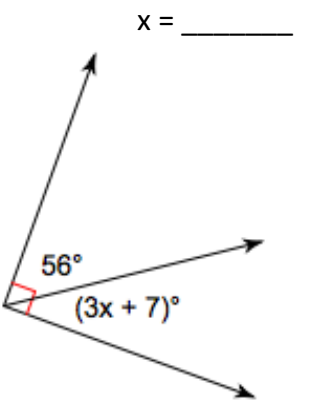|	
10. In ΔABC, the measure of ∠A is one-half the measure of ∠B and the measure of ∠C is three times the measure of ∠B. Find the measures of each angle.	11. In ΔPQR, the measure of ∠P is twice the measure of angle ∠Q. The measure of ∠R is three times the measure ∠P. Find the measures of each angle.
12. Find the degree measure of each angle of a triangle if the ratio of the measures of the three angles are 1 : 3 : 5. Then list them in order from least to greatest.	13. Find the degree measure of each angle of a triangle if the ratio of the measures of the three angles are 1 : 4 : 7. Then list them in order from least to greatest.
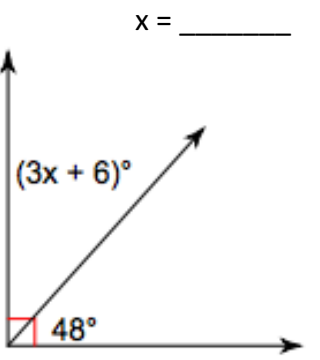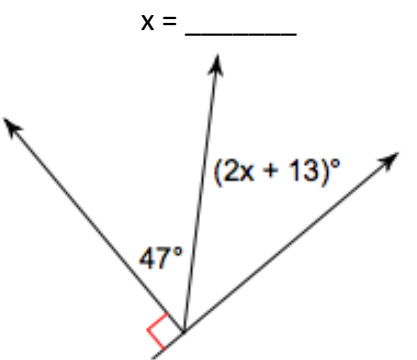
More Vocabulary

Word	Definition/Explanation	Examples/Helpful Tips
Complementary Angles		
Supplementary Angles		
Linear Pair		
Vertical Angles		

Practice

1.	2.	3.
m∠b = _____	m∠b = _____	b = _____
b 51°	31° b	b 37°

4.	5.	6.
x = _____	x = _____	x = _____
56° (3x + 7)°	(3x + 6)° 48°	(2x + 13)° 47°

7.	8.	9.
b = _____	x = _____	x = _____
61° b	(x - 22)° 135°	108° 4x°

10.	11.	12.
x = _____	x = _____	x = _____
138° x	75° x	2x° 74°

13.	14.	15.
x = _____	x = _____	x = _____
126° $(x + 77)°$	85° 55° 8x°	75° $(6x - 21)°$ 105°

16.	17. If m<FTE = 58°, find the measures of all the remaining angles.
x = _____ y = _____	
105° $(12x + 15)°$ 75° $(6y - 27)°$	K T E H F R

18. Based on the diagram, are the following true or false?

a) ∠5 and ∠3 are vertical angles   T or F

b) ∠1 and ∠5 are a linear pair   T or F

c) ∠4 and ∠3 are adjacent angles   T or F

d) ∠4 and ∠1 are vertical angles   T or F

e) ∠3 and ∠4 are a linear pair   T or F
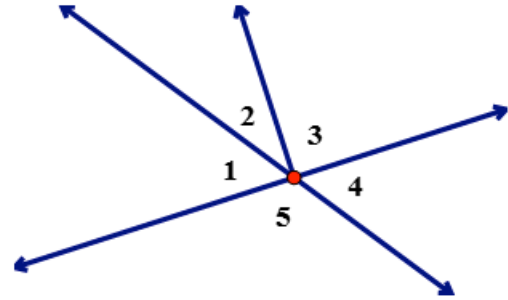
19. If ∠A and ∠B are supplements and m∠A = 150°, what is m∠B?	20. If ∠A and ∠B are complements and m∠A = 27°, what is m∠B?	21. If ∠A and ∠B are vertical angles and m∠A = 36°, what is m∠B?

22. If ∠A and ∠B are a linear pair and m∠A = 2x + 8 and m∠B = 3x + 2, what is the value of x?	23. If m∠A = 7x - 5 and m∠B = 4x + 10 and ∠A and ∠B are vertical angles, what is the value of x?

24. m∠A = _____ m∠C = _____	25. x = _____ m∠C = _____

24.

m∠A = _____   m∠C = _____

B

118°

A   *C*

25.

x = _____   m∠C = _____

B

2x

3x + 5

A   *C*

26.	27.
x = _____	x = _____

26. x = _____

121°

x

27. x = _____

42°

x

28. x = _____

x   47°   81°

29. x = _____

52°   x

30. m∠1 = _____   m∠2 = _____   m∠3 = _____

64°

1   2   3

31. m∠1 = _____   m∠2 = _____   m∠3 = _____

1   2
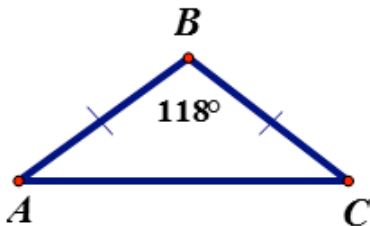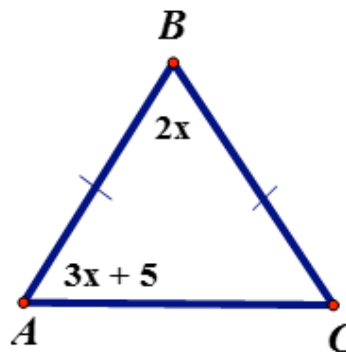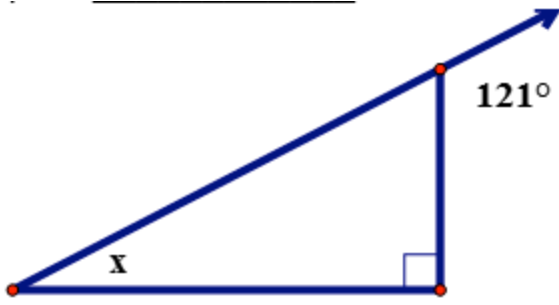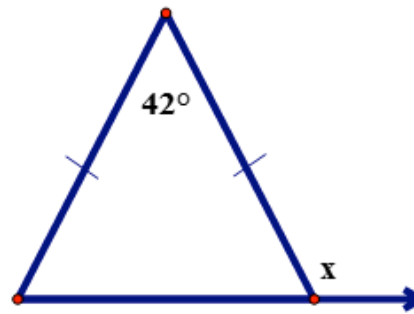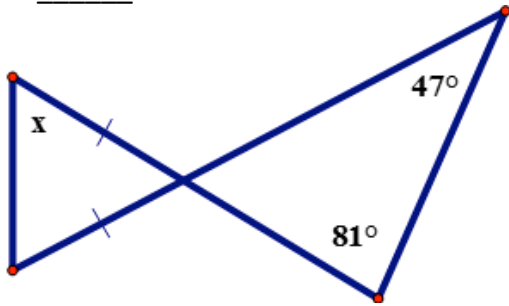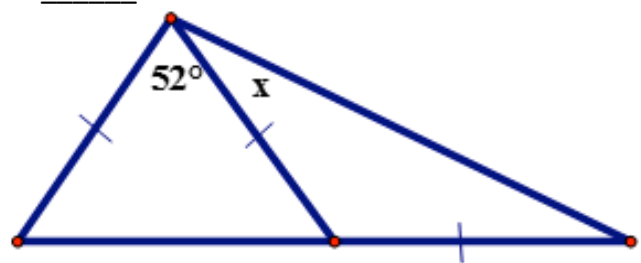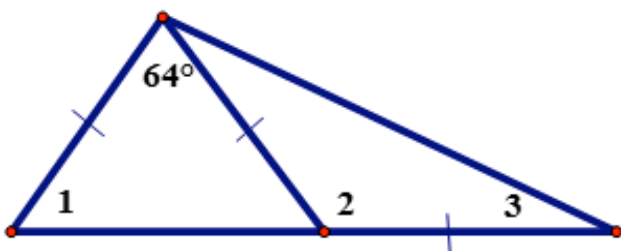
68°   3
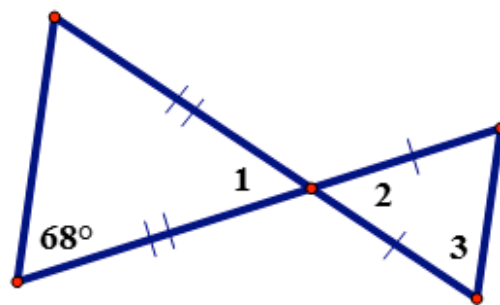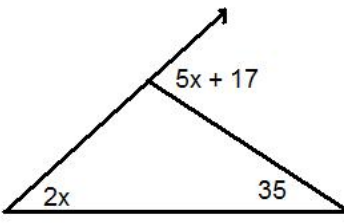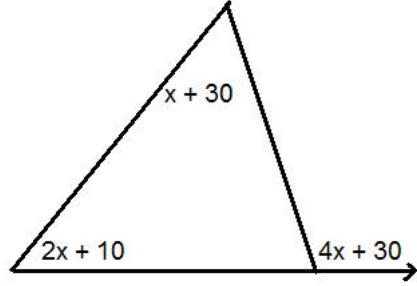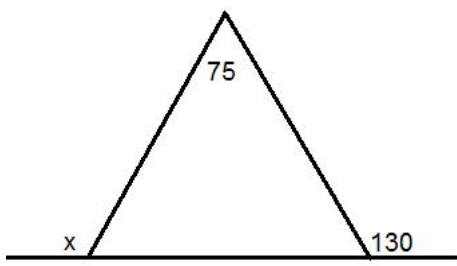
Exterior Angle Theorem

Word	Examples	Non-Examples
Exterior Angle		

Development of the Exterior Angle Theorem
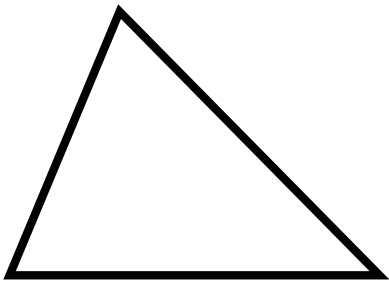
Practice

1.	2.	3.
8.	9.	10.
14.	15.	16.

17.	18.	19.
5x + 17, 2x, 35	x + 30, 2x + 10, 4x + 30	75, x, 130

| 20. Find the measure of either of the exterior angles formed by extending the base of an isosceles triangle, if the vertex angle of the triangle is 20.	28. In $\triangle PQR$, the measure of $\angle P$ is twice the measure of $\angle Q$. If an exterior angle at vertex $\angle R$ has a degree measure of 120, find m$\angle Q$
Find the measure of either of the exterior angles formed by extending the base of an isosceles triangle, if the vertex angle of the triangle is 135.	29. In $\triangle ABC$, m$\angle B$ is four times as large as m$\angle A$. An exterior angle at $\angle C$ measures 125. Find the degrees m$\angle A$.

Parallel Lines

Word	Definition/Explanation	Examples/Helpful Tips
Parallel Lines		
Transversal Line		

Parallel Lines Cut by a Transversal

Parallel Lines   **Nonparallel Lines**

$l \| m$

t is a transversal for l and m.   **r is a transversal for b and c.**
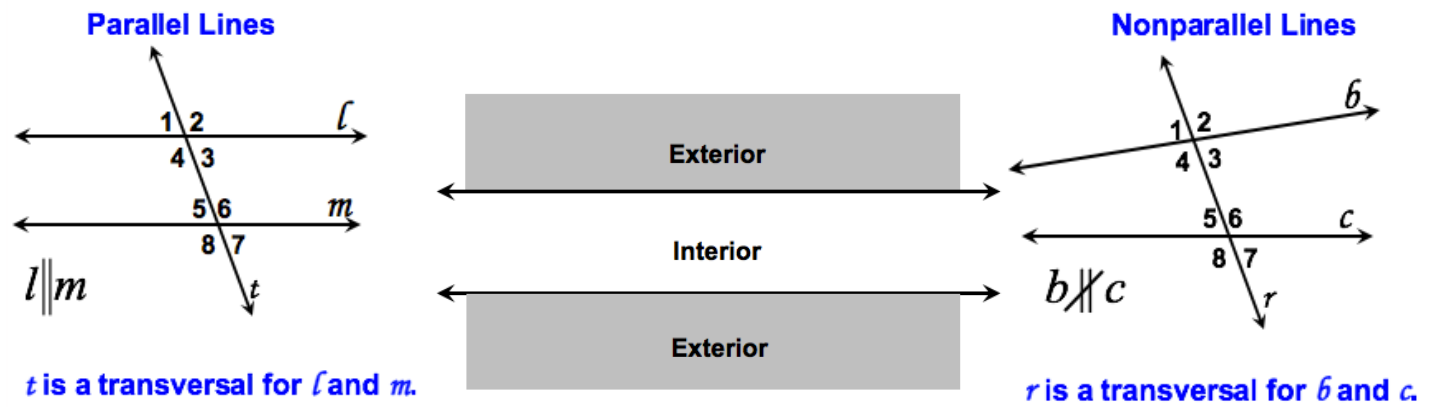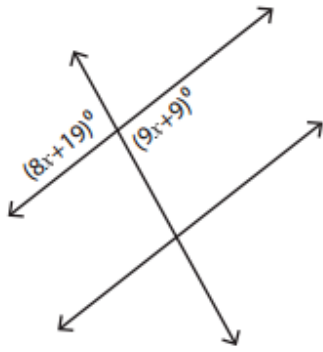
Note: Parallel Lines can be in any direction

Angle Relationships in Parallel Lines Cut by a Transversal
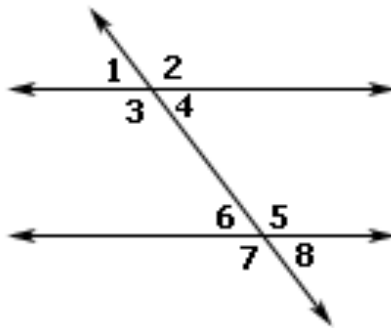
Type of Relationship	Angle Relationship	Examples
Alternate Interior Angles		
Alternate Exterior Angles		
Corresponding Angles		
Same Side Interior Angles		
Same Side Exterior Angles		

Practice

1.	2.	3.
$(8x+19)^0$ $(9x+9)^0$	$(3x-31)^0$ $(x+59)^0$	$(5x-33)^0$ $(6x+4)^0$

4.	5.	6.
$2x^0$ $(3x-26)^0$	$(x+10)^0$ $(x+50)^0$	$(6x+3)^0$ $(7x-12)^0$

7.	8.	9.
$(3x+19)^0$ $(4x-2)^0$	$(3x+1)^0$ $(x+11)^0$	$7x^0$ $(5x+12)^0$

10.

$(2x+9)^0$

$(14-x)^0$

11.

$(39+x)^0$

$(x+11)^0$

12.

$(x+5)^0$

$(75-x)^0$

13.

$(8x+1)^0$

$(4x+11)^0$

14.

$(3x+25)^0$

$(4x-5)^0$

15.

$(2x+6)^0$

$(x+55)^0$

16.

$(3x-100)^0$

$(2x-20)^0$

17.

$(5x+10)^0$

$(4x-10)^0$

18.

$(6x+8)^0$

$(7x-5)^0$
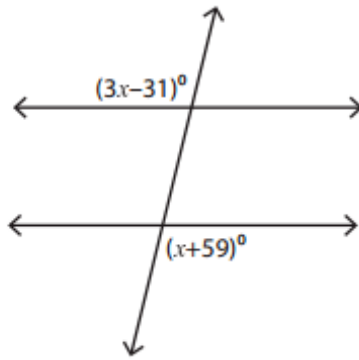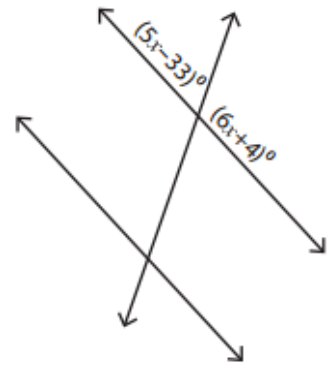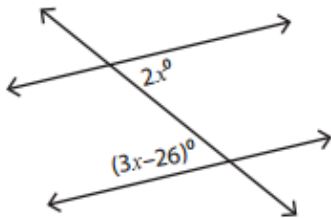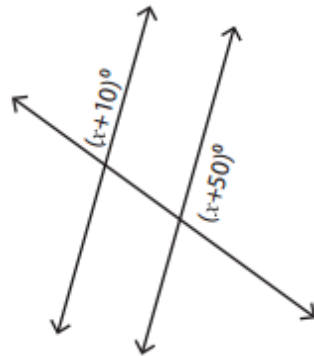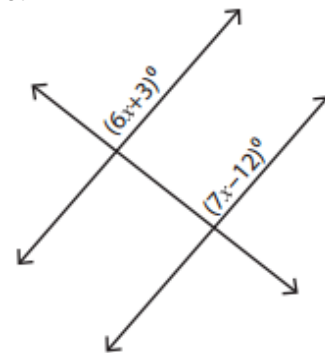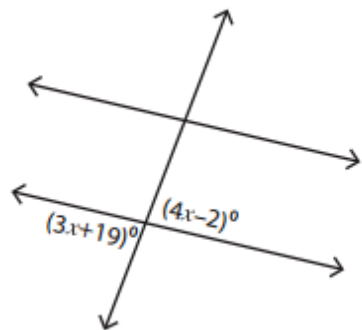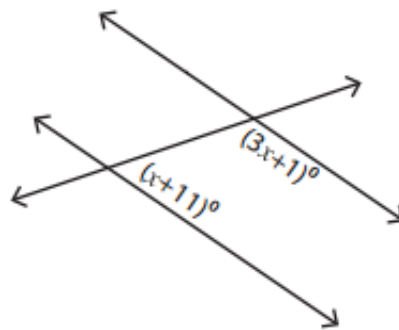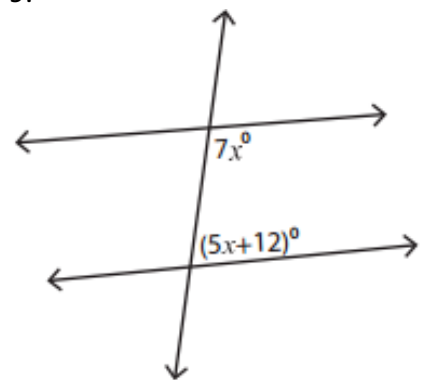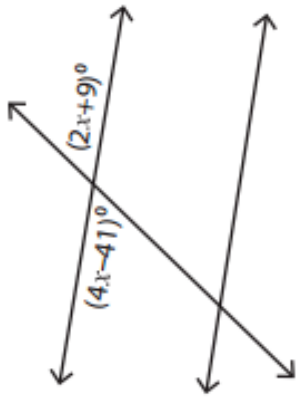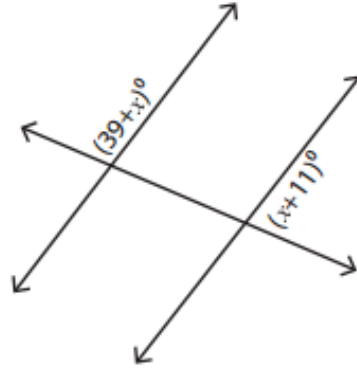
19.	20.	21.
$(8x-12)^o$ $(3x+28)^o$	$(7x+10)^o$ $(26x+5)^o$	$(2x+39)^o$ $(x+64)^o$
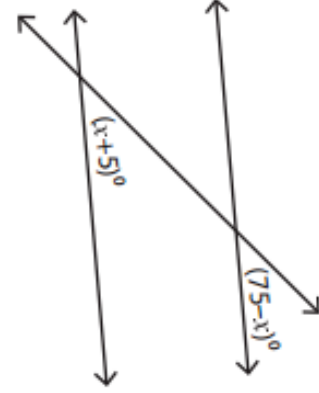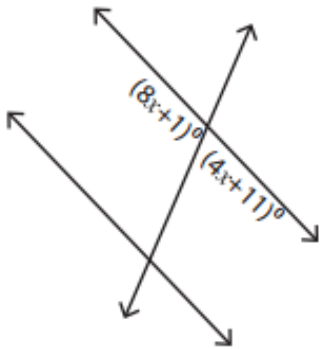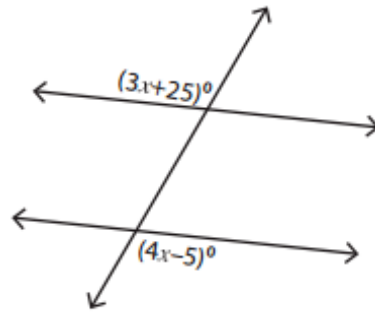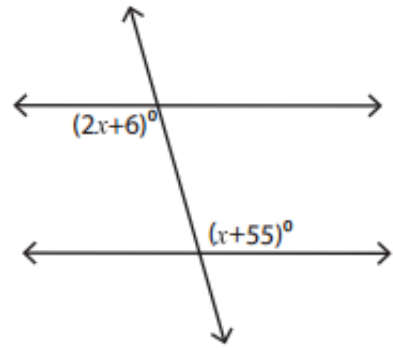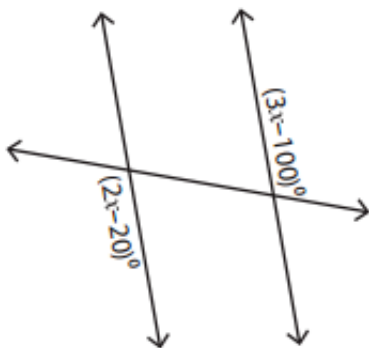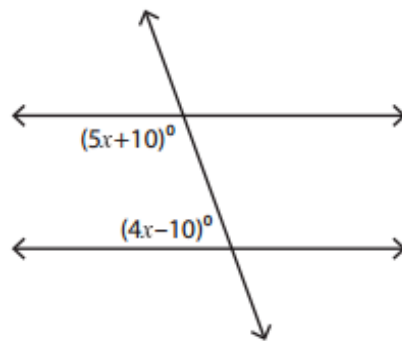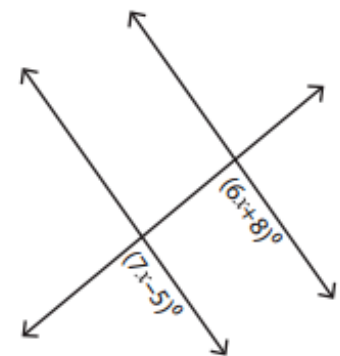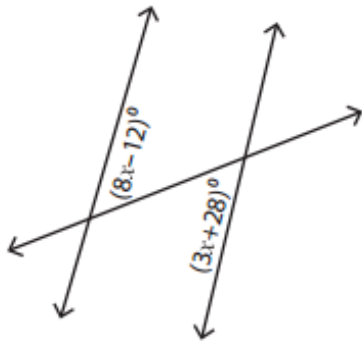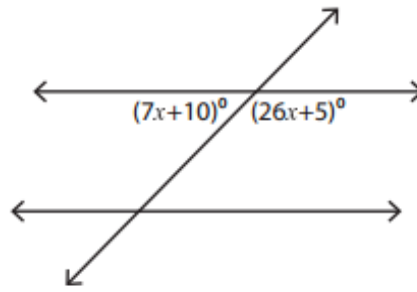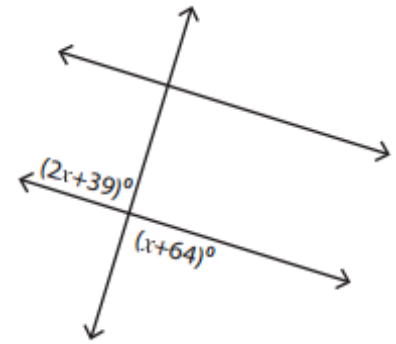
22. a) $\angle 1 = \angle 4$ T or F

   b) $\angle 3 = \angle 5$ T or F

   c) $\angle 2 = \angle 10$ T or F

   d) $\angle 12 = \angle 14$ T or F

   e) $\angle 9 = \angle 11$ T or F

   f) $\angle 9 = \angle 15$ T or F

   g) $\angle 6 = \angle 16$ T or F

   h) $\angle 4 = \angle 5$ T or F

   i) $m\angle 11 + m\angle 15 = 180^o$ T or F

   j) $m\angle 1 + m\angle 8 = 180^o$ T or F

13.	14.
x = _____ y = _____	x = _____ y = _____
$6y$ $9x + 12$ $13y - 10$	$4x - 5$ $3y + 1$ $3x + 11$
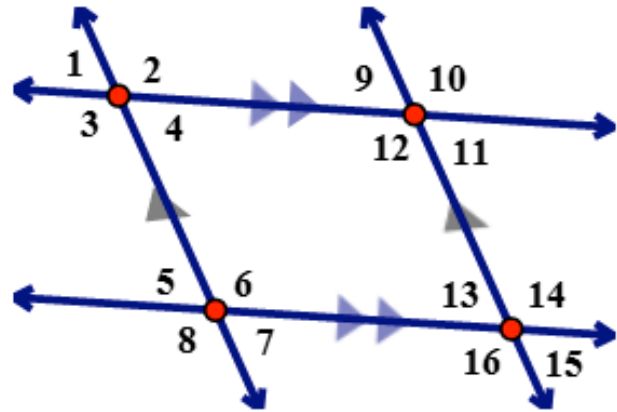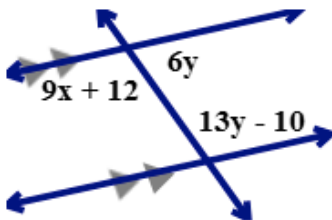
Triangle Inequality Theorem
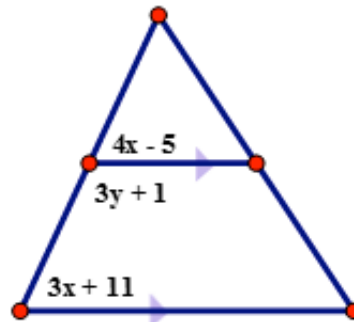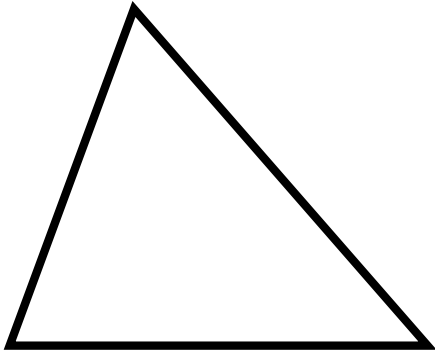
Practice

Tell whether the given lengths may be the measure of the sides of a triangle.				
1. 3, 4, 5	2. 5, 8, 13	3. 6, 7, 10	4. 3, 9, 15	5. 2, 2, 3
6. 1, 1, 2	7. 3, 4, 4	8. 5, 8, 11	9. 6, 2, 3	10. 5, 3, 7

Triangle Inequality Theorem Discovery

Practice Using the Discovery

Tell whether the given lengths may be the measure of the sides of a triangle.				
11. 4, 6, 3	12. 9, 4, 5	13. 2, 3, 5	14. 4, 4, 8	15. 3, 4, 8
16. 5, 6, 7	17. 6, 10, 9	18. 7, 5, 8	19. 6, 13, 7	20. 2, 5, 3

More Practice

| 1. Which set of numbers could not be the lengths of the sides of a triangle? 1) 1, 1, 2 2) 2, 3, 4 3) 1, $\sqrt{3}$, 2 4) 3, 4, 5	2. Which set of numbers could not be the lengths of the sides of a triangle? 1) 4, 7, 9 2) 4, 8, 12 3) 9, 10, 11 4) 6, 6, 11
3. Which set of numbers could not be the lengths of the sides of a triangle? 1) 9, 12, 19 2) 6, 8, 11 3) 7, 18, 11 4) 7, 5, 6	4. Which set of numbers could be the lengths of the sides of a isosceles triangle? 1) 15, 5, 10 2) 3, 4, 5 3) 1, 1, 3 4) 6, 6, 5
5. Two sides of an isosceles triangle have lengths 2 and 12 respectively. What is the length of the third side? 1) 9 2) 8 3) 12 4) 14	6. Two sides of an isosceles triangle have lengths 4 and 8. What is the third side? 1) 4 2) 6 3) 5 4) 8
7. Two sides of a triangle have lengths 5 and 8. Which length can not be the length of the third side? 1) 5 2) 4 3) 3 4) 6	8. Two sides of a triangle have lengths 4 and 7. Which length can not be the length of the third side? 1) 11 2) 5 3) 7 4) 4

Triangle Largest and Smallest Angles and Sides
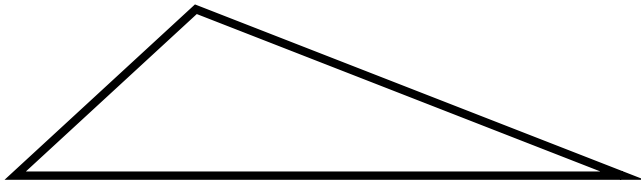
Practice
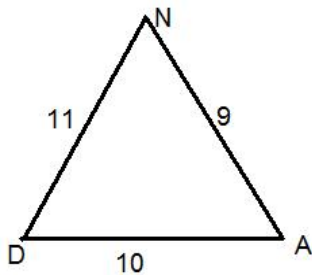
1. In ΔDNA, find:	2. In ΔSUE, find:
a) smallest angle_____ b) largest angle_____	a) smallest angle_____ b) largest angle_____
3. In ΔAME, find:	4. In ΔNES, find:
a) smallest side_____ b) largest side_____	a) smallest side_____ b) largest side_____
5. In ΔZPA, find:	6. In ΔFCX, find:
a) smallest side_____ b) largest side_____	a) smallest side_____ b) largest side_____
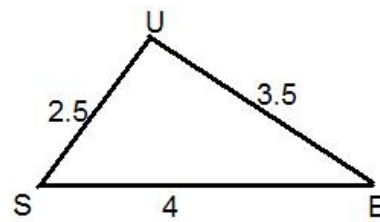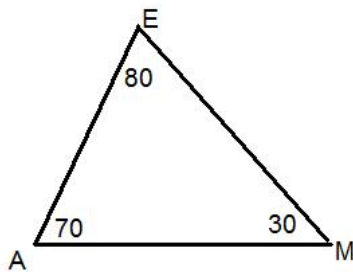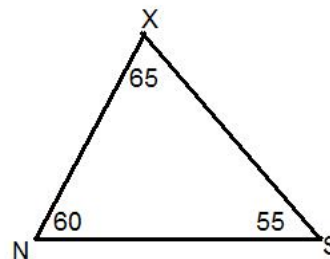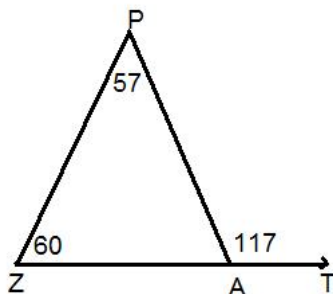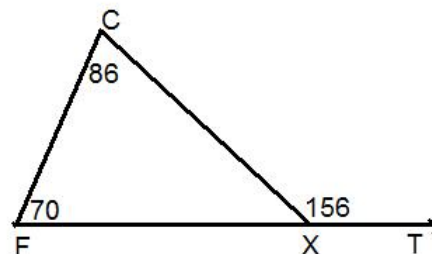
7. On the banks of a river, surveyors marked locations *A*, *B*, and *C*. The measure of ∠ACE = 70° and the measure of ∠ABC = 65°.
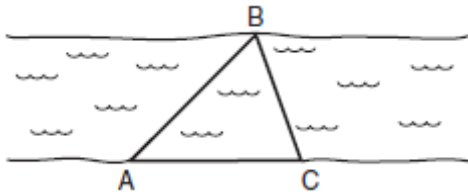
Which expression shows the relationship between the lengths of the sides of this triangle?
1) AB < BC < AC
2) BC < AB < AC
3) BC < AC < AB
4) AC < AB < BC

8. In ΔPQR, $PQ = 8$, $QR = 12$, and $RP = 13$. Which statement about the angles of ΔPQR must be true?
1) $m\angle Q > m\angle P > m\angle R$
2) $m\angle Q > m\angle R > m\angle P$
3) $m\angle R > m\angle P > m\angle Q$
4) $m\angle P > m\angle R > m\angle Q$

9. In ΔABC, ∠A ≅ ∠B and m∠C is an obtuse angle. Which statement is true?
1) $\overline{AC} \cong \overline{AB}$ and $\overline{BC}$ is the longest side.
2) $\overline{AC} \cong \overline{BC}$ and $\overline{AB}$ is the longest side.
3) $\overline{AC} \cong \overline{AB}$ and $\overline{BC}$ is the shortest side.
4) $\overline{AC} \cong \overline{BC}$ and $\overline{AB}$ is the shortest side.

10. In ΔABC, m∠A = 60°, m∠B = 80°, $m\angle A = 60$, and m∠C = 40°. Which inequality is true?
1) AB > BC
2) AC > BC
3) AC < BA
4) BC < BA

11. In ΔABC, $m\angle A = x^2 + 12$, $m\angle B = 11x + 5$, and $m\angle C = 13x - 17$. Determine the longest side of ΔABC.

12. As shown in the diagram of ΔACD below, *B* is a point on $\overline{AC}$ and $\overline{DB}$ is drawn.
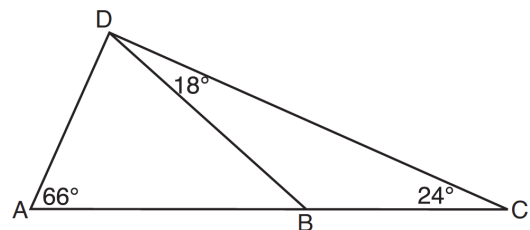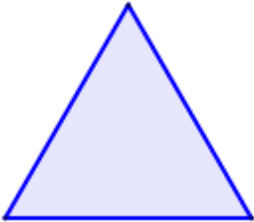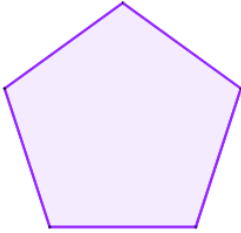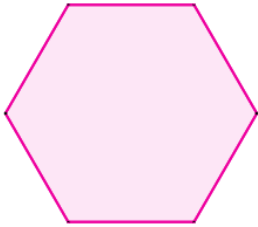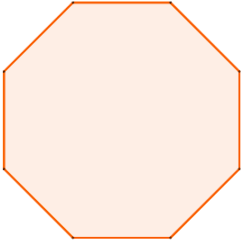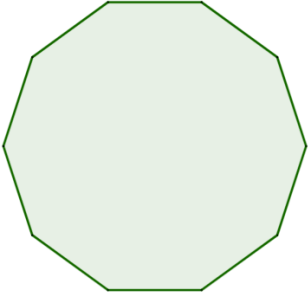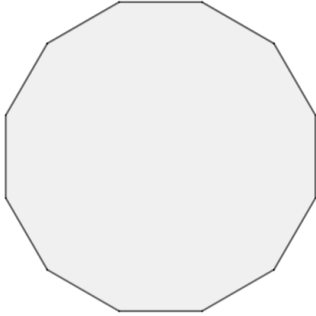
If $m\angle A = 66$, $m\angle CDB = 18$, and $m\angle C = 24$, what is the longest side of ΔABD?
1) $\overline{AB}$
2) $\overline{DC}$
3) $\overline{AD}$
4) $\overline{BD}$

Polygons

Word	Definition/Explanation	Examples/Helpful Tips
Polygon		
Regular Polygon		

Identifying Polygons

Name each polygon			
1.	2.	3.	4.
5.		6.	7.

Exterior Angles of Polygons

Word	Examples	Non-Examples
Exterior Angles of Polygons		

Exterior Angles of Polygons Discovery
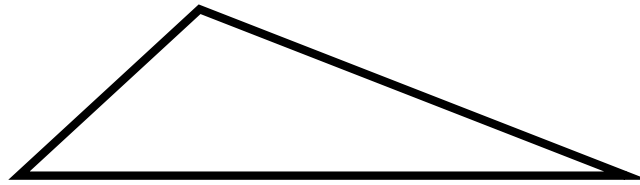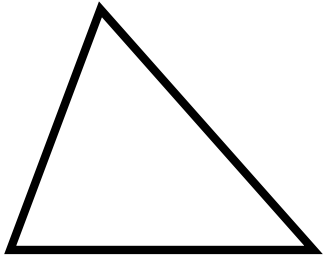
Practice

1. The pentagon in the diagram below is formed by five rays. What is the degree measure of angle *x*? 1) 72 2) 96 3) 108 4) 112	2. A stop sign in the shape of a regular octagon is resting on a brick wall, as shown in the accompanying diagram. What is the measure of angle *x*? 1) 45° 2) 60° 3) 120° 4) 135°
3. Which regular polygon has a minimum rotation of 45° to carry the polygon onto itself? 1) octagon 2) decagon 3) hexagon 4) pentagon	4. A regular hexagon is rotated in a counterclockwise direction about its center. Determine and state the minimum number of degrees in the rotation such that the hexagon will coincide with itself.
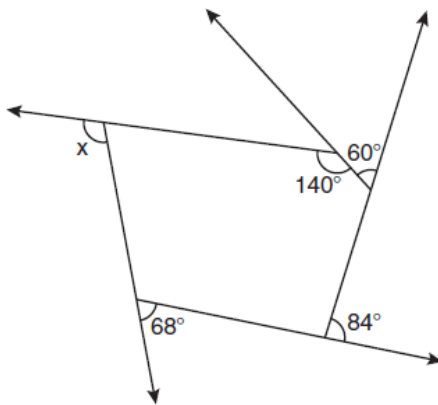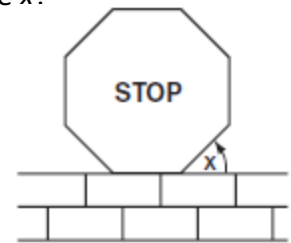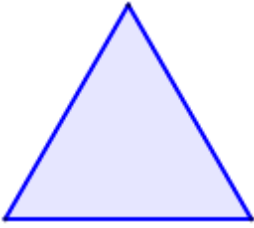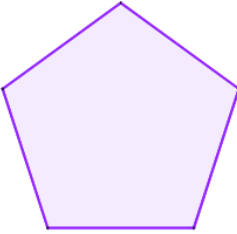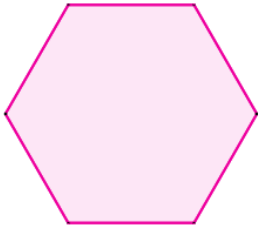
Interior Angles of Polygons Discovery

Determine the Sum of the Interior Angles of Each Figure			
1.	2.	3.	4.

Practice

1. What is the measure of each interior angle in a regular octagon? 1) 108º 2) 135º 3) 144º 4) 1080º	2. The sum of the interior angles of a regular polygon is 540°. Determine and state the number of degrees in one interior angle of the polygon.
3. The measure of an interior angle of a regular polygon is 108°. What is the name of the polygon?	4. The measure of an interior angle of a regular polygon is 120°. How many sides does the polygon have? 1) 5 2) 6 3) 3 4) 4

Mixed Review Questions

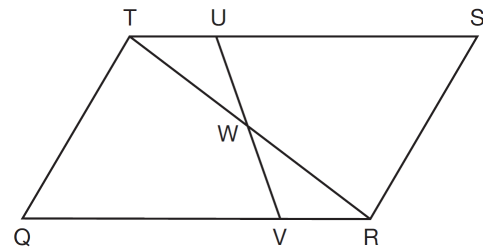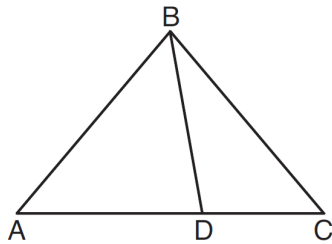|	
1. In the diagram of parallelogram *FRED* shown below, $\overline{ED}$ is extended to A, and $\overline{AF}$ is drawn such that $\overline{AF} \cong \overline{DF}$. If $m\angle R = 124°$, what is $m\angle AFD$? 1) 124° 2) 112° 3) 68° 4) 56°	2. In parallelogram *QRST* shown below, diagonal $\overline{TR}$ is drawn, *U* and *V* are points on $\overline{TS}$ and $\overline{QR}$, respectively, and $\overline{UV}$ intersects $\overline{TR}$ at *W*. If $m\angle S = 60°$, $m\angle SRT = 83°$, and $m\angle TWU = 35°$, what is $m\angle WVQ$? 1) 37º 2) 60º 3) 72º 4) 83º
3. In the diagram below, $m\angle BDC = 100°$, $m\angle A = 50°$, and $m\angle DBC = 30°$. Which statement is true? 1) $\triangle ABD$ is obtuse. 2) $\triangle ABC$ is isosceles. 3) $m\angle ABD = 80°$ 4) $\triangle ABD$ is scalene.	4. Steve drew line segments *ABCD, EFG, BF,* and *CF* as shown in the diagram below. Scalene $\triangle BFC$ is formed. Which statement will allow Steve to prove $\overline{ABCD} \parallel \overline{EFG}$? 1) $\angle CFG \cong \angle FCB$ 2) $\angle ABF \cong \angle BFC$ 3) $\angle EFB \cong \angle CFB$ 4) $\angle CBF \cong \angle GFC$
5. In the diagram below, $\overleftrightarrow{EF}$ intersects $\overline{AB}$ and $\overline{CD}$ at *G* and *H*, respectively, and $\overline{GI}$ is drawn such that $\overline{GH} \cong \overline{IH}$. If $m\angle EGB = 50°$ and $m\angle DIG = 115°$, explain why $\overline{AB} \parallel \overline{CD}$.	6. In the diagram below, lines ℓ, *m*, *n*, and *p* intersect line *r*. Which statement is true? 1) $\ell \parallel n$ 2) $\ell \parallel p$ 3) $m \parallel p$ 4) $m \parallel n$
7. In the diagram below of isosceles triangle *ABC*, $\overline{AB} \cong \overline{CB}$ and angle bisectors $\overline{AD}, \overline{BF}$, and $\overline{CE}$ are drawn and intersect at *X*. If $m\angle BAC = 50°$, find $m\angle AXC$.	
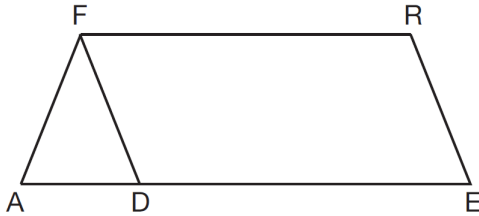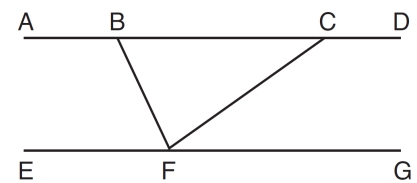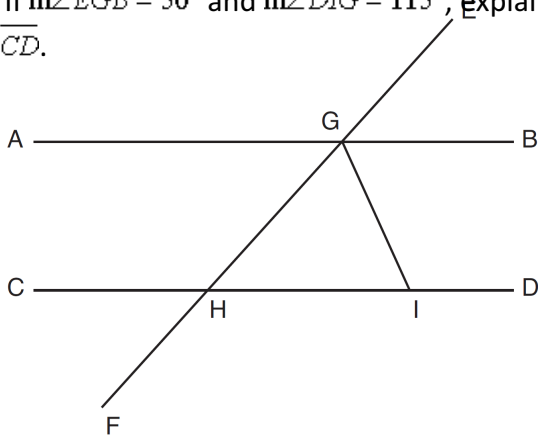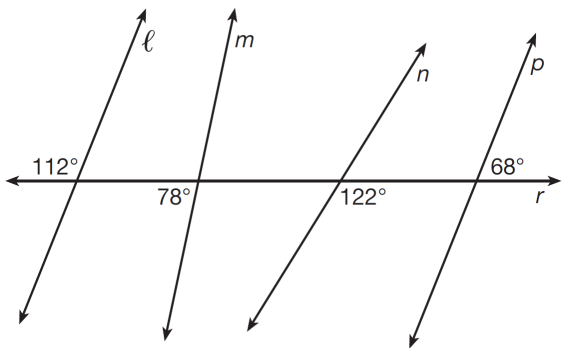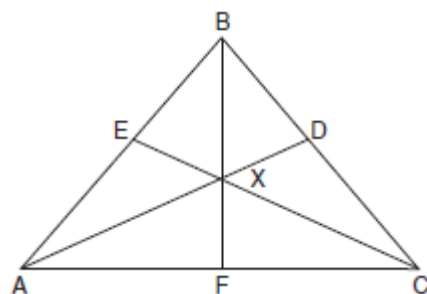
8. The diagram below shows ∆ABD, with ABC, BE ⊥ AD, and ∠EBD ≅ ∠CBD.
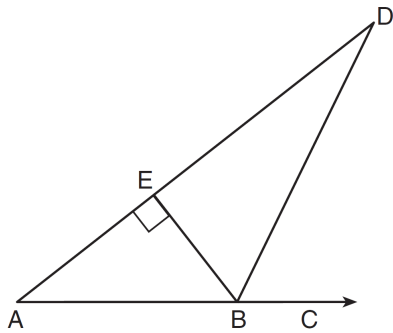
If m∠ABE = 52°, what is m∠D?
1) 26
2) 38
3) 52
4) 64

9. In the diagram of ∆JEA below, m∠JEA = 90° and m∠EAJ = 48°. Line segment *MS* connects points M and *S* on the triangle, such that m∠EMS = 58°.

What is m∠JSM?
1) 163
2) 121
3) 42
4) 17

10. The angles of triangle *ABC* are in the ratio of 8 : 3 : 4. What is the measure of the *smallest* angle?
1) 12º
2) 24º
3) 36º
4) 72º

11. In an equilateral triangle, what is the difference between the sum of the exterior angles and the sum of the interior angles?
1) 180°
2) 120°
3) 90°
4) 60°

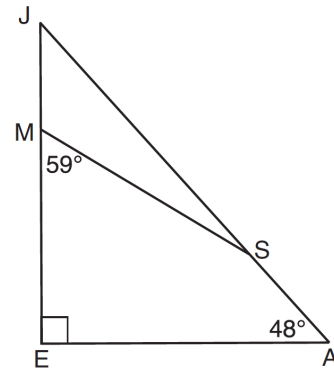12. Triangle *PQR* has angles in the ratio of 2 : 3 : 5. Which type of triangle is ∆PQR?
1) acute
2) isosceles
3) obtuse
4) right

13. In ∆ABC, m∠A = 3x + 1, m∠B = 4x - 17, and m∠C = 5x - 20. Which type of triangle is ∆ABC?
1) right
2) scalene
3) isosceles
4) equilateral

14. In ∆ABC, m∠A = x, m∠B = 2x + 2, and m∠C = 3x + 4. What is the value of *x*?
1) 29
2) 31
3) 59
4) 61

15. In ∆DEF, m∠D = 3x + 5, m∠E = 4x - 15, and m∠F = 2x + 10. Which statement is true?
1) DF = FE
2) DE = FE
3) m∠E = m∠F
4) m∠D = m∠F

16. Juliann plans on drawing ∆ABC, where the measure of m∠A can range from 50° to 60° and the measure of m∠B can range from 90° to 100°. Given these conditions, what is the correct range of measures possible for m∠C?
1) 20° to 40°
2) 30° to 50°
3) 80° to 90°
4) 120° to 130°

17. The degree measures of the angles of ∆ABC are represented by x, 3x, and 5x - 24. Find the value of *x*.

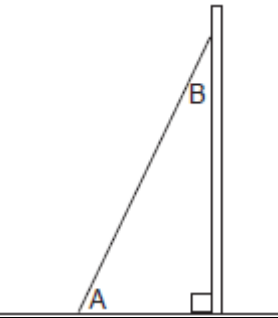| 18. What is the measure of the largest angle in the accompanying triangle?	19. A billboard on level ground is supported by a brace, as shown in the accompanying diagram. The measure of angle A is 15° greater than twice the measure of angle B. Determine the measure of angle A and the measure of angle B.
1) 41 2) 46.5 3) 56 4) 83	
20. In right triangle ABC, $m\angle C = 3y - 10$, $m\angle B = y + 40$, and $m\angle A = 90$. What type of right triangle is triangle ABC? 1) scalene 2) isosceles 3) equilateral 4) obtuse	21. If the measures of the angles of a triangle are represented by $2x$, $3x - 15$, and $7x - 15$ the triangle is 1) an isosceles triangle 2) a right triangle 3) an acute triangle 4) an equiangular triangle
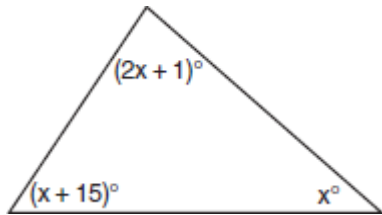
22. If the measures, in degrees, of the three angles of a triangle are x, $x + 10$ and $2x - 6$, the triangle must be
1) isosceles
2) equilateral
3) right
4) scalene
	23. If the vertex angles of two isosceles triangles are congruent, then the triangles must be
	    1) acute 2) congruent
	    3) right 4) similar

24. The accompanying diagram shows the roof of a house that is in the shape of an isosceles triangle. The vertex angle formed at the peak of the roof is 84°. What is the measure of x? 1) 138° 2) 96° 3) 84° 4) 48°	25. Tina wants to sew a piece of fabric into a scarf in the shape of an isosceles triangle, as shown in the accompanying diagram. What are the values of x and y? 1) x = 42 and y = 96 2) x = 69 and y = 69 3) x = 90 and y = 48 4) x = 96 and y = 42
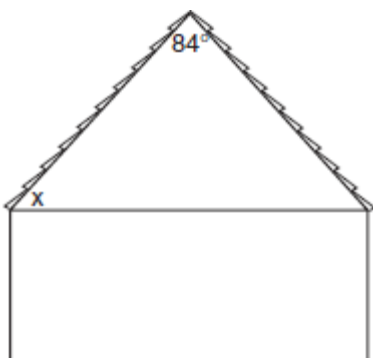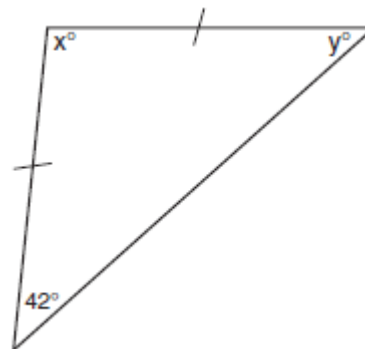
26. In the accompanying diagram, isosceles △ABC ≅ isosceles △DEF, m∠C = 5x, and m∠D = 2x + 18. Find m∠B and m∠BAG.

27. In the accompanying diagram, △ABC and △ABD are isosceles triangles with m∠CAB = 50 and m∠BDA = 55. If AB = AC and AB = BD, what is m∠CBD?

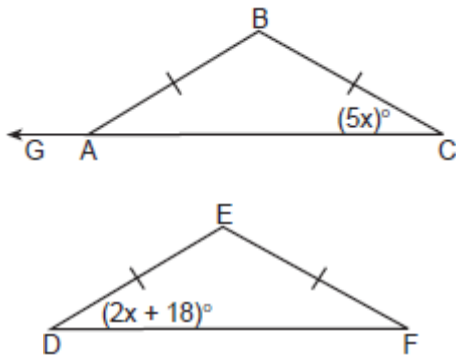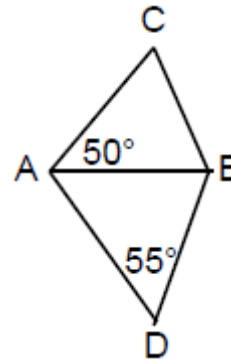28. In isosceles triangle DOG, the measure of the vertex angle is three times the measure of one of the base angles. Which statement about △DOG is true?
1) △DOG is a scalene triangle.
2) △DOG is an acute triangle.
3) △DOG is a right triangle.
4) △DOG is a obtuse triangle.

29. Vertex angle *A* of isosceles triangle *ABC* measures 20° more than three times m∠B. Find m∠C.

30. Hersch says if a triangle is an obtuse triangle, then it cannot also be an isosceles triangle. Using a diagram, show that Hersch is incorrect, and indicate the measures of all the angles and sides to justify your answer.
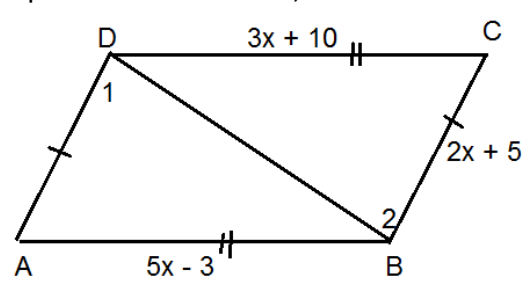
31. In △ABC, the measure of m∠B is 21 less than four times the measure of m∠A, and the measure of m∠C is 1 more than five times the measure of m∠A. Find the measure, in degrees, of each angle of

32. Triangle ABC is congruent to triangle A`B`C`. If m∠C is represented by 2x − 10 and m∠C` is represented by x + 30:
   a) Find x
   b) Find the m∠C
   c) Find m∠B if it is represented by x - 25

33. In isosceles triangle ABC, AB = BC. Which statement will always be true?
   1) m∠B = m∠A   2) m∠A > m∠B
   3) m∠A = m∠C   4) m∠C < m∠B

34. Triangle DEF is congruent to triangle D`E`F`. If EF is represented by $3x + 2$ and E`F` is represented by $x + 10$ and ED is represented by $x + 2$:    a) find x,   b) Find ED   c) Find E`D` d) Find EF	35. Given that AD ≅ CB and ∠1 ≅ ∠2 and AB = 5x − 3, CD = 3x + 10 and BC = 2x + 5, write an equation to solve for x, and then find AB, CD, and BC.

36. If ΔABC, BD is the median to side AC and must be congruent if ΔABD In ΔABC ΔCBD, then ΔABC must be
 	
     1) scalene   2) isosceles
     3) right   4) equilateral
	37. Two right triangles:
	   1) The hypotenuse of one triangle is congruent to the hypotenuse of the other.
	   2) An acute angle of one triangle is congruent to an acute triangle of the other.
	   3) Two leg of one triangle are congruent to two legs of the other.
	   4) Each contains a right angle.

38. Two isosceles triangles are congruent if
 1) The vertex angle of one triangle is congruent to the vertex angle of the other.
 2) A base angle of one triangle is congruent to a base angles of the other.
 3) Leg of one triangle is congruent to a leg of the other
 4) A leg and vertex angle of one triangle are congruent to a leg and vertex angle of the other.
	39. In ΔABC, D is a point on BC such that AD is both angle bisector and an altitude in ΔABC. Which statement may be false?
	   1) BD = CD 2) AB = AC
	   3) AC = BC 4) m∠B = m∠C