

Algebra 8 Final Review Packet - ANSWERS

Write two expressions that are equivalent to the given expression. **ANSWERS WILL VARY**

1.) $5(x-3)+11$

$$5x-15+11 \quad 11+5(x-3)$$

$$5x-4 \quad 11+5x-15$$

$$-4+5x$$

3.) $4x-2-3x+x$

$$2x-2 \quad 2(x-2)$$

$$-2+2x$$

$$x-2+x$$

2.) $3x+15$

$$3(x+5) \quad 3x+3 \cdot 5$$

$$15+3x$$

$$x+x+x+15$$

4.) $x+x+x+8+8+8$

$$3x+24 \quad 24+3x$$

$$3(x+8)$$

$$8+8+8+x+x+x$$

Simplify the following expressions.

5.) $12(-2x+1)-20$

$$-24x+12-20$$

$$-24x-8$$

6.) $-5x-(x-6)$

$$-5x-x+6$$

$$-6x+6$$

7.) $-2(5-4x)+8(-3x+3)$

$$-10+8x+(-24x)+24$$

$$-16x+14$$

8.) $10+7(-5x+4x-5)+14$

$$10-35x+28x-35+14$$

$$-9-7x$$

The Student Council is organizing a charity bake sale. They came up with the following expenses and incomes:

E - They need to spend \$70 on baking materials - flour, sugar, butter, etc

I - They will sell each baked good for \$2.50.

9.) Write an equation for the profit P based on selling n baked goods. Simplify your equation.

$$P = I - E$$

$$P = 2.50n - 70$$

10.) How many baked goods do they need to sell to break even? $\rightarrow P=0$

$$\begin{array}{r} 0 = 2.50n - 70 \\ +70 \quad \quad +70 \\ \hline 70 = 2.50n \end{array}$$

$$70 = 2.50n$$

$$\begin{array}{r} 2.50n = 70 \\ \underline{2.50 \quad 2.50} \end{array}$$

$$n = 28 \text{ baked goods}$$

11.) Their goal is to raise \$325. How many baked goods do they need to sell to reach their goal? $P=325$

$$\begin{array}{r} 325 = 2.50n - 70 \\ +70 \quad \quad +70 \\ \hline 405 = 2.50n \end{array}$$

$$405 = 2.50n$$

$$\begin{array}{r} 2.50n = 395 \\ \underline{2.50 \quad 2.50} \end{array}$$

$$n = 158 \text{ baked goods}$$

The profit P of a concession stand outside Fenway park is depended on the number of customers C that go to the stand before, during, and after the game. The number of customers depends on the probability of rain R . The owner of the stand came up with the following equations to help predict their daily profit.

$$P = 8C - 400$$

$$C = 250 - 150R$$

12.) What do the numbers in the profit equation mean **in the context of this situation**?

$8 = \$$ expected per customer on average $400 =$ expenses of running the stand

13.) What is the profit of the concession stand if the probability of rain is 40%?

$$C = 250 - 150(.40)$$

$$P = 8(190) - 400$$

$$C = 250 - 60$$

$$P = 1520 - 400$$

$$C = 190$$

$$P = \$1120$$

14.) Write an equation for profit P in terms of probability of rain R . Think about what variable you *don't* want and how you can get rid of that variable.

$$C = [250 - 150R]$$

$$P = 8C - 400$$

$$P = 8(250 - 150R) - 400$$

15.) Simplify your profit equation from #14. Use it to help you calculate the probability of rain if the profit of the concession stand is \$1540. $P = 1540$

$$P = 8(250 - 150R) - 400$$

$$P = 2000 - 1200R - 400$$

$$P = 1600 - 1200R$$

Solve for the given variable.

$$1540 = 1600 - 1200R$$

$$-1600 \quad -1600$$

$$-60 = -1200R$$

$$-1200 \quad -1200$$

$$R = .05 \rightarrow 5\% \text{ chance of rain}$$

16.) x in terms of y

$$3x + 9y = 27$$

$$-9y \quad -9y$$

$$3x = -9y + 27$$

$$\frac{3x}{3} = \frac{-9y + 27}{3}$$

$$x = -3y + 9$$

18.) z in terms of x and y

$$2x - 8y + 4z = 20$$

$$-2x \quad -2x$$

$$-8y + 4z = -2x + 20$$

$$+8y \quad +8y$$

$$4z = -2x + 8y + 20$$

$$\frac{4z}{4} = \frac{-2x + 8y + 20}{4}$$

17.) y in terms of x

$$5(2x + y) = 35 - 6x$$

$$10x + 5y = 35 - 6x$$

$$-10x \quad -10x$$

$$5y = 35 - 16x$$

$$\frac{5y}{5} = \frac{35 - 16x}{5}$$

$$y = 7 - \frac{16}{5}x$$

19.) w in terms of P and l

$$P = 2l + 2w$$

$$-2l \quad -2l$$

$$P - 2l = 2w$$

$$\frac{P - 2l}{2} = \frac{2w}{2}$$

$$\frac{P}{2} - l = w$$

$$w = \frac{P}{2} - l$$

Using the two given equations, write a new equation relating the given variables. Think about what variable you *don't* want and how you can rid of that variable by substitution.

20.) x in terms of z Don't want y

$$x = 3y + 4z$$

$$y = 5z + 9$$

$$x = 3(5z + 9) + 4z$$

21.) A in terms of B Don't want C

$$A = BC$$

$$B = 5 + C$$

$$\begin{array}{r} -5 \quad -5 \\ \hline [B - 5] = C \end{array}$$

$$A = B(B - 5)$$

22.) A in terms of l and P Don't want w

$$A = lw$$

$$P = 2l + 2w$$

$$\begin{array}{r} -2l \quad -2l \\ \hline P - 2l = 2w \\ \hline \frac{P}{2} - l = w \end{array}$$

$$\left[\frac{P}{2} - l \right] = w$$

$$A = l \left(\frac{P}{2} - l \right)$$

23.) I in terms of n Don't want p

$$I = np$$

$$10n = 75 - 5p$$

$$\begin{array}{r} -75 \quad -75 \\ \hline 10n - 75 = -5p \\ \hline -5 \quad -5 \end{array}$$

$$[-2n + 15] = p$$

$$I = n(-2n + 15)$$

For 24-27, use the following information.

The Metropolis Middle School volleyball team is operating the concession stand at school basketball games to help raise money for new uniforms. The profit in dollars P from operating the stand is given by the equation $P = 15n - 5(2n + 20)$, where n is the total number of items sold.

24.) How much money will the volleyball team raise if they sell 100 items?

$$P = 15(100) - 5(2(100) + 20)$$

$$P = 1500 - 5(200 + 20)$$

$$P = 1500 - 5(220)$$

$$P = 1500 - 1100$$

$$P = \$400$$

25.) How many items does the team need to sell in order to **break even?** $P = 0$

$$0 = 15n - 5(2n + 20)$$

$$0 = 15n - 10n - 100$$

$$0 = 5n - 100$$

$$\begin{array}{r} +100 \quad +100 \\ \hline 100 = 5n \end{array}$$

$$\begin{array}{r} 100 = 5n \\ \hline \frac{100}{5} = \frac{5n}{5} \end{array}$$

$$n = 20 \text{ items}$$

26.) If the team needs to raise \$1,600 for new uniforms, how many items will they have to sell?

$$1600 = 5n - 100$$

$$\begin{array}{r} +100 \quad +100 \\ \hline 1700 = 5n \end{array}$$

$$\begin{array}{r} 1700 = 5n \\ \hline \frac{1700}{5} = \frac{5n}{5} \end{array}$$

$$\begin{array}{r} 340 = n \end{array}$$

$$n = 340 \text{ items}$$

27.) Write an equivalent equation for the profit P .

$$P = 15n - 10n - 100$$

$$P = 5n - 100$$

For 28 and 29, identify the key features and graph the equation.

28.) $y = x^2 + 6x + 8$

Factored Form: $y = (x+4)(x+2)$

y-intercept: $(0, 8)$

x-intercepts: $0 = (x+4)(x+2)$

$(-4, 0)$ & $(-2, 0)$ $x+4=0$ $x+2=0$
 $x = -4$ $x = -2$

line of symmetry:

$\frac{-4 + (-2)}{2} = -3$ $x = -3$

vertex: $y = (-3)^2 + 6(-3) + 8$
 $= 9 - 18 + 8$
 $= -1$ $(-3, -1)$

up/down

Positive $a \rightarrow$ opens up

additional point:

Evaluate $x = 1$

$y = (1)^2 + 6(1) + 8$ $(1, 15)$
 $= 15$



29.) $y = (-x-4)(x-5)$

Expanded Form: $y = -x^2 + x + 20$

y-intercept:

From c-value: $(0, 20)$

x-intercepts: $0 = (-x-4)(x-5)$

$(-4, 0)$ & $(5, 0)$ $-x-4=0$ $x-5=0$
 $-x=4$ $x=5$
 $x = -4$ $x = 5$

line of symmetry:

$\frac{-4 + 5}{2} = \frac{1}{2}$ $x = \frac{1}{2}$

vertex: $y = (-\frac{1}{2} - 4)(\frac{1}{2} - 5)$
 $= (-\frac{9}{2})(-\frac{9}{2})$ $(\frac{1}{2}, \frac{81}{4})$
 $= 81/4$

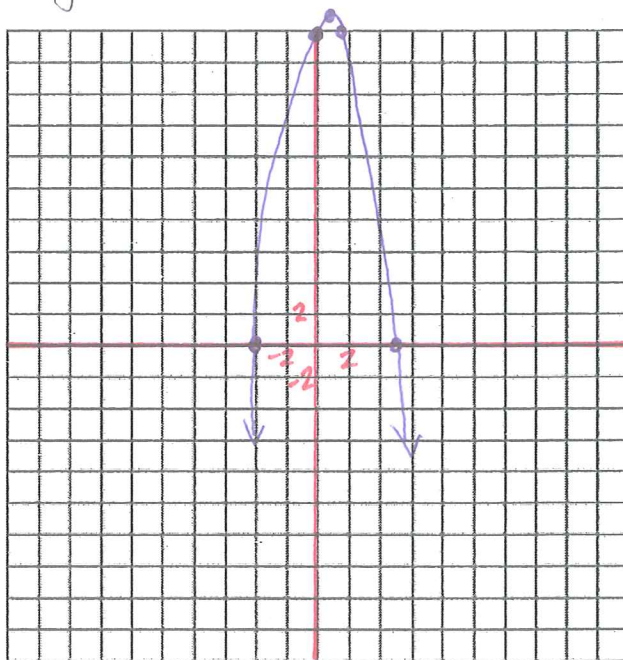
up/down

Negative $a \rightarrow$ opens down

additional point:

Evaluate $x = 1$

$y = (-1-4)(1-5)$ $(1, 20)$
 $= (-5)(-4)$
 $= 20$



Solve for the given variable.

30.) $5x + 2(x + 4) = 64$

$$5x + 2x + 8 = 64$$

$$7x + 8 = 64$$

$$7x = 56$$

$$x = 8$$

31.) $6(n - 5) - 11n = 0$

$$6n - 30 - 11n = 0$$

$$-5n - 30 = 0$$

$$-5n = 30$$

$$n = -6$$

32.) $9y - 4(y + 5) = 40$

$$9y - 4y - 20 = 40$$

$$5y - 20 = 40$$

$$5y = 60$$

$$y = 12$$

33.) $7(6x - 1) + x = 36$

$$42x - 7 + x = 36$$

$$43x - 7 = 36$$

$$43x = 43$$

$$x = 1$$

34.) $\frac{2}{7}(4m - 18) = 12$

$$x7\left(\frac{8}{7}m - \frac{36}{7}\right) = (12) \times 7$$

$$8m - 36 = 84$$

$$8m = 120$$

$$m = 15$$

35.) $33 + 15w = 3w - w + 4w$

$$33 + 15w = 6w$$

$$33 = -9w$$

$$w = -\frac{33}{9} = -\frac{11}{3} \text{ or } -3\frac{2}{3}$$

36.) $7(7c + 1) - 4c = 13(3c - 2)$

$$49c + 7 - 4c = 39c - 26$$

$$45c + 7 = 39c - 26$$

$$45c = 39c - 33$$

$$6c = -33$$

$$c = -\frac{33}{6} = -\frac{11}{2} = -5\frac{1}{2}$$

37.) $3q - 16q = 7 + \frac{1}{2}(-32q - 12)$

$$3q - 16q = 7 - 16q - 6$$

$$-13q = 1 - 16q$$

$$3q = 1$$

$$q = \frac{1}{3}$$

Expand the expression completely.

38.) $2x(x-5)$

$$2x^2 - 10x$$

39.) $(x+3)(x+10)$

$$x^2 + 10x + 3x + 30$$

$$x^2 + 13x + 30$$

40.) $(x-7)(x-5)$

$$x^2 - 5x - 7x + 35$$

$$x^2 - 12x + 35$$

41.) $(2x+3)(x-6)$

$$2x^2 - 12x + 3x - 18$$

$$2x^2 - 9x - 18$$

Factor the expression completely.

42.) $4x^2 - 20x$

$$4x(x-5)$$

43.) $x^2 + 7x + 10$

$$(x+5)(x+2)$$

44.) $x^2 - x - 30$

$$(x-6)(x+5)$$

45.) $2x^2 + 13x + 6$

$$2x^2 + 12x + x + 6$$

$$2x(x+6) + 1(x+6)$$

$$(2x+1)(x+6)$$

Solve the equation by factoring.

46.) $x^2 + 8x + 16 = 0$

$$(x+4)(x+4) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ x+4=0 & x+4=0 \end{array}$$

$$x = -4$$

47.) $x^2 - 3x - 10 = 0$

$$(x-5)(x+2) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ x-5=0 & x+2=0 \end{array}$$

$$x = 5$$

$$x = -2$$

48.) $x^2 - 12x = 0$

$$x(x-12) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ x=0 & x-12=0 \end{array}$$

$$x = 12$$

49.) $x^2 - 49 = 0$

$$(x+7)(x-7) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ x+7=0 & x-7=0 \end{array}$$

$$x = -7$$

$$x = 7$$

50.) $x^2 - 45 = -12x$ HAS to equal 0

$$x^2 + 12x - 45 = 0$$

$$(x+15)(x-3) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ x+15=0 & x-3=0 \end{array}$$

$$x = -15$$

$$x = 3$$

52.) $4x^2 + 7x + 3 = 0$

$$(4x+3)(x+1) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ 4x+3=0 & x+1=0 \end{array}$$

$$4x = -3$$

$$x = -1$$

$$x = -\frac{3}{4}$$

51.) $2x^2 + 11x + 5 = 0$

$$(2x+1)(x+5) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ 2x+1=0 & x+5=0 \end{array}$$

$$2x = -1$$

$$x = -\frac{1}{2}$$

$$x = -5$$

53.) $8x^2 + 2x - 15 = 0$

$$(4x+5)(2x-3) = 0$$

$$\begin{array}{cc} \swarrow & \searrow \\ 4x+5=0 & 2x-3=0 \end{array}$$

$$4x = -5$$

$$x = -\frac{5}{4}$$

$$2x = 3$$

$$x = \frac{3}{2}$$

For questions 54-57, use the following information.

A stomp rocket is launched into the air from ground level. It's height h as a function of time t can be modeled by the equation $h = -16t^2 + 64t$.

54.) How high will the rocket be at 1.5 seconds?

$$h = -16(1.5)^2 + 64(1.5)$$

$$h = -16(2.25) + 96$$

$$h = -36 + 96$$

$$h = 60 \text{ feet}$$

55.) How long will it take for the rocket to hit the ground? $h=0$

$$0 = -16t^2 + 64t$$

$$0 = -16t(t - 4)$$

$$-16t = 0$$

$$t = 0$$

$$t - 4 = 0$$

$$t = 4 \text{ seconds}$$

56.) When will the rocket reach its maximum height?

2 seconds - halfway between x-intercepts

57.) The advertising on the package says "Can fly over 60 feet high!" Does this rocket exceed the height listed on the package?

$$h = -16(2)^2 + 64(2)$$

$$h = -16(4) + 128$$

$$h = -64 + 128$$

$$h = 64 \text{ ft.}$$

Yes. The rocket has a maximum height of 64 feet at 2 seconds.

State whether each equation below represents a linear, exponential, or quadratic relationship and **explain how you know**.

58.) $y = 3x^2 - 12$

Quadratic - x^2 in
expanded form

59.) $y = 2(3.5)^x$

Exponential - variable is
the exponent

60.) $y = (x - 4)(2x + 8)$

Quadratic - two
linear factors

61.) $y = -x + 14$

Linear - follows $mx + b$.
 x^1

62.) $y = 6(x - 2) + 7(x + 1)$

Linear - simplifies to $13x - 5$,
which follows $mx + b$.
 x^1

63.) $y = .25^x$

Exponential - variable is
the exponent

64.) $y = \frac{1}{2}x^2 - 15x + 11$

Quadratic - x^2 in
expanded form

65.) $y = 3(2x + 12)(-3x + 2)$

Quadratic - two linear
factors

For 66-71, decide whether the following relationships are linear, exponential, quadratic, or none of these by using their first and second differences. Explain your reasoning. If it is one of those three, calculate the next 2 values in the table.
66.)

x	y	1 st Differences	2 nd Differences	Type of Relationship
-3	33			Linear
-2	26	> -7	> 0	
-1	19	> -7	> 0	
0	12	> -7	> 0	
1	5	> -7	> 0	

67.)

x	y	1 st Differences	2 nd Differences	Type of Relationship
0	3			Exponential Growth factor = 4!
1	12	> +9	> +27	
2	48	> +36	> +98	
3	192	> +134	> +442	
4	768	> +576		

68.)

x	y	1 st Differences	2 nd Differences	Type of Relationship
1	469			Linear
2	513	> +44	> +0	
3	557	> +44	> +0	
4	601	> +44	> +0	
5	645	> +44		

69.)

x	y
-1	9
0	0
1	-7
2	-12
3	-15

1st Differences 2nd Differences Type of Relationship

> -9

> +2

> -7

> +2

> -5

> +2

> -3

Quadratic

70.)

x	y
2	12
3	33
4	62
5	99
6	144

1st Differences 2nd Differences Type of Relationship

> +21

> +8

> +29

> +8

> +37

> +8

> +45

Quadratic

71.)

x	y
-3	-5
-2	-1
-1	-6
0	0
1	-7

1st Differences 2nd Differences Type of Relationship

> +4

> -9

> -5

> +11

> +6

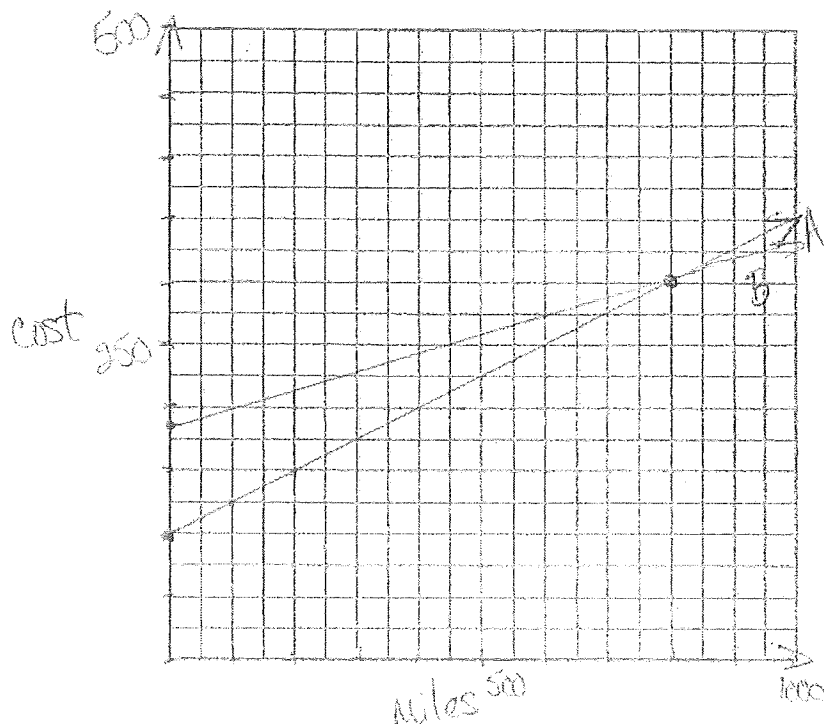
> -13

> -7

Unknown

You are planning a road trip this summer and are considering two car rental companies. Company A charges \$100 up front and an additional \$0.25 per mile. Company B charges \$180 up front and an additional \$0.15 per mile.

72.) Graph both situations. Remember that you may need to go out pretty far on your x and y axes.



$$\text{Company A} = 100 + .25x$$

$$\text{Company B} = 180 + .15x$$

73.) Use your graph to estimate at how many miles the costs of the two companies will be the same. What is that cost?

800 miles, \$300

74.) For how many miles is Company A less than Company B?

From 0 - 800 miles

75.) Redo problems 57 and 58 algebraically using your equations.

$$73.) 100 + .25x = 180 + .15x \quad 100 + .25(800) = 300$$

$$.10x = 80$$

$$x = 800 \text{ miles}$$

$$74.) \text{Company A} < \text{Company B}$$

$$100 + .25x < 180 + .15x$$

$$.10x < 80$$

$$x < 800 \text{ miles}$$

76.) Say you choose Company B and drive 1000 miles. How much will it cost?

$$180 + .15(1000) = 180 + 150 = 330 \quad \$330$$

77.) Marcello is an artist who makes oil paintings and charcoal sketches. He sells each oil painting for \$500 and each charcoal sketch for \$300. Suppose Marcello makes 86 works in total and earns \$30,000. Write a system of equations that could represent this situation. **DO NOT SOLVE THE SYSTEM.**

$$500p + 300s = 30,000$$

$$p + s = 86$$

p = painting
s = sketch

78.) The Plano Texans are a youth drum and bugle corps that competes with music and precision marching against other groups all over the country. The corps rents instruments to members. Each bugle rents for \$10 per month and each drum rents for \$5 per month. Suppose that there are 12 members of the drum and bugle corps who rent an instrument. Write a system of equations that finds the number of bugle rentals b and drum rentals d that supply 12 members and rental budget of \$100. **DO NOT SOLVE THE SYSTEM.**

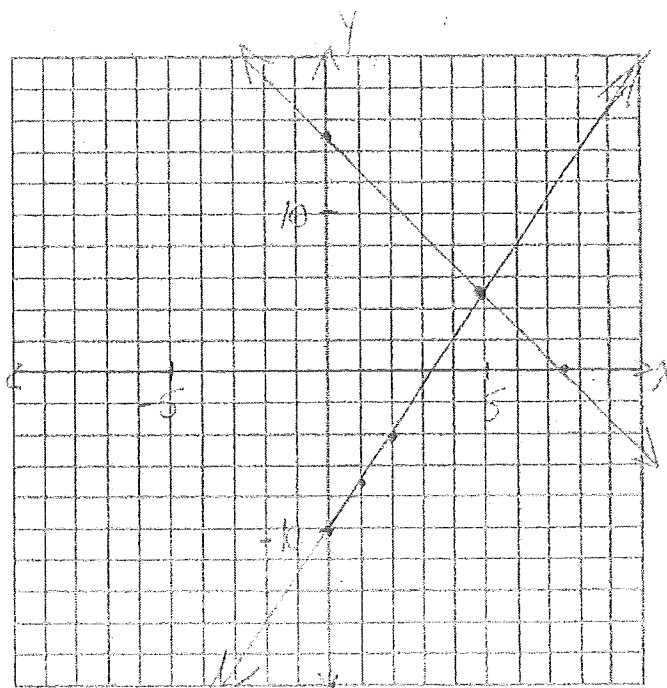
$$10b + 5d = 100$$

$$b + d = 12$$

Solve the system by graphing.

$$79.) \begin{cases} y = 3x - 10 \\ 2x + y = 15 \end{cases} \rightarrow (2.5, 0), (0, 5)$$

(5, 5)



Solve the system using the equivalent forms method.

$$80.) \begin{cases} y = \frac{1}{2}x + 4 \\ y = 4x - 3 \end{cases}$$

$$\frac{1}{2}x + 4 = 4x - 3$$

$$\frac{1}{2}x + 7 = 4x$$

$$7 = 3.5x$$

$$x = 2$$

$$y = \frac{1}{2}(2) + 4$$

$$y = 1 + 4$$

$$y = 5$$

$$(2, 5)$$

Solve the system using the substitution method.

$$81.) \begin{cases} x = 3y + 8 \\ 4x - 2y = 2 \end{cases}$$

$$4(3y + 8) - 2y = 2$$

$$12y + 32 - 2y = 2$$

$$10y + 32 = 2$$

$$10y = -30$$

$$y = -3$$

$$x = 3(-3) + 8$$

$$x = -9 + 8$$

$$x = -1$$

$$(-1, -3)$$

Solve the system using the combination/elimination method.

$$82.) \begin{cases} -x + 3y = 9 \\ x + 3y = -1 \end{cases}$$

$$+ \quad \underline{\hspace{1cm}}$$

$$6y = 8$$

$$y = \frac{8}{6} = \frac{4}{3} \text{ or } 1\frac{1}{3}$$

$$x + 3\left(\frac{4}{3}\right) = -1$$

$$x + 4 = -1$$

$$x = -5$$

$$\left(-5, \frac{4}{3}\right)$$

Solve the systems using any method you like. These are most efficient/easiest methods.

$$83.) \begin{cases} 6x - 3y = 15 \\ 4x - 3y = 7 \end{cases}$$

$$2x = 8$$

$$x = 4$$

$$(4, 3)$$

$$4(4) - 3y = 7$$

$$16 - 3y = 7$$

$$-3y = -9$$

$$y = 3$$

$$84.) \begin{cases} 7x - 3y = -5 \\ -2x + 8y = -20 \end{cases} \rightarrow -2x = -8y - 20$$

$$x = 4y + 10$$

$$7(4y + 10) - 3y = -5$$

$$28y + 70 - 3y = -5$$

$$25y + 70 = -5$$

$$25y = -75$$

$$y = -3$$

$$x = 4(-3) + 10$$

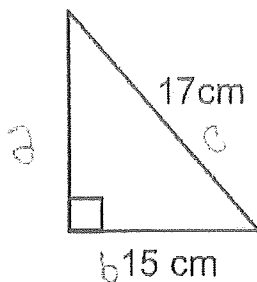
$$x = -12 + 10$$

$$x = -2$$

$$(-2, -3)$$

Find the missing side length using the Pythagorean Theorem.

85.)



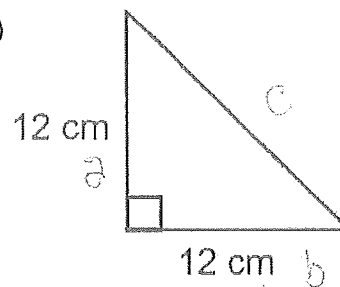
$$a^2 + 15^2 = 17^2$$

$$a^2 + 225 = 289$$

$$\sqrt{a^2} = \sqrt{64}$$

$$a = 8 \text{ cm}$$

86.)



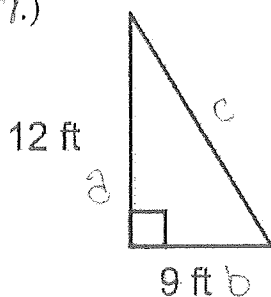
$$12^2 + 12^2 = c^2$$

$$144 + 144 = c^2$$

$$\sqrt{288} = \sqrt{c^2}$$

$$c = 16.97 \text{ cm}$$

87.)



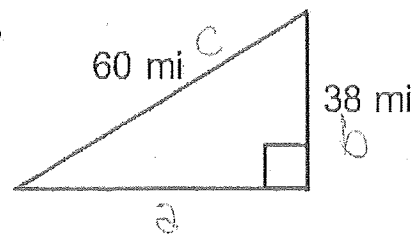
$$12^2 + 9^2 = c^2$$

$$144 + 81 = c^2$$

$$\sqrt{225} = \sqrt{c^2}$$

$$c = 15 \text{ ft.}$$

88.)



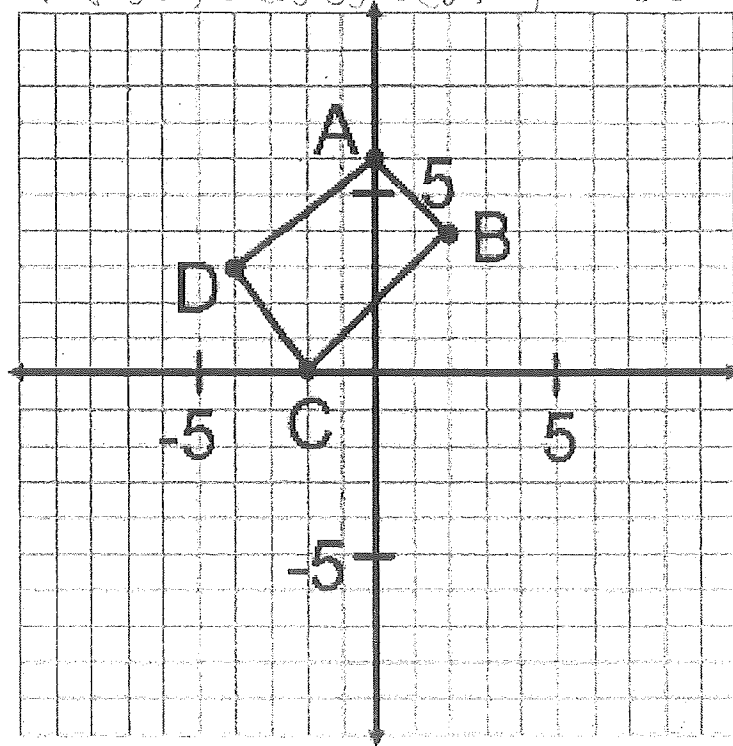
$$a^2 + 38^2 = 60^2$$

$$a^2 + 1444 = 3600 \quad a = 46.43 \text{ mi}$$

$$\sqrt{a^2} = \sqrt{2156}$$

Use the following diagram to perform the given transformations. Identify the coordinates of the new point, segment, or shape.

$$A(0,6), B(2,4), C(-2,0), D(-4,3)$$



89.) A after a translation of $(x-7, y+2)$

$$A'(-7,8)$$

90.) B after a reflection across the y -axis

$$B'(-2,4)$$

91.) Segment CD after a reflection across the x -axis

$$C'(-2,0), D'(-4,-3)$$

92.) D after a rotation 90 degrees about the origin

$$D'(3,4)$$

93.) Segment AB after a rotation of 180 degrees about the origin

$$A'(0,-6), B'(-2,-4)$$

94.) Quadrilateral $ABCD$ after a reflection across the y -axis

$$A'(0,6), B'(-2,4), C'(2,0), D'(4,3)$$

95.) Quadrilateral $ABCD$ after a translation of $(x+6, y)$

$$A'(6,6), B'(8,4), C'(4,0), D'(2,3)$$

96.) Quadrilateral $ABCD$ after a rotation of 90 degrees counterclockwise about the origin

$$A'(-6,0), B'(-4,2), C'(0,-2), D'(-3,-4)$$

97.) Quadrilateral $ABCD$ after a rotation of 180 degrees about the origin

$$A'(0,-6), B'(-2,-4), C'(2,0), D'(4,-3)$$

98.) Quadrilateral $ABCD$ after a reflection across the x -axis

$$A'(0,-6), B'(2,-4), C'(-2,0), D'(-4,-3)$$