Ch. 28 - Transformational Geometry

Kuta Software - Infinite Geometry

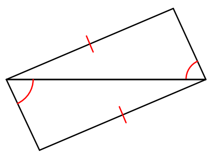
Name________________________________

SSS, SAS, ASA, and AAS Congruence

Date________________ Period____

State if the two triangles are congruent. If they are, state how you know.

1)



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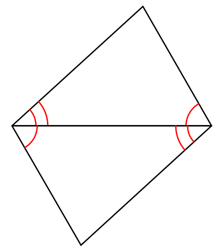

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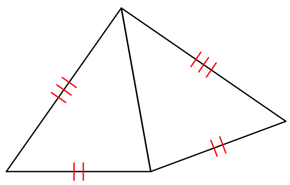

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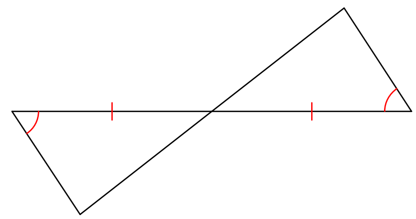

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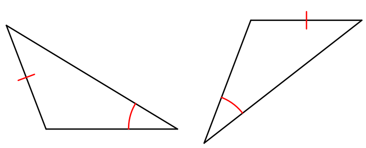

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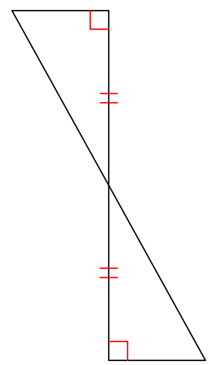

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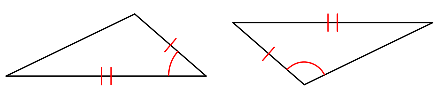

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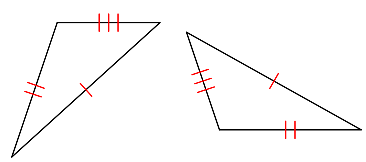

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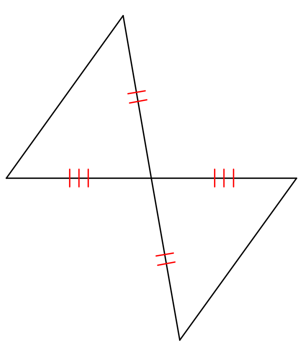

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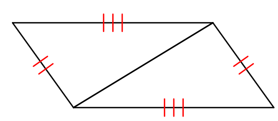
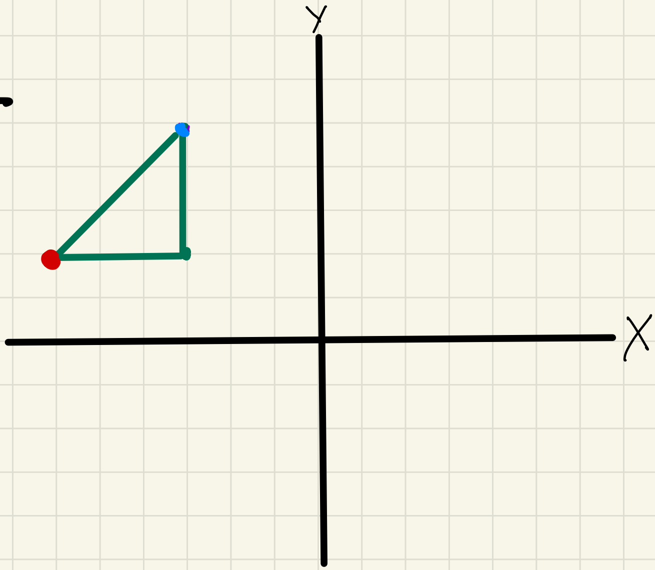


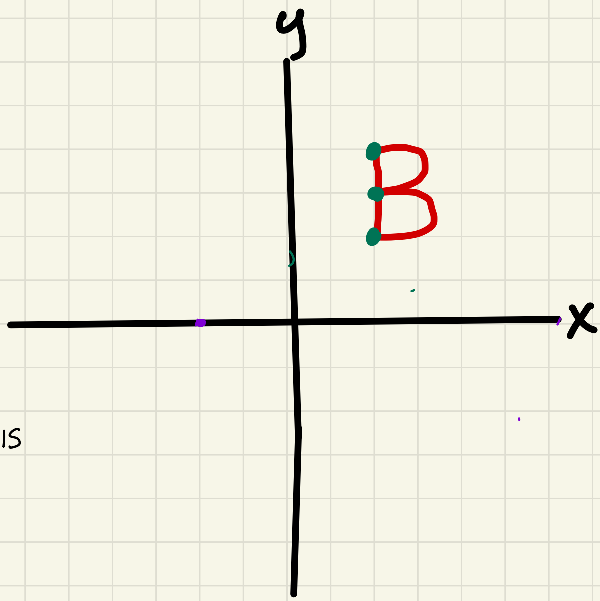
Ch. 28 - TRANSFORMATIONAL GEOMETRY

TRANSLATION



1) TRANSLATE THE ◺ UP 2, RIGHT 4
2) TRANSLATE DOWN 6, LEFT 1
3) TRANSLATE RIGHT 5, DOWN 3

REFLECTION

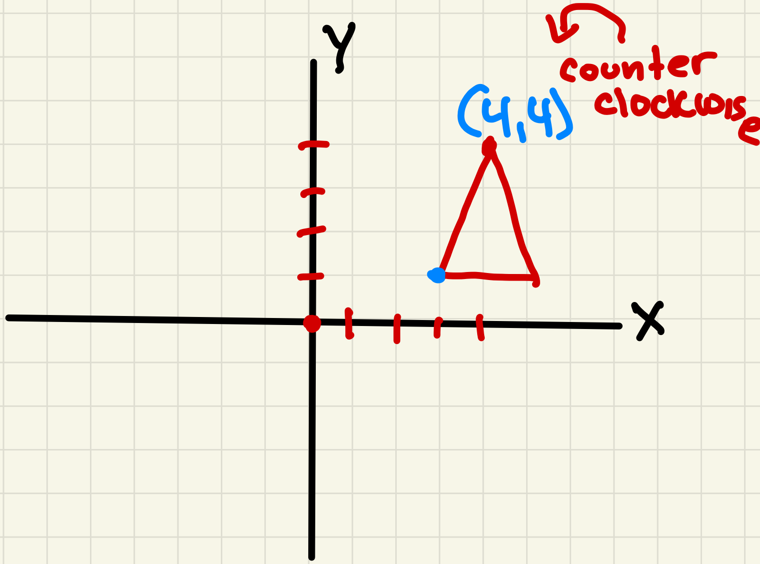


1) REFLECT ACROSS Y-AXIS
(-x, y)

2) REFLECT B OVER X-AXIS
(x, -y)

3) REFLECT ORIGINAL OVER X-AXIS
(x, -y)

ROTATION



ROTATION 90°

COUNTER CLOCKWISE

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

$(3,1) \rightarrow (-1,3)$

ROTATE 180°

$(3,1) \rightarrow (-3,-1)$

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

ROTATE 270°

From Δ

$(3,1) \rightarrow (1,-3)$

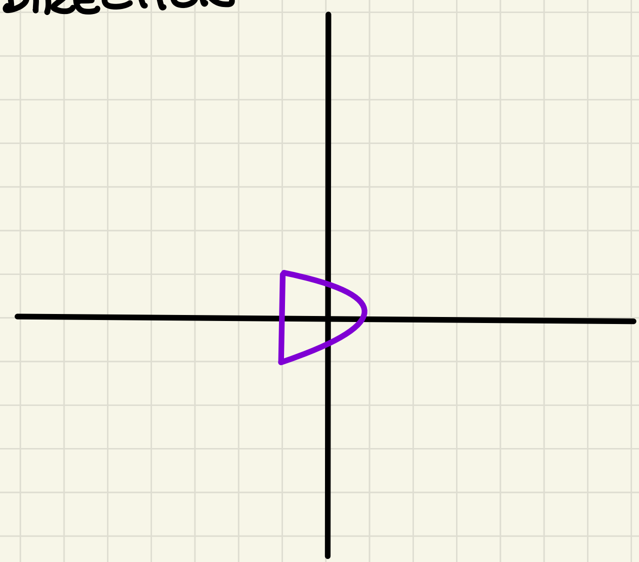
$(x,y) \rightarrow (y,-x)$

DILATION

EXPAND IN EVERY DIRECTION

DILATE BY ______

DILATE BY ______



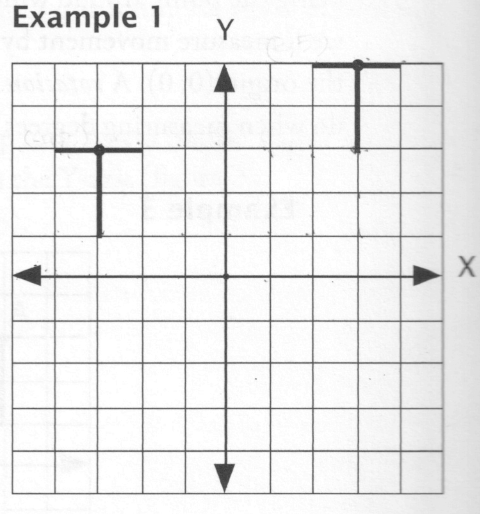
LESSON 28

Transformational Geometry

Transformational geometry involves moving geometric shapes around and transforming them on a grid. On a computer, think of drawing a figure on Cartesian coordinates and then doing various commands with your figure. Or, you can pretend you've drawn a shape, and then cut it out and moved it from its original position to another location. What we cover in this lesson are four distinct movements that can be used: translation, reflection, rotation, dilation. The first movement is a translation.

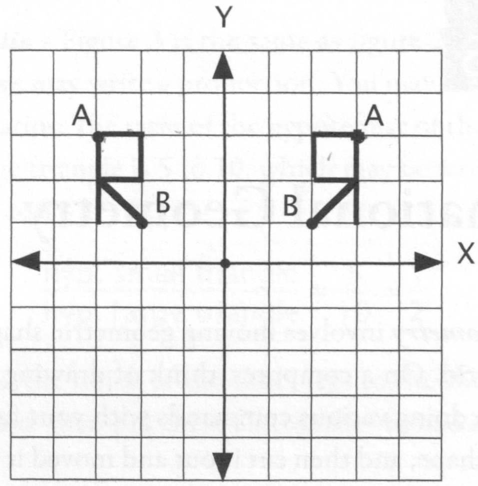
Translation - In a *translation*, the shape stays intact and is simply moved to another place on the grid. In example 1, we start with the letter "T" in the second quadrant. The T is moved to the first quadrant. The movement is described in terms of the horizontal (over) and vertical (up or down) coordinates. To measure the movements, pick a point on T. Any point will do. I chose a point at the intersection of the two lines in the letter. On the graph, move over six spaces and up two spaces from the chosen point.

Example 1



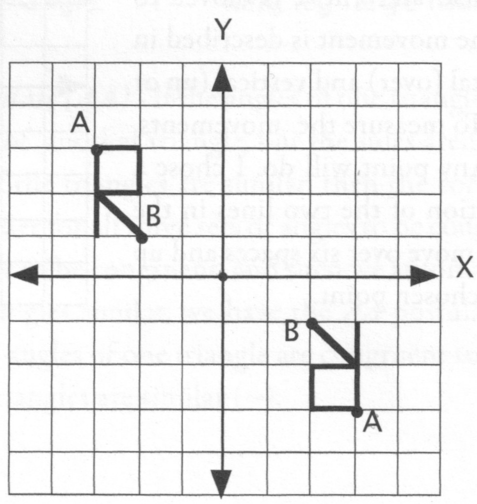
Reflection - Think of a mirror resting on its edge somewhere on the graph. In example 2, we've placed the mirror vertically (running north-south) on the Y-axis. Our figure "R" begins in the second quadrant. I chose two points, A and B, on the R to help in plotting the *reflection* on the graph. The resultant movement is perpendicular to the mirror.

Example 2



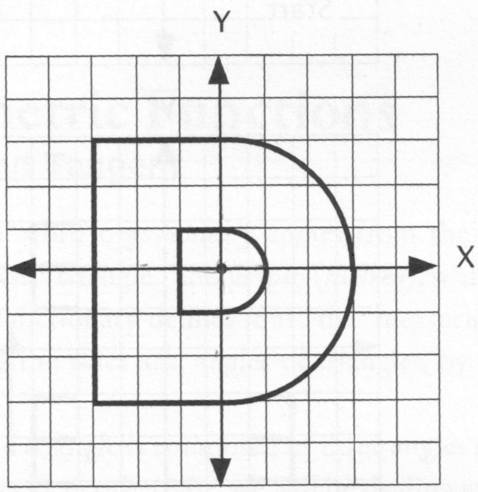
Rotation - When you reflect an object, the central focus is on the location of the mirror. When you rotate an object, the rotation occurs around a specific point. Think of your object lying on the edge of a circle, the center of the circle being the point around which you are moving. Since we are dealing with a circle, we'll measure movement by degrees. In example 3, the R has moved 180° around the origin (0, 0). A *rotation* moves counterclockwise around the circle, just as we do when measuring degrees on a graph.

Example 3



Dilation - When going from darkness into the presence of light, the pupil in the human eye will contract. Conversely, in a dark room, pupils expand (dilate) to allow more light to enter the eye. In the context of transformational geometry, *dilation* is the enlarging or reducing in size of an object without changing its shape. If you have used a computer, you know that you can click and drag on a corner of an object to change its size without changing its shape. In example 4, our shape is a "D" whose edges are one unit from the origin in each direction. We will enlarge it by a factor of three so the resultant D is three times as large in each direction.

Example 4



Combining Transformations - You can also combine transformations. In example 5, E moves from the third quadrant to the first quadrant. There are several possibilities of how it got there:

1. Reflection on the Y-axis and a translation up four spaces (figure 1).
2. Reflection on the X-axis and a reflection on the Y-axis (figure 2).
3. Rotation of 180° around the origin (figure 3).

Example 5

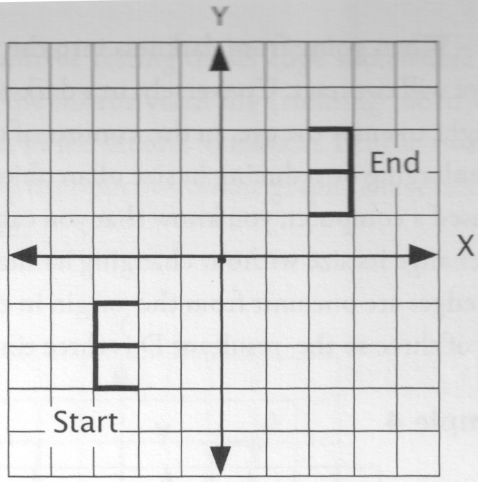


Figure 1

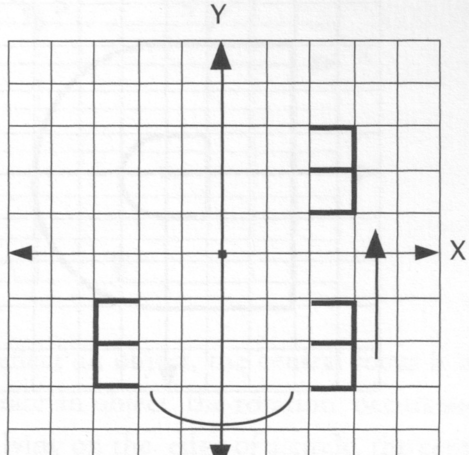


Figure 2

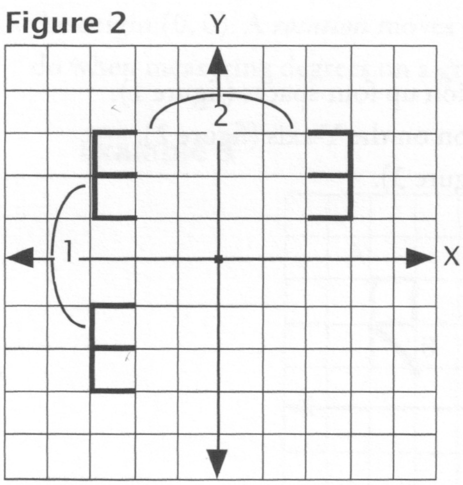
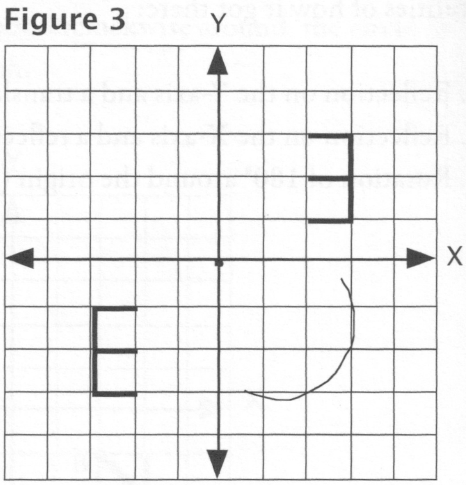


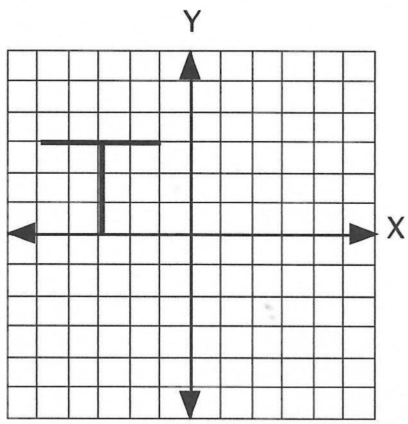
Figure 3



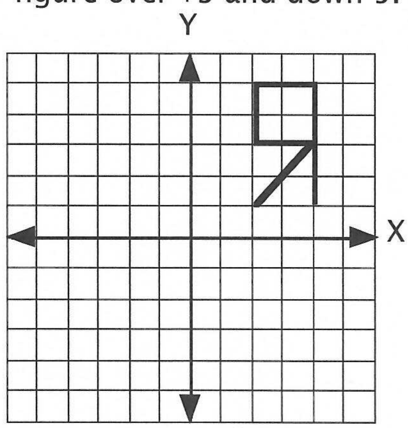
Can you list a different series of transformations?

LESSON PRACTICE

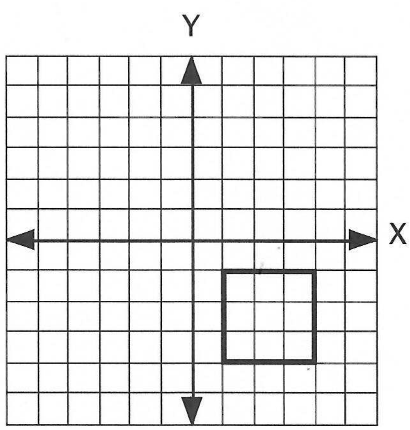
Complete the following transformations.



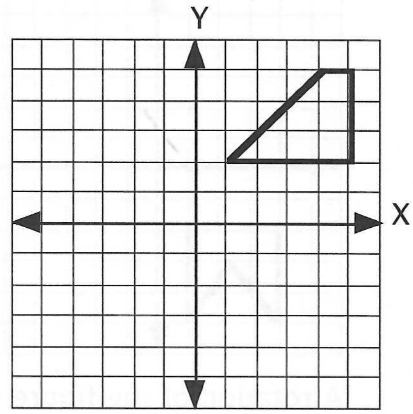
1. A translation (slide) of the figure over +3 and down 5.



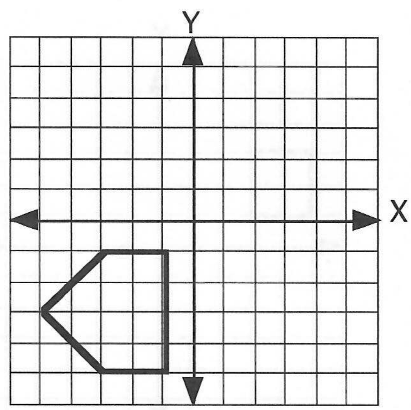
2. A translation of the figure over –6 and down 7.



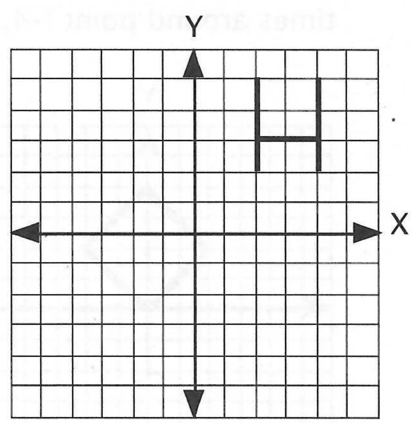
3. A translation of the figure over –5 and up 7.



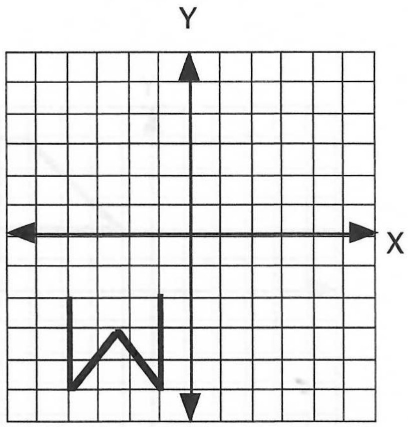
4. A reflection (flip) of the figure in the X-axis.



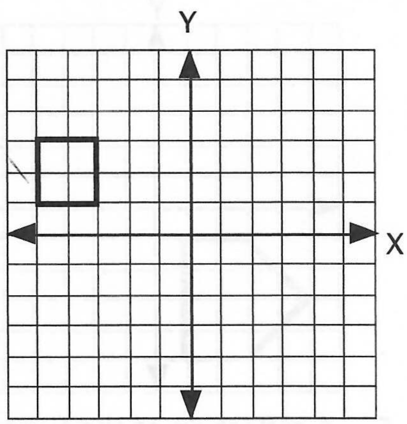
5. A reflection of the figure in the Y-axis.



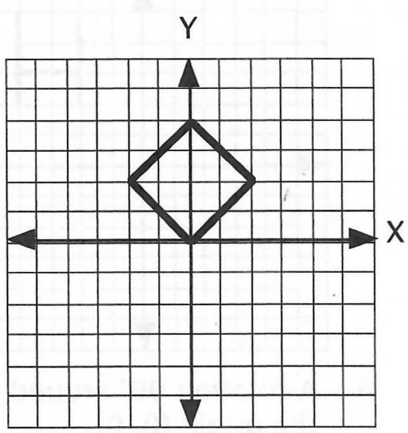
6. A rotation 90° around the origin (0, 0).



7. A rotation of the figure 270° around the origin (0, 0).



8. A dilation (stretch) two times around point (–4, 2).



9. A dilation two times around point (0, 2).

LESSON PRACTICE

Follow the directions. Be sure to factor each equation completely.

For #1-3 $X^2 + X = 56$

1. Find the factors. Make the right side equal to zero first.

2. Find all solutions of X.

3. Check by substituting the solutions.

For #4-6 $X^2 - 11X + 30 = 0$

4. Find the factors.

5. Find all solutions of X.

6. Check by substituting the solutions.

For #7-9 $X^2 - 15X + 56 = 0$

7. Find the factors.

8. Find all solutions of X.

9. Check by substituting the solutions.

For #10-12 $X^2 - 13X + 40 = 0$

10. Find the factors.

11. Find all solutions of X.

12. Check by substituting the solutions.

SYSTEMATIC REVIEW

Find all solutions of X.

1. $2X^2 + 7X + 6 = 0$

2. Check #1 by substituting the solutions.

3. $X^2 + 6X + 8 = 0$

4. Check #3 by substituting the solutions.

5. $X^2 + 3X + 4 = 14$

6. Check #5 by substituting the solutions.

Build and find the product.

7. $(X - 6)(X - 6) =$

8. Check #7 by multiplying the binomials vertically.

9. Use the difference of two squares to find the factors of $X^2 - 16$.

10. Use the difference of two squares to find the factors of $X^2 - 49$.

Simplify.

11. $-4^2 + (-2)^2 =$

12. $3^{-1} \times 3^1 =$

13. $(X^2)^2\ (X^{-3})^{-1}$

14. $\frac{2X^2X^{-1}Y}{Y^3} - \frac{3X^0Y^3}{X^2} + \frac{5Y^{-2}}{X^{-1}} =$
(X and Y $\neq$ 0)

15. Rewrite $2X + 4Y - 8 = 0$ in slope-intercept form of an equation of a line.

16. What is the slope of a line perpendicular to the line described in #15?

17. What is the GCF of 11 and 33?

18. Find the prime factors of 100.

19. Solve by elimination: $Y = X - 3$ and $Y = 2X - 4$.

20. $(2X + 3)(2X + 1) = (2X)(\quad + \quad) + (\quad)(2X + 1) = (\quad + \quad) + (\quad + \quad)$

SYSTEMATIC REVIEW

Find all solutions of X.

1. $2X^2 + 9X + 4 = 0$

2. Check #1 by substituting the solutions.

3. $X^2 + 13X - 68 = 0$

4. Check #3 by substituting the solutions.

5. $X^2 - 2X + 5 = 8$

6. Check #5 by substituting the solutions.

Build and find the product.

7. $(X - 4)(X - 4) =$

8. Check #7 by multiplying the binomials vertically.

9. Use the difference of two squares to find the factors of $X^2 - Y^2$.

10. Use the difference of two squares to find the factors of $4X^2 - 4Y^2$.

Simplify.

11. $-3^2 - (2)^2 =$

12. $4^{-2} \times 4^3 =$

13. $(X^2)^3\,(X^{-2})^2 =$

14. $2B^2B^1 - \frac{3B^{-1}}{B^{-4}} + \frac{5B^4}{B^{-1}} =$

(when $B \neq 0$)

15. Solve for B: $\frac{B}{4} = \frac{9}{25}$

16. Solve for R: $\frac{3.4}{5} = \frac{R}{15}$

17. How long will it take you to travel 520 miles at 65 mph?

18. How fast will you be going if you drive 240 miles in six hours?

19. Solve by substitution: $Y + 2X = -2$ and $X = 4$.

20. $(\quad + \quad)(X + 2) = (3X)(X + 2) + (4)(X + 2) = (\quad + \quad) + (\quad + \quad)$