1. Billie Sue's BBQ had their grand opening this year. The first month they did not turn a profit. However, each month thereafter, they have had steady profits of $1,600 per month. If x represents the number of months they have profited, which of the following equations represents the amount of profits after x months?

- A. $y = 1{,}600 - x$
- B. $y = 1{,}600x$
- C. $y = 1{,}600x + x$
- D. $y = x + 1{,}600$

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2. Jackson is playing a video game that has 3 castles to conquer within each level. Jackson has completed 5 levels so far.

If x represents the number of remaining levels to complete, which of the following equations can be used to find the total number of castles Jackson will have conquered once he completes the final level?

- A. $y = 15x + 3$
- B. $y = 3x + 5$
- C. $y = 3x + 15$
- D. $y = 5x + 3$

3.
Directions: Select all the correct answers.

A box company completed a study to determine the number of boxes an old machine would produce in an hour. They determined that the old machine produced 280 boxes in 4 hours.

During its first day of operation, a new machine, after running a full 8 hours, produced 56 more boxes than the old machine would have produced in that time.

Which of the following is true about the new machine?

- ☐ The new machine can produce 14 boxes an hour.
- ☐ The equation $y = 77x$ represents the production rate of the new machine.

- ☐

  The new machine can produce 7 more boxes an hour than the old machine.

  ☐

  The equation $y = 84x$ represents the production rate of the new machine.

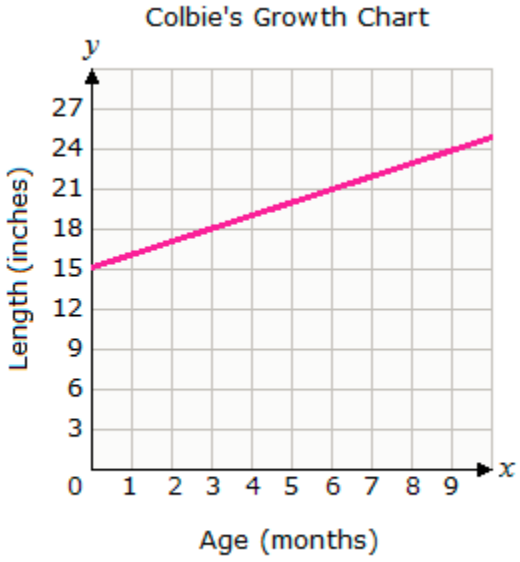
4.

Directions: Select the correct location on the image.

Colbie was born early, and so she was a little smaller than other babies in the nursery.

Her doctor tracked her growth on the graph below.

According to the graph, what was her length when she was a newborn baby?



5.
Directions: Type the correct answer in each box. Use numerals instead of words.

Tim is writing a script for a new television series. Beginning in day 2, he realized he was writing at a constant rate. He recorded the number of days he spent writing and the total pages written in the following table.

Day of Writing	Total Pages Written
2	15
3	22.5
4	30
5	37.5

Complete the equation below to represent the total number of pages, *y*, written over *x* days during the first 5 days Tim spent writing.

$$y = \square\, x$$

On day 6, Tim's computer crashed and had to be rebooted. After the reboot, he encountered problems for the remainder of the 10 days he was writing. Beginning in day 7, he recorded the number of days he spent writing and the total pages written at the new constant rate in the following table. Complete the table for day 9.

Day of Writing	Total Pages Written After Computer Crash
7	11.5
8	17.25
9	

Complete the equation to represent the total number of pages, *y*, written over *x* days after the computer crashed.

$$y = \square\, x$$

How many total pages did he write in the 10-day period? _____ pages

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6. Gordon recently started jogging. Last week he jogged for 13 minutes. Starting this week, he decided to add 2 minutes to his jog each week. Which of the following equations represents how long his jog will be after x additional weeks?

- A. $y = 13x + 2$
- B. $y = 13x + 15$
- C. $y = 2x + 15$
- D. $y = 2x + 13$

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7. Helen has been working on a science project about plant growth. Plant A started at a height of 6 cm and exhibited steady growth during the first four weeks of the project. After those four weeks, Plant A was 26.8 cm in height.

In a linear model of Plant A's growth, x represents the number of weeks after being planted, and y represents the plant's height [in cm].

Relative to this model, which of the following statements applies?

- A. An additional 8.2 weeks of growth is associated with an additional centimeter of plant height.
- B. An additional week of growth is associated with an additional 5.2 cm of plant height.
- C. An additional 5.2 weeks of growth is associated with an additional centimeter of plant height.
- D. An additional week of growth is associated with an additional 8.2 cm of plant height.

8.

Directions: Drag each label to the correct location on the equation. Not all labels will be used.

A data analyst for a phone company is analyzing the data of 150 of their customers, which accounts for 1% of their total customers. The analyst wants to determine the average number of hours each day a customer uses their phone, for calls and for texts, during a 30-day period. Based on the data, the customers averaged 0.25 hours per day per call and 1.75 hours each day for texts. Construct an equation in the correct form to represent this situation. Let t represent the number of calls made per day, and e represent the total number of hours a customer uses their phone each day.

- 0.01
- 30
- 150
- 1.75
- 1
- 0.25
- t
-

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9. Robin's family breeds Great Danes. In the last litter, one of the puppies grew at an unusually consistent rate. At birth, he weighed two pounds. At eight months, he weighed 110 pounds.

In a linear model of this situation, which of the following statements applies?

- A. An additional month of growth is associated with an additional 13.5 pounds of weight.
- B. An additional month of growth is associated with an additional 13.75 pounds of weight.
- C. An additional month of growth is associated with an additional 8 pounds of weight.
- D. An additional month of growth is associated with an additional 14 pounds of weight.

10.
Directions: Type the correct answer in each box. Use numerals instead of words. If necessary, use / for the fraction bar(s).

Jaren is the manager of a department store. The morning of a big holiday sale, when Jaren opened the door, 12 customers were waiting outside to come into the store.

Each hour the store is open, another 13 customers enter the store, and 8 customers leave the store. Use this information to complete the table below.

Hours Open	Number of Customers In the Store
0	12
1	17
2	22
3	
4	

The *x*-values represent the number of hours the store is open. The *y*-values represent the number of customers in the store.

The equation which represents the number of customers in the store is $y =$ _____ $x +$ _____.

Answers

1. B
2. C
3. --
4. --
5. --
6. D
7. B
8. --
9. A
10. --

Explanations

1. The profit per month, $1,600, indicates the rate of change.

Since *x* represents the number of months of profit, $1,600 is the value to be attached to the variable *x*.

Further, since the business did not profit the first month, the additional months' profits do not need to be added to any other values.

Therefore, the equation which represents the amount of profits after x months is $\boldsymbol{y = 1{,}600x}$.

2. Jackson has already completed 5 levels with 3 castles conquered per level. So, he has already conquered 15 castles.

Each remaining level, represented by x, contains 3 castles to conquer.

Therefore, the equation that can be used to find the total number of castles Jackson will have conquered once he completes the final level is shown below.

$$\boldsymbol{y = 3x + 15}$$

3.

First, determine how many boxes the old machine produced per hour by dividing the number of boxes produced by the number of hours.

$$280 \text{ boxes} \div 4 \text{ hours} = 70 \text{ boxes per hour}$$

The equation $y = 70x$ represents this production rate of the old machine.

During its first day of operation, a new machine, after running a full 8 hours, produced 56 more boxes than the old machine would have produced in that time. Determine the additional number of boxes per hour the new machine produced by dividing.

$$56 \text{ boxes} \div 8 \text{ hours} = 7 \text{ boxes per hour}$$

Therefore, **the new machine can produce 7 more boxes an hour than the old machine**.

Find the total number of boxes that the new machine can produce per hour.

$$70 \text{ boxes per hour} + 7 \text{ boxes per hour} = 77 \text{ boxes per hour}$$

The equation $y = 77x$ represents the production rate of the new machine.

4.

When Colbie was a newborn baby, her age was 0 months.

To determine her length at 0 months, go up the y-axis to the y-intercept.

The *y*-intercept is the point (0, 15). Therefore, when Colbie was a newborn baby, her length was 15 inches long.

5.

Determine his rate of pages per day for the first 5 days. Subtract day 2's writing (11.5 pages) from day 3's writing (17.25 pages) to calculate the rate of pages per day.

$$17.25 \text{ pages} - 11.5 \text{ pages} = 7.5 \text{ pages}$$

Since his rate was 7.5 pages per day, the equation for the first 5 days is $\boldsymbol{y = 7.5x}$.

Next, calculate Tim's writing rate for his last 5 days of writing by subtracting day 7's writing (11.5 pages) from day 8's writing (17.25 pages). Then, complete the table.

$$17.25 \text{ pages} - 11.5 \text{ pages} = 5.75 \text{ pages}$$

Day of Writing	**Total Pages Written After Computer Crash**
7	11.5
8	17.25
9	17.25 + 5.75 = **23**

Since his rate was 5.75 pages per day, the equation for days 6 through 10 will be $\boldsymbol{y = 5.75x}$.

To determine the total amount of writing for days 6 through 10, add 5.75 pages to 23 pages.

$$23 \text{ pages} + 5.75 \text{ pages} = 28.75 \text{ pages}$$

To find the number of pages written in the 10-day period, add the total for days 1 through 5 (from the first table) to the total from days 6 through 10.

$$37.5 \text{ pages} + 28.75 \text{ pages} = 66.25 \text{ pages}$$

Therefore, he wrote a total of **66.25** pages in the 10-day period.

6. The number of minutes by which he increases his jog, 2, indicates the rate of change.

Since his jog time increases by that amount every week, and *x* represents the number of weeks, 2 is the value to be attached to the variable *x*.

Further, the additional minutes added to Gordon's jog have to be added to the original length of

his jog in order to determine his total jog time.

Therefore, the equation which represents how long his jog will be after x weeks is $\boldsymbol{y = 2x + 13}$.

7. In a linear model of this situation, the y-intercept represents Plant A's starting height, 6 cm.

The rate of change, or slope, can be determined using two values: height at start, (0, 6), and height after 4 weeks, (4, 26.8).

The rate of change, or slope, indicates that **an additional week of growth is associated with an additional 5.2 cm of plant height**.

8.

The number and percent of customers is not important to create the equation. The number of days are not important either.

To determine the number of hours the customer used the phone, the average number of hours spent texting, 1.75 hours, should be added to the time for a phone call, 0.25 hour, times the number of calls.

The correct equation is $e = \mathbf{0.25}\boldsymbol{t} + \mathbf{1.75}$.

9. In a linear model of this situation, the y-intercept represents the dog's weight at birth, two pounds.

The rate of change, or slope, can be determined using two values: weight at birth, (0, 2), and weight at 8 months, (8, 110).

The linear model of this situation is $y = 13.5x + 2$, where x represents the dog's age in months.

The rate of change, or slope, indicates that **an additional month of growth is associated with an additional 13.5 pounds of weight**.

10.

To finish the table, remember that for every hour the store is open, 13 customers enter, and 8 customers leave, giving an overall change of 5 additional customers every hour.

Hours Open	Number of Customers In the Store

0	12
1	17
2	22
3	**27**
4	**32**

The 12 customers at the door when it opened represents the *y*-intercept and the 5 additional customers per hour represents the rate of change (or slope). The *x*-values represent the number of hours the store is open.

Therefore, the equation that represents the number of customers in the store is $y = \mathbf{5}x + \mathbf{12}$.