Chapter 4 – Triangle Congruence

Terms, Postulates and Theorems

4.1

Scalene triangle - A triangle with all three sides having different lengths.

Equilateral triangle - All sides of a triangle are congruent.

Isosceles triangle - A triangle with at least two sides congruent.

- *Legs of an isosceles triangle* - The congruent sides in an isosceles triangle.
- *Vertex angle* - The angle formed by the legs in an isosceles triangle.
- *Base* - The side opposite the vertex angle.
- *Base angles* - The angles formed by the base.

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

Corollary 4-1 - A triangle is equilateral if and only if it is equiangular.

Acute triangle - A triangle with all acute angles.

Equiangular triangle - A triangle with all angles congruent.

Obtuse triangle - A triangle with one obtuse angle.

Right triangle - A triangle with one right angle.

- *Hypotenuse* - The side opposite the right angle in a right triangle.
- *Legs of a right triangle* - The two sides that form the 90°.

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

Corollary 4-2 - Each angle of an equilateral triangle measures 60°.

Definition of Congruent Triangles (CPCTC) - Two triangles are congruent iff their corresponding parts are congruent.

4.2

SSS Congruence Postulate (Side-Side-Side)
If the sides of one triangle are congruent to the sides of a second triangle, then the triangles are congruent.

SAS Congruence Postulate (Side-Angle-Side)
If two sides and the included angle of one triangle are congruent to two sides and an included angle of another triangle, then the triangles are congruent.

Median: a segment in a triangle that connects a vertex to the midpoint of the opposite side.

Altitude: a segment in a triangle that connects a vertex to the side opposite forming a perpendicular.

Angle Bisector: a segment that bisects an angle in a triangle and connects a vertex to the opposite side.

Theorem 4.1 – If a median is drawn from the vertex angle of an isosceles triangle, then the median is also an angle bisector and an altitude.

4.3

ASA Congruence Postulate (Angle-Side-Angle)
If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, the triangles are congruent.

AAS Congruence Postulate (Angle-Angle-Side)
If two angles and a nonincluded side of one triangle are congruent to the corresponding two angles and side of a second triangle, the two triangles are congruent.

4.4

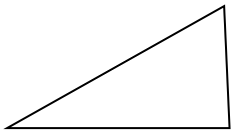
HL Congruence Theorem (HL) – If the hypotenuse and leg of one right triangle are congruent to the hypotenuse and leg of another right triangle, then the triangles are congruent.

Triangles

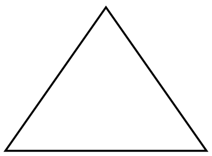
Notes Section 4.1

Classify by Sides

Scalene triangle - A triangle with all three sides having different lengths.



Equilateral triangle - All sides of a triangle are congruent.



Isosceles triangle - A triangle with at least two sides congruent.

- *Legs of an isosceles triangle* - The congruent sides in an isosceles triangle.
- *Vertex angle* - The angle formed by the legs in an isosceles triangle.
- *Base* - The side opposite the vertex angle.
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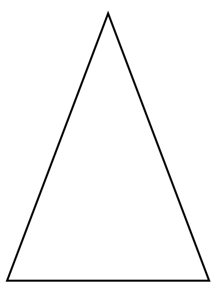


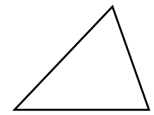
Isosceles Triangle Theorem
If two sides of a triangle are congruent, then the angles opposite those sides are congruent.

Corollary 4-1 - A triangle is equilateral if and only if it is equiangular.

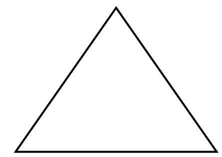
Classify by Angles

Acute triangle - A triangle with all acute angles.

- *Acute angle* - An angle greater than 0° and less than 90°.

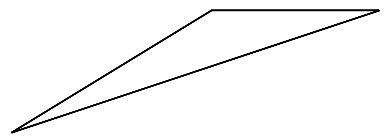


Equiangular triangle - A triangle with all angles congruent.



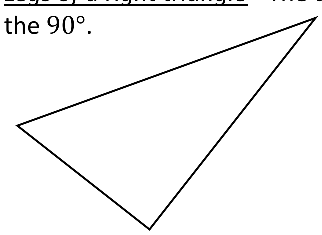
Obtuse triangle - A triangle with one obtuse angle.

- *Obtuse angle* - An angle more than 90°and less than 180°.



Right triangle - A triangle with one right angle.

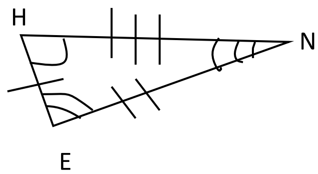
- *Right angle* - An angle that is 90°.
- *Hypotenuse* - The side opposite the right angle in a right triangle.
- *Legs of a right triangle* - The two sides that form the 90°.

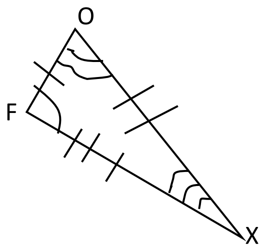


Converse to the Isosceles Triangle Theorem
If two angles of a triangle are congruent, then the sides opposite those angles are congruent.

Corollary 4-2 - Each angle of an equilateral triangle measures 60°.

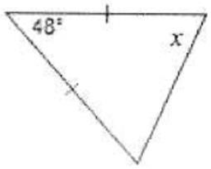
__Definition of Congruent Triangles (CPCTC)__ - Two triangles are congruent iff their corresponding parts are congruent.





Find the value of x.

1.



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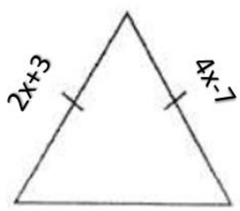

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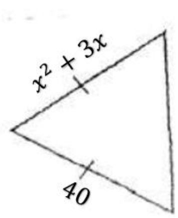
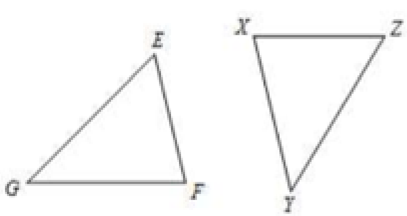


List pairs of corresponding parts.

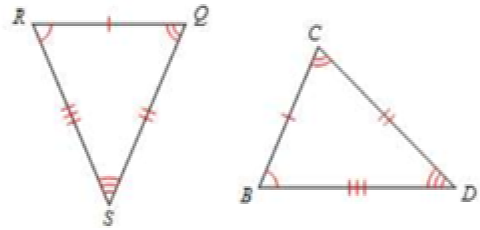
4.

$\Delta EFG \cong \Delta ZXY$



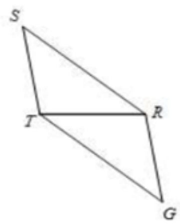
Name congruent figures.

5.



6.

$\Delta RTS \cong \Delta TRG$



$\overline{SR} \cong ?$

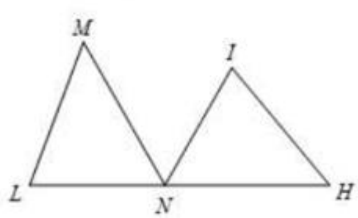
7.

$\Delta ZXY \cong \Delta ZXJ$

$\overline{YZ} \cong ?$

8.

$\Delta LMN \cong \Delta IHN$



$\angle MNL \cong ?$

SSS and SAS

Notes Section 4.2

SSS Congruence Postulate (Side-Side-Side)
If the sides of one triangle are congruent to the sides of a second triangle, then the triangles are congruent.

SAS Congruence Postulate (Side-Angle-Side)
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Median: a segment in a triangle that connects a vertex to the midpoint of the opposite side.

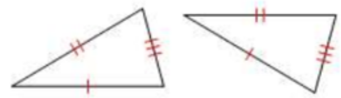
Altitude: a segment in a triangle that connects a vertex to the side opposite forming a perpendicular.

Angle Bisector: a segment that bisects an angle in a triangle and connects a vertex to the opposite side.

Theorem 4.1 – If a median is drawn from the vertex angle of an isosceles triangle, then the median is also an angle bisector and an altitude.

State if the two triangles are congruent. If they are, state why.

1.



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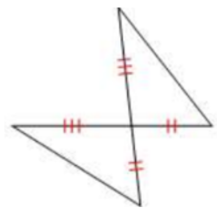
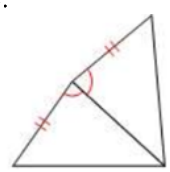


3.



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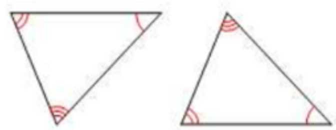

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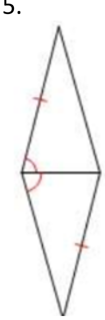

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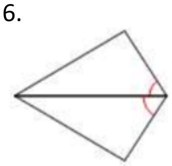
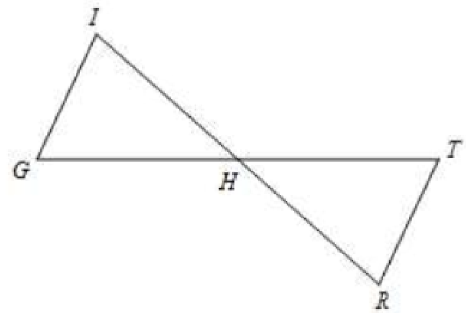


Given: H is the midpoint of $\overline{GT}$
$\overline{HR} \cong \overline{IH}$

Prove: $\Delta GHI \cong \Delta THR$

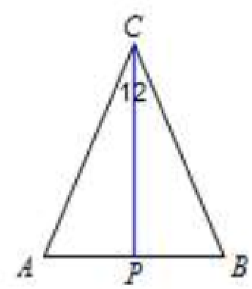


WHY ARE THE TWO TRIANGLES CONGRUENT?____________

STATEMENTS	REASONS
1. $\overline{HR} \cong \overline{IH}$ H is the midpoint of $\overline{GT}$	1.
2.	2.
3.	3.
4.	4.

Given: ΔACB is an isosceles triangle with base $\overline{AB}$
$\overline{CP}$ is an angle bisector of $\angle ACB$

Prove: $\Delta ACP \cong \Delta BCP$



WHY ARE THE TWO TRIANGLES CONGRUENT?____________

STATEMENTS	REASONS
1. ΔACB is an isosceles triangle $\overline{CP}$ is an angle bisector of $\angle ACB$	1.
2.	2.
3.	3.
4.	4.
5.	5.

AAS and ASA

Notes Section 4.3

ASA Congruence Postulate (Angle-Side-Angle)

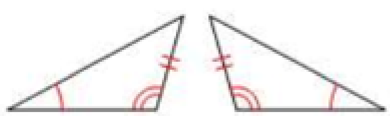
If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, the triangles are congruent.

AAS Congruence Postulate (Angle-Angle-Side)

If two angles and a nonincluded side of one triangle are congruent to the corresponding two angles and side of a second triangle, the two triangles are congruent.

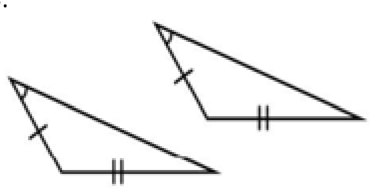
State if the two triangles are congruent. If they are, state why.

1.



2.

3.



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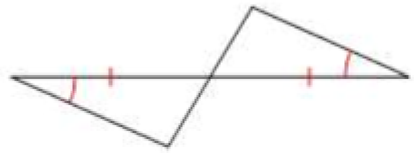

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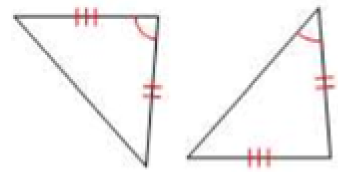
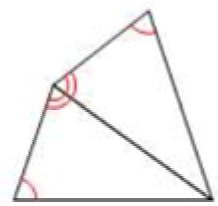


6.



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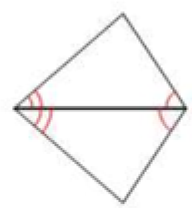

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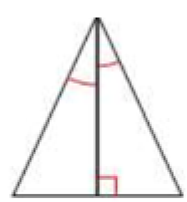
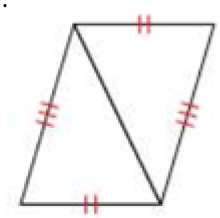
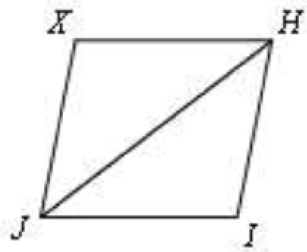


9.



Given: $\angle X \cong \angle I$
$\overline{XJ} \parallel \overline{IH}$

Prove: $\Delta JHI \cong \Delta HJX$

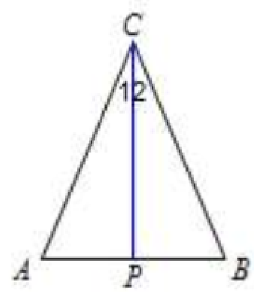


WHY ARE THE TWO TRIANGLES CONGRUENT?____________

STATEMENTS	REASONS
1. $\overline{XJ} \parallel \overline{IH}$ $\angle X \cong \angle I$	1.
2.	2.
3.	3.
4.	4.

Given: $\overline{AC} \cong \overline{BC}$
$\overline{CP}$ **is perpendicular to** $\overline{AB}$

Prove: $\Delta ACP \cong \Delta BCP$



WHY ARE THE TWO TRIANGLES CONGRUENT?____________

STATEMENTS	REASONS
1. $\overline{AC} \cong \overline{BC}$ $\overline{CP}$ is perpendicular to $\overline{AB}$	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

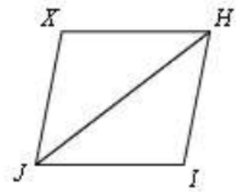
HL

Notes Section 4.4

HL Congruence Theorem (HL) – If the hypotenuse and leg of one right triangle are congruent to the hypotenuse and leg of another right triangle, then the triangles are congruent.

Given: $\overline{XJ} \cong \overline{HI}$
$\overline{XJ} \parallel \overline{IH}$

Prove: $\overline{XH} \cong \overline{JI}$

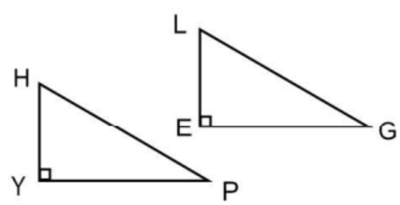


WHY ARE THE TWO TRIANGLES CONGRUENT?___________

STATEMENTS	REASONS
1. $\overline{XJ} \parallel \overline{IH}$ $\overline{XJ} \cong \overline{HI}$	1.
2.	2.
3.	3.
4.	4.
5.	5.

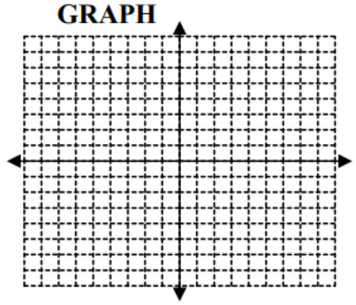
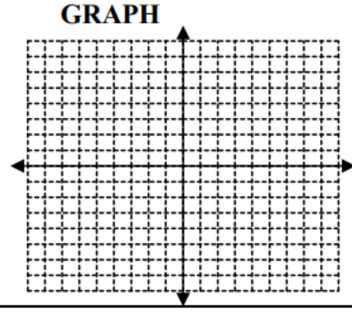
Given: $\angle HYP$ and $\angle LEG$ are right angles
$\overline{HY} \cong \overline{EL}$
$\overline{HP} \cong \overline{LG}$

Prove: $\Delta HYP \cong \Delta LEG$



WHY ARE THE TWO TRIANGLES CONGRUENT?___________

STATEMENTS	REASONS
1. $\angle HYP$ and $\angle LEG$ are right angles $\overline{HY} \cong \overline{EL}$ $\overline{HP} \cong \overline{LG}$	1.
2.	2.
3.	3.

ALGEBRA REVIEW		
SOLVE $26 = -7 + 3(2x - 4) - x$	**GRAPH** $y = -\frac{3}{2}x$ 	**MULTIPLY** $(2x - 1)(2x + 1)$
SOLVE $\frac{5}{12} = \frac{-8}{x}$	**GRAPH** $y = 1 - x$ 	**FACTOR** $x^2 + 23x + 42$

Chapter 4 Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

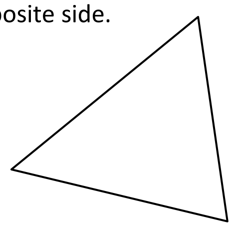
3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.

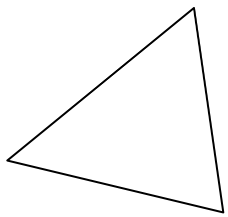
Bisectors, Medians and Altitudes

Notes Section 5.1

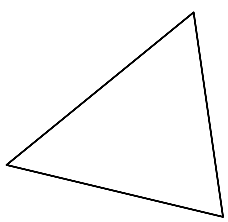
Median: a segment in a triangle that connects a vertex to the midpoint of the opposite side.



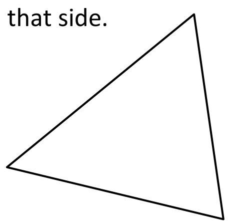
Altitude: a segment in a triangle that connects a vertex to the side opposite forming a perpendicular.



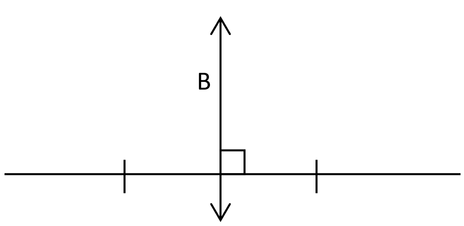
Angle Bisector: a segment that bisects an angle in a triangle and connects a vertex to the opposite side.



Perpendicular Bisector: a segment in a triangle that passes through the midpoint of a side and is perpendicular to that side.



Theorem 5-1.2: A point is on the perpendicular bisector IFF it is equidistant from the endpoints of the segment.



Draw and label a figure to illustrate each situation.

#1) $\overline{PT}$ and $\overline{RS}$ are medians of triangle ΔPQR and intersect at V.

#2) $\overline{AD}$ is a median and an altitude of ΔABC.

#3) ΔDEF is a right triangle with right angle at F. $\overline{FG}$ is a median of ΔDEF and $\overline{GH}$ is the perpendicular bisector of $\overline{DE}$.

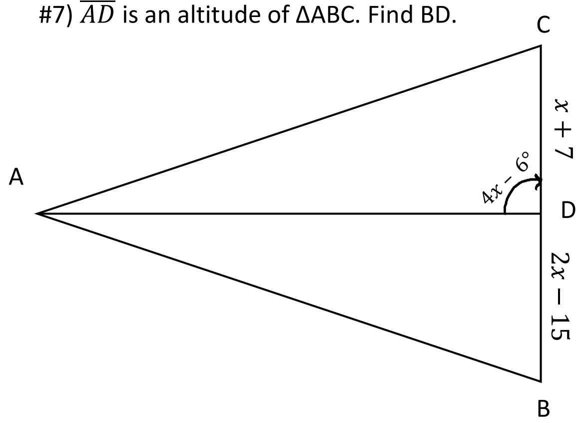
State whether each sentence is always, sometimes, or never true.

#4) Three medians of a triangle intersect at a point inside the triangle.

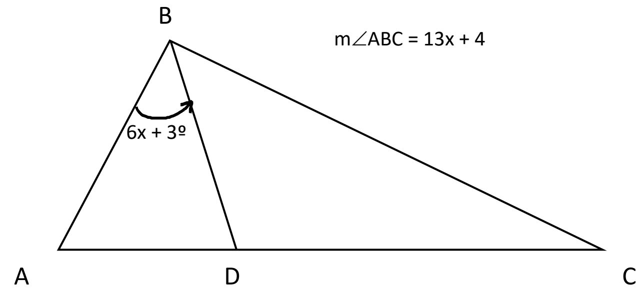
#5) The three angle bisectors of a triangle intersect at a point outside the triangle.

#6) The three altitudes of a triangle intersect at a vertex of the triangle.

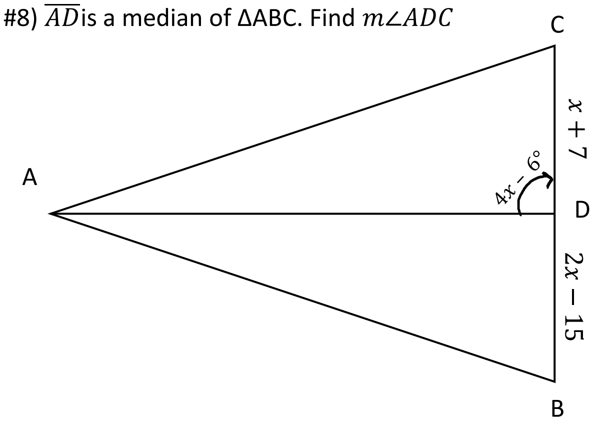
#7) $\overline{AD}$ is an altitude of ΔABC. Find BD.



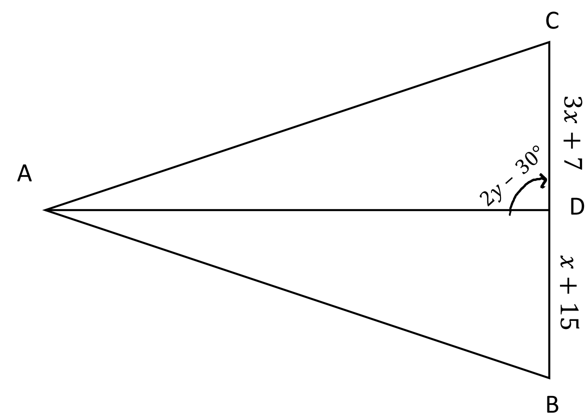
#10) Find m∠ABC if $\overline{BD}$ is an angle bisector of ΔABC.



#8) $\overline{AD}$is a median of ΔABC. Find $m\angle ADC$



#11) $\overline{AD}$ is a perpendicular bisector of $\overline{BC}$. Find x and y.



#9) Find the midpoint of A(2, 4) and B(-5, 8)

Chapter 6 – Quadrilaterals

Terms, Theorems & Postulates

Section 6.2

Parallelogram: a quadrilateral with both pairs of opposite sides parallel.

Theorem 6-1: Opposite sides of a parallelogram are congruent.

Theorem 6-2: Opposite angles of a parallelogram are congruent.

Theorem 6-3: Consecutive angles in a parallelogram are supplementary.

Theorem 6-4: If a parallelogram has one right angle then it has four right angles.

Theorem 6-5: The diagonals of a parallelogram bisect each other.

Theorem 6-6: Each diagonal of a parallelogram separates the parallelogram into two congruent triangles.

Section 6.3

Theorem 6-7: If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Theorem 6-8: If one pair of opposite sides of a quadrilateral is both parallel and congruent, then the quadrilateral is a parallelogram.

Theorem 6-9:If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

Theorem 6-10: If both pairs of opposite angles in a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Section 6.4

Rectangle: a quadrilateral with four right angles. (Also could define as a parallelogram with one right angle.)

Theorem 6-11.12: A parallelogram is a rectangle IFF its diagonals are congruent.

Section 6.5

Rhombus: A quadrilateral with four congruent sides. (Also could be defined as a parallelogram with four congruent sides.)

Theorem 6-13.14: A parallelogram is a rhombus IFF its diagonals are perpendicular.

Theorem 6-15: Each diagonal of a rhombus bisects a pair of opposite angles.

Square:
(a rectangular rhombus; a rhombicular rectangle.) A quadrilateral that is both a rhombus and a rectangle.

Section 6.6

Trapezoid: a quadrilateral with exactly one pair of parallel sides.
Bases: the parallel sides of a trapezoid.
Legs: the nonparallel sides of a trapezoid.

Pair of base angles: two angles in a trapezoid that share a common base.

Isosceles trapezoid: a trapezoid with congruent legs.

Theorem 6-16:
Both pairs of base angles of an isosceles trapezoid are congruent.

Theorem 6-17:
The diagonals of an isosceles trapezoid are congruent.

Median of a Trapezoid:
a segment that connects the midpoints of the legs.

Theorem 6-18:
The median of a trapezoid is parallel to the bases and its measure is one half the sum of the measures of the bases.

The quiz will consist of one matching section and one multiple choice section. The matching section will contain all terms and the theorems that have names. The multiple choice section will contain all theorems, postulates, and corollaries that have no names. I will remove a word from the sentence and give you three or four choices to complete the sentence.

Solving Systems of Equations

Notes Section 6.1

Solve each system of equations by substitution or elimination. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions.

#1) x = 7
5y + x = 12

#2) 5x + 4y = -9
2x – 4y = -40

#3) y = 3x – 2
3x – y = 7

Substitution PRO TIPS

If possible you may want to transform one or both of your EQs. Such as getting rid of fractions or decimals.

#1) In one of the EQ, solve for a variable.

#2) Then substitute for the variable into the other EQ.

#3) Solve the EQ.

#4) Then substitute the value of the variable into one of the EQ and solve.

If at any point while solving an EQ you get a true statement such as, 9 = 9, then the answer is infinitely many solutions. If at any point you get a false statement, such as 3 = 7, then the answer is no solution.

#4) -3x – 4y = 5
2x + 2y = 0

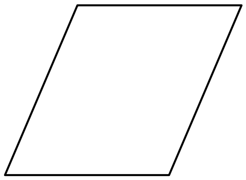
#5) $\frac{4}{7}x + \frac{-2}{3}y = 2$
2y = -2x + 20

#6) x + 2y = -2
.75x + .15y = 2.55

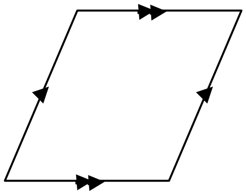
Parallelograms

Notes Section 6.2

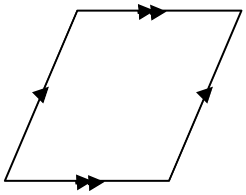
Parallelogram: a quadrilateral with both pairs of opposite sides parallel.



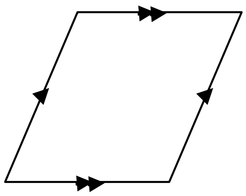
Theorem 6-1: Opposite sides of a parallelogram are congruent.



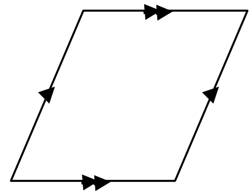
Theorem 6-2: Opposite angles of a parallelogram are congruent.



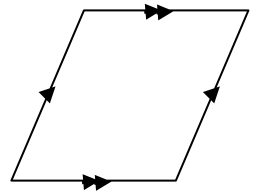
Theorem 6-3: Consecutive angles in a parallelogram are supplementary.



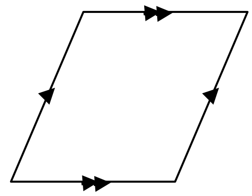
Theorem 6-4: If a parallelogram has one right angle then it has four right angles.



Theorem 6-5: The diagonals of a parallelogram bisect each other.

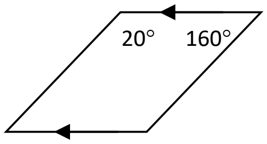


Theorem 6-6: Each diagonal of a parallelogram separates the parallelogram into two congruent triangles.

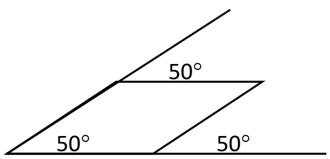


Is each quadrilateral a parallelogram? Justify your answer.

#1)

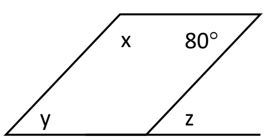


#2)

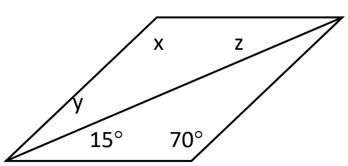


If each quadrilateral is a parallelogram, find the value of x, y, and z.

#3)



#4)



With the given information, answer each question.

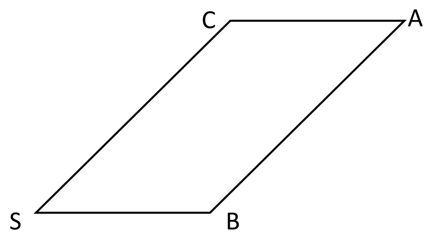
#5) Given parallelogram PQRS with m∠P = 2y and m∠Q = 4y + 30, find the m∠R and m∠S.

#6) If NCTM is a parallelogram, m∠N = 12x + 10y + 5, m∠C = 9x, and m∠T = 6x + 15y, find m∠M.

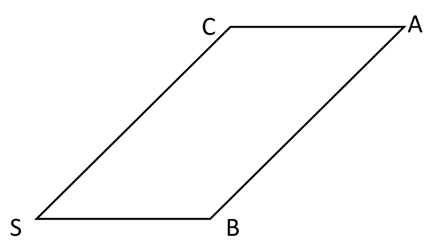
Tests for Parallelograms

Notes Section 6.3

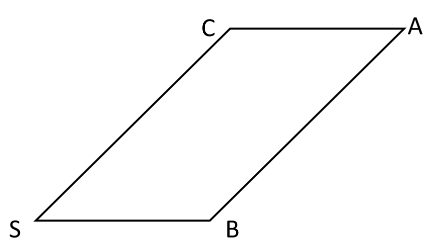
<u>Theorem 6-7</u>:
If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.



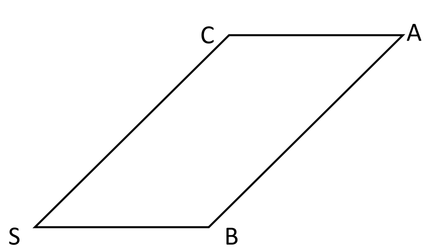
<u>Theorem 6-8</u>:
If one pair of opposite sides of a quadrilateral is both parallel and congruent, then the quadrilateral is a parallelogram.



<u>Theorem 6-9</u>:
If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

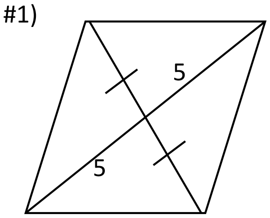


<u>Theorem 6-10</u>:
If both pairs of opposite angles in a quadrilateral are congruent, then the quadrilateral is a parallelogram.

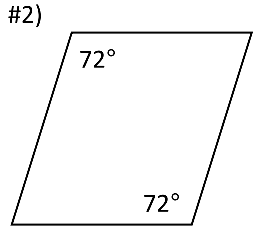


Determine if each quadrilateral must be a parallelogram. Justify your answer.

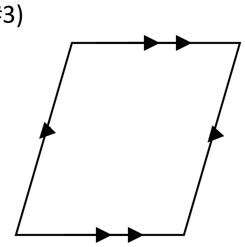
#1)



#2)

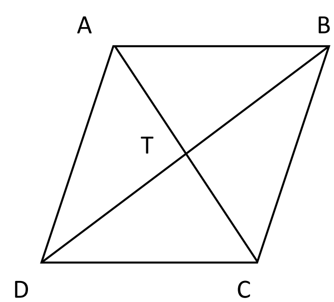


#3)

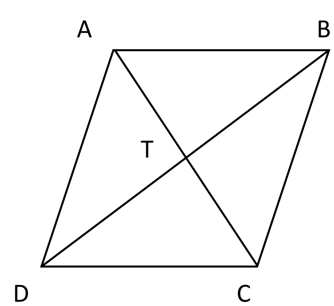


Use parallelogram ABCD and the given information to find each value.

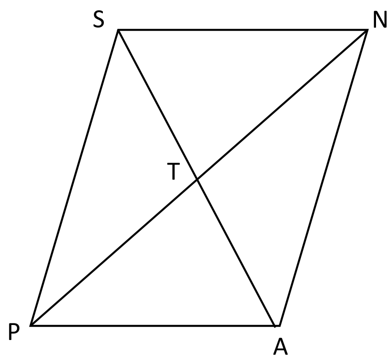
#4) m∠ABC = 50°. Find m∠BCD



#5) AB = 11, BC = 2, m∠ADC = 84°. Find DC.



#6) What values must x and y be in order for quadrilateral to be a parallelogram? ST = x + 3y, TA = 6, PT = 4x + 2y and TN = 14



#7) The coordinates of the vertices of quadrilateral ABCD are A(-1, 3), B(2, 1), C(9, 2), and D(6, 4). Determine if the quadrilateral ABCD is a parallelogram.

Option 1: Use the distance formula to find the length of all four sides. *If opposite lengths are the same, then the quad is a parallelogram.
Option 2: Use the slope formula to find the slope of all four sides. *If opposite slopes are the same, then the quad is a parallelogram.
Option 3: Find the slopes and lengths of one pair of opposite sides. *If the pair of opposite sides have the same slope and length, then the quad is a parallelogram.
Option 4: Find the midpoints of the diagonals. *If the midpoints of the diagonals are the same, then the quad is a parallelogram.

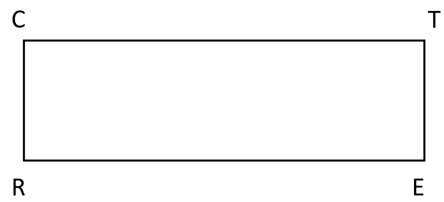
A(-1, 3), B(2, 1), C(9, 2), and D(6, 4).

Geometry 22

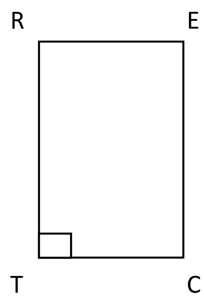
Rectangles

Notes Section 6.4

Rectangle: a quadrilateral with four right angles. (Also could define as a parallelogram with one right angle.)

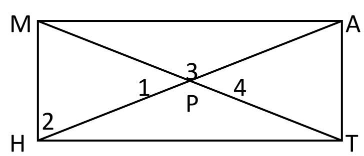


Theorem 6-11.12: A parallelogram is a rectangle IFF its diagonals are congruent.

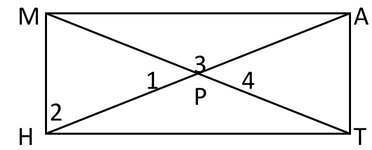


Use rectangle MATH and given information to solve each problem.

#1) HP = 10. Find MT.



#2) m$\angle$1 = 40°. Find m$\angle$2

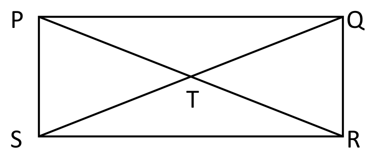


Draw a counterexample to show that each statement below is false.

#3) If a quadrilateral has one pair of congruent sides, it is a rectangle.

#4) If a quadrilateral has two pairs of congruent sides, it is a rectangle.

Find the values of x and y in rectangle PQRS.
#5) TR = 3x – 12y, TQ = -2x + 9y + 4, ST = 3



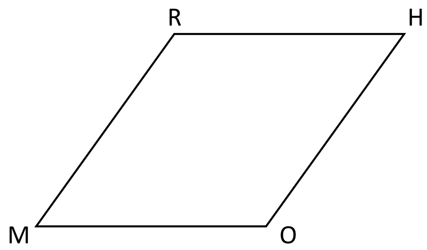
Determine whether ABCD is a rectangle. Explain.
#6) A(1, 2), B(3, 6), C(9, 3), D(7, -1)

Option 1: Use the distance formula to find the length of all four sides. Use the slope formula to find the slopes of two consecutive sides. *If opposite lengths are the same, and consecutive slopes are perpendicular, then the quad is a rectangle.
Option 2: Use the slope formula to find the slope of all four sides. *If opposite slopes are parallel and consecutive slopes are perpendicular, then the quad is a rectangle.
Option 3: Find the midpoints of the diagonals. Find the lengths of the diagonals. *If the midpoints of the diagonals are the same and the diagonals are the same length, then the quad is a rectangle.

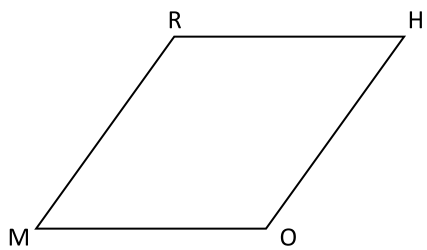
Squares and Rhombi

Notes Section 6.5

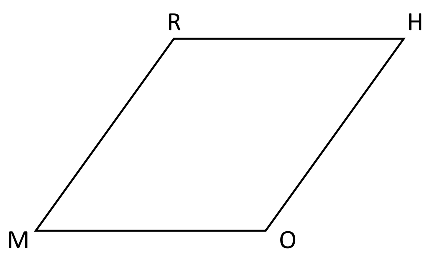
Rhombus:
A quadrilateral with four congruent sides. (Also could be defined as a parallelogram with four congruent sides.)



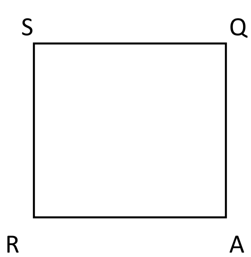
Theorem 6-13.14:
A parallelogram is a rhombus IFF its diagonals are perpendicular.



Theorem 6-15:
Each diagonal of a rhombus bisects a pair of opposite angles.



Square:
(a rectangular rhombus; a rhombicular rectangle.) A quadrilateral that is both a rhombus and a rectangle.



Name all the quadrilaterals – parallelogram, rectangle, rhombus, or square – that have each property.

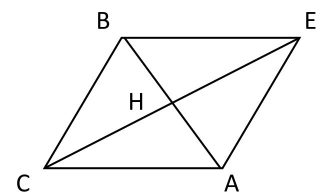
#1) The opposite sides are parallel.

#2) The opposite sides are congruent.

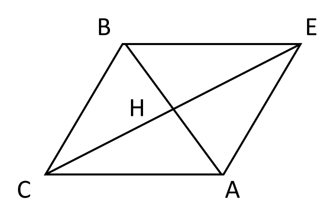
#3) All sides are congruent.

#4) It is equiangular and equilateral.

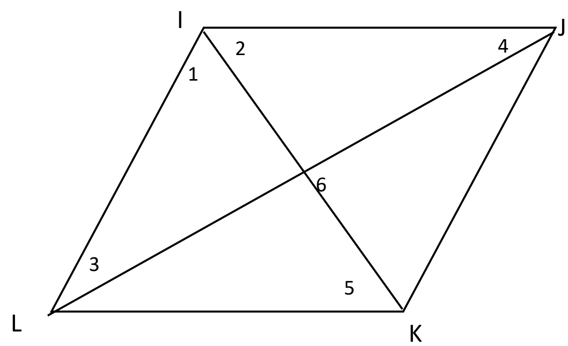
Use rhombus BEAC with BA = 10 to determine whether each statement is true or false. Justify your answer.
#5) CE = 10



#6) $\overline{CE} \perp \overline{AB}$



Use rhombus IJKL and the given information to solve each problem.
#7) If m∠3 = 4(x + 1) and m∠5 = 2(x + 1), find x.



Determine whether EFGH is a parallelogram, rectangle, rhombus, or square. List all that apply.
#8) E(6, 5), F(2, 3), G(-2, 5), H(2, 7)

To determine if a quad is a parallelogram. The diagonals must have the same midpoint.
To determine if a quad is a rectangle. The midpoints of the diagonals must be the same and the diagonals must have the same length.
To determine if a quad is a rhombus. The midpoints of the diagonals must be the same and the diagonals must be perpendicular
To determine if a quad is a square. The quad must be a rectangle and a rhombus.

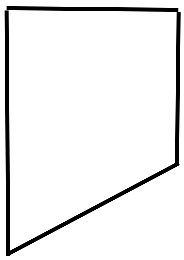
Trapezoids

Notes Section 6.6

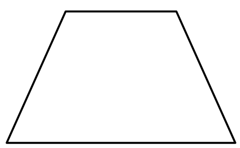
<u>Trapezoid</u>: a quadrilateral with exactly one pair of parallel sides.

<u>Bases</u>: the parallel sides of a trapezoid.

<u>Legs</u>: the nonparallel sides of a trapezoid.

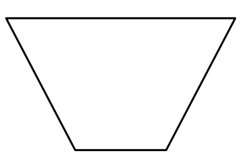


<u>Pair of base angles</u>: two angles in a trapezoid that share a common base.



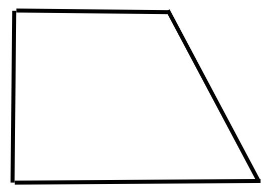
<u>Isosceles trapezoid</u>: a trapezoid with congruent legs.

<u>Theorem 6-16</u>:
Both pairs of base angles of an isosceles trapezoid are congruent.

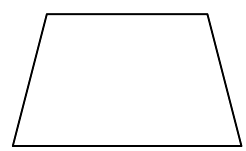


<u>Theorem 6-17</u>:
The diagonals of an isosceles trapezoid are congruent.

<u>Median of a Trapezoid</u>:
a segment that connects the midpoints of the legs.



<u>Theorem 6-18</u>:
The median of a trapezoid is parallel to the bases and its measure is one half the sum of the measures of the bases.



If possible, draw a trapezoid that has the following characteristics. If the trapezoid cannot be drawn, explain why.

#1) Four congruent sides.

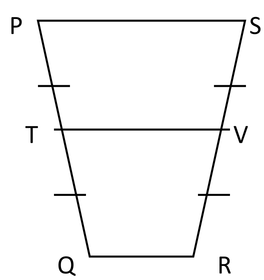
#2) One right angle.

#3) One pair of opposite angles congruent.

#4) Congruent diagonals.

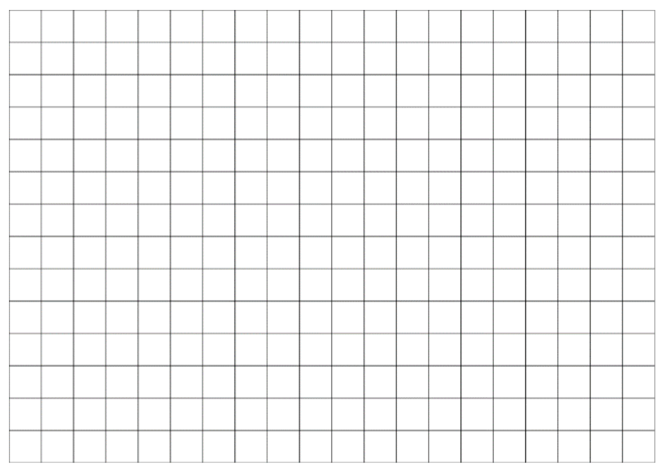
PQRS is an isosceles trapezoid with bases $\overline{PS}$ and $\overline{QR}$. Use the figure and the given information to solve each problem.

#5) If TV = 2x + 5 and PS + QR = 5x + 3, find x.



#6) If the measure of the median of an isosceles trapezoid is 7.5, what are the possible integral measures for the bases?

#7) $\overline{UR}$ is the median of a trapezoid with bases $\overline{ON}$ and $\overline{TS}$. If the coordinates of the points are U(2, 2), R(6, 2), O(6, -2), N(0, -2), find the coordinates of T and S.



Chapter 6 Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.

Chapter 7 – Similarity

Terms, Theorems & Postulates

Section 7.1

Ratio: a comparison of two quantities.

Proportion: an equation stating that two ratios are equal.

Section 7.2

Rate: a ratio of two measurements that may have different types of units.

Similar Polygons: Two polygons are similar IFF their corresponding angles are congruent and the measures of their corresponding sides are proportional.

Scale Factor: The ratio of the lengths of two corresponding sides of two similar polygons

Section 7.3

AA Similarity: If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.

SSS Similarity: If the measures of the corresponding sides of two triangles are proportional, then the triangles are similar.

SAS Similarity: If the measures of two sides of a triangle are proportional to the measures of two corresponding sides of another triangle and the included angles are congruent, then the triangles are similar.

Theorem 7-3: Similarity of triangles is reflexive, symmetric, and transitive.

Section 7.4

Triangle Proportionality: A line, that intersects two sides of a triangle in two distinct points, is parallel to the third side IFF it separates these sides into segments of proportional lengths.

Theorem 7-6: a segment whose endpoints are the midpoints of two sides of a triangle is parallel to the third side of the triangle and its length is one-half the length of the third side.

Corollary 7-1: If three or more parallel lines intersect two transversals, then they cut off the transversals proportionally.

Corollary 7-2: If three or more parallel lines cut off congruent segments on one transversal then they cut off congruent segments on every transversal.

Section 7.5

Proportional Perimeter: If two triangles are similar, then the perimeters are proportional to the measures of corresponding sides.

Proportional Altitudes Theorem: If two triangles are similar, then the measures of the corresponding altitudes are proportional to the measures of the corresponding sides.

Proportional Angle Bisectors Theorem: If two triangles are similar, then the measures of the corresponding angle bisectors are proportional to the measures of the corresponding sides.

Proportional Medians Theorem If two triangles are similar, then the measures of the corresponding medians are proportional to the measures of the corresponding sides.

Angle Bisector Theorem: An angle bisector in a triangle separates the opposite side into segments that have the same ratio as the other two sides.

The quiz will consist of one matching section and one multiple choice section. The matching section will contain all terms and the theorems that have names.
The multiple choice section will contain all theorems, postulates, and corollaries that have no names. I will remove a word from the sentence and give you three or four choices to complete the sentence.

Properties of Proportions

Notes Section 7.1

Ratio: a comparison of two quantities.

What is the ratio of female students to male students in this class?

What is the ratio to Twinkie riders to car riders in this class?

Proportion: an equation stating that two ratios are equal.

Example:

Solve each proportion.

#1) $\frac{x}{12} = \frac{8}{30}$

#2) $\frac{10}{9} = \frac{30}{x+2}$

#3) $\frac{x+6}{10} = \frac{2x-5}{3}$

#4) $\frac{7-x}{9} = \frac{2}{6}$

#5) On a bike, the ratio of the number of rear sprocket teeth to the number of front sprocket teeth is equivalent to the number of rear sprocket wheel revolutions to the number of pedal revolutions. If there are 8 rear sprocket teeth and 18 front sprocket teeth, how many revolutions of the rear sprocket wheel will occur for 5 revolutions of the pedal?

#6) One way to determine the strength of a bank is to calculate its capital-to-assets ratio as a percent. A weak bank has a ratio of less than 4%. The Gnaden National Bank has a capital of $177,000 and assets of $4,450,000. Is it a weak bank? Explain.

#7) The ratio of the measures of the angles of a triangle is 3:5:7. What is the measure of each angle in the triangle?

#8) On a map of Ohio, three fourths of an inch represents 15 miles. If it is approximately 10 inches from Sandusky to Cambridge on the map, what is the actual distance in miles?

Similar Polygons

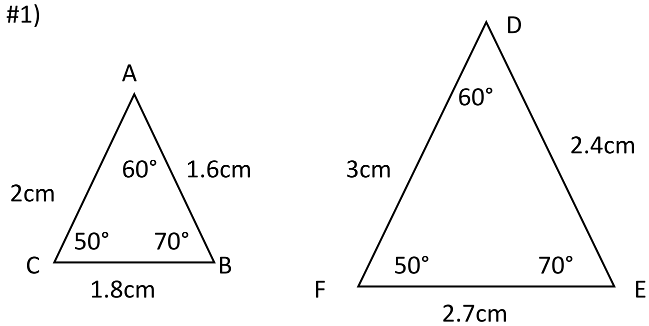
Notes Section 7.2

Similar Polygons: Two polygons are similar IFF their corresponding angles are congruent and the measures of their corresponding sides are proportional.

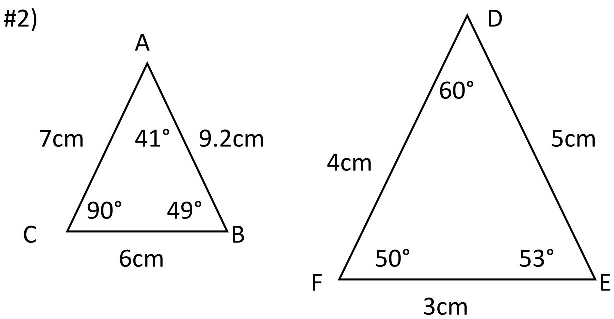
Scale Factor: The ratio of the lengths of two corresponding sides of two similar polygons

Determine whether each pair of figures is similar. Justify your answer.

#1)



#2)



Draw and label a pair of polygons for each. If it is impossible to draw two such figures, write “Mission: Impossible.”

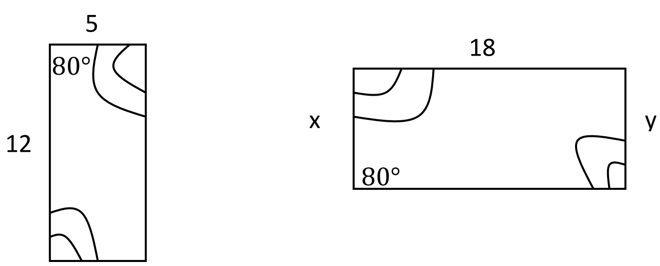
#3) two pentagons that are similar

#4) two squares that are not similar

Given two similar polygons find the value of x and y.

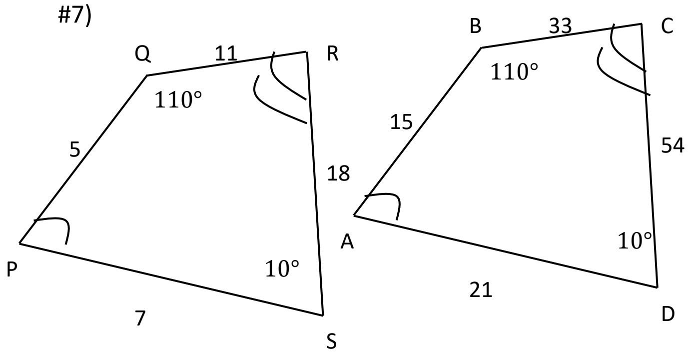
#5)

#6)



IF quadrilateral PQRS is similar to ABCD, find the scale factor of quadrilateral PQRS to quadrilateral ABCD.

#7)



Make a scale drawing using the given scale.

#8) A basketball court is 84 feet by 50 feet.

Scale: $\frac{1}{8}$ inch = 2 ft.

Similar Triangles

Notes Section 7.3

<u>AA Similarity:</u> If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.

<u>SSS Similarity:</u> If the measures of the corresponding sides of two triangles are proportional, then the triangles are similar.

<u>SAS Similarity:</u> If the measures of two sides of a triangle are proportional to the measures of two corresponding sides of another triangle and the included angles are congruent, then the triangles are similar.

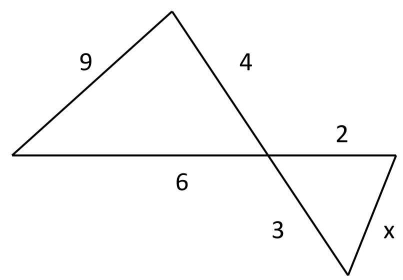
<u>Theorem 7-3:</u> Similarity of triangles is reflexive, symmetric, and transitive.

Reflexive

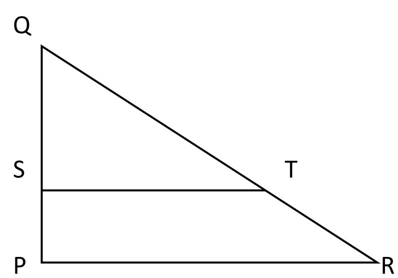
Symmetric

Transitive

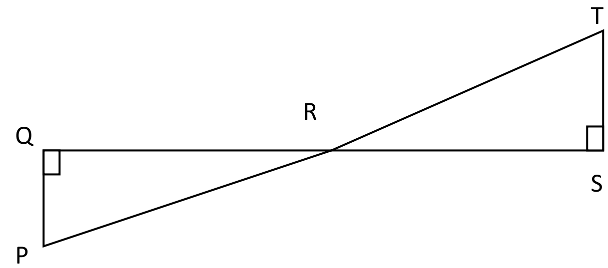
#1) Determine if each pair of triangles is similar. If similar, state the reason and find the missing measure.



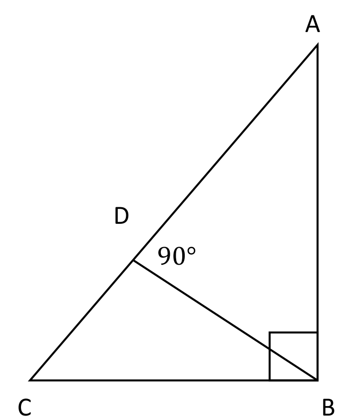
#2) In the figure, $\overline{ST} \parallel \overline{PR}$, QS = 3, SP = 1, and TR = 1.2. Find QT.



#3) If TS = 6, QP = 4, RS = x + 1, and QR = 3x – 4, find the value of x



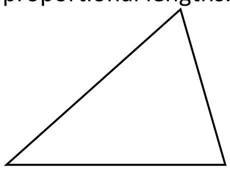
#4) Identify the similar triangles in each figure. Explain your answer.



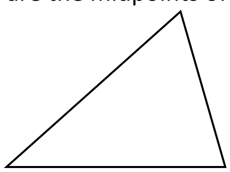
Parallel Lines & Proportional Parts

Notes Section 7.4

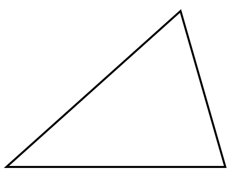
Triangle Proportionality: A line, that intersects two sides of a triangle in two distinct points, is parallel to the third side IFF it separates these sides into segments of proportional lengths.



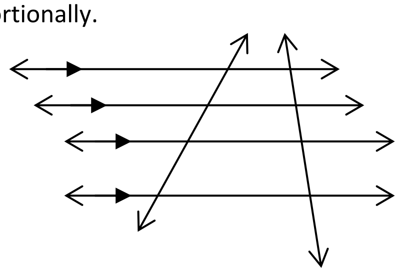
Midsegment: A segment in a triangle with endpoints that are the midpoints of two sides of the triangle.



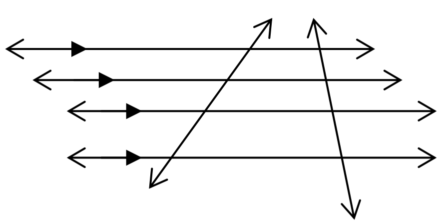
Theorem 7-6: A midsegment is parallel to the third side of the triangle and its length is one-half the length of the third side.



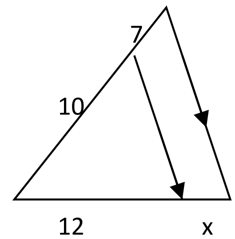
Corollary 7-1: If three or more parallel lines intersect two transversals, then they cut off the transversals proportionally.



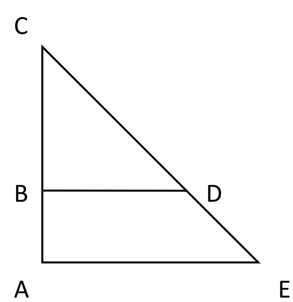
Corollary 7-2: If three or more parallel lines cut off congruent segments on one transversal then they cut off congruent segments on every transversal.



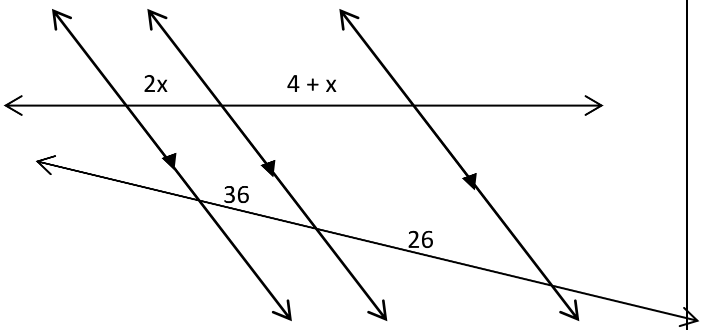
#1) Find the value of x.



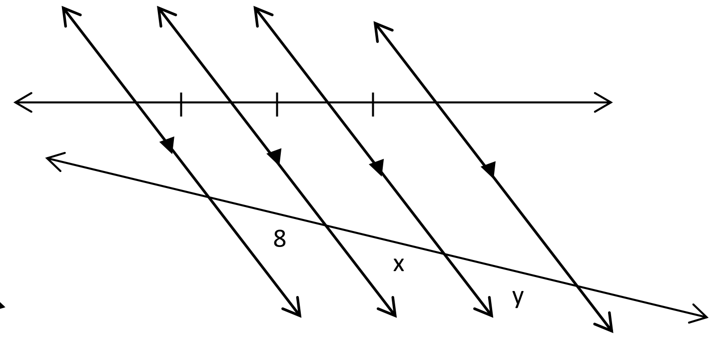
#2) Determine if $\overline{BD} // \overline{AE}$.
CA = 15, AB = 3, CD = 8, CE = 10



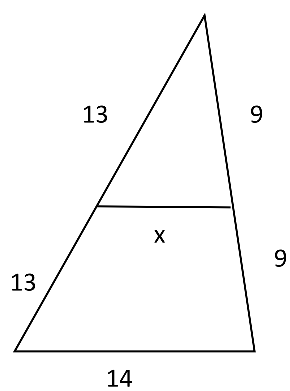
#3) Find the value of x.



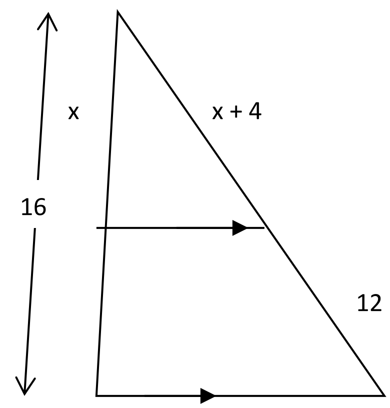
#5) Find the value of x and y.



#4) Find the value of x.



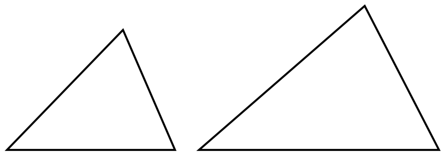
#6) Find the value of x.



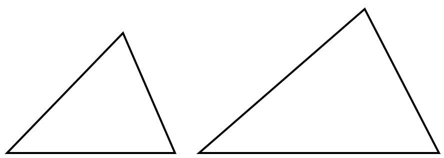
Parts of Similar Triangles

Notes Section 7.5

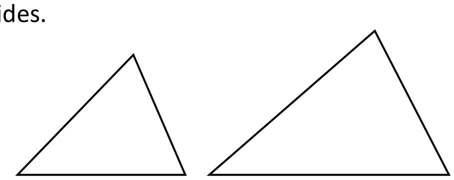
Proportional Perimeter Theorem: If two triangles are similar, then the perimeters are proportional to the measures of corresponding sides.



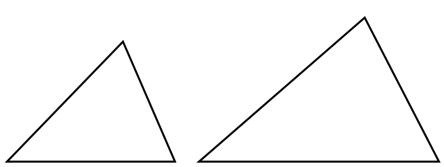
Proportional Altitudes Theorem: If two triangles are similar, then the measures of the corresponding altitudes are proportional to the measures of the corresponding sides.



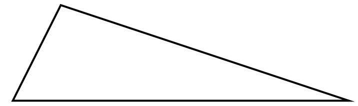
Proportional Angle Bisectors Theorem: If two triangles are similar, then the measures of the corresponding angle bisectors are proportional to the measures of the corresponding sides.



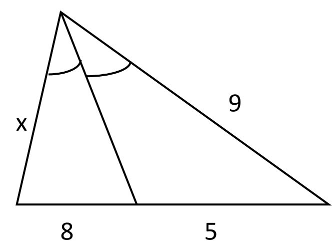
Proportional Medians Theorem: If two triangles are similar, then the measures of the corresponding medians are proportional to the measures of the corresponding sides.



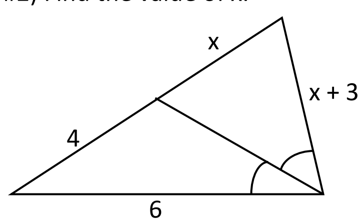
Angle Bisector Theorem: An angle bisector in a triangle separates the opposite side into segments that have the same ratio as the other two sides.



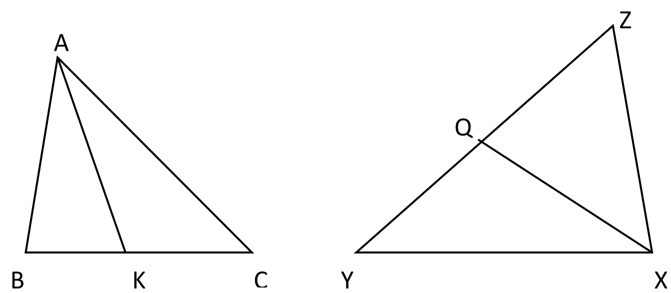
#1) Find the value of x.



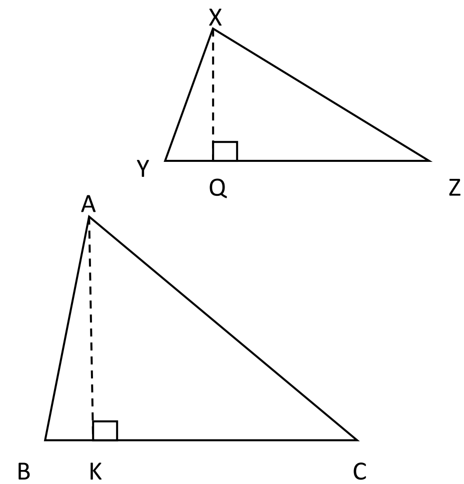
#2) Find the value of x.



#3) ΔABC is similar to ΔXYZ. Segments $\overline{AK}$ and $\overline{QX}$ are medians of the triangles.
AK =4, BK = 3, YZ = x + 2, QX = 2x – 5. Find QZ.



ΔABC is similar to ΔXYZ. Determine if each proportion is true or false.



#4) $\frac{AB}{XY} = \frac{AC}{XZ}$

#5) $\frac{AK}{BC} = \frac{XQ}{YZ}$

#6) $\frac{BC}{YZ} = \frac{XY}{AB}$

#7) $\frac{AB}{AK} = \frac{XY}{XQ}$

Chapter 7 Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.

Transformations – Isometries

Notes T.1 ***(G.CO.A.2)***

An **ISOMETRIC TRANSFORMATION (RIGID MOTION)** is a transformation that

____

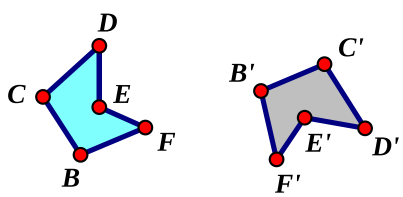
____

Synonym for isometry __________________________

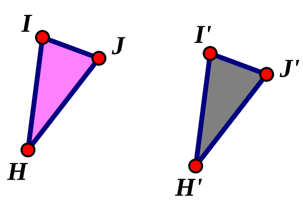
Isometric Transformations

Rotations, Translations, & Reflections

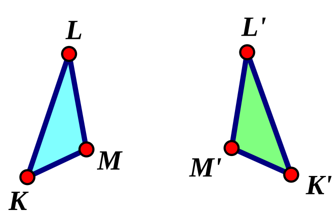
This is a _______________________________



This is a _______________________________



This is a _______________________________



A NON-ISOMETRIC TRANSFORMATION (NON-RIGID MOTION) is a transformation

____

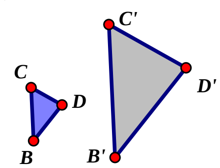
____

Non-Isometric Transformations

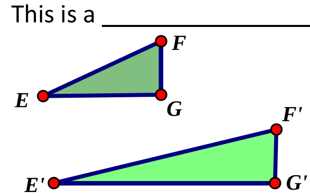
Dilations and Stretches

This is a _______________________________which

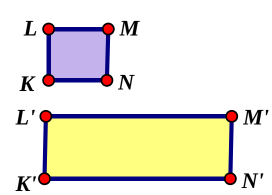
produces_______________________figures.



This is a _______________________________



This is also a ___________________________________



1. Circle which of the following are isometric transformations? (there may be more than 1 answer) And determine which transformation took place by writing reflection, translation, rotation, dilation, stretch or other under each image.

Pre-Image

Image A

____

Image B

____

Image C

____

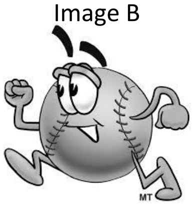
2. Circle which of the following are isometric transformations? (there may be more than 1 answer) And determine which transformation took place by writing reflection, translation, rotation, dilation, stretch or other under each image.

Pre-Image

Image A

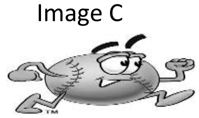
____

Image B



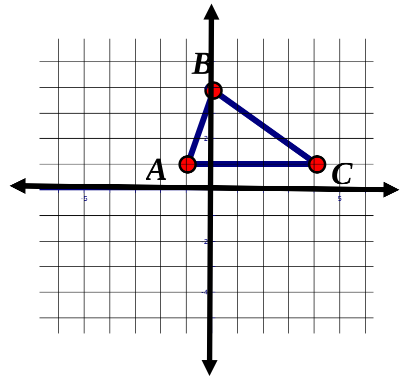
____

Image C



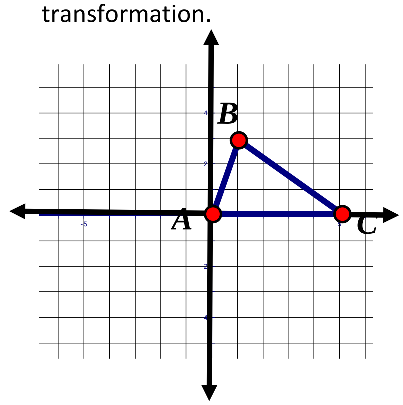
____

3. Determine the coordinates of the image, plot the image and determine if it is an isometric transformation.



	Transformation
a) Pre-Image Points A (-1,1) B (0,4) C (4,1) Isometry? Yes or No Transformation Type:	Coordinate Rule (x,y) → (-y, x) Image Points A' (______,______) B' (______,______) C' (______,______)

4. Determine the coordinates of the image, plot the image and determine if it is an isometric transformation.



	Transformation
a) Pre-Image Points A (0,0) B (1,3) C (5,0) Isometry? Yes or No Transformation Type:	Coordinate Rule (x,y) → (x, -2y) Image Points A' (______,______) B' (______,______) C' (______,______)

Transformations – Symmetry

Notes T.2 ***(G.CO.A.3)***

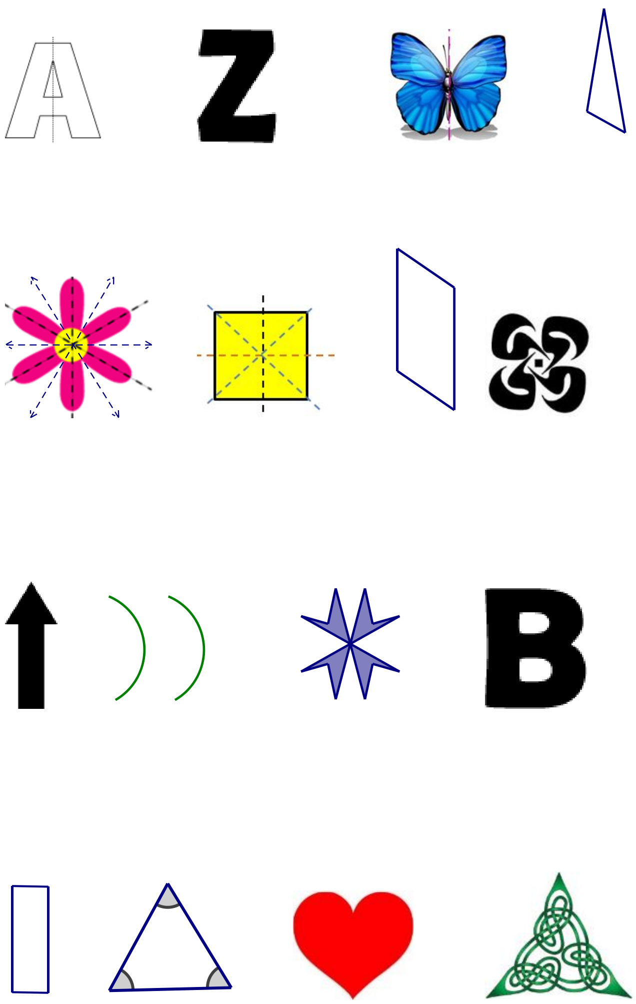
What does it mean to carry a shape onto itself?

What types of symmetry are there?

<u>LINE SYMMETRY (or REFLECTIONAL SYMMETRY)</u>

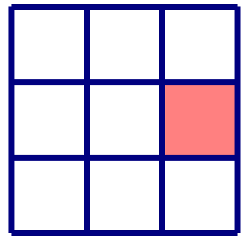
What is the definition of Line Symmetry?

How many lines of symmetry does each figure have?

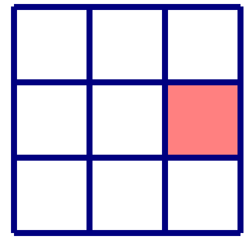


Shade each figure so it has the indicated number of line symmetries.

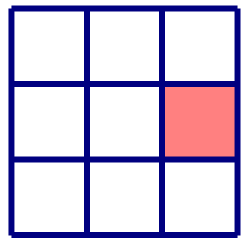
Exactly 1 Line of Symmetry



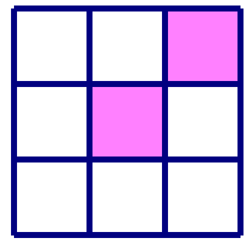
Exactly 2 lines of symmetry



Exactly 4 lines of symmetry



Exactly 4 lines of symmetry



What are the characteristics of a polygon produces the maximum amount of symmetry for its number of sides?

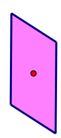
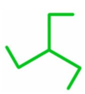
ROTATIONAL SYMMETRY

A geometric figure has rotational symmetry if the figure is the image of itself under a rotation about a point through any angle whose measure is strictly between 0° and 360°. 0° and 360° are excluded from counting as having rotational symmetry because it represents the starting position.

ANGLE OF ROTATION - When a shape has rotational symmetry we sometimes want to know what the angle of rotational symmetry is. To determine this we determine the SMALLEST angle through which the figure can be rotated to coincide with itself. This number will always be a factor of 360°.

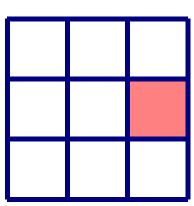
ORDER OF ROTATION SYMMETRY -- The number of positions in which the object looks exactly the same is called the **order** of the symmetry. When determining order, the last rotation returns the object to its original position.
Order 1 implies no true rotational symmetry since a full 360 degree rotation was needed.

Determine the angle or rotation and order of rotation.

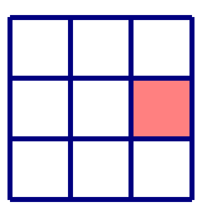
			
Angle = ____°	Angle = ____°	Angle = ____°	Angle = __°
Order = ____	Order = ____	Order = ____	Order = ___
			
Angle = ____°	Angle = ____°	Angle = ____°	Angle = __°
Order = ____	Order = ____	Order = ____	Order = ___

Shade each figure so it has the indicated angle or rotation and order of rotation.

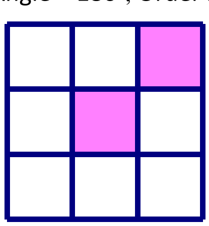
Angle = 180°, Order 2



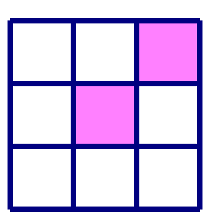
Angle = 90°, Order 4



Angle = 180°, Order 2



Angle = 90°, Order 4

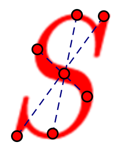


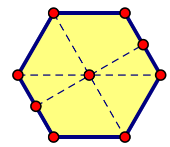
POINT SYMMETRY

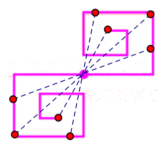
Point Symmetry exists when a figure is built around a point such that every point in the figure has a matching point that is the SAME DISTANCE from the central point but IN THE OPPOSITE DIRECTION.

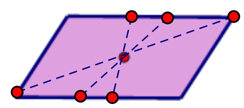
A simple test to determine whether a figure has point symmetry is to turn it upside-down and see if it looks the same. A figure that has point symmetry is unchanged in appearance by a 180 degree rotation.

You will notice that the point of rotation is a midpoint between every point and its image.









Transformations – Isometries

Notes T.3 ***(G.CO.A.4)***

REFLECTION DEFINITION

A **reflection** in a line m is a isometric transformation that maps every point P in the plane to a point P', so that the following properties are true:

1. If point P is **NOT** on line m, then line m is the perpendicular bisector of $\overline{PP'}$.

2. If point P is **ON** line m, then P = P'

The line of reflection is the ______________of the segment joining every point and its image.

$$r_m\left(\Delta ABC\right)=\Delta A'B'C'$$

CHARACTERISTICS

DISTANCES FROM PRE-IMAGE TO IMAGE Points in the plane move ________________ distances, depending on their distance from the line of reflection. Points farther away from the line of reflection move a _____________ distance than those closer to the line of reflection. Notice how $\overline{AA'}//\overline{BB'}//\overline{CC'}$.

ORIENTATION
The pre-image has ____________________orientation to its image. The reflection creates a ________image.

SPECIAL POINTS
The points on the line of reflection ______________.

TRANSLATION DEFINITION

A **translation** is an isometric transformation that maps every two points A and B in the plane to points A' and B', so that the following properties are true:

1. AA' = BB' (a fixed distance).
2. $\overline{AA'}\|\overline{BB'}$ (a fixed direction).

$$T_{<x,y>}\left(\Delta ABC\right)=\Delta A'B'C'$$

CHARACTERISTICS

DISTANCES FROM PRE-IMAGE TO IMAGE
Points in the plane all map the_________________

ORIENTATION
The pre-image has ________orientation as its image.

SPECIAL POINTS
There are _________________ special points

SPECIAL TRANSLATION PROPERTY – TRANSLATING AN ANGLE ALONG ONE OF ITS RAYS

A translation of ∠ABC by vector $\overrightarrow{BA}$ maps all points so:

1. ∠ABC ≅ ∠A'B'C' (Isometry)
2. B, A, B' and A' are collinear (translation on angle ray)

Because the two angles are equal and formed on the same ray, then:

$$\overrightarrow{BC} \,||\, \overrightarrow{B'C'}$$

All segments that are translated are parallel to each other.

ROTATION DEFINITION

A **rotation** about a Point O through ϴ degrees is an isometric transformation that maps every point P in the plane to a point P’, so that the following properties are true:

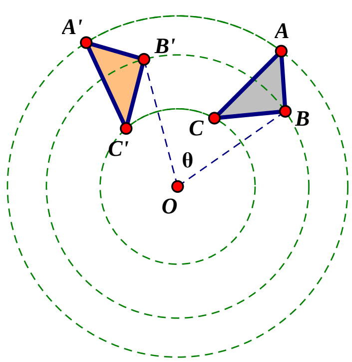
1. If point P is **NOT** point O, then OP = OP’ and m∠POP’ = ϴ°.

2. If point P **IS** the point of rotation, then P = P’. The center of rotation is the ONLY point in the plane that is unaffected by a rotation.

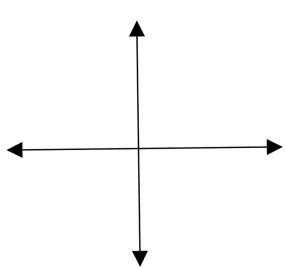
A **rotation** is an isometric transformation that turns a figure about a fixed point called the center of rotation (notation $R_{\text{center, degree}}$).

An object and its rotation are the same shape and size, but the figures may be turned in different directions.

$$R_{O,\theta}(\Delta ABC) = \Delta A'B'C'$$



ROTATION DIRECTION



CHARACTERISTICS

DISTANCES FROM PRE-IMAGE TO IMAGE Points in the plane move ________________ distances, depending on their distance from the center of rotation. Points farther away from the center of rotation move a distance than those closer to the center of rotation.

Notice how $\overline{AA'}$, $\overline{BB'}$, $\overline{CC'}$ are _________ parallel.

ORIENTATION

The pre-image has ____________ orientation as its image.

SPECIAL POINTS

The ____________________________ is the only point in the plane that is unchanged.

EQUIVALENT ROTATIONS

Conterminal angle = initial angle + 360n

SPECIAL ROTATION – ROTATION OF 180°

A rotation of 180° maps A to A’ such that:

1. m∠AOA’ = 180° (from definition of rotation)
2. OA = OA’ (from definition of rotation)
3. Ray $\overrightarrow{OA}$ and Ray $\overrightarrow{OA'}$ are opposite rays.
   $\overleftrightarrow{AO}$ is the same line as $\overleftrightarrow{AA'}$

NOTATION CONSISTENCY

REFLECTION

A Reflection is recognizable because it will have only ONE item as a subscript… the line of reflection. (Some use a small r for reflection and a capital R for rotation.)

$r_{x\ axis}$ Reflection over the x axis

r_x is probably okay as well

$r_{y\ axis}$ Reflection over the y axis

r_y is probably okay as well

$r_{x=3}$ Reflection over the x = 3 line

$r_{y=x}$ Reflection over the y = 1x line

r_m Reflection over line m

$r_{\overline{AB}}$ Reflection over segment AB

$r_{\overleftrightarrow{AB}}$ Reflection over line AB

TRANSLATION

A translation is recognizable because it will have vector notation.

$T_{\langle -6,4\rangle}$ Translate 6 left and 4 up

ROTATION

A rotation is recognizable because it will have TWO items in the subscript… a center and a degree.

$R_{O,89^\circ}$

Rotation about Point O for a positive 89°

When O is used it is implied that O = Origin at (0, 0)

$R_{P,-134^\circ}$

Rotation about Point P for a negative 134°

$R_{(2,3),42^\circ}$

Rotation about location (2,3) for a positive 42°

DILATION

$D_{O,3}$ Dilation from point O a scale factor of 3

$D_{O,\frac{1}{2}}$ Dilation from point O a scale factor of 1/2

$D_{A,-2}$ Dilation from point A a scale factor of -2

HOW TO WRITE COMPOSITE TRANSFORMATIONS

$r_{x\ axis} \circ r_{y=x}(A)$

Reflect Point A over the y = x line **and then** reflect that image over the x axis.

$r_{y\ axis} \circ R_{O,180^\circ}(A)$

Rotate A about point O 180° **and then** reflect that image over the y axis.

$r_{x\ axis} \circ T_{\langle -5,3\rangle}(A)$

Translate 5 left and 3 up **and then** reflect that image over the x axis.

NOTICE THAT LIKE COMPOSITE FUNCTIONS WE WORK FROM THE INSIDE OUT. WE WORK RIGHT TO LEFT…..

Translations Part 2 Terms

Translations

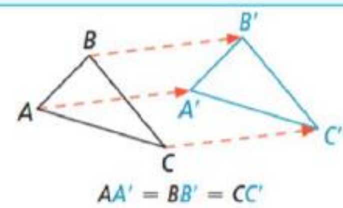
take note

Key Concept Translation

A **translation** is a transformation that maps all points of a figure the same distance in the same direction.

A translation is an isometry.

SLIDE



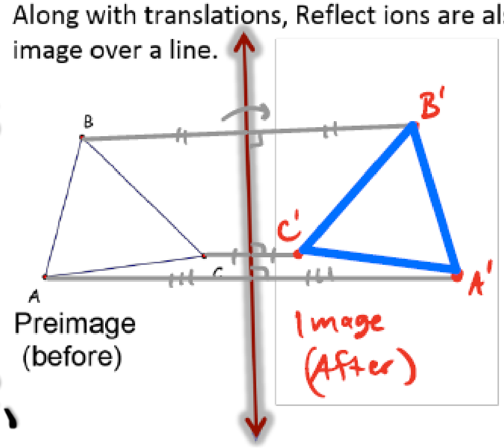
There are three ways to write a translation:

$P(x,y) \rightarrow (x+a, y+b)$ or $T_{a,b}$ or $\langle a, b \rangle$

Translations'

Along with translations, Reflect ions are also an ___Isometry___. Reflections "flip" an image over a line.

Reflections

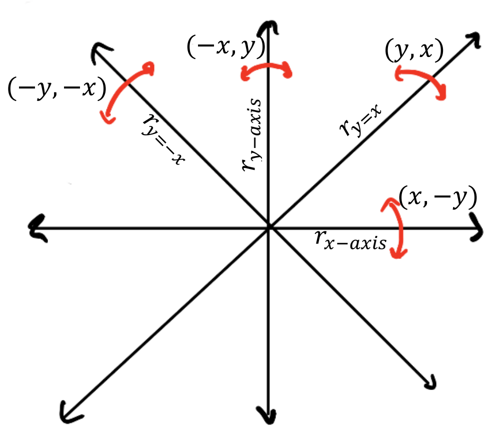


We say $\Delta ABC \rightarrow \Delta A'B'C'$

or ΔABC is mapped to $\Delta A'B'C'$

Reflections'

Preimage (x,y)



Translations Part 2 Terms

Rotations'

Rotations

Rotations are exactly as you would expect: a transformation that turns an image around a given point. When we are graphing, that point will ~~always~~ usually be the origin (0,0).

We usually rotate in the same direction that we number the quadrants: Counterclockwise. If you are asked to rotate clockwise, find the equivalent rotation counterclockwise. (More later…)

Rule	Abbreviation	Preimage (x, y) Rule
Rotation of 90° about the origin	$R_{O,90°}$	$(-y, x)$
Rotation of 180° about the origin	$R_{O,180°}$	$(-x, -y)$
Rotation of 270° about the origin	$R_{O,270°}$	$(y, -x)$
Rotation of 360° about the origin	$R_{O,360°}$	(x, y)

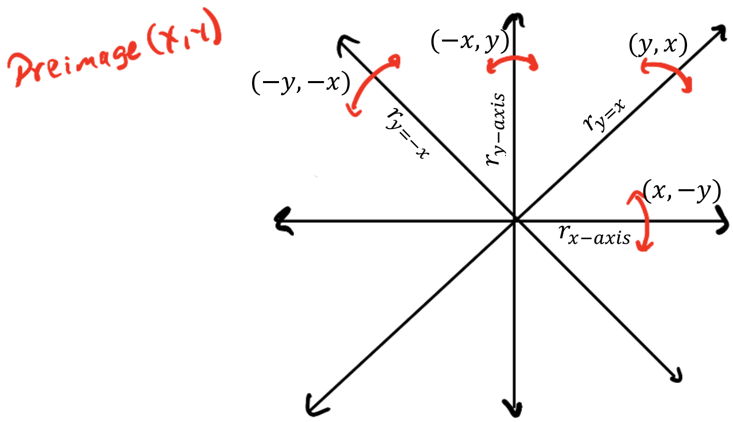
Translations Part 2 Terms

Quiz Answer Key

Translations

Algebraic Rule	Shorthand	Vector Notation
$P(x,y) \to (x+a, y+b)$	$T_{a,b}$	$\langle a, b\rangle$

Reflections



Rotations

Preimage (x,y)

Rule	Abbreviation	Rule
Rotation of 90° about the origin	$R_{O,90°}$	$(-y,x)$
Rotation of 180° about the origin	$R_{O,180°}$	$(-x,-y)$
Rotation of 270° about the origin	$R_{O,270°}$	$(y,-x)$
Rotation of 360° about the origin	$R_{O,360°}$	(x,y)

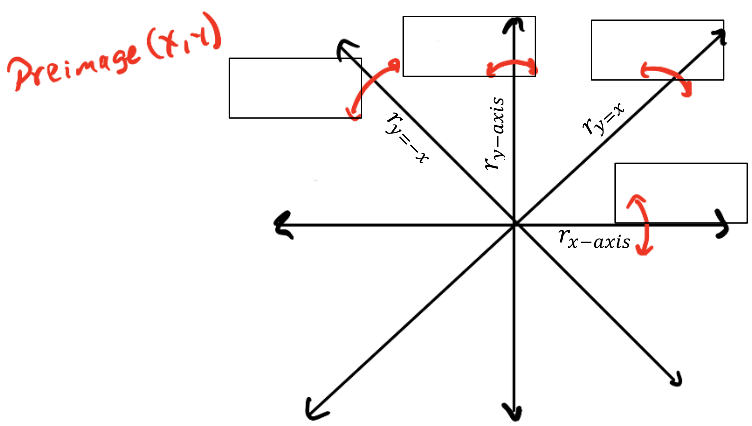
Translations Part 2 Terms

Quiz T.A

Translations

Algebraic Rule	Shorthand	Vector Notation
$P(x, y) \rightarrow$		

Reflections



Rotations

Preimage (x, y)

Rule	Abbreviation	Rule
Rotation of 90° about the origin	$R_{O,90°}$	
Rotation of 180° about the origin	$R_{O,180°}$	
Rotation of 270° about the origin	$R_{O,270°}$	
Rotation of 360° about the origin	$R_{O,360°}$	

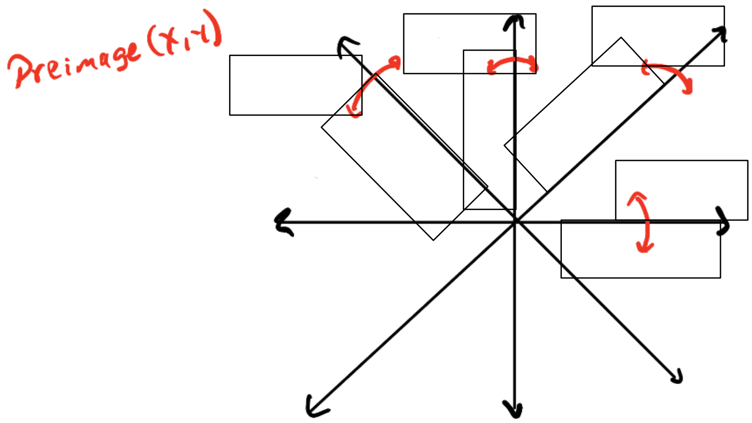
Translations Part 2 Terms

Quiz T.B

Translations

Algebraic Rule	Shorthand	Vector Notation
$P(x, y) \rightarrow$		

Reflections



Rotations

Preimage (x, y)

Rule	Abbreviation	Rule
Rotation of $90°$ about the origin		
Rotation of $180°$ about the origin		
Rotation of $270°$ about the origin		
Rotation of $360°$ about the origin		

Translations Part 2 Terms

Quiz T.C

Translations

Algebraic Rule	Shorthand	Vector Notation

Reflections

Rotations

Preimage (x, y)

Abbreviation	Rule

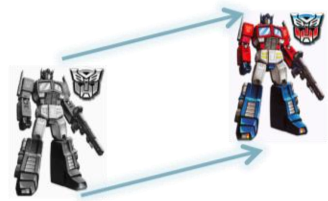
Translations

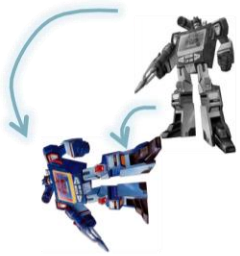
Notes T.4 ***(G.CO.A.5)***

Write your questions here!

Transformations

A transformation is when an image is changed in some way. The change could be a change is size, shape, or position. The following images have been transformed:





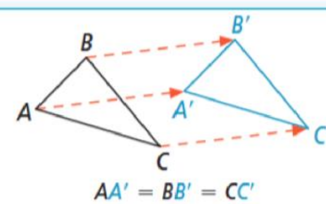
Translations, Reflections and Rotations are called ____________ because the image is congruent to the __________________.

Translations

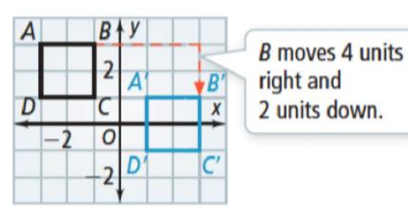
take note **Key Concept** **Translation**

A **translation** is a transformation that maps all points of a figure the same distance in the same direction.

A translation is an isometry.



The diagram at the right shows a translation in the coordinate plane. Each point of the black square moves 4 units right and 2 units down. Using variables, you can say that each (x, y) pair in the original figure is mapped to (x', y'), where $x' = x + 4$ and $y' = y - 2$. You can use arrow notation to write the following *translation rule*.



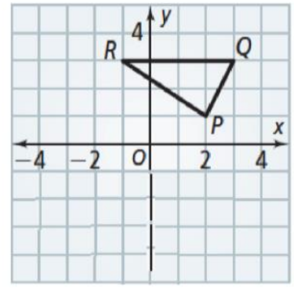
Write your questions here!

What does the rule tell you about the direction each point moves?
$x' = x - 2$ means that each point moves 2 units left. $y' = y - 5$ means that each point moves 5 units down.

Example 1:

Finding the Image of a Translation

What are the images of the vertices of $\triangle PQR$ for the translation $(x, y) \to (x - 2, y - 5)$? Graph the image of $\triangle PQR$.



Identify the coordinates of each vertex. Use the translation rule to find the coordinates of each vertex of the image.

$(x, y) \to (x - 2, y - 5)$

$P(2, 1) \to$

$Q(3, 3) \to$

$R(-1, 3) \to$

To graph the image of $\triangle PQR$, first graph P', Q', and R'. Then draw $\overline{P'Q'}$, $\overline{Q'R'}$, and $\overline{R'P'}$.

There are three ways to write a translation:

________________ or ____ or ____

For example, a translation that moves a point 4 units right and 3 units down can be written as follows:

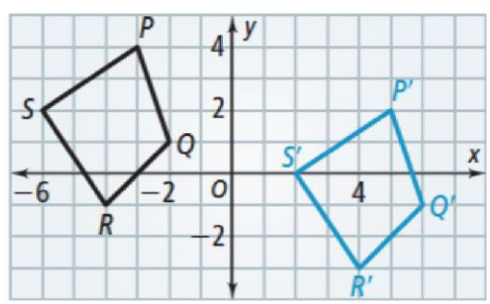
$P(x,y) \to$ ________________ or ________ or ________

(Algebraic Rule) (Shorthand) (Vector notation)

Example 2:

Writing a Rule to Describe a Translation

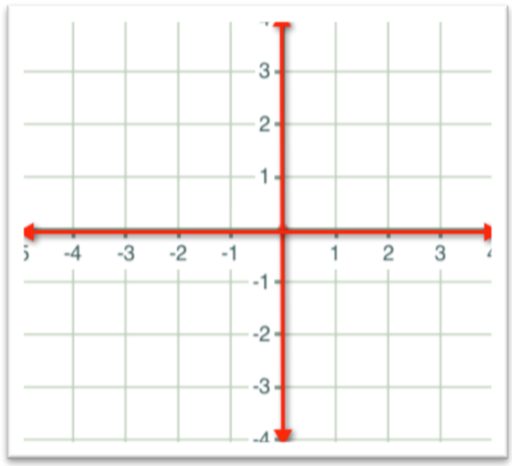
What is a rule that describes the translation $PQRS \to P'Q'R'S'$?



Write your questions here!

Example 3:

Graph the image of the figure C(1, -2), A(-2, 1) T(-3, -3) using the rule 1 unit left and 2 units up. Then, write the translation rule.



Example 4:

Write an algebraic rule to describe the transformation:

C(2, 1), O(0, 0) L(-5, 4), D(-2, 1)
to
C'(0, 1), O'(-2, 0) L'(-7, 4), D'(-4, 1)

Example 5:

Write an algebraic rule to describe the transformation:

F(5, -2), R(10, 0) E(-5, 12), D(0, -3)
to
F'(23, -16), R'(28, -14) E'(13, -2), D'(18, -17)

Now, summarize your notes here!

Algebra Review

Solve each equation for x!

1. $-2x - 3 > 15$

2. $2x - 5 - 2 = -4 + 3x - 5$

Factor!

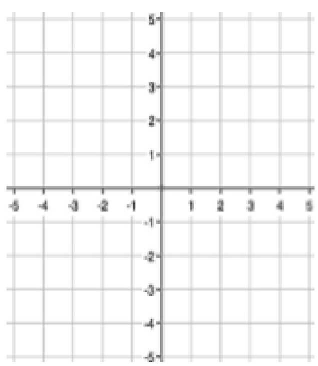
3. $3x^2 + 5x - 12$

Factor!

4. $(x^2 - 9)$

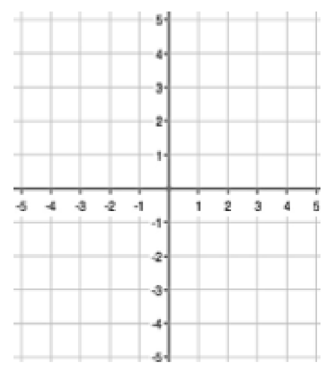
5. Graph the equation:

$2y = 2 - x$



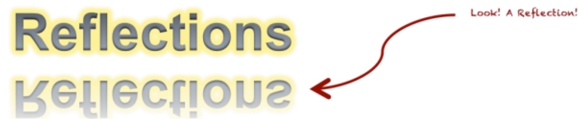
6. Graph the equation:

$3x + 2y = 12$

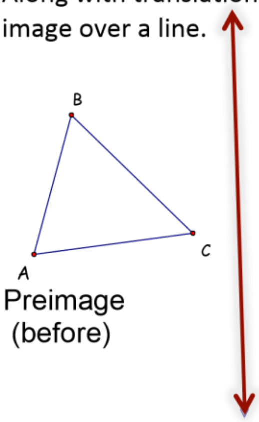


Write your questions here!

Notes T.5 Reflections



Along with translations, Reflect ions are also an _______________. Reflections "flip" an image over a line.

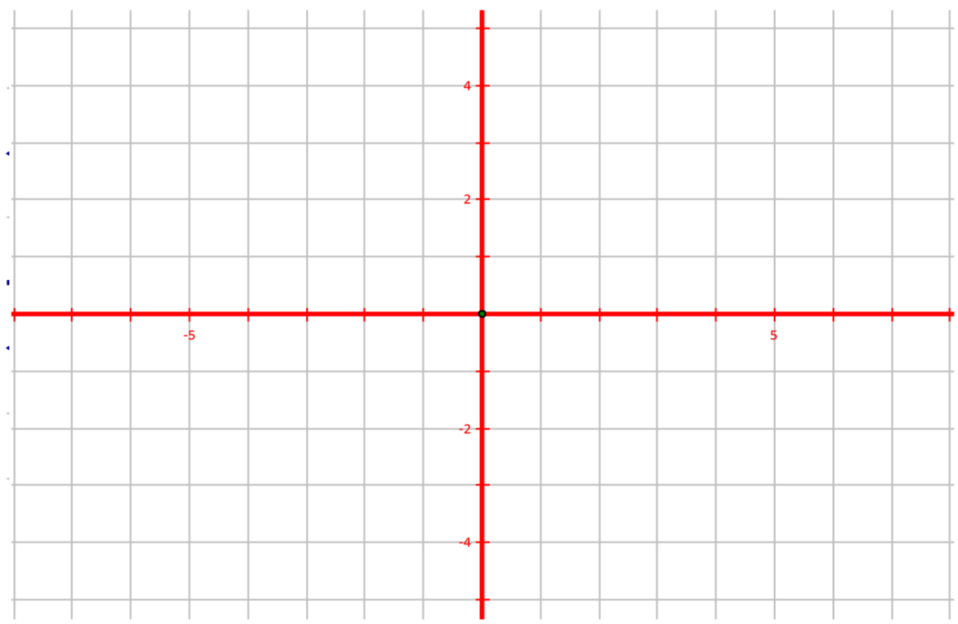


Preimage
(before)

We say ______________________
or ΔABC is mapped to $\Delta A'B'C'$

A reflection involves a ____________ of an image, usually over the x or y-axis. It may also be flipped over other lines, such as y = x or x = 2, etc. The best way to graph the image of a reflection is to simply graph the pre-image, measure the distance to the line, and find the image ______________________ on the other side of the line.

Review of commonly used lines:



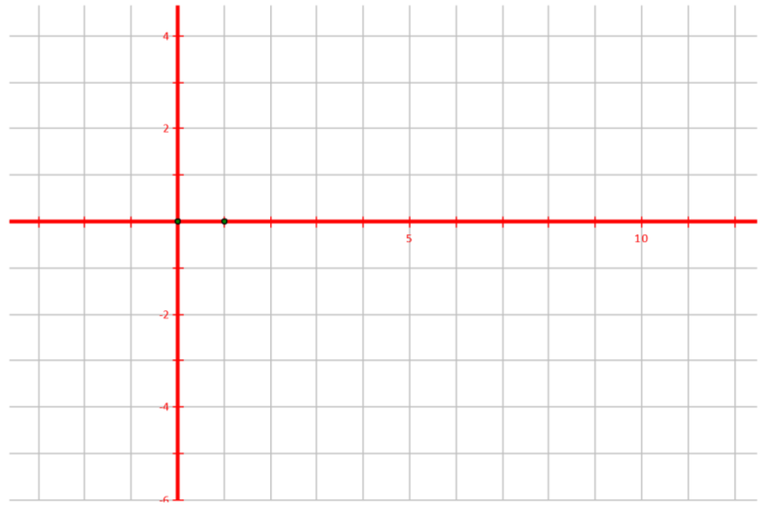
Use these examples as a reference when reflecting images.

Notes T.5 Reflections

Write your questions here!

Example 1:

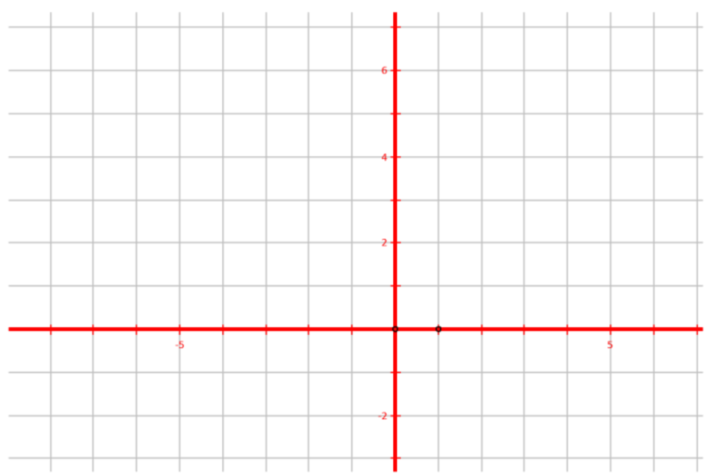
Graph and reflect the preimage ΔA(5, 0), B(3,-1) and C(4, -3) in the x-$axis$.



Did you?:

- ✓ Use a straight-edge?
- ✓ Label all points?

Example 2:



Did you?:

- ✓ Use a straight-edge?
- ✓ Label all points?

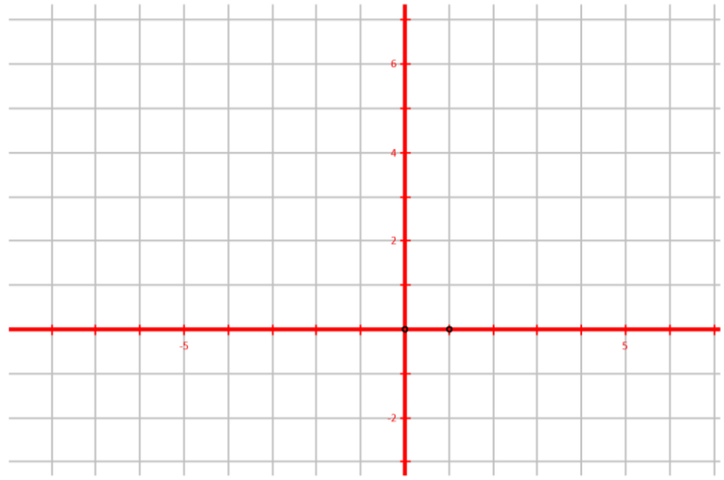
Type of reflection	Abbreviation	Rule
Reflection in the x-axis		(x, y) →
Reflection in the y-axis		(x, y) →
Reflection in the y = x		(x, y) →
Reflection in the y = -x		(x, y) →

Notes T.5 Reflections

Write your questions here!

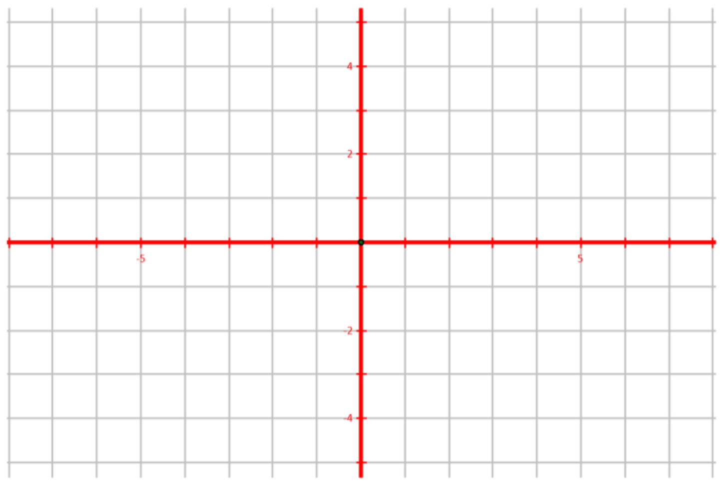
Example 3:

Parallelogram A(-2, 4), B(-3, 2), C(1, 3), D(2, 5) is reflected over the line $y = -x$. Graph the preimage and the image and label the coordinates.



Example 4:

Reflect the triangle A(-6, 2), B(-5, 4) and C(-4, 3) in the line $x = -3$.



Example 5:

Find the coordinates of the following figure after a reflection in the line $y = x$.

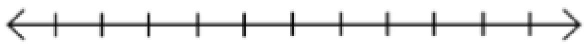
F(5, -2), R(10, 0) E(-5, 12), D(0, -3)

Notes T.5 Reflections

Algebra Review

Solve each equation for x!

1. $12 - x > 15$



2. $12x - 1 - x = -4 + 2x + 12$

Factor!	Factor!
3. $2x^2 - 3x - 2$	4. $(x^2 - 36)$

5. Graph the equation:

   $y + 2 = 2 - 2x$

6. Graph the equation:

   $-x - 2y = 8$

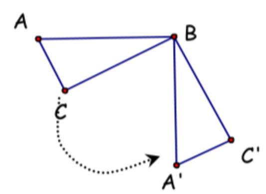
Notes T.6 Rotations

Write your questions here!

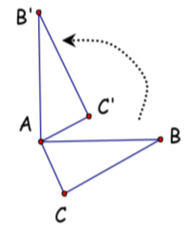
Rotations

Rotations are exactly as you would expect: a transformation that turns an image around a given point. When we are graphing, that point will always be the origin (0,0).

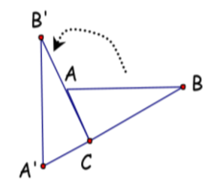
We usually rotate in the same direction that we number the quadrants: ____________________. If you are asked to rotate clockwise, find the equivalent rotation counterclockwise. (More later…)



ΔABC is rotated 90° about point B



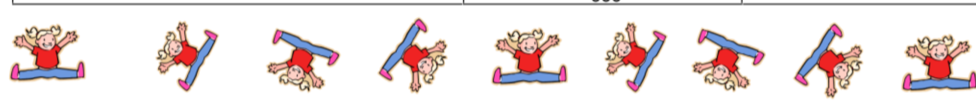
ΔABC is rotated 90° about point A



ΔABC is rotated 90° about point C

Rules for rotating __________________________________ about the origin:

Rule	Abbreviation	Transformation
Rotation of 90° about the origin	R_{90°	(x, y) →
Rotation of 180° about the origin	R_{180°	(x, y) →
Rotation of 270° about the origin	R_{270°	(x, y) →
Rotation of 360° about the origin	R_{360°	(x, y) →



Please keep in mind:

A rotation of 270° COUNTERCLOCKWISE is equivalent to a rotation of ____________________!
A rotation of 360° in either direction maps each preimage onto itself.

Example 1:

Find the coordinates of ΔA(2, 1), B(3, -1), C(-4, 0) after a rotation of 90° counterclockwise about the origin.

Write your questions here!

Notes T.6 Rotations

Example 2:

Find the coordinates of $\Delta D(-2, 5)$, $E(0, 4)$, $F(-4, -3)$ after a rotation of 180° counterclockwise about the origin.

Example 3:

Find the coordinates of $\Delta G(4, -7)$, $H(-2, 4)$, $F(-1, 0)$ after a rotation of 90° clockwise about the origin.

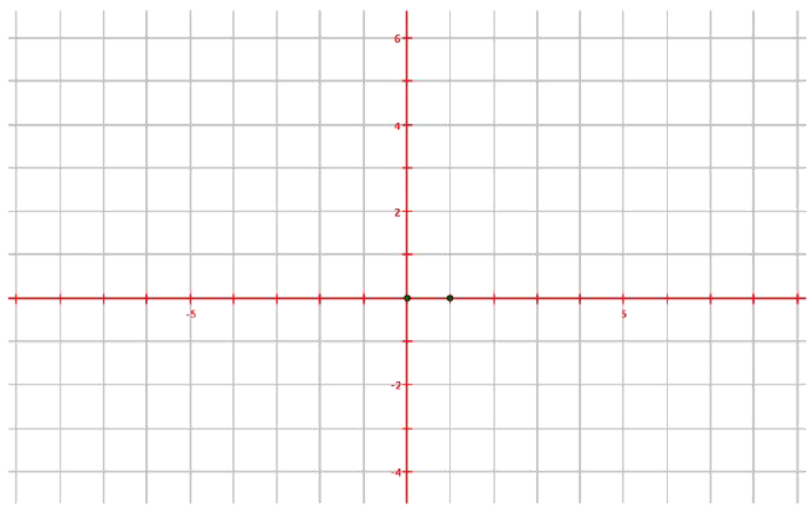
Example 4:

a. Graph trapezoid TRAP where T(0, 4), R(-2,1), A(-5,1), and P(-5,4).

b. Graph T'R'A'P', the image of TRAP after $R_{270^{0}}$.

c. Graph kite KITE where K(-3, -3), I(-1, -3), T(-1, -1) and E(-4, 0).

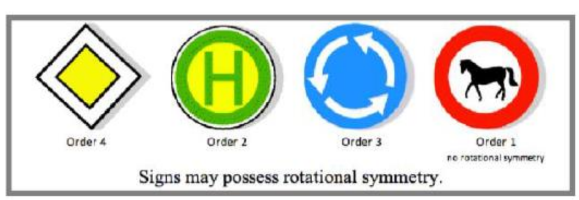
d. Graph K'I'T'E', the image of KITE after $R_{90^{0}}$.



Symmetry

An object has ____________________ if there is a center point around which the object is rotated a certain number of degrees and the object looks the same.

Examples:



Signs may possess rotational symmetry.

Notes T.6 Rotations

Which of the following letters have ***rotational symmetry***?

Which have ***reflectional symmetry***?

A B C D E F
G H I J K L
M N O P Q
R S T U V W
X Y Z

Now, summarize your notes here!

Solve each equation for x!

1. $20 - x > 19.5$

2. $36 - 4x = -x - x$

Factor!

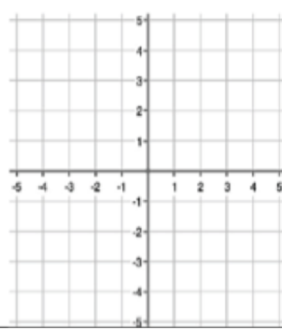
3. $2x^2 - x - 3$

Factor!

4. $(x^2 - 1)$

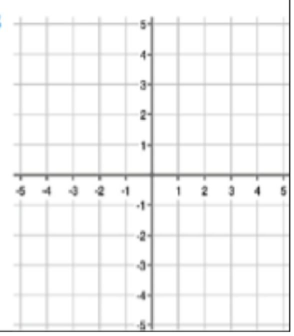
5. Graph the equation:

$3x + 2 = 2 - 2x$



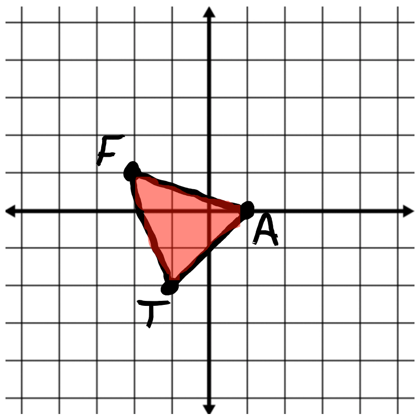
6. Graph the equation:

$-x - 4y = 8$



Notes T.7 Dilations

1) Dilate ΔFAT by scale factor of 2 about origin.

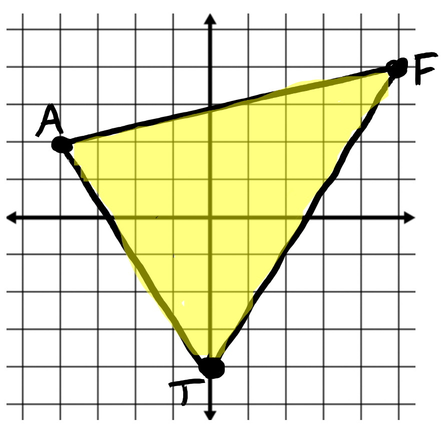


$F(-2,1) \rightarrow F'$

$A(1,0) \rightarrow A'$

$T(-1,-2) \rightarrow T'$

2) Dilate ΔFAT by scale factor of $\frac{1}{2}$ about origin.



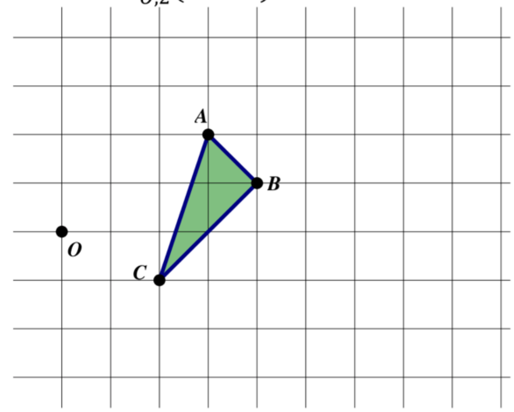
$F(5,4) \rightarrow F'$

$A(-4,2) \rightarrow A'$

$T(0,-4) \rightarrow T'$

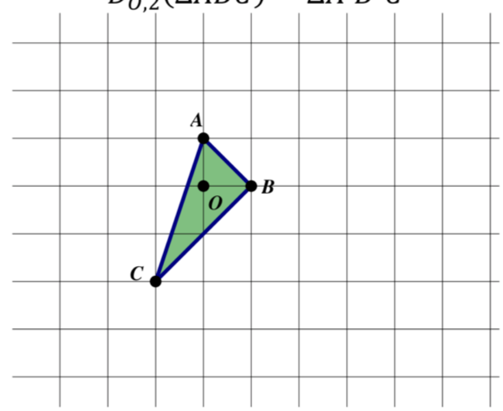
3)

$D_{O,2}(\Delta ABC) = \Delta A'B'C$



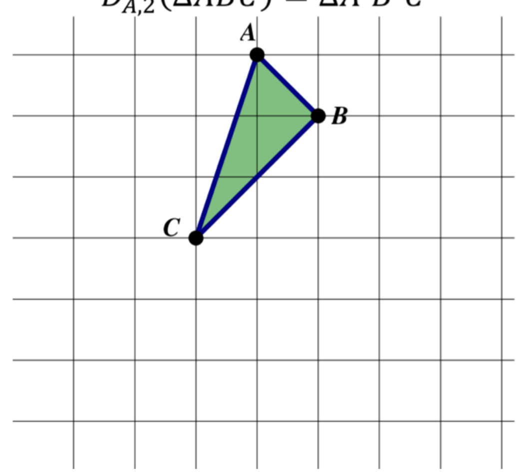
4)

$D_{O,2}(\Delta ABC) = \Delta A'B'C$



5)

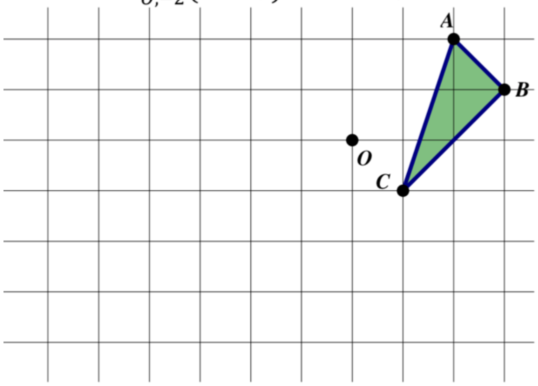
$D_{A,2}(\Delta ABC) = \Delta A'B'C$



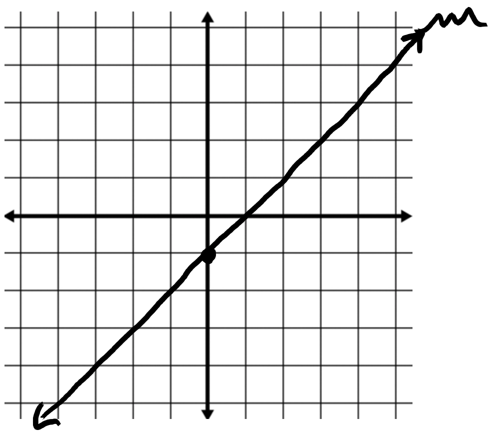
Notes T.7 Dilations

6)

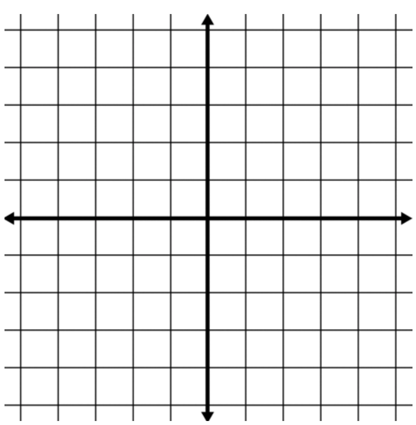
$D_{O,-2}(\Delta ABC) = \Delta A'B'C$



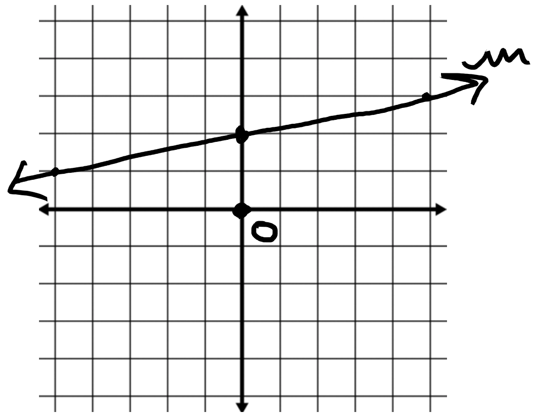
7) Dilate m about the origin by 3.



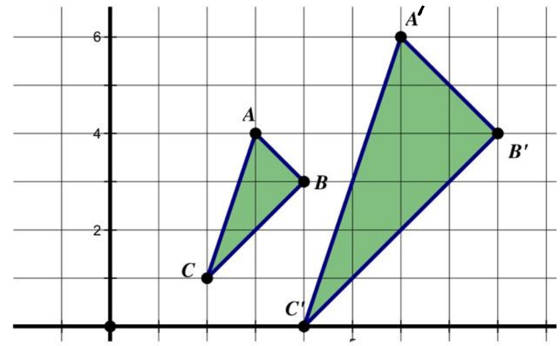
8) Dilate $y = \frac{-1}{2}x + 4$ about the origin by $\frac{1}{2}$



9) $D_{0,2}(m) = m'$



10) Determine the scale factor and center of dilation.



11) Determine if the dilation is an enlargement or reduction.

Scale factor = 3:2

12) Determine if the dilation is an enlargement or reduction.

$D_{0,\frac{6}{11}}(\triangle ABC) = \Delta A'B'C'$

Chapter Transformations Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

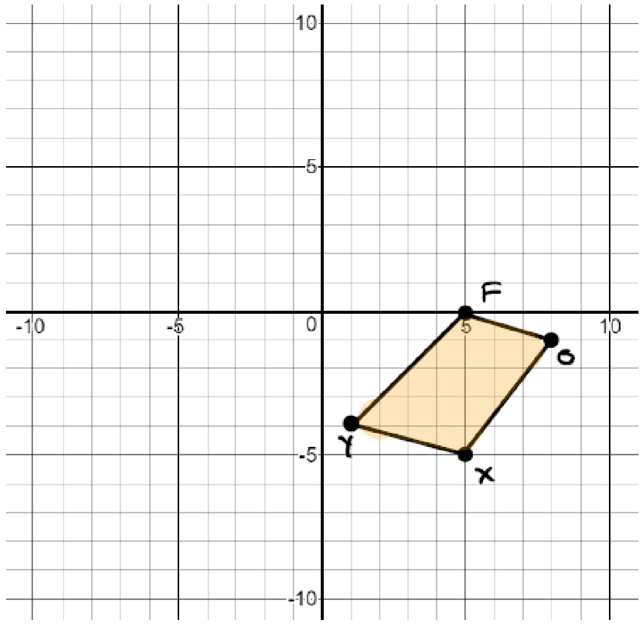
3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.

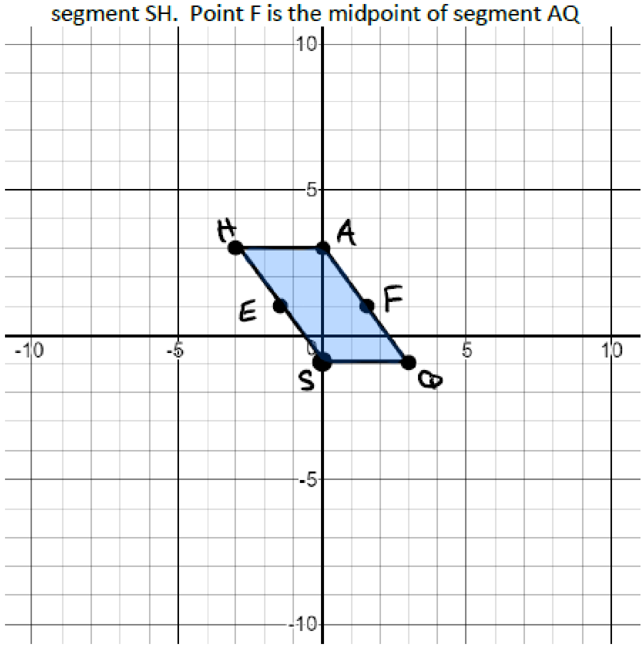
Transformations

Notes Review

1) Reflect FOXY across line y = x.



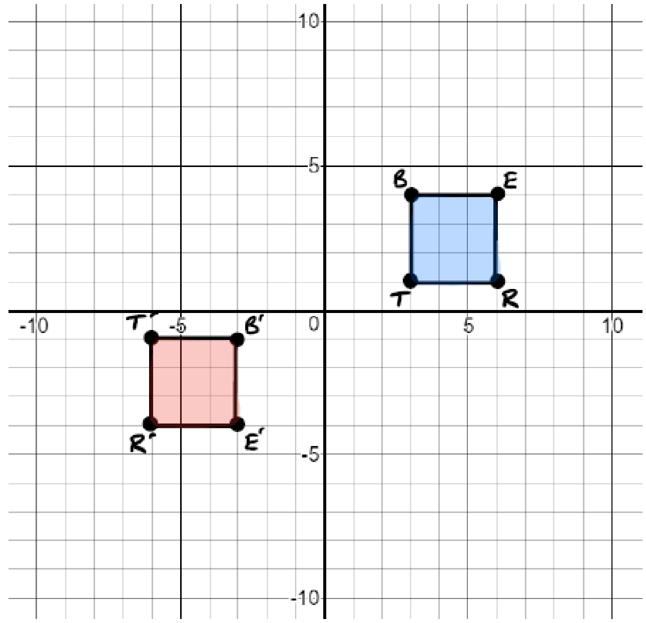
2) Parallelogram SHAQ is shown. Point E is the midpoint of segment SH. Point F is the midpoint of segment AQ



Which transformation carries the parallelogram onto itself?

A) A reflection across line segment SA
B) A reflection across line segment EF
C) A rotation of 180 degrees clockwise about the origin
D) A rotation of 180 degrees clockwise about the center of the parallelogram.

3) Square BERT is transformed to create the image B'E'R'T', as shown.



Select all of the transformations that could have been performed.

A) A reflection across the line y = x
B) A reflection across the line y = -2x
C) A rotation of 180 degrees clockwise about the origin
D) A reflection across the x-axis, and then a reflection across the y-axis.
E) A rotation of 270 degrees counterclockwise about the origin, and then a reflection across the x-axis.

4) Joe Momma performs a transformation on a hexagon. The resulting triangle is similar but not congruent to the original triangle. Which transformation did Joe Momma perform on the hexagon?

A) Dilation
B) Reflection
C) Rotation
D) Translation

5) Triangle ABC had vertices of A(1, 1), B(3, 6) and C(0, 2). It is dilated by a scale factor of ¼ about the origin to create triangle A'B'C'. What is the length, in units, of side $\overline{B'C'}$?

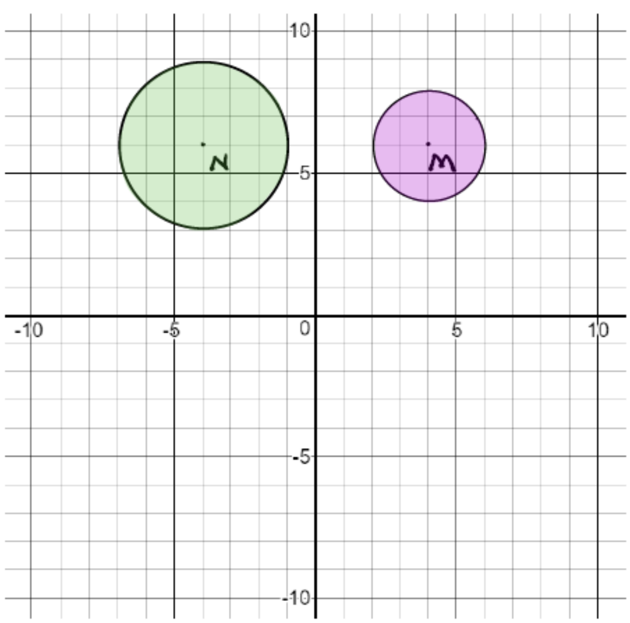
6) Complete the statement to explain how it can be shown that two circles are similar.

Circle M can be mapped onto circle N by a reflection

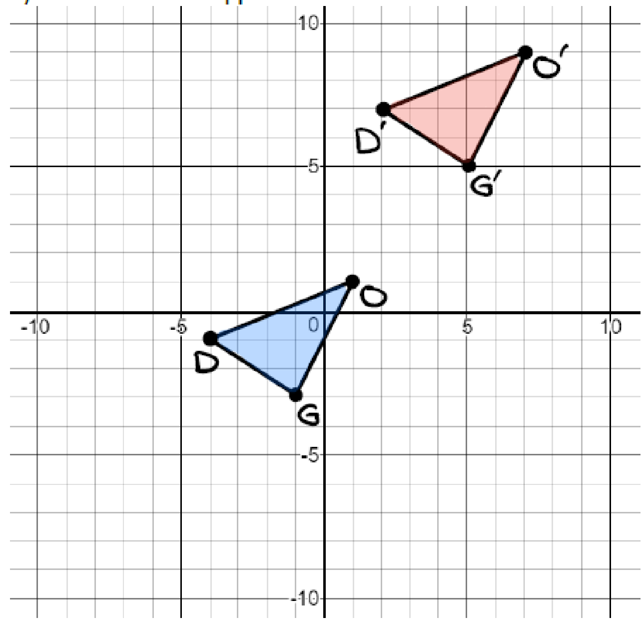
across ______________________ and a dilation

about the center of circle M by a scale factor of

____



7) A translation is applied to ΔDOG to create $\Delta D'O'G'$.

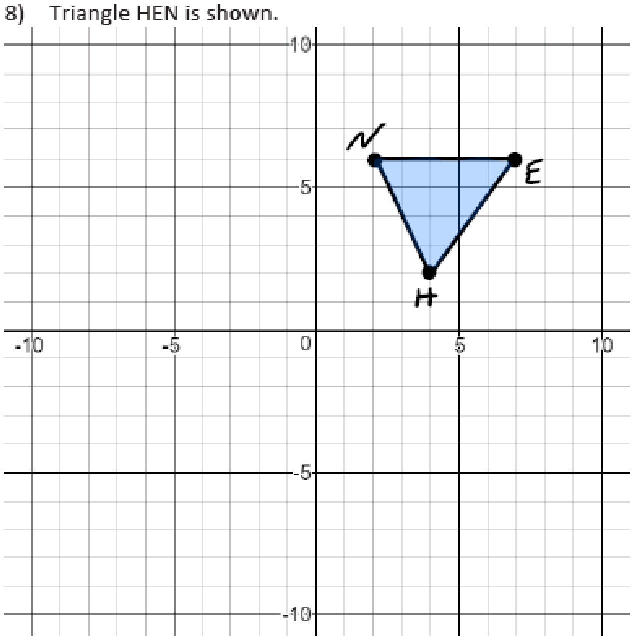


Let the statement $(x, y) \rightarrow (a, b)$ describe the translation. Create equations for a in terms of x and for b in terms of y that could be used to describe the translation.

a = ______________________

b = ______________________

8) Triangle HEN is shown.



Triangle $H'E'N'$ is created by dilating triangle HEN by a scale factor of 3. What is the length of $\overline{H'E'}$?

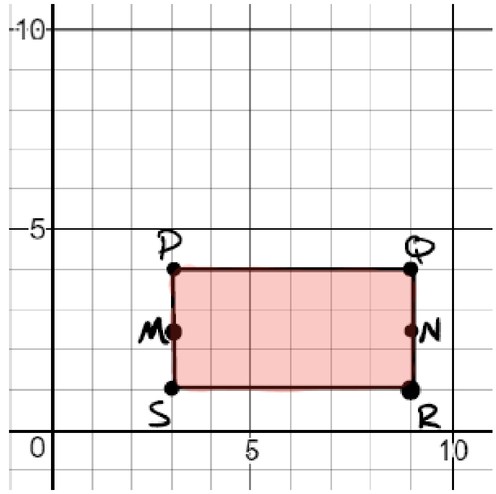
9) A figure is fully contained in Quadrant IV. The figure is transformed as shown.

- A reflection over the y-axis
- A reflection over the line y = x
- A 90° clockwise rotation about the origin.

In which quadrant does the resulting image lie?

A) Quadrant I
B) Quadrant II
C) Quadrant III
D) Quadrant IV

10) Rectangle PQRS is shown in the coordinate plane. Points M and N are midpoints of their respective sides.



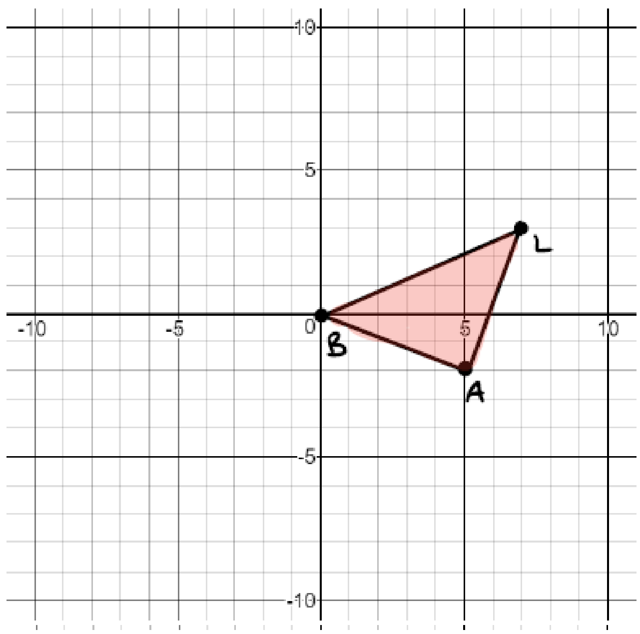
Select all of the transformations that map the rectangle onto itself.

A) A 90° clockwise rotation around the center of the rectangle
B) A 180° clockwise rotation around the center of the rectangle
C) A reflection across $\overline{PR}$
D) A reflection across $\overline{NM}$
E) A reflection across $\overline{QS}$

11) Triangle ABC is reflected across the line y = ½x to form triangle RST. Select all of the true statements.

A) $\overline{AB} = \overline{RS}$ (I know this notation is wrong, but some moron used this wrong notation on the state test.)
B) $\overline{AB} = 2 \cdot \overline{RS}$ (I know this notation is wrong, but some moron used this wrong notation on the state test.)
C) $\Delta ABC \sim \Delta RST$
D) $\Delta ABC \cong \Delta RST$
E) $m\angle BAC = m\angle SRT$
F) $m\angle BAC = 2 \cdot m\angle SRT$

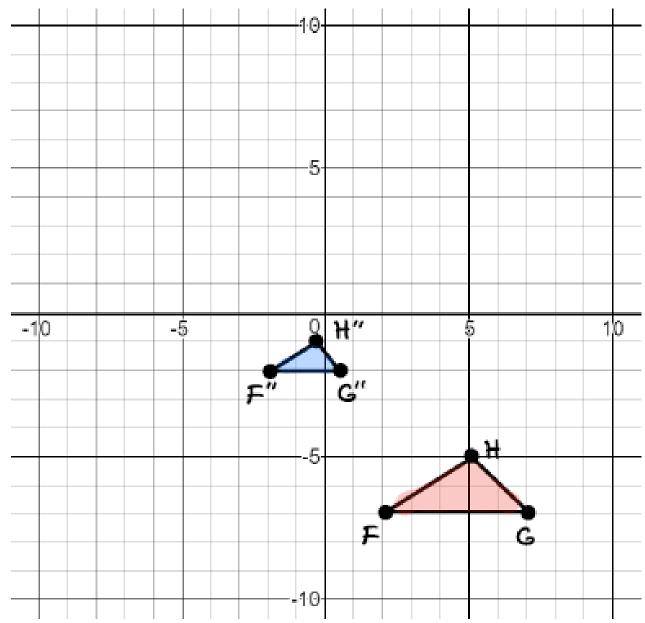
12) Triangle BAL is reflected across the line y = x. Draw the resulting triangle.



13) All corresponding sides and angles of ΔRST and ΔDEF are congruent.
Select all of the statements that must be true.

A) There is a reflection that maps $\overline{RS}$ to $\overline{DE}$
B) There is a dilation that maps ΔRST to ΔDEF
C) There is a translation followed by a rotation that maps $\overline{RT}$ to $\overline{DF}$
D) There is a sequence of transformations that maps ΔRST to ΔDEF
E) There is not necessarily a sequence of rigid motions that maps ΔRST to ΔDEF

14) The coordinate plane shows ΔFGH and $\Delta F''G''H''$



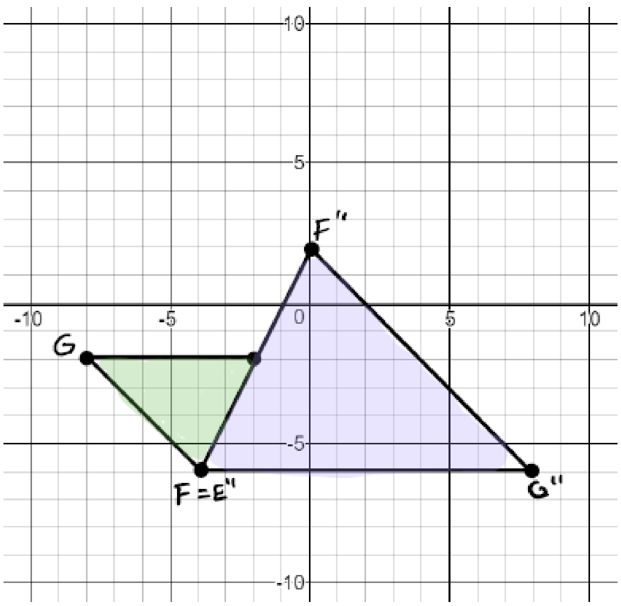
Which sequence of transformations can be used to show that $\Delta FGH \sim \Delta F''G''H''$?

A) A dilation about the origin with a scale factor of 2, followed by a 180° clockwise rotation about the origin.
B) A dilation about the origin with a scale factor of 2, followed by a reflection over the line y = x
C) A translation 5 units up and 4 units left, followed by a dilation with a scale factor of ½ about point F″
D) A 180° clockwise rotation about the origin, followed by a dilation with a scale factor of ½ about F″

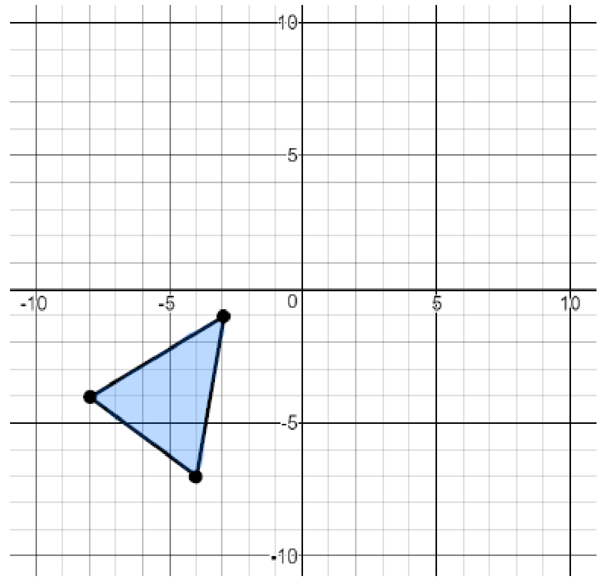
15) Two triangles are shown.

Which sequence of transformations could be performed on ΔEFG to show that it is similar to ΔJKL?

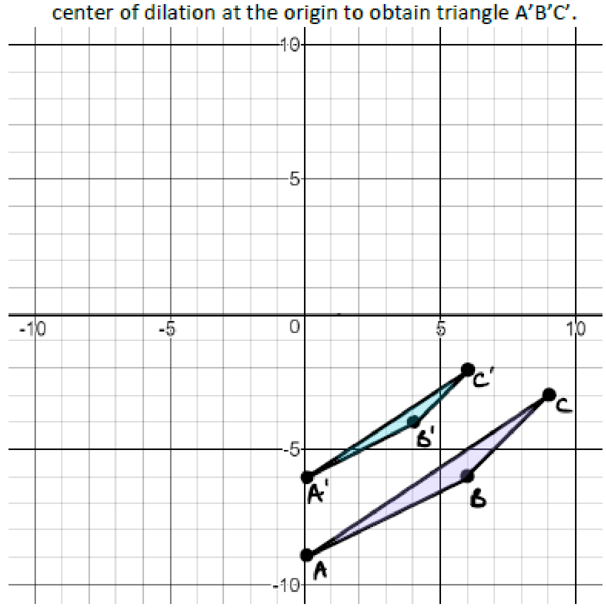
A) Rotate ΔEFG 90° clockwise about the origin, and then dilate it by a scale factor of ½ with a center of dilation at point F'
B) Rotate ΔEFG 180° clockwise about point E, and then dilate it by a scale factor of 2 with a center of dilation at point E'
C) Translate ΔEFG 1 unit up, then reflect it across the x-axis, and then dilate it by a factor of ½ with a center of dilation at point E"
D) Reflect ΔEFG across the x-axis, then reflect it across the line y = x, and then dilate it by a scale factor of 2 with a center of dilation at point F"



16) A triangle is shown on the coordinate grid. Draw the triangle after a transformation following the rule $(x, y) \rightarrow (x + 5, y - 1)$



17) Triangle ABC is dilated with a scale factor of k and a center of dilation at the origin to obtain triangle A'B'C'.



What is the scale factor?

18) A pentagon is rotated about its center.

Select all of the angles of rotation that will map the pentagon onto itself.

A) 72 degrees
B) 144 degrees
C) 180 degrees
D) 216 degrees
E) 270 degrees
F) 315 degrees

19) Circle J is located in the first quadrant with center (m, n) and radius k. Felipe transforms Circle J to prove that it is similar to any circle centered at the origin with radius g.

Which sequence of transformations did Felipe use?

A) Translate Circle J by $(x - m, y - n)$ and dilate by a factor of $\frac{g}{k}$
B) Translate Circle J by $(x - m, y - n)$ and dilate by a factor of $\frac{k}{g}$
C) Translate Circle J by $(x + m, y + n)$ and dilate by a factor of $\frac{g}{k}$
D) Translate Circle J by $(x + m, y + n)$ and dilate by a factor of $\frac{k}{g}$