

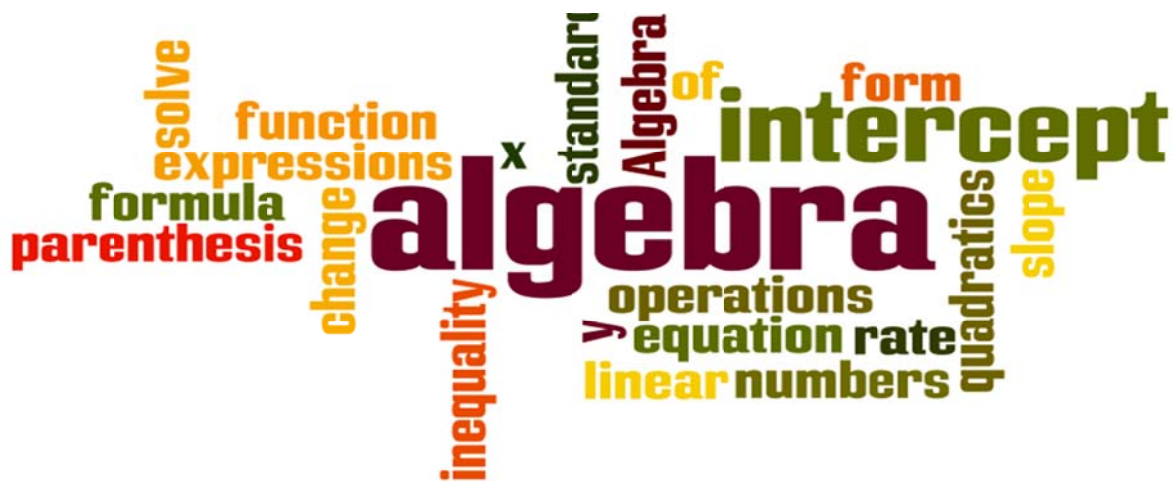


2014

Algebra 1

Spring Break

Practice



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1. Moving beyond slope-intercept

Smithville is one of the fastest growing communities in the state. In fact, the town had to build a new high school to accommodate the growth. The first year it opened, Smithville High School housed just faculty and the freshman class. Each year they have added another grade level as well as more faculty to teach those students. In addition, new construction and businesses are drawing more families to the area. So, the school population has kept increasing even after the school contained freshmen through seniors.

a) As a result of this population explosion, Smithville High has had to expand the size of its parking lot each year since opening. Here is a partial table documenting parking lot construction:

Smithville High School Parking Lot

| Number of years since opening | Perimeter of parking lot in yards |
|-------------------------------|-----------------------------------|
| 2 | 2000 |
| 4 | 2800 |
| 6 | 3600 |

Would a linear function be an appropriate model for these data? Why?

Yes, a linear function would be an appropriate model. The data exhibit a constant rate of change.

Each time the number of years increases by 2, the perimeter increases by 800 yards. This leads to a constant rate of change of $800 \text{ yards} / 2 \text{ years} = 400 \text{ yards/year}$.

b) What is the value of the y-intercept, and what does it mean in this problem situation?

The y-intercept is 1200. In this case, the y-intercept stands for the perimeter of the parking lot on opening day of the Smithville High School.

c) Now return to the original data:

Smithville High School Parking Lot

| Number of years since opening | Perimeter of parking lot in yards |
|-------------------------------|-----------------------------------|
| 2 | 2000 |
| 4 | 2800 |
| 6 | 3600 |

Find the equation of a line, in point-slope form, that best represents the information given. To start, use the table to find the slope.

$y = 400x + 1200$, where x is the number of years and y is the perimeter of the parking lot.

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d) The Smithville school board was initially presented with several different scenarios predicting anticipated parking-lot need at the high school. The school board then had to decide which lot size would be the most economical with which to open the facility. Which of the following would parallel the growth rate of the data set you just explored? More than one choice may apply. Justify your choices.

A. Smithville High School Parking Lot

| Number of years since opening | Perimeter of parking lot (in yards) |
|-------------------------------|-------------------------------------|
| 0 | 800 |
| 1 | 1200 |
| 2 | 1600 |
| 3 | 2000 |
| 4 | 2400 |

B. Smithville High School Parking Lot

| Number of years since opening | Perimeter of parking lot (in yards) |
|-------------------------------|-------------------------------------|
| 0 | 1200 |
| 2 | 1800 |
| 4 | 2400 |
| 6 | 3000 |
| 8 | 3600 |

C. Smithville High School Parking Lot

| Number of years since opening | Perimeter of parking lot (in yards) |
|-------------------------------|-------------------------------------|
| 0 | 1800 |
| 1 | 2200 |
| 2 | 2600 |
| 3 | 3000 |
| 4 | 3400 |

D. $y = 420x + 1200$

E. $y = 400x + 1800$

Choices A, C, and E all exhibit the same rate of growth as in the original situation. Each of these situations can be represented by a line with a slope of 400.

These three situations have the same rate of change as the original data. (Note: Choice B has a rate of change of 300 while Choice D has a rate of change of 420.)

2. Vacations

Here is some information about how some students are paying for their summer vacations.

Carla: Her mom gave her \$100 in January and Carla has saved \$25 every month since, starting in February.

Arnie: Arnie put \$150 in his piggy bank in January.

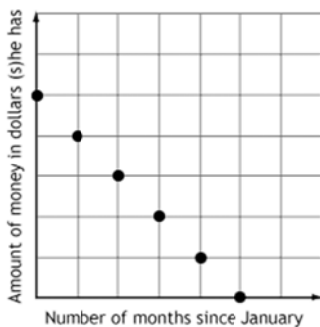
Sue: Sue booked her vacation in January. She had \$250 in her piggy bank. Starting in February, she is paying \$50 each month to the travel company.

Ben: Starting in February, Ben saves \$30 every month.

Here are some graphs illustrating these situations.

1. Match each person with a graph and explain how you decided.

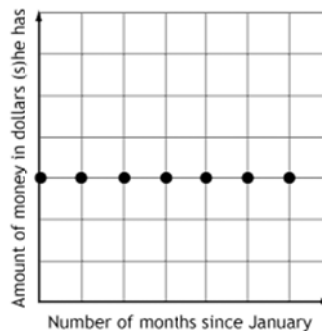
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Name: Sue:

Reason: graph goes downhill, showing that the amount of money in her piggy bank is decreasing.

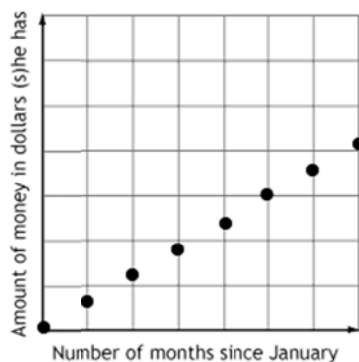
Intercept \$250: Slope < 0 or $-\$50$



Name: Arnie:

Reason: graph is horizontal, showing the amount of money in his piggy bank stays the same.

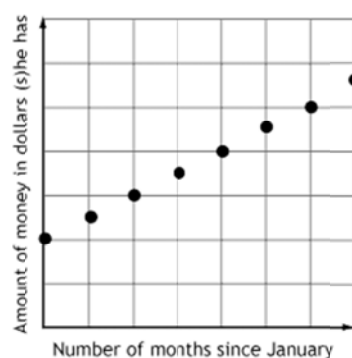
Intercept \$150: Slope constant or 0



Name: Ben:

Reason: graph starts at 0 and goes up in steady steps.

Intercept \$0: Slope > 0 \$30



Name: Carla:

Reason: graph starts above 0 and goes up in steady steps.

Intercept \$100: Slope > 0 or \$25

2. In these equations, A is the amount of money and n is the number of months since January.

$$A = 250 - 50n$$

$$A = 30n$$

$$A = 150$$

- a. Find the person for each of these equations.

Carla's equation none of the given equations

3. Arnie's equation $A = 150$
 4. Sue's equation $A = 250 - 50n$
 5. Ben's equation $A = 30n$

- b. Write a formula for the fourth person.

formula for Carla: $A = 100 + 25n$

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6. Write a possible description for this formula: $A = 50n + 150$

Student starts with \$150 and saves \$50 a month.

3. Solving Linear Equations

Consider these three equations:

Equation A: $2(x + 3) = 3(x + 2) - x$

Equation B: $2(x + 3) = 3(x + 1) - x$

Equation C: $2(x + 3) = 3(x + 1) - 2x$.

One of these has no number in its solution set, one has exactly one number in its solution set, and one has all the numbers in its solutions set.

- a) Solve each of those three equations by hand. Show your work. Explain how your work tells you what type of solution set each equation has.

Equation A: $2(x + 3) = 3(x + 2) - x$

$$2x + 6 = 3x + 6 - x$$

$$2x + 6 = 2x + 6$$

Equation B: $2(x + 3) = 3(x + 1) - x$

$$2x + 6 = 3x + 3 - x$$

$$2x + 6 = 2x + 3$$

$$6 = 3$$

Equation C: $2(x + 3) = 3(x + 1) - 2x$.

$$2x + 6 = 3x + 3 - 2x$$

$$2x + 6 = x + 3$$

$$x = -3$$

Equation A is true for all real numbers. Equation B has no solution (empty set). Equation C has a single number in its solution set.

- b) Suppose you made a table of values for both sides of each of those three equations. What would you expect to see in the table for Equation A? For Equation B? For Equation C?

The table for the first equation has been done for you.

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| x | $y = 2(x + 3)$ | $y = 3(x + 2) - x$ |
|-----|------------------------|---|
| -2 | $2(-2 + 3) = 2(1) = 2$ | $3(-2 + 2) - (-2) = 3(0) + 2 = 0 + 2 = 2$ |
| -1 | $2(-1 + 3) = 2(2) = 4$ | $3(-1 + 2) - (-1) = 3(1) + 1 = 3 + 1 = 4$ |
| 0 | $2(0 + 3) = 2(3) = 6$ | $3(0 + 2) - 0 = 3(2) - 0 = 6 - 0 = 6$ |
| 1 | $2(1 + 3) = 2(4) = 8$ | $3(1 + 2) - 1 = 3(3) - 1 = 9 - 1 = 8$ |
| 2 | $2(2 + 3) = 2(5) = 10$ | $3(2 + 2) - 2 = 3(4) - 2 = 12 - 2 = 10$ |

For Equation A, for each row in the table, the numbers in both y columns would be the same (equal).

Equation B

| x | $y = 2(x + 3)$ | $y = 3(x + 1) - x$ |
|-----|------------------------|--|
| -2 | $2(-2 + 3) = 2(1) = 2$ | $3(-2 + 1) - (-2) = 3(-1) + 2 = -3 + 2 = -1$ |
| -1 | $2(-1 + 3) = 2(2) = 4$ | $3(-1 + 1) - (-1) = 3(0) + 1 = 0 + 1 = 1$ |
| 0 | $2(0 + 3) = 2(3) = 6$ | $3(0 + 1) - 0 = 3(1) - 0 = 3 - 0 = 3$ |
| 1 | $2(1 + 3) = 2(4) = 8$ | $3(1 + 1) - 1 = 3(2) - 1 = 6 - 1 = 5$ |
| 2 | $2(2 + 3) = 2(5) = 10$ | $3(2 + 1) - 2 = 3(3) - 2 = 9 - 2 = 7$ |

For Equation B, for each row in the table, the numbers in both y columns would be different (not equal).

Equation C

| x | $y = 2(x + 3)$ | $y = 3(x + 1) - 2x$ |
|-----|------------------------|--|
| -3 | $2(-3 + 3) = 2(0) = 0$ | $3(-3 + 1) - 2(-3) = 3(-2) + 6 = -6 + 6 = 0$ |
| -2 | $2(-2 + 3) = 2(1) = 2$ | $3(-2 + 1) - 2(-2) = 3(-1) + 4 = -3 + 4 = 1$ |
| -1 | $2(-1 + 3) = 2(2) = 4$ | $3(-1 + 1) - 2(-1) = 3(0) + 2 = 0 + 2 = 2$ |
| 0 | $2(0 + 3) = 2(3) = 6$ | $3(0 + 1) - 2(0) = 3(1) - 0 = 3 - 0 = 3$ |
| 1 | $2(1 + 3) = 2(4) = 8$ | $3(1 + 1) - 2(1) = 3(2) - 2 = 6 - 2 = 4$ |
| 2 | $2(2 + 3) = 2(5) = 10$ | $3(2 + 1) - 2(2) = 3(3) - 4 = 9 - 4 = 5$ |

For Equation C, for each row in the table, the numbers in both y columns would be different, except where $x = -3$; here the values in the two y columns would be the same. The y -value in each column would be 0.

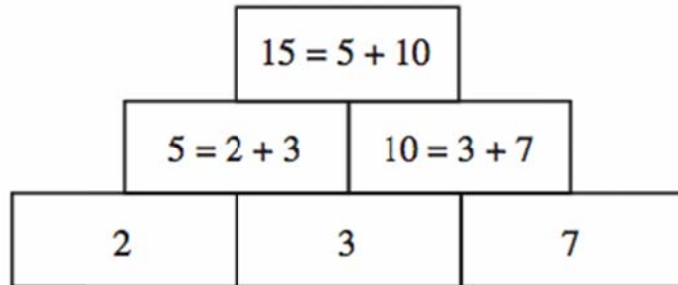
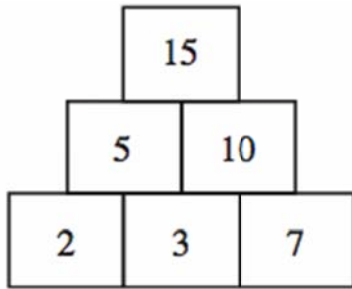
4. Formulating and Solving Systems

Number Towers

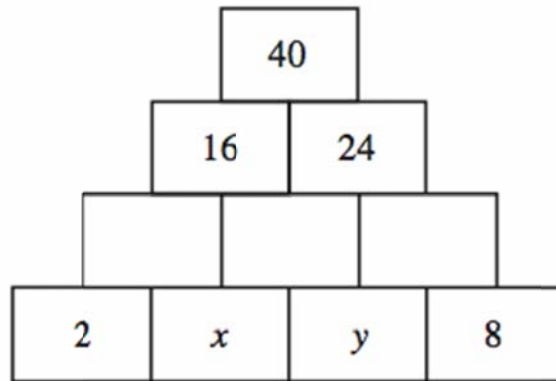
An addition number tower is shown below.

In this tower, each number is the sum of the two numbers just below it.

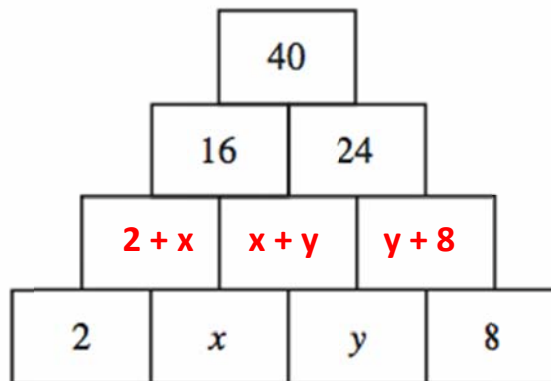
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Marcie makes a bigger number tower:



- Complete the number tower by writing algebraic expressions in the empty boxes.



- Use the completed number tower to show that $2x + y = 14$ and $x + 2y = 16$.

$$\begin{aligned} 2 + x + x + y &= 16 \\ 2x + y &= 14 \end{aligned}$$

$$\begin{aligned} x + y + y + 8 &= 24 \\ x + 2y &= 16 \end{aligned}$$

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3. Find values of x and y that satisfy both equations: $2x + y = 14$ and $x + 2y = 16$.

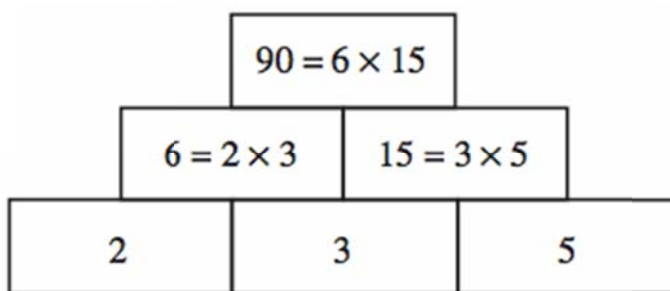
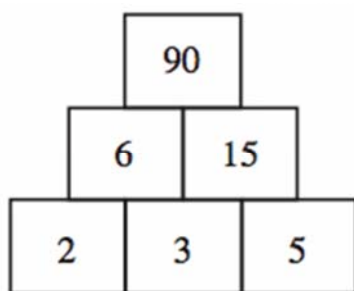
$$2x + y = 14 \rightarrow y = 14 - 2x$$

$$\begin{aligned} x + 2y = 16 &\rightarrow x + 2(14 - 2x) = 16 \\ &x + 28 - 4x = 16 \\ &-3x = 16 - 28 \\ &-3x = -12 \\ &x = 4 \end{aligned}$$

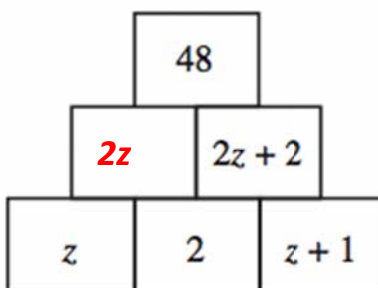
$$y = 14 - 2x = 14 - 2(4) = 14 - 8 = 6$$

$$\text{Solution: } x = 4, y = 6$$

Marcie also designs a multiplication number tower.



Look at the multiplication tower below.



4. Complete the multiplication tower by writing an algebraic expression in the empty box.

5. Use the completed multiplication tower to show that $4z^2 + 4z = 48$.

$$2z(2z + 2) = 48$$

$$2z(2z + 2) = 48$$

$$4z^2 + 4z = 48$$

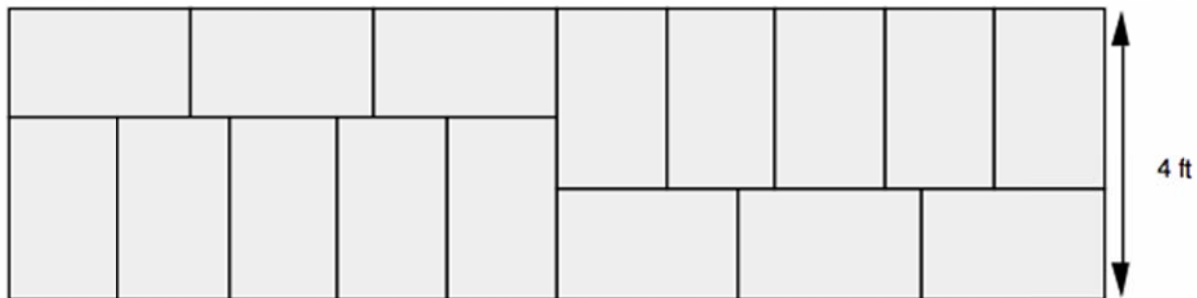
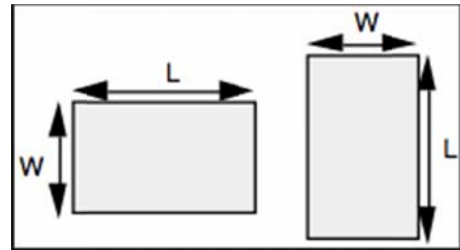
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6. Find the possible values of z in $4z^2 + 4z = 48$.

$$\begin{aligned}
 4z^2 + 4z &= 48 \\
 4z^2 + 4z - 48 &= 0 \\
 \frac{4z^2 + 4z - 48}{4} &= \frac{0}{4} \\
 z^2 + z - 12 &= 0 \\
 (z + 4)(z - 3) &= 0 \\
 (z + 4) = 0 \text{ or } (z - 3) &= 0 \\
 z = -4 \text{ or } z = 3 &
 \end{aligned}$$

Pathways

Bob uses paving stones to make a pathway.
The paving stones are rectangles and they are all the same size.



The pathway is 4 feet wide.

Find the length and width of one paving stone.

$$l + w = 4 \rightarrow w = 4 - l$$

$$\begin{aligned}
 5w &= 3l \rightarrow 5(4 - l) = 3l \\
 20 - 5l &= 3l \\
 20 &= 8l \\
 2.5 &= l
 \end{aligned}$$

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$$W = 4 - l = 4 - 2.5 = 1.5$$

Length is 2.5 ft

Width is 1.5 ft

Explain how you figured it out.

EOC Type Questions

MA.912.A.2.3 – Functions

1. Tyler received some money for his birthday and hopes to buy video games. The store charges \$45 for the first game purchased. Any additional game will cost only \$21. The total amount spent on video games can be described by the function below.

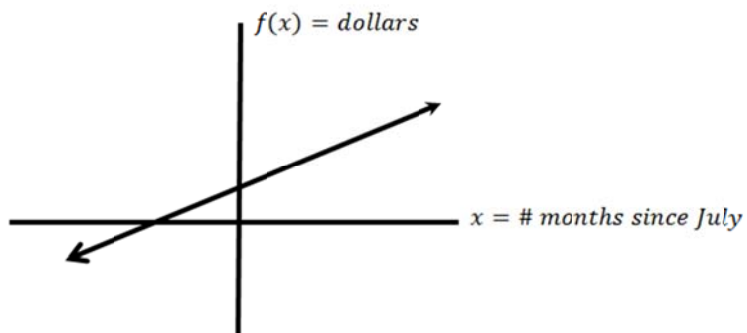
$$f(x) = \$45 + \$21x,$$

where x represents the number of video games purchased. Tyler spent \$129. How many games did he purchase?

- A. 3
- B. 4
- C. 5
- D. 6

2. Tara received money for her birthday last July. Since then, she has deposited an additional \$30 every month. The following graph represents the amount of money in Tara's bank account since her birthday.

Based on this graph, which function would best represent the money in her account if x = number of months since July and $f(x)$ = dollars in the account.



- A. $f(x) = -30x$
- B. $f(x) = 30x$
- C. $f(x) = -30x + 50$
- D. $f(x) = 30x + 50$

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MA.912.A.3.1 – Solve Linear Equations

3. Pedro picks two index cards displaying algebraic expressions.

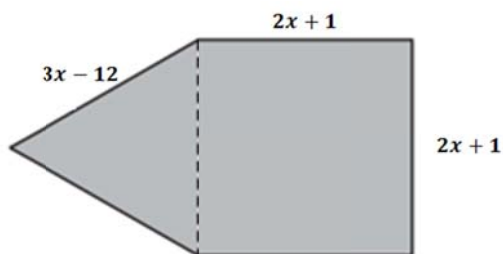
$$\frac{1}{8}(3m - 2)$$

$$\frac{1}{4}(m + 5)$$

What value of m would make them equal?

| | | | | | | |
|---|---|--|--|--|--|--|
| 1 | 2 | | | | | |
|---|---|--|--|--|--|--|

4. Maria’s backyard contains a flower garden in the shape of a square and an isosceles triangle. Maria is constructing a boundary around the garden.



The formula for the perimeter is represented by the function shown below.

$$P = (3x - 12) + (3x - 12) + (2x + 1) + (2x + 1) + (2x + 1),$$

where P represents the perimeter. If the perimeter of the garden is 33 feet, find the value of x .

| | | | | | | |
|---|---|---|--|--|--|--|
| 4 | . | 5 | | | | |
|---|---|---|--|--|--|--|

MA.912.A.3.5 – Write Linear Equations and Inequalities

5. The table below shows the cost of a monthly gym membership.

| Number of Months | Total Cost |
|------------------|------------|
| 0 | \$15 |
| 1 | \$45 |
| 2 | \$75 |
| 3 | \$105 |

Which equation would you use to find the total cost, T , of the gym membership for m months?

A. $T = 15m$

B. $T = 45m$

C. $T = 30m + 15$

D. $T = 15m + 25$

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6. Erin purchased a beach chair for \$8 and some cold beverages for a trip to the beach. The maximum price of a beverage is \$1.25. Which inequality could be used to determine C , the total cost of the chair and n beverages?

A. $C \leq 8 + 1.25n$

B. $C < 8 + 1.25n$

C. $C \geq 8 + 1.25n$

D. $C > 8 + 1.25n$

MA.912.A.3.9 – Slope and intercepts

7. Roger plotted the two points $(20, 3)$ and $(75, 25)$ on a graph. What is the x -coordinate of the x -intercept of the line that contains these two points?

| | | | | | | |
|---|---|---|---|--|--|--|
| 1 | 2 | . | 5 | | | |
|---|---|---|---|--|--|--|

8. A line passes through the point $(40, 54)$ with a slope of $\frac{8}{5}$.

| | | | | | | |
|---|---|---|--|--|--|--|
| - | 1 | 0 | | | | |
|---|---|---|--|--|--|--|

MA.912.A.3.10 – Write Linear Equations

9. Determine if the following lines are parallel, perpendicular, or neither.

$$3x - 9y = 9$$

$$3y = x + 12$$

A. Parallel

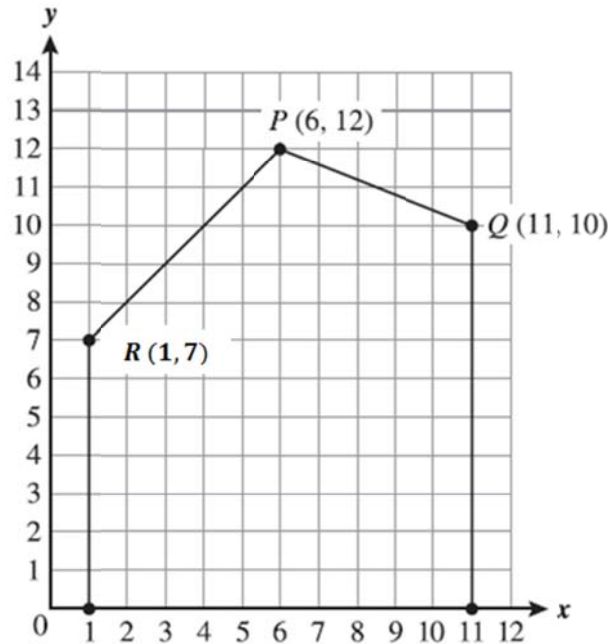
B. Perpendicular

C. Neither

D. Cannot be determined

10. In a technical drawing class, students are analyzing the side view of a house that has been positioned on a coordinate grid, as shown below.

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Which of the following equations best represents the line that is perpendicular to \overline{RP} and passing through point R?

- A. $x + y = 6$
- B. $x + y = 8$
- C. $x - y = 6$
- D. $x - y = 8$

MA.912.A.3.14 – Systems of Equations

11. Pizza Pizzazz sells the items shown in the table. During lunch, the restaurant sold 35 more pizza slices than pizza pockets and made \$825.50.

| Item | Price |
|--------------|--------|
| Pizza Slice | \$2.50 |
| Pizza Pocket | \$3.50 |

How many pizza slices were sold?

| | | | | | | |
|---|---|---|--|--|--|--|
| 1 | 5 | 8 | | | | |
|---|---|---|--|--|--|--|

12. The Central Florida Zoo has a *Zoo Friend* animal adoption program that includes a stuffed animal and a photo of the animal. The *Kingdom Keeper* program also includes two zoo passes. The table shows the number of memberships in each program sold in the past two weeks and the total money collected.

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| Zoo Friend | Kingdom Keeper | Money Collected |
|------------|----------------|-----------------|
| 7 | 2 | \$400 |
| 5 | 6 | \$560 |

How many dollars did each Zoo Friend membership cost?

| | | | | | | | |
|---|---|--|--|--|--|--|--|
| 4 | 0 | | | | | | |
|---|---|--|--|--|--|--|--|