

Middle College High School Honors Algebra I
2020 Summer Packet

This Packet must be completed by Monday, August 10th and turned in to your instructor.

This is **NO CALCULATOR**. You must **show work** for all questions to receive credit.

Combining Like Terms

3. Which of the following is equivalent to the expression $9x + 2x - 5x$?

(1) $6x$ (3) $6x^3$

(2) $-27x^2$ (4) $16x$

4. When $7x - 3$ is added to $-2x + 11$ the result is which of the following?

(1) $-9x - 8$ (3) $-14x - 33$

(2) $14x - 14$ (4) $5x + 8$

5. Rewrite each of the following in simplest form. Rewrite subtraction as addition if needed.

(a) $6c + 8 + 11c + 2$

(b) $10x - 1 + 3x - 12$

(c) $7t + 1 - 10t - 6$

6. Rewrite each of the following expressions in simplest form by using the distributive property and by combining like terms.

(a) $5x + 7 + 2(4x + 3)$

(b) $8(n - 1) + 3(n + 2)$

(c) $5(4t + 1) - 2(t + 6)$

(d) $5y - (7y - 3)$

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

(f) $(9n + 2) - 2(n - 5)$

7. Consider the two expressions shown below:

Expression #1: $5x + 3 - 2x - 1$

Expression #2: $(5x + 3) - (2x - 1)$

(a) Evaluate both expression for $x = 2$. Show your substitutions and steps in evaluating.

(b) Write both expressions in simplest form. Are they equivalent expressions? Explain.

Variables and Expressions

1. Find the value of each of the following expressions for the given value of the variable. Show the steps in your calculations and simplify any fraction.

(a) $x + 8$ for $x = -12$

(b) $\frac{y}{5}$ for $y = 35$

(c) n^2 for $n = 10$

(d) $3(t - 6)$ for $t = 10$

(e) $\frac{3}{2}x + 4$ for $x = 12$

(f) $\frac{20}{n - 2}$ for $n = 17$

(g) $-2x + 5$ for $x = 3$

(h) $50 - 4n$ for $n = 11$

(i) $t^2 - 6$ for $t = 4$

2. Rewrite each of the following expressions in simplest form by using the **associative property of multiplication**. The first is done as an example for you.

$$(a) 5(8x) = (5 \cdot 8)x \\ = 40x$$

$$(b) 3(7y)$$

$$(c) -6(2t)$$

$$(d) 10\left(\frac{2}{5}c\right)$$

$$(e) -\frac{1}{3}(-12m)$$

$$(f) \frac{5}{3}\left(\frac{1}{10}k\right)$$

3. For each expression below, use the **distributive property** to rewrite the expression in standard form. The first is done as an example.

$$(a) 5(3x + 7) = 5(3x) + 5(7) \\ = (5 \times 3)x + 35 \\ = 15x + 35$$

$$(b) 2(3x + 4)$$

$$(c) 8(4x - 3)$$

$$(d) -4(5x + 1)$$

$$(e) \frac{1}{2}(-10x + 6)$$

$$(f) 10\left(6 - \frac{3}{5}n\right)$$

4. Consider the expression $5(x - 3)$.

(a) Rewrite the expression using the distributive property.

(b) Evaluate both the original expression and your one from (a) for the value of $x = 3$. Show your substitutions.

Two-Step Equations

1. Which of the following is the solution to the equation $4n + 2 = -10$?

$$(1) n = 5$$

$$(3) n = -3$$

$$(2) n = -2$$

$$(4) n = 1$$

2. The solution to $6r - 3 = 7$ is

(1) $r = \frac{2}{5}$

(3) $r = \frac{3}{2}$

(2) $r = \frac{5}{3}$

(4) $r = \frac{6}{5}$

3. Solve each of the following two-step equations. Show your work. Express all answers in simplest form.

(a) $5x - 12 = 43$

(b) $-3n - 5 = 16$

(c) $4y + 11 = 17$

(d) $\frac{m}{6} + 9 = 12$

(e) $\frac{2}{7}w - 6 = -2$

(f) $\frac{5}{4}c + 12 = 2$

5. Jackson was selling cups of lemonade. On Saturday, he sold a total of 14 cups. On Sunday he sold cups at a steady rate of 3 cups per hour. Let h represent the number of hours that Jackson sold lemonade on Sunday.

(a) How many total cups has Jackson sold after 4 hours on Sunday? Show the calculations that lead to your answer.

(b) Set up and solve an equation to find how many hours, h , it took Jackson to sell 47 cups (including those from Saturday).

6. Hannah is at an arcade where each game requires her to use two tokens. She buys 40 tokens to begin. Let n be the number of games Hannah has played. Set up and solve an equation for the number of games Hannah has played when she has only 16 tokens left.

7. Consider the equation $2x + 11 = 3$. Without solving the equation, explain why its solution cannot be a positive number. Hint: consider the expression on the left side of the equation.

Linear Equations and their Graphs

You will need a straight edge (ruler type object that has a straight side to draw lines).

4. When graphed, which of the following lines would be steepest? Explain your choice.

(1) $y = \frac{1}{10}x$

(3) $y = \frac{11}{5}x$

(2) $y = \frac{9}{2}x$

(4) $y = 4x$

1. Which of the following is the slope of the line whose equation is $y = 4x + 7$?

(1) 7

(3) $\frac{1}{7}$

(2) $\frac{1}{4}$

(4) 4

2. The line $y = 2x + 5$ would pass through which of the following points?

(1) (0, 2)

(3) (0, 5)

(2) (0, 10)

(4) (0, 7)

3. Which of the following is true of points on the line $y = \frac{5}{3}x + \frac{1}{2}$?

(1) For every 3 units that x increases, y will increase by 5 units.

(2) For every 5 units that x increases, y will increase by 2 units.

(3) For every 2 units that x increases, y will increase by 1 unit.

(4) For every 1 unit that x increases, y will increase by 2 units.

4. Given the line shown, answer the following:

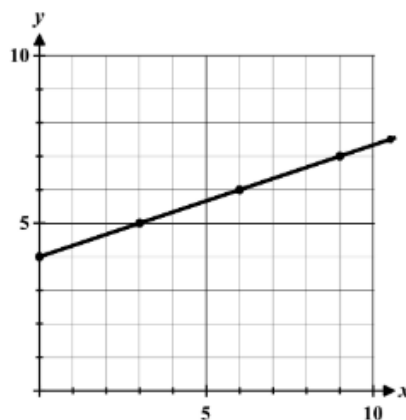
(a) What is its slope?

(b) What is its y -intercept?

5. Recall that the equation of a line is always:

$$y = (\text{slope})x + (y - \text{intercept})$$

Write the line's equation: _____



6. For each of the following lines, identify its slope (in ratio form) and its y -intercept and then plot the line on the grid given. Label each line with its equation.

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

slope: $\qquad\qquad\qquad$ y -intercept: $\qquad\qquad\qquad$

(b) $y = \frac{2}{5}x + 7$

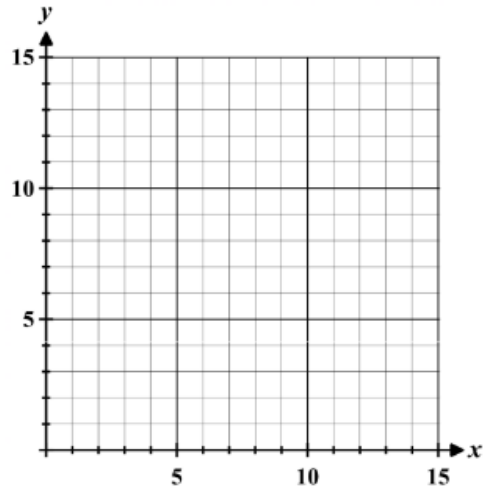
slope: $\qquad\qquad\qquad$ y -intercept: $\qquad\qquad\qquad$

(c) $y = 3x + 2$

slope: $\qquad\qquad\qquad$ y -intercept: $\qquad\qquad\qquad$

(d) $y = \frac{1}{6}x + 3$

slope: $\qquad\qquad\qquad$ y -intercept: $\qquad\qquad\qquad$



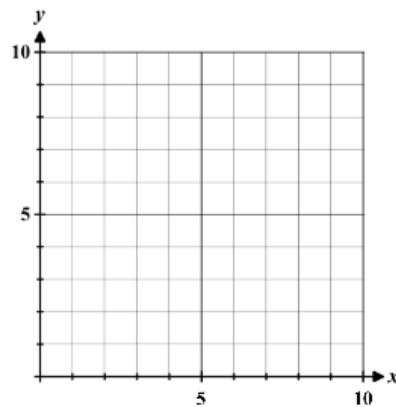
7. Consider the line whose equation is $y = x + 3$.

- (a) Fill in the table below and then plot the line.

| x | $x + 3$ | (x, y) |
|-----|---------|----------|
| 0 | | |
| 1 | | |
| 2 | | |
| 3 | | |

- (b) When x increases by one unit, how many units does y -increase?

- (c) What is the slope of this line? Why doesn't it have to be written?

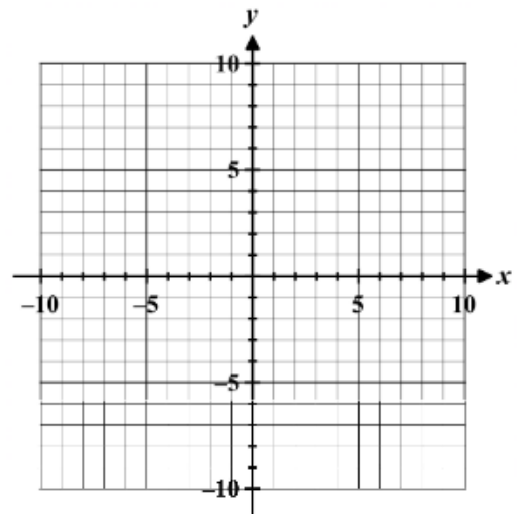


3. Solve the system of equations below. Make sure to graph each line, label it with its equation, circle the solution and then check your answer.

$$y = \frac{1}{3}x + 2$$

$$y = 2x - 8$$

Check your answer:

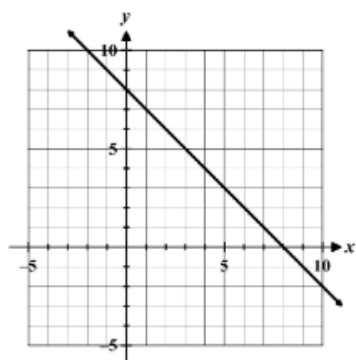


1. Which of the points below is a solution to the system: $y = 3x + 2$ and $y = 5x - 6$?

- (1) (3, 11) (3) (2, 4)
(2) (4, 14) (4) (18, 60)

2. The line $y = -x + 8$ is graphed on the grid below. If the line $y = \frac{2}{3}x + 3$ was also graphed to form a system, which point below would be the solution to this system?

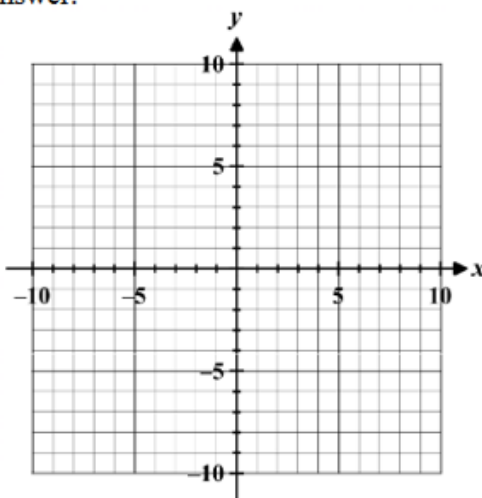
- (1) (0, 3)
(2) (7, 1)
(3) (3, 5)
(4) (6, 2)



4. Solve the system of equations below. Check your answer.

$y = -\frac{3}{2}x + 3$ $y = x + 8$

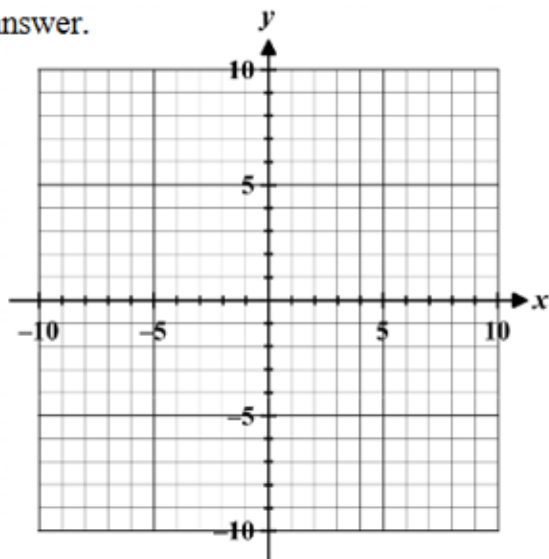
Check:



5. Solve the system of equations below. Check your answer.

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

Check:



6. Is it possible that a system of two lines won't have a solution? If so, how would this be possible? Explain.

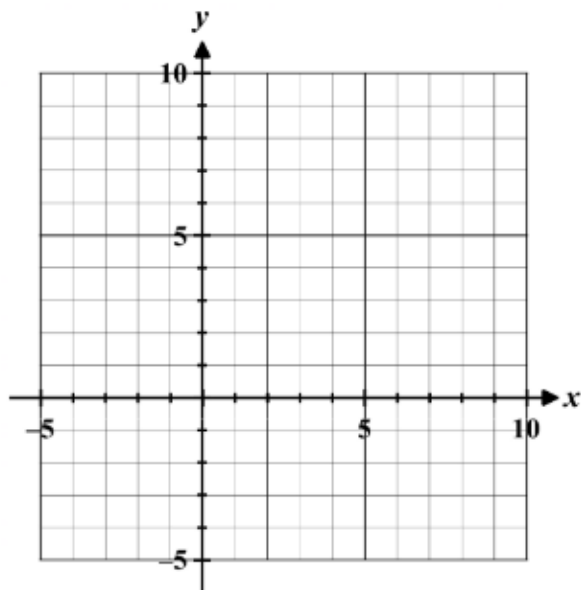
2. Solve each of the following systems of equations algebraically. Show the steps that lead to your solution.

(a) $y = 2x - 9$ $y = -4x + 21$ (b) $y = -x + 4$ $y = 3x + 16$

1. Consider the system of equations shown below.

$y = x + 2$ $y = -3x + 10$

(a) Solve this system graphically. Make sure to label your lines and give the coordinates of the intersection point below.



(b) Solve the system algebraically by setting the equations equal to each other. Show your work.

3. Solve each of the following systems of equations algebraically. Show the steps that lead to your solution.

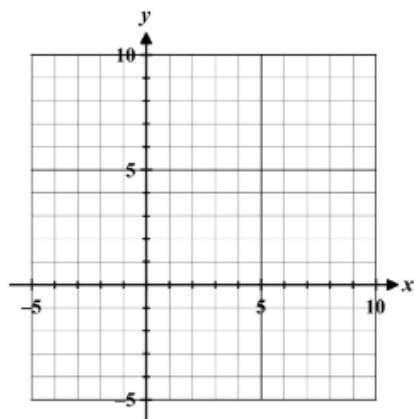
(a) $y = \frac{3}{4}x - 3$ $y = \frac{1}{4}x + 1$ (b) $y = x + 11$ $y = \frac{1}{2}x + 8$

REASONING

4. Consider the system shown below.

$$y = 2x + 4 \quad y = 2x - 3$$

- (a) Solve this system algebraically.



- (b) Graph this system. What appears to be true about the two lines? How does this support your answer to (a)?

Functions

1. The table below shows y as a function of x . Which of the following is the average rate of change of the function from $x = 2$ to $x = 6$?

(1) $\frac{13}{6}$

(3) $\frac{2}{5}$

| | | | | |
|-----|---|----|----|----|
| x | 0 | 2 | 6 | 9 |
| y | 6 | 11 | 13 | 20 |

(2) $\frac{1}{2}$

(4) $\frac{20}{9}$

2. Given the function defined by $y = x^2$, which of the following is its average rate of change from $x = 2$ to $x = 10$?

(1) $\frac{5}{2}$

(3) $\frac{8}{3}$

(2) 2

(4) 12

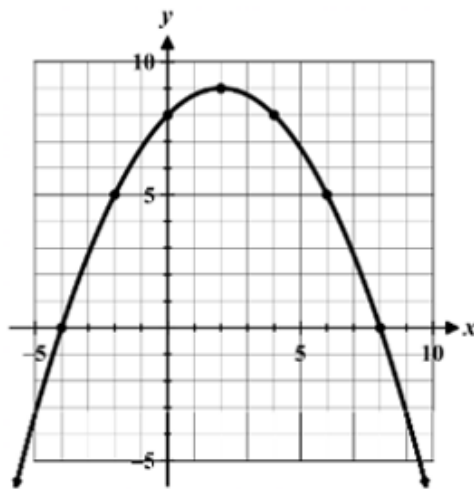
3. For the graph of the function shown, answer the following questions.

- (a) Find the outputs for each of the following inputs.

$$x = 0 \Rightarrow y = \underline{\hspace{2cm}} \quad x = 6 \Rightarrow y = \underline{\hspace{2cm}}$$

- (b) Find the average rate of change of the function between $x = 0$ and $x = 6$.

- (c) Why would the average rate of change be equal to zero from $x = -2$ to $x = 6$?



4. A semi-truck is being loaded with boxes of varying weights. The total weight of boxes loaded is shown below as a function of the number of boxes loaded into the truck.

| | | | | |
|-----------------------|----|----|----|-----|
| Number of Boxes | 5 | 11 | 20 | 25 |
| Total Weight (pounds) | 18 | 45 | 99 | 115 |

- (a) For each interval below, find the average rate of change. Do not round. Include units with your answers.

5 to 11 boxes:

11 to 20 boxes:

20 to 25 boxes:

5. A hot liquid was placed in a freezer and its temperature was recorded. The data for the first 8 minutes is shown below.

What is the average rate the temperature is changing from 2 to 8 minutes? Use proper units.

| Time (min) | Temp. ($^{\circ}$ F) |
|------------|-----------------------|
| 0 | 190 |
| 2 | 135 |
| 4 | 93 |
| 6 | 77 |
| 8 | 63 |

REASONING

6. Given the function $y = 4x + 3$ do the following. Find its average rate of change:

(a) from $x = 2$ to $x = 5$

(b) from $x = 4$ to $x = 10$.

(c) Why do you think these two answers were equal?