

ALGEBRA I

MODULE 1

CONSTRUCTED-RESPONSE ITEMS

11. A large washtub already contains 6 gallons of water. A faucet is turned on and continues to fill the washtub at a rate of $\frac{1}{2}$ gallon per minute.

- A. How many total gallons of water will be in the washtub when the faucet has been on for 5 minutes?

$$= 6 \text{ gallons} + (5 \text{ min}) \left(\frac{1}{2} \frac{\text{gallon}}{\text{min}} \right)$$

$$= 6 + 2.5$$

8.5 gallons

When the faucet has been on for x minutes, there will be y gallons of water in the washtub.

- B. Write a linear equation to model the number of gallons of water (y) in the washtub x minutes after the faucet has been turned on.

$$y = 6 + \frac{1}{2}x$$

linear equation: $y = 6 + \frac{1}{2}x$

- C. Using your equation, determine the number of minutes from when the faucet is turned on until there are exactly $23\frac{3}{4}$ gallons of water in the washtub.

$$23\frac{3}{4} = 6 + \frac{1}{2}x$$

$$17\frac{3}{4} = \frac{1}{2}x$$

35.5 minutes

$$35.5 = x$$

Go to the next page to finish question 11.

11. *Continued.* Please refer to the previous page for task explanation.

A second washtub already contains 2 gallons of water. A larger faucet is used to fill this washtub at a rate $1\frac{1}{2}$ times the rate of the first faucet.

Both faucets are turned on at the same time.

- D. Determine the number of minutes until both washtubs contain the same number of gallons of water.

$$\text{rate of tub}_1 = \frac{1}{2} \text{ gallon/min}$$

$$\text{rate of tub}_2 = (1.5)\left(\frac{1}{2}\right) = \frac{3}{4} \text{ gallon/min}$$

$$\text{tub}_2 = 2 + \frac{3}{4}x$$

$$\text{tub}_1 = 6 + \frac{1}{2}x$$

$$2 + \frac{3}{4}x = 6 + \frac{1}{2}x$$

$$\frac{1}{4}x = 4$$

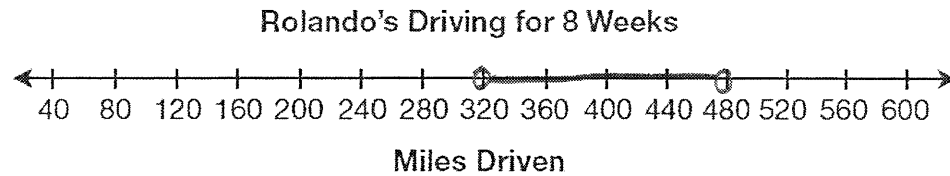
$$x = 16 \text{ min}$$

12. Rolando drives at least 40 miles but less than 60 miles each week.

$$\rightarrow \times 8 = 320$$

$$\rightarrow \times 8 = 480$$

- A. Graph the compound inequality representing all of the possible distances Rolando could drive for 8 weeks.



- B. Explain why you chose to use the symbols you used for the endpoints of the compound inequality in part A.

- open circles is for "less than" —
he can drive any distance less than 480 mi.
- the closed circle indicates that
he can drive 320 mi, used here
for greater than or equal to.

Go to the next page to finish question 12.

12. *Continued.* Please refer to the previous page for task explanation.

Rolando buys at least 8.5 but no more than 11 gallons of gas each week. The price of gas has ranged from \$2.40 to \$2.65 per gallon each week.

- C. Write an inequality to model all of the possible amounts of money (m) Rolando spends on gas each week. Show or explain all your work.

at minimum $(8.5)(\$2.40) = \20.40 This is the least amount of gas at the lowest price.

no more than $(11)(\$2.65/\text{gallon}) = \29.15 This is the greatest amount of gas at the highest cost.

$$20.40 \leq m \leq 29.15$$

This inequality shows that he will spend anywhere from \$20.40 to \$29.15 on gas each week.

CONSTRUCTED-RESPONSE ITEMS

11. Albert sells baseball programs at a stadium. The function $m(x) = 2.50x$ represents the total amount of money collected, in dollars, for selling x baseball programs.

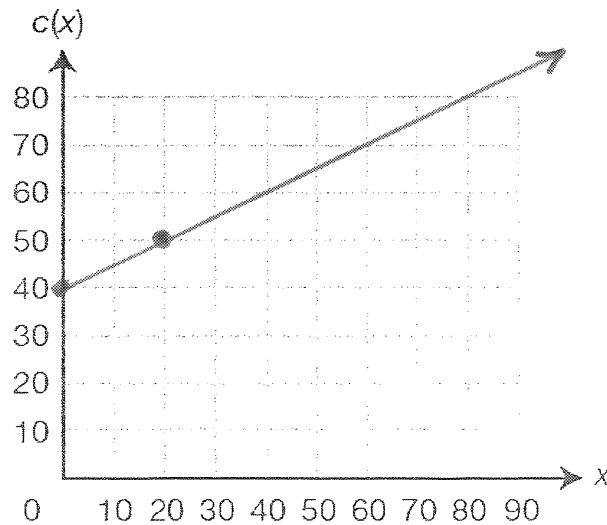
- A. Fill in the table with the amounts of money collected for selling baseball programs.

Albert's Revenue

Baseball Programs Sold	Money Collected (\$)
150	375
175	437.50
197	492.50

The cost, in dollars, to print up x programs for each game is represented by the function $c(x) = 0.50x + 40$.

- B. On the grid below, draw a line that contains the coordinate points of the cost to print up x programs for each game.



Go to the next page to finish question 11.

11. **Continued.** Please refer to the previous page for task explanation.

In addition to his hourly wage, Albert earns a bonus when the amount of money collected is greater than the cost to print the total number of programs he sold. His bonus is equal to $\frac{1}{2}$ of the difference between the amount of money collected, $m(x) = 2.50x$, and the cost, $c(x) = 0.5x + 40$.

- C. How much money does Albert earn as a bonus when he sells 309 baseball programs? Show all of your work. Explain why you did each step.

$$m(309) = (2.50)(309) = \$772.50 \text{ money collected}$$

$$c(309) = 0.5(309) + 40 = \$194.50 \text{ cost to print}$$

$$\underline{\text{difference}} \quad 772.50 - 194.50 = \$578$$

$$\underline{\text{half difference}} \quad \frac{1}{2}(578) = \$289$$

12. A large bucket that is full of water has a small leak on the bottom. The bucket loses water at the rate of 0.5 gallon per minute. After 6 minutes the bucket contains exactly 9 gallons of water.

A. How many gallons of water were initially in the bucket?

$$6 \text{ min} \times 0.5 \text{ gal/min} = 3 \text{ gallons}$$

$$3 \text{ gallons} + 9 \text{ gallons} = 12 \text{ g}$$

12 gallons

B. Write an equation in point-slope form to model the number of gallons (y) of water in the bucket after x minutes.

$$\begin{matrix} x_1 & y_1 \\ (6, 9) \\ \uparrow & \nwarrow \\ 6 \text{ min} & 9 \text{ gallons} \end{matrix}$$

$$m = -0.5 \text{ gallons/min}$$

$$y - 9 = -0.5(x - 6)$$

point-slope equation: $y - 9 = -0.5(x - 6)$

Go to the next page to finish question 12.

12. **Continued.** Please refer to the previous page for task explanation.

C. How many minutes does it take for the bucket to lose 7.5 gallons of water?

$$\left(\frac{1}{2} \text{ gallon}\right)(x) = 7.5$$

$$x = 15$$

15

minutes

D. What is the total number of minutes it will take for the bucket to be completely empty?

$$y - 9 = -0.5(x - 6) \quad \leftarrow \text{eqn from (B)}$$

$$y - 9 = -0.5x + 3$$

$$y = -0.5x + 12 \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{solve for } y$$

$$0 = -0.5x + 12 \quad \leftarrow \text{set } y = 0$$

$$-12 = -0.5x$$

$$24 = x$$

\leftarrow Solve

24

minutes