MATH II Key

Name: _____ Date: _____ Period___ Class____

Transformational Geometry Note Sheet

A **transformation** is a change in the size, location, or orientation of a figure.

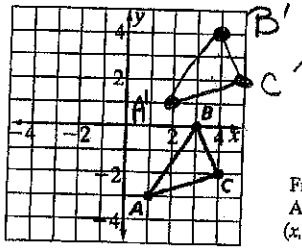
A **translation** is a transformation which moves each point of a figure the same distance and in the same direction

The resulting figure after a transformation is called the image of the original figure.

EXAMPLE 1:

ΔABC is translated 1 unit right and 4 units up. Draw the image $\Delta A'B'C'$.

What are the coordinates of:



A (1, -3) → A' (2, 1)

B (3, 0) → B' (4, 4)

C (4, -2) → C' (5, 2)

From EXAMPLE 1, $\Delta ABC \rightarrow \Delta A'B'C'$

As a general rule this translation could be written as $(x, y) \rightarrow (x + \_\_, y + \_\_)$.

EXAMPLE 2

ΔJKL has coordinates J (0,2), K (3,4), and L (5,1).

a) Draw ΔJKL. b) Draw the image $\Delta J'K'L'$ after a translation of 4 units to the left and 5 units up. Label the triangle. What are the coordinates of:

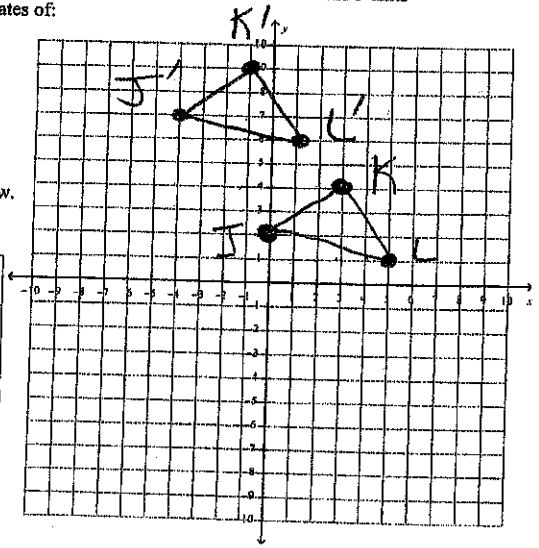
J (0, 2) → J' (-4, 7)

K (3, 4) → K' (-1, 9)

L (5, 1) → L' (1, 6)

Rule: $(x, y) \rightarrow (x - 4, y + 5)$

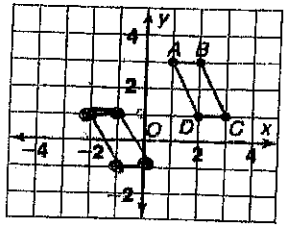
Tell me more about this figure, is it congruent or similar? Explain how you know.



Translation Location

	Add	Subtract
x coordinate	right	left
y coordinate	up	down

left 3 units, down 2 units



2 a) Use arrow notation to write a rule for the given translation. $(x, y) \rightarrow (x - 3, y - 2)$

b) Graph and label the image after the translation.

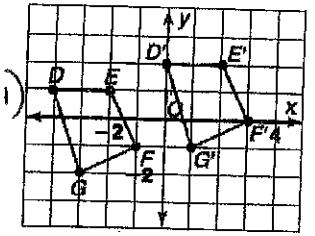
c) Name the coordinates of the image.

A' (-2, 1) B' (-1, 1)

C' (0, -1) D' (-1, -1)

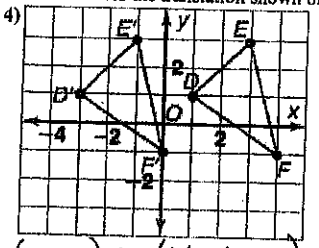
In questions 3 and 4 below, use arrow notation to write a rule that describes the translation shown on the graph.

3)



$(x, y) \rightarrow (x + 4, y + 1)$

4)



$(x, y) \rightarrow (x - 4, y)$

5) MULTIPLE CHOICE: Write a description of the rule $(x, y) \rightarrow (x - 7, y + 4)$.

(a) translation 7 units to the right and 4 units up

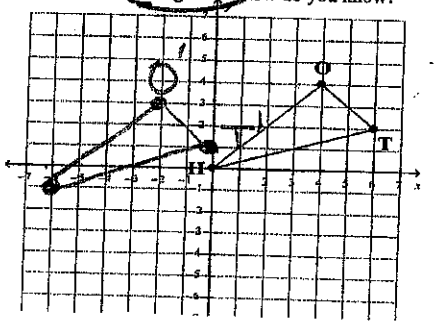
(b) translation 7 units to the left and 4 units down

(c) translation 7 units to the right and 4 units down

(d) translation 7 units to the left and 4 units up

Classwork/Homework/More Practice/Graded Work

1. Draw the translation of the triangle HOT six units left and one unit down. Label the image $H'O'T'$. Is the image similar or congruent? How do you know?

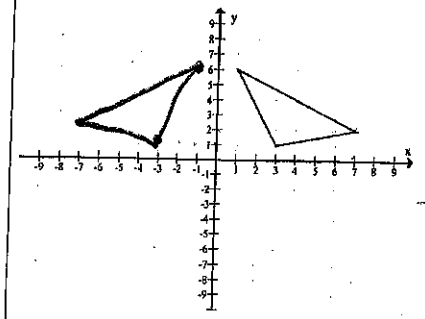


Same shape
Same size

Name: _____

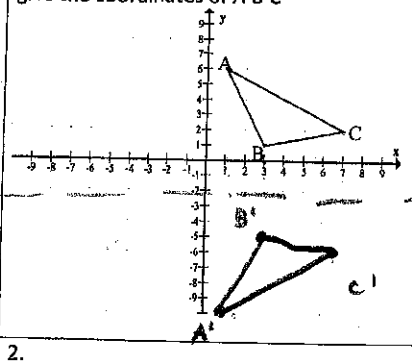
Reflections Worksheet

1. Give the coordinates of ABC. Reflect over the y-axis. Then give the coordinates of A'B'C'



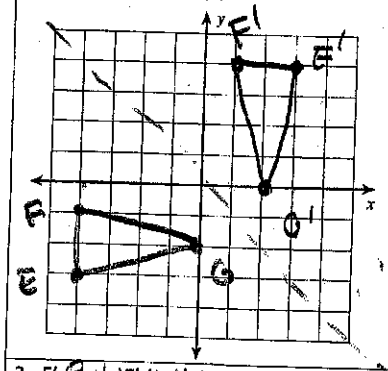
1.
A (1, 6) A' (-1, 6)
B (3, 1) B' (-3, 1)
C (7, 2) C' (-7, 2)

2. Give the coordinates of ABC. Reflect over the line horizontal line $y = -2$ .Then give the coordinates of A'B'C'



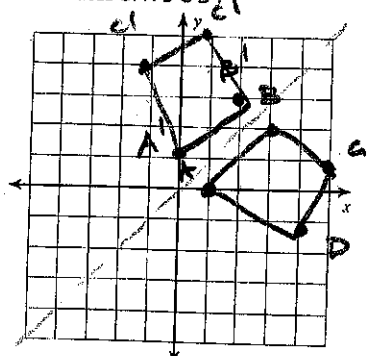
2.
A (6, 1) A' (1, -5)
B (3, 1) B' (3, -5)
C (7, 2) C' (7, -6)

3. Plot E(-4,-3), F(-4,-1), G(0,-2). Reflect across the line $y = -x$. Give the coordinates of E'F'G'.



3. E' (3, 4) F' (1, 4) G' (2, 0)

4. Plot A(1, 0), B(3,2), C(5, 1), D(4, -1). Reflect across the line $y = x$. Give the coordinates of A'B'C'D'.

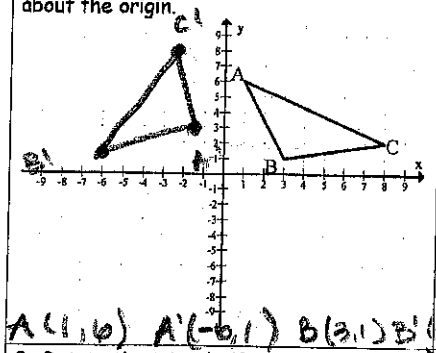


4. A' (0, 1) B' (2, 3) C' (1, 5) D' (-1, 4)

Rotations Worksheet

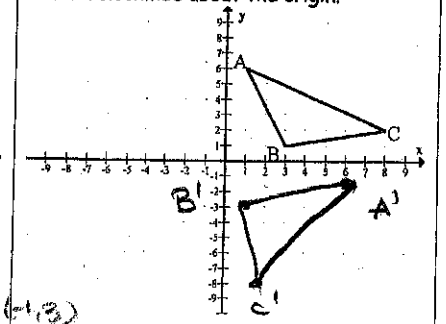
For #1-4, draw the triangle after each transformation and give the coordinates of A', B' and C'.

1. Rotate the triangle 90° counterclockwise about the origin.

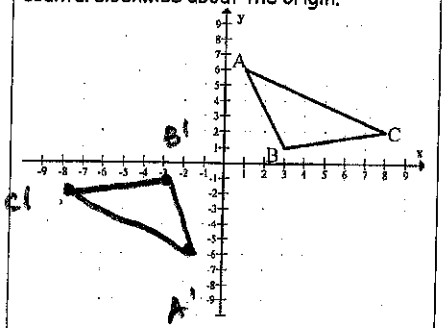


A (1, 6) A' (-6, 1) B (3, 1) B' (-1, 3)

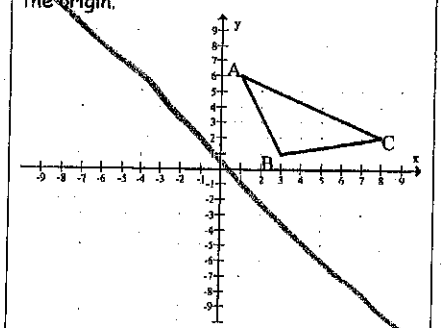
2. Rotate the triangle 270° counterclockwise about the origin. 90 CW



3. Rotate the triangle 180° counterclockwise about the origin.



4. Rotate the triangle 90° clockwise about the origin.



Complete.

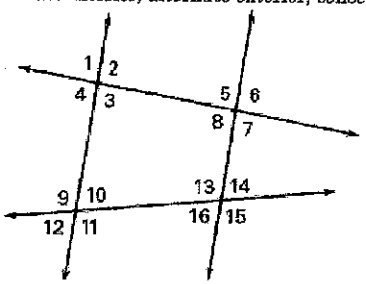
5. Give the coordinates of D(-2, -4) after a 270° counterclockwise rotation about the origin. 90 CW

D' (-4, 2)

6. Give the coordinates of E(-4, 5) after a 180° counterclockwise rotation about the origin.

E' (4, -5)

Classify each angle pair as *corresponding, alternate interior, alternate exterior, consecutive interior, or consecutive exterior.*



a) ∠1 and ∠9 Corr

b) ∠8 and ∠13 SSI

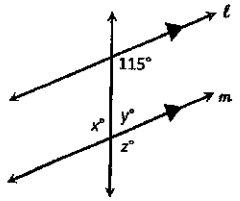
c) ∠6 and ∠16 AEA

d) ∠4 and ∠10 AIA

e) ∠8 and ∠16 Corr

f) ∠10 and ∠13 SSI

Discovery: Lines l and m are parallel. **Note: Parallel lines are distinguished by a matching set of arrows on the lines that are parallel.** Find the measure of the missing angles by using transparent paper. Then, let's go back and fill in the theorems.

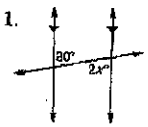


Key Question: If x = 115°, is it possible for y to equal 115°?

No, SSI are supplementary

For t he following diagrams, state the type of angles that are given, state their relationship, and then find x.

1.



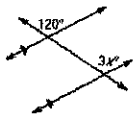
AIA

≅

2x = 80

x = 40

2.



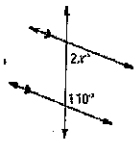
Corr

≅

3x = 120

x = 40

3.



SSI

180

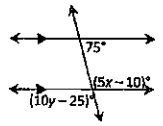
2x + 110 = 180

2x = 70

x = 35

Find the missing variables.

4.



75 + 5x − 10 = 180

5x + 65 = 180

5x = 115

x = 23

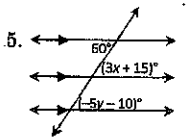
5(23) − 10 = 105

10y − 25 = 105

10y = 130

y = 13

5.



60 = 3x + 15

45 = 3x

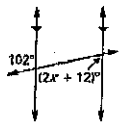
15 = x

60 = −5y − 10

70 = −5y

−14 = y

6.



102 + 2x + 12 = 180

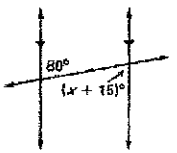
2x + 114 = 180

2x = 66

x = 33

On Your Own: For t he following diagrams, state the type of angles that are given, state their relationship, and then find x.

1.

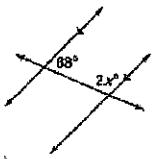


AIA ≅

80 = x + 15

x = 65

2.



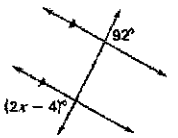
SSI 180

68 + 2x = 180

2x = 112

x = 56

3.



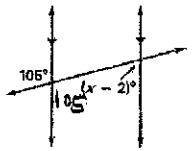
AEA ≅

2x − 4 = 92

2x = 96

x = 48

4.



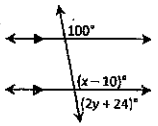
SSI 180

105 + x − 2 = 180

x + 103 = 180

x = 77

5.



Corr ≅

100 = x − 10

110 = x

y = 28

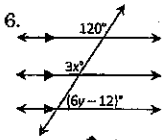
SSE 180

100 + 2y + 24 = 180

124 + 2y = 180

2y = 56

6.



Corr ≅

3x = 120

x = 40

SSI 180

120 − 12 + 6y = 180

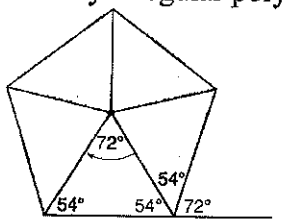
108 + 6y = 180

6y = 72

y = 12

1 ANS: 2

Segments drawn from the center of the regular pentagon bisect each angle of the pentagon, and create five isosceles triangles as shown in the diagram below. Since each exterior angle equals the angles formed by the segments drawn from the center of the regular pentagon, the minimum degrees necessary to carry a regular polygon onto itself are equal to the measure of an exterior angle of the regular polygon.



$\frac{360}{5} = 72.$

REF: spr1402geo

2 ANS: 3

$\frac{360°}{5} = 72°$ 216° is a multiple of 72°

REF: 061819geo

3 ANS: 1

$\frac{360°}{45°} = 8$

REF: 061510geo

4 ANS: 4

$\frac{360°}{10} = 36°$ 252° is a multiple of 36°

REF: 011717geo

5 ANS: 4

$\frac{360°}{10} = 36°$ 252° is a multiple of 36°

REF: 081722geo

6 ANS: 3 REF: 011815geo

7 ANS: 1 REF: 061707geo

8 ANS: 3 REF: 011904geo

9 ANS: 1 REF: 081505geo

10 ANS: 3

The x-axis and line $x = 4$ are lines of symmetry and $(4, 0)$ is a point of symmetry.

REF: 081706geo

11 ANS: 3 REF: 081817geo

12 ANS:

$\frac{360}{6} = 60$

REF: 081627geo

[1] B

[2] D

[3] C

[4] A

[5] A

[6] C

[7] D

[8] B

[9] reflection

[10] translation

[11] rotation

[12] rotation

[13] translation

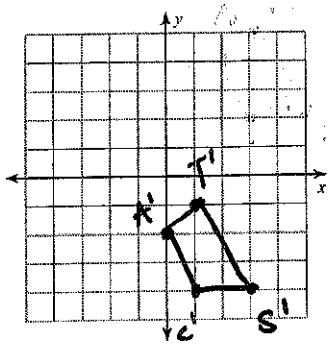
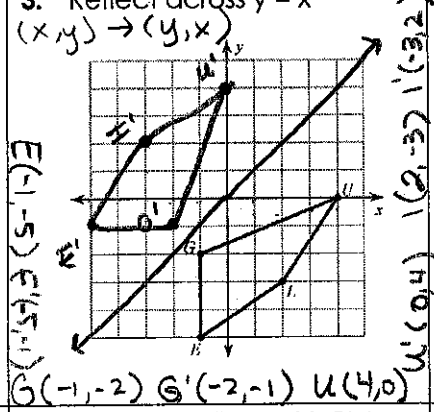
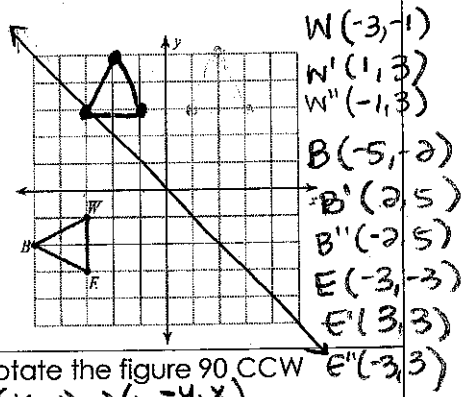
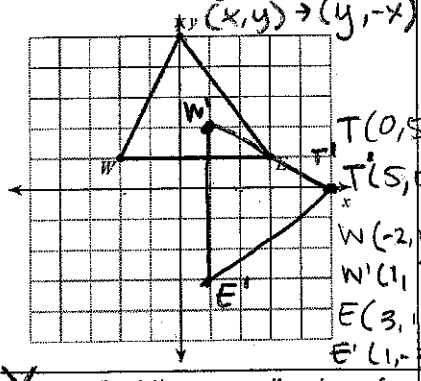
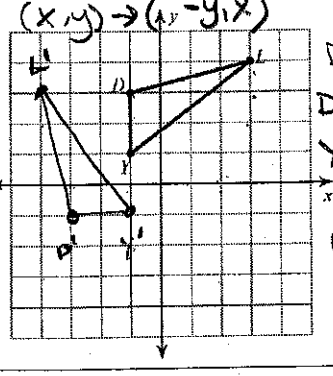
[14] rotation

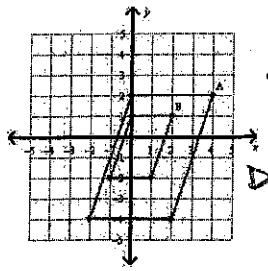
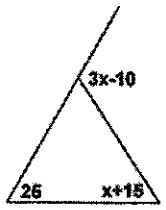
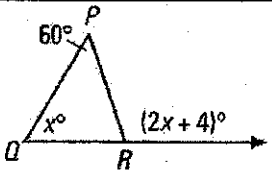
[15] translation

[16] glide reflection

Honors Geometry Unit 1 Transformations and Triangle Review Study Guide

Name: _____ Date: _____ Period_____

What you need to know & be able to do	Things to remember	Problem	Problem
Translations	• Find the new coordinates by adding/ subtracting the given value. • Find the pre-image by doing the OPPOSITE. • A translation is a rigid motion which means the pre-image and image are congruent	**1.** Translate the following points by the rule: $(x,y)\rightarrow(x+1,y-4)$ D (-5, 2)→ D' (-4, -2) O(-4, 5)→ O' (-3, 1) G (-1, 1)→ G' (0, -3) S(-4, -2)→ S' (-3, -6)	**2.** Translation: (x, y) → (x – 2, y – 6) **Graph pre-image and image.** **C(3, 2) A(2, 4) T(3, 5) S(5,2)** 
Reflections	• Reflect over x-axis: (x, -y) • Reflect over y-axis: (-x, y) • Reflect across y = x (switch x and y) • Reflect across y = -x (switch x and y AND change their signs)	**3.** Reflect across y = x $(x,y)\rightarrow(y,x)$  G(-1,-2) G'(-2,-1) U(4,0) U'(0,4) I(2,-3) I'(-3,2) E(-3,-1) E'(-1,-3)	**4.** Reflect across y = -x then reflect across the y-axis  W(-3,-1) W'(1,3) W''(-1,3) B(-5,-2) B'(2,5) B''(-2,5) E(-3,-3) E'(3,3) E''(-3,3)
Rotations	• 90CW/270CCW: (y, -x) • 180: (-x, -y) • 90CCW/270CW: (-y, x) • **"drive the car": the fist that goes over the other is the sign that changes; switch the order.**	**5.** Rotate the figure 90 CW $(x,y)\rightarrow(y,-x)$  T(0,5) T'(5,0) W(-2,1) W'(1,2) E(3,1) E'(1,-3)	**6.** Rotate the figure 90 CCW $(x,y)\rightarrow(-y,x)$  D(-1,3) D'(-3,-1) Y(-1,1) Y'(1,-1) L(3,4) L'(-4,3)
Dilations	• Multiply the coordinates by the given scale factor (k) • Pre-image and image are NOT congruent; they are similar. • Dilations are NOT rigid motions	**7.** A. Find the coordinates of the new vertices of the image that has been dilated by a factor of 5. R (-4, 5)→ R' (-20, 25) A(-1, 1)→ A' (-5, 5) T (-4, -2)→ T' (-20, -10)	**8.** Find the scale factor of the outside image if the inside figure is the pre-image. (smaller to larger) >>> see next page

		Find the coordinates of the new vertices of the image that has been dilated by a factor of 1/2. U(2, 4)→ U' (1,2) R(4,-6)→ R' (2,-3) P(-2, 2)→ P' (-1,1)	 A (4, 2) B (2, 1) Dilation of 2
Multiple Transformations	• ORDER IS IMPORTANT • Use the *previous* ordered pairs to do the next transformation.	**9.** Given the points **M (-3, 1) S (5, -2)** Translate: (x – 3, y + 2) Reflect: over y -axis M' → (-6, 3) S' → (2, 0) M'' → (6, 3) S'' → (-2, 0)	**10.** Given the points **K (0, -4) P (-6, -3) R (1, 2)** Reflect: over the x-axis Rotate: 270 CCW 90 CW K' → (0, 4) P' → (-6, 3) R' → (1, -2) K'' → (4, 0) P'' → (3, 6) R'' → (2, 1)
Angles of a triangle	• Angles add up to 180 • The exterior angle of a triangle is equal to the sum of the 2 remote interior angles	**11.** The angles of a triangle measure x+14, 4x – 2, and 5x +8. Solve for x and find the 3 angle measures. X= 16 Angles 30, 62, 92	**12.** Given the sides lengths, find the interval of the 3rd side a. 5 and 8 $3 < X < 13$ b. 10 and 11 $1 < X < 21$
		13.  X = 25	**14.**  X= 64

(11) $x+14+4x-2+5x+8=180$

$10x+20=180$

$10x=160$

$x=16$

(13) $25+x+15=3x-10$

$40+x=3x-10$

$50=2x$

$25=x$

(14) $x+60=2x-4$

$64=x$

Special angle relationships

- Parallel lines cut by a transversal forms congruent and supplementary angles
- Angle relationships can be vertical, adjacent, alternate interior, alternate exterior, corresponding, same-side interior, and same-side exterior.

(16) $2x+20+3x+45$

$5x+65=180$

$5x=115$

$x=23$

(20) $82=2x+10$

$72=2x$

$36=x$

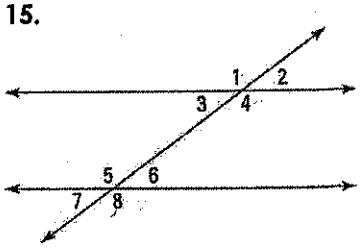
(21) $5x+10+3x+2$

$8x+12=180$

$8x=168$

$x=21$

15.



Congruent angles:
1 and 4, 5, 8
2 and 3, 6, 7
Supplementary angles:
Angle 1 and 3, 7, 2
Angle 2 and 1, 4, 8

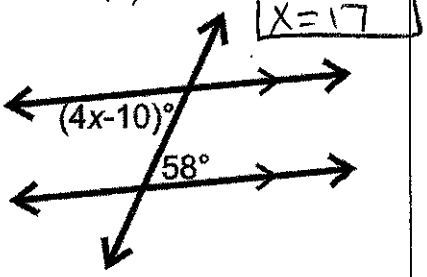
16. If <3 = 2x + 20 and <5=3x+45, solve for x and find angles 5 and 3.
X= 23
<3= 66
<5= 114

17. a. Solve for x.

$4x-10=58$

$4x=68$

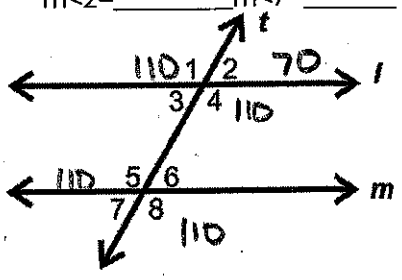
$X=17$



18. If m<5=110, find

m<8= 110 m<4= 110

m<2= 70 m<7=

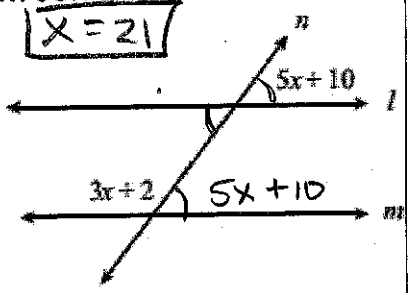


19. Relationships:
Angles 1and 8: AEA ≅
Angles1and 5: Corr. ≅
Angles 4 and 8: Corr ≅
Angles 3 and 6: AIA ≅
Angles 7and 6: VA ≅
Angles 7 and 8: LP = 180
Angles 3 and 5: SSI = 180
Angles 2 and 8: SSE = 180

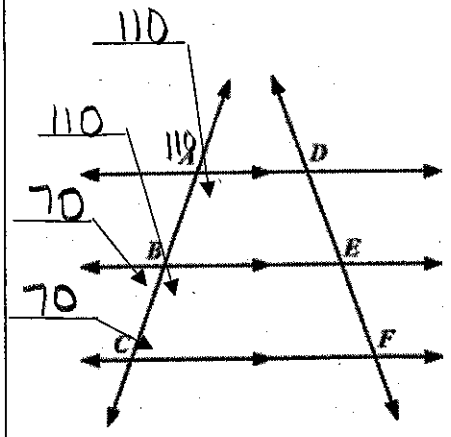
20. If <6 =82 and <3 =2x+10, find x and angles 6 and 3.
X= 36 **m<6=** 82
m<3= 82

21. Solve for x.

$X=21$



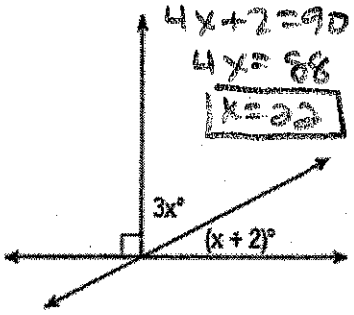
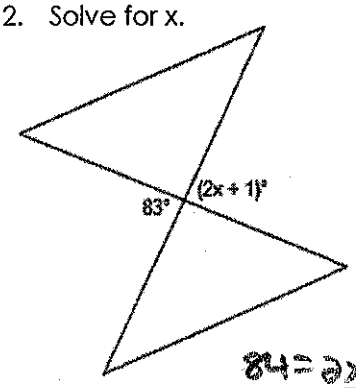
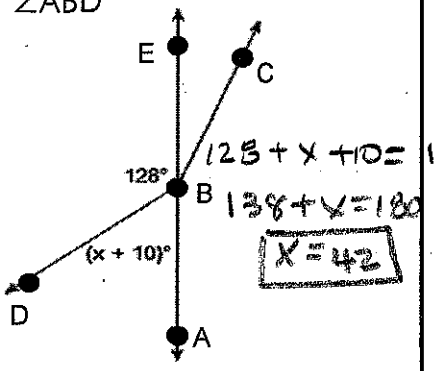
22. a. If <A = 110, find the angles the arrows are pointing to.



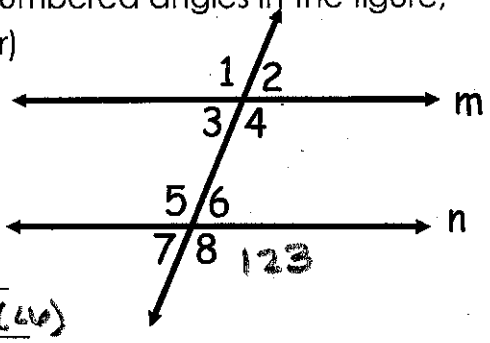
GSE Geometry Test Review

Name: _____ Date: _____

Use the following to review for you test. **Show your work on a separate sheet of paper if needed.**

Things to Know	Things to Remember	Examples
Solving for missing angles	Linear Pair – ___+___ = 180° Supplementary Angles ___+___ = 180° Complementary Angles ___+___ = 90° Vertical Angles ___ = ___ Alternate Interior Angles ___ = ___ Alternate Exterior Angles ___ = ___ Corresponding Angles ___ = ___ Consecutive Interior Angles ___+___ = 180°	1. Solve for x. $3x+x+2=90$ $4x+2=90$ $4x=88$ $x=22$  2. Solve for x.  $83=2x+1$ $82=2x$ $41=x$ 3. Solve for x, and the measure of ∠ABD  $128+x+10=180$ $138+x=180$ $x=42$ 4. One of two supplementary angles is 98° greater than its supplement. Find the measure of both angles. $m\angle 1 = x+98$ $m\angle 2 = x$ $2x+98=180$ $2x=82$ $x=41$ 5. ∠1 and ∠2 are complementary angles. Solve for x and the measure of both angles. $\angle 1 = 7x+20$ 41 $\angle 2 = 17x-2$ 49 $24x+18=90$ $24x=72$ $x=3$

6. Given m□n, $m\angle 8 = 123°$, find the measures of all the numbered angles in the figure, and give the reason why (vocab in things to remember)

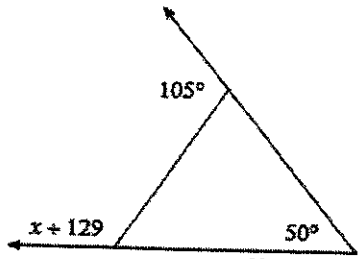
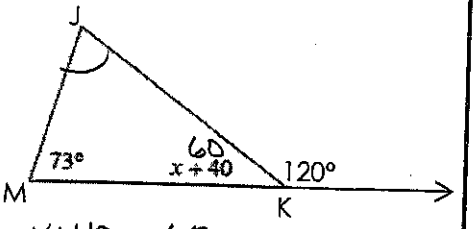
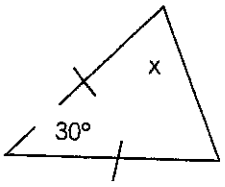
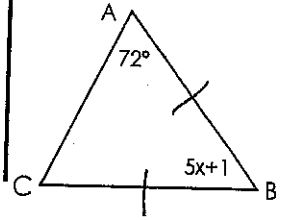


$m\angle 1 =$ 123, $m\angle 2 =$ 57, $m\angle 3 =$ 57

VA ≅ Corr ≅ (∠4) VA ≅ (∠2)

$m\angle 4 =$ 123, $m\angle 5 =$ 123, $m\angle 6 =$ 57, $m\angle 7 =$ 57

Alt ≅ VA ≅ Linear Pair VA ≅ (∠6)

Sum of Interior & Exterior Angles	The sum of all interior angles is 180°. $\angle 1 + \angle 2 + \angle 3 = 180°$ The sum of a straight line is 180°.	7. Solve for x = -4  $X+129 = 50+75$ $X = -4$	8. Solve for x = 20 and $\angle J = 47$  $X+40 = 60$ $X = 20$
Base Angles	-If 2 angles in a triangle are congruent, then the sides opposite them are congruent. -If 2 sides in a triangle are congruent, then the angles opposite them are congruent.	11. Solve for x.  $30+2x=180$ $2x=150$ $X=75$	12. ΔABC is an isosceles triangle with AB and BC as the legs. Solve for x.  $X=7$ $5x+1+72+72=180$ $5x+145=180$ $5x=35$ $X=7$