

ANSWER KEY

Algebra 8 Final Exam Review Packet

The final will be 20 multiple choice questions. You will have one class period to complete it. You may use a calculator. What you need to know:

Say it With Symbols

- Write equivalent equations and expressions using distributive, commutative, and associative properties (Inv. 1)
- Combine equations together by adding or by substituting one equation in for another equation and simplifying (Inv. 2)
- Solve linear equations with parentheses using distributive property and properties of equality (Inv. 3)
- Solve quadratic equations by factoring and using the zero product property, also the same process as finding the x-intercepts (Inv. 3)
- Solve problems about objects in motion in a real life context by using the above strategy (Inv. 3)
- Solve for one variable in terms of another (Inv. 3)
- Decide whether an equation represents a linear, exponential, or quadratic relationship (Inv. 4)

The Shapes of Algebra

- Interpret a graph of linear systems in a real life context (Inv. 2)
- Write and solve linear inequalities and graph your solution on a number line (Inv. 2)
- Write a system of equations about a real life situation (Inv. 3)
- Write an equation in standard form ($ax + by = c$) (Inv. 3)
- Go from standard form to slope-intercept form ($y = mx + b$) (Inv. 3)
- Identify slope, x-intercept, and y-intercept given standard form or given slope-intercept form (Inv. 3)
- Graph equations in standard form or slope-intercept form (Inv. 3)
- Solve a system of equations by graphing and finding the point of intersection (Inv. 3)
- Solve a system of equations using the equivalent forms method (Inv. 4)
- Solve a system of equations using the substitution method (Inv. 4)
- Solve a system of equations using the combination/elimination method (Inv. 4)

From our mini-geometry unit:

- Use the Pythagorean Theorem to find side lengths in right triangles
- Translate a figure in a coordinate plane given an algebraic rule (Ex: $(x - 1, y + 2)$)
- Reflect a figure across a line of reflection in a coordinate plane
- Rotate a figure 90° clockwise or counterclockwise about the origin
- Rotate a figure 180° about the origin

Write **two** expressions that are equivalent to the given expression. *MANY POSSIBLE ANSWERS*

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

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

$$5x - 4$$

2.) $3x + 15$

$$3(x + 5)$$

$$15 + 3x$$

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

$$2x - 2$$

$$2(x - 2)$$

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

$$3x + 24$$

$$3(x + 8)$$

Simplify the following expressions.

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

$$-24x + 12 - 20$$

$$-24x - 8$$

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

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

$$-16x + 14$$

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

$$-5x - x + 6$$

$$-6x + 6$$

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

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

$$-7x - 11$$

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

- They need to spend \$70 on baking materials – flour, sugar, butter, etc
- 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. $I = 2.50n$ $E = 70$

$$P = 2.50n - 70$$

10.) How many baked goods do they need to sell to break even?

$$0 = 2.50n - 70$$

$$70 = 2.50n$$

$$n = 28 \text{ items}$$

11.) Their goal is to raise \$325. How many baked goods do they need to sell to reach their goal? $325 = 2.50n - 70$

$$395 = 2.50n$$

$$n = 158 \text{ items}$$

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 - avg \$ spent per customer 400 - operating costs

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

$$C = 250 - 150(0.40)$$

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

$$C = 250 - 60$$

$$P = \$1120$$

$$C = 190$$

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.

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

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.

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

$$1540 = 1600 - 1200R$$

$$P = 1600 - 1200R$$

$$-60 = -1200R$$

$$.05 = R$$

5% probability
of rain

Solve for the given variable.

16.) x in terms of y

$$3x + 9y = 27$$

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

$$x = -3y + 9$$

17.) y in terms of x

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

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

$$5y = -16x + 35$$

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

18.) z in terms of x and y

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

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

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

19.) w in terms of P and l

$$P = 2l + 2w$$

$$2w = P - 2l$$

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

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

$$x = 3y + 4z$$

$$y = 5z + 9$$

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

$$x = 19z + 27$$

21.) A in terms of B

$$A = BC$$

$$B = 5 + C$$

$$B - 5 = C$$

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

$$A = B^2 - 5B$$

22.) A in terms of l and P

$$A = lw$$

$$P = 2l + 2w$$

$$2w = P - 2l$$

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

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

23.) I in terms of n

$$I = np$$

$$10n = 75 - 5p$$

$$-5p = 10n - 75$$

$$p = -2n + 15$$

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

$$I = -2n^2 + 15n$$

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?

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

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

$$P = \$400$$

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

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

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

$$0 = 5n - 100$$

$$100 = 5n$$

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

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

$$1600 = 5n - 100$$

$$1700 = 5n$$

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

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

$$P = 5n - 100$$

Solve for the given variable.

28.) $5x + 2(x + 4) = 64$

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

$$7x = 56$$

$$x = 8$$

29.) $6(n - 5) - 11n = 0$

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

$$-5n = 30$$

$$n = -6$$

30.) $9y - 4(y + 5) = 40$

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

$$5y = 60$$

$$y = 12$$

31.) $7(6x - 1) + x = 36$

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

$$43x = 43$$

$$x = 1$$

32.) $\left(\frac{2}{7}(4m - 18) = 12\right) \times 7$

$$2(4m - 18) = 84$$

$$8m - 36 = 84$$

$$8m = 120$$

$$m = 15$$

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

$$33 + 15w = 6w$$

$$33 = w$$

$$w = 33$$

34.) $7(7c + 1) - 4c = 13(3c - 2)$

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

$$6c = -33$$

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

35.) $3q - 16q = 7 + \frac{1}{2}(-32q - 12)$

$$-13q = 7 + (-16q) - 6$$

$$3q = 1$$

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

Solve the equation by factoring.

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

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

$$x = -4$$

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

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

$$\begin{array}{l} \swarrow \quad \searrow \\ x-5=0 \quad x+2=0 \\ x=5 \quad \text{or} \quad x=-2 \end{array}$$

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

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

$$\begin{array}{l} \swarrow \quad \searrow \\ x=0 \quad \text{or} \quad x-12=0 \\ \quad \quad x=12 \end{array}$$

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

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

$$\begin{array}{l} \swarrow \quad \searrow \\ x+7=0 \quad x-7=0 \\ x=-7 \quad \quad x=7 \end{array}$$

40.) $x^2 - 45 = -12x$

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

$$(x+15)(x-2)=0$$

$$\begin{array}{l} \swarrow \quad \searrow \\ x+15=0 \quad x-2=0 \\ x=-15 \quad \text{or} \quad x=2 \end{array}$$

41.) $2x^2 + 11x + 5 = 0$

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

$$\begin{array}{l} \swarrow \quad \searrow \\ 2x+1=0 \quad x+5=0 \\ 2x=-1 \quad \quad x=-5 \\ x=-\frac{1}{2} \quad \text{or} \quad x=-5 \end{array}$$

42.) $4x^2 + 7x + 3 = 0$

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

$$\begin{array}{l} \swarrow \quad \searrow \\ 4x+3=0 \quad x+1=0 \\ 4x=-3 \quad \quad x=-1 \\ x=-\frac{3}{4} \quad \text{or} \end{array}$$

43.) $8x^2 + 2x - 15 = 0$

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

$$\begin{array}{l} \swarrow \quad \searrow \\ 2x+3=0 \quad 4x-5=0 \\ 2x=-3 \quad \quad 4x=5 \\ x=-\frac{3}{2} \quad \text{or} \quad x=\frac{5}{4} \end{array}$$

For questions 44-47, use the following information.

A stomp rocket is launched into the air from ground level. Its height h as a function of time t can be modeled by the equation $h = -16t^2 + 64t$.

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

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

$$h = -16 \cdot 2.25 + 96$$

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

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

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

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

4 seconds

$$\swarrow \quad \searrow$$
$$-16t = 0$$

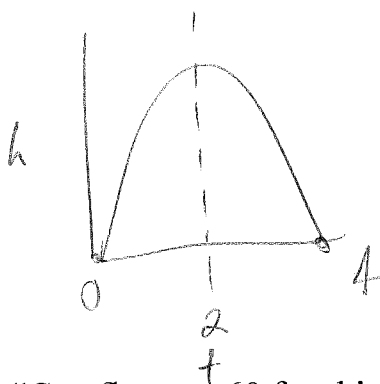
$$t - 4 = 0$$

$$t = 0$$

$$t = 4$$

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

2 seconds



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

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

Yes, it does.

$$h = -16 \cdot 4 + 128$$

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

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

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

Quadratic.

Expanded form, 2 is highest exponent on x .

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

Exponential.

Variable is exponent.

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

Quadratic.

Factored form, two linear factors.

51.) $y = -x + 14$

Linear.

Follows $mx + b$.

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

Linear.

Adding two linear expressions.

53.) $y = .25^x$

Exponential.

Variable is exponent.

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

Quadratic.

Expanded form, 2 is highest exponent on x .

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

Quadratic.

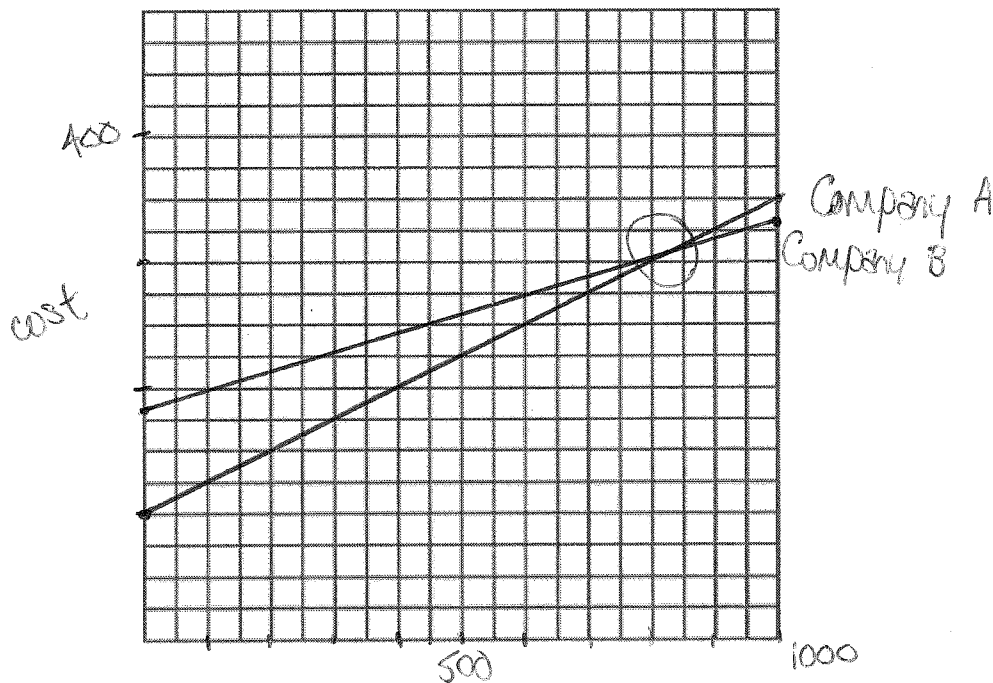
Factored form, two linear factors.

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.

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

$$A = .25x + 100$$

$$B = .15x + 180$$



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

$$M = 825 \text{ miles}$$

$$C = \$305$$

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

$$0 - 825 \text{ miles}$$

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

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

From 0 - 800 miles

$$.10x = 80$$

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

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

$$.15(1000) + 180 = 150 + 180 = 330 \text{ dollars}$$

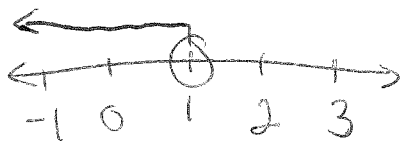
Solve the inequality and graph your solution on a number line.

61.) $5(-x+2) > 8x-3$

$$-5x + 10 > 8x - 3$$

$$-13x > -13$$

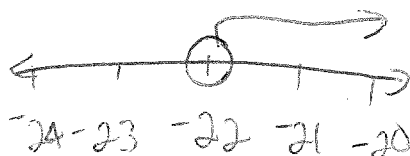
$$x < 1$$



63.) $3x - 8 - 4x < 14$

$$-x < 22$$

$$x > -22$$

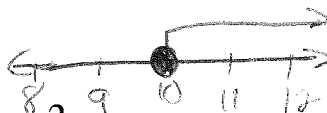


62.) $\left(\frac{3}{4}x - \frac{7}{2} \geq \frac{1}{4}x + 6\right) \times 4$

$$3x - 14 \geq x + 6$$

$$2x \geq 20$$

$$x \geq 10$$



64.) $\left(\frac{2}{3}(5-3x) \leq 12x\right) \times 3$

$$2(5-3x) \leq 36x$$

$$10 - 6x \leq 36x$$

$$10 \leq 42x$$

$$x \geq \frac{21}{5} = 4\frac{1}{5}$$



Write the equation in slope-intercept form. Identify the slope, x-intercept, and y-intercept.

65.) $5x + 10y = 25$

$$10y = -5x + 25$$

$$y = -\frac{1}{2}x + 2.5$$

slope: $-\frac{1}{2}$

x-int: (5, 0)

y-int: (0, 2.5)

66.) $-3x = 12 + 2y$

$$2y = -3x - 12$$

$$y = -\frac{3}{2}x - 6$$

slope: $-\frac{3}{2}$

x-int: (-4, 0)

y-int: (0, -6)

Write the equation in standard form. Identify the slope, x-intercept, and y-intercept.

67.) $y = -\frac{2}{5}x + 8$

$$\frac{2}{5}x + y = 8$$

slope: $-\frac{2}{5}$

x-int: (20, 0)

y-int: (0, 8)

68.) $x = 2y + 10$

$$x - 2y = 10$$

slope: $\frac{1}{2}$

x-int: (10, 0)

y-int: (0, -5)

69.) 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.**

$$\begin{cases} 500x + 300y = 30,000 \\ x + y = 86 \end{cases}$$

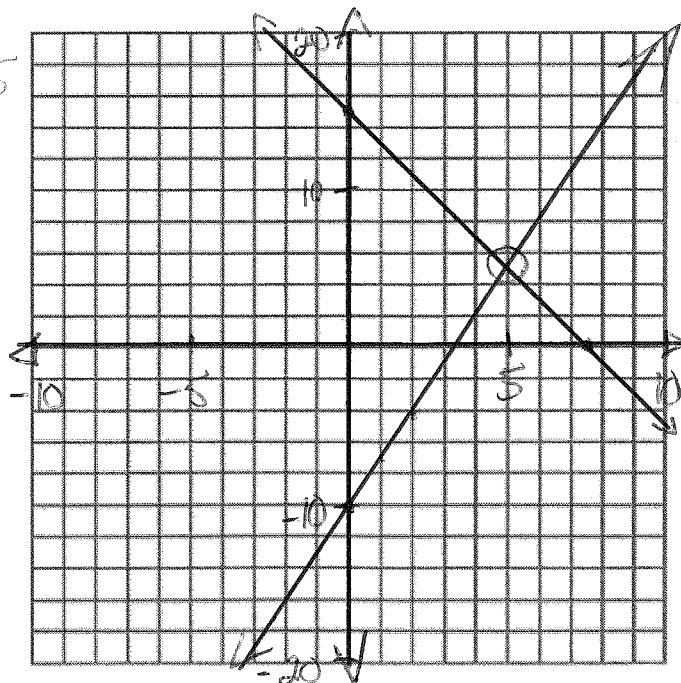
70.) The Plano Texans are a youth drum and bugle corps that competes with music and precision marching against other groups all over the country. The corps rents instruments to members. Each bugle rents for \$10 per month and each drum rents for \$5 per month. Suppose that there are 12 members of the 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.**

$$\begin{cases} 10b + 5d = 100 \\ b + d = 12 \end{cases}$$

Solve the system by graphing.

71.) $\begin{cases} y = 3x - 10 \\ 2x + y = 15 \end{cases} \rightarrow x = \frac{15}{2}, y = 15$

$(5, 5)$



Solve the system using the equivalent forms method.

$$72.) \begin{cases} y = \frac{1}{2}x + 4 \\ y = 4x - 3 \end{cases}$$

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

$$y = 1 + 4$$

$$y = 5$$

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

$$7 = 3\frac{1}{2}x$$

$$x = 2$$

$$(2, 5)$$

Solve the system using the substitution method.

$$73.) \begin{cases} x = 3y + 8 \\ 4x - 2y = 2 \end{cases}$$

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

$$x = -9 + 8$$

$$x = -1$$

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

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

$$10y = -30$$

$$y = -3$$

$$(-1, -3)$$

Solve the system using the combination/elimination method.

$$74.) \begin{cases} -x + 3y = 9 \\ x + 3y = -1 \end{cases}$$

$$6y = 8$$

$$y = \frac{8}{6} = \frac{4}{3}$$

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

$$x + 4 = -1$$

$$x = -5$$

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

Solve the systems using any method you like.

$$75.) \begin{cases} 6x - 3y = 15 \\ 4x - 3y = 7 \end{cases}$$

$$2x = 8$$

$$x = 4$$

$$(4, 3)$$

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

$$16 - 3y = 7$$

$$-3y = -9$$

$$y = 3$$

$$76.) \begin{cases} 7x - 3y = -5 \\ -2x + 8y = -20 \end{cases}$$

$$-2x = -8y - 20$$

$$x = 4y + 10$$

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

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

$$25y = -75$$

$$y = -3$$

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

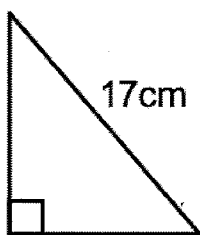
$$x = -12 + 10$$

$$x = -2$$

$$(-2, -3)$$

Find the missing side length using the Pythagorean Theorem.

77.)



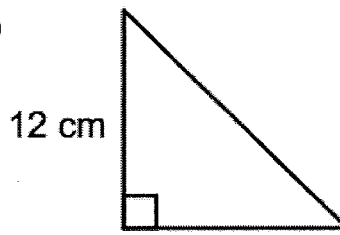
15 cm

$$15^2 + b^2 = 17^2$$

$$b^2 = 64$$

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

78.)



12 cm

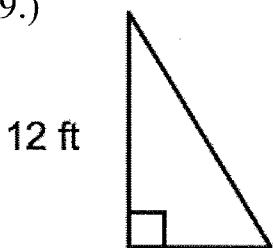
$$12^2 + 12^2 = c^2$$

$$144 + 144 = c^2$$

$$288 = c^2$$

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

79.)



12 ft

9 ft

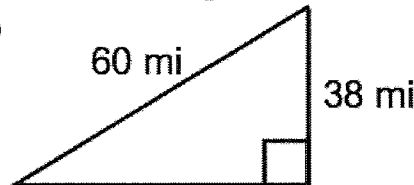
$$9^2 + 12^2 = c^2$$

$$81 + 144 = c^2$$

$$225 = c^2$$

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

80.)



60 mi

38 mi

$$38^2 + b^2 = 60^2$$

$$1444 + b^2 = 3600$$

$$b^2 = 2156$$

$$b = 46.43$$

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

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

$(-7, 8)$

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

$(-2, 4)$

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

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

84.) D after a rotation 90 degrees clockwise about the origin

$D'(3, 4)$

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

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

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

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

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

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

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

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

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

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

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

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

