

I.

- $x$  = figure number;  $y$  = # of tiles in frame.
  - 80
  - figure #39 (Solve:  $4x+4=160$ )
- $x$  = time (in hours);  $y$  = volume (in gallons)
  - 31 hours and 15 min. (Solve:  $240x + 15,000=7500$ )
- The  $x$ -value (or input value) that corresponds to the  $y$ -value (or output value) of zero. Yes. The zero (or root) of  $f(x) = 9x$  is 0 because  $f(0) = 9 \times 0 = 0$ . [Note: the zero of a function is not always zero. Ex: The zero of  $f(x) = 3x-3$  is 1 because  $f(1) = 0$ ]
- If  $a \neq 0$ ,  $f(x) = ax + b$  (or  $y = ax + b$ ) has exactly one zero. If  $a = 0$ ,  $b \neq 0$ , we have a horizontal line passing through  $(0, b)$ , and therefore  $f(x)$  has no zeros.
- At the  $x$ -intercept: the zero of the linear function is the  $x$ -coordinate of this point.

II.

- $y = 3x + 2$  (or  $f(x) = 3x + 2$ )
  - 27 (Solve:  $3x + 2 = 83$ )
- $y = 4.5Y + 5$  (or  $f(x) = 4.5x + 5$ )
  - 20 hrs. (Solve:  $4.5x + 5 = 95$ )
- 11/2
  - 2
  - 2/3
- 7/5

III.

- $y = 5.25x - 20$  (or  $f(x) = 5.25x - 20$ )
  - 51.43 hrs. (or 51 hrs. and 26 min. But since you are paid by the hour, you must work 52 hours.)
  - Functional Exploration:
    - Trace the graph of  $y = 5.25x - 20$  and locate  $y = 250$ ; the corresponding  $x$  is the solution.
    - Use TBLSET and TABLE. Locate 250 in the  $y$ -column, then find the corresponding  $x$ .
  - Symbolic Manipulation: Solve  $5.25x - 20 = 250$ .  
 $5.25x = 270$  (by adding 20 to both sides).  $x = 51.43$   
 (by dividing both sides by 5.25)

# ALGEBRA 1

## The Complete Course

### Lesson Nine

### Section II:

## Exploring Linear Functions

# Problem Solving with Linear Equations

KA8439

## Worksheet

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#### HOW TO USE THE VIDEO AND WORKSHEET

- The "STOP TO THINK" signal means pause to think.
- The "STOP TO WORK" signal means work the problem(s).
- Rewind the tape and watch the lesson again if the concept is not clear.
- Students should complete the exercises on the worksheet to confirm their understanding of this lesson.

Instructors may duplicate the worksheets as needed

## I. VIDEOTAPE FOLLOW-UP QUESTIONS

- In Problem 1 we found  $y=4x+4$ .
  - What did the variables  $x$  and  $y$  represent?
  - How many tiles are in the frame of figure #19?
  - Which figure has a frame of 160 tiles?
- In Problem 2 we found  $y=-240x+15,000$ .
  - What did the variables  $x$  and  $y$  represent?
  - How many hours would it take this pump to empty the pool half-way?
- What is meant by the “zero” or the “root” of a linear function  $f(x)=ax+b$ ? Can the zero equal zero? Give an example.
- How many zeros (or roots) does a linear function of the form  $f(x)=ax+b$  have?
- Where, on its graph, do we find the zero of a linear function?

## II. SUPPLEMENTARY EXERCISES

1.



Figure:	1	2	3	4
Partial Frame:	5	8	11	14

In the following sequence of figures, the “partial frame” consists of the tiles bordering the darkened square on three sides.

- Find the linear relationship between the figure number  $x$  and the number of tiles  $y$  in the partial frame.
  - A figure in this sequence has a partial frame of 83. What is the figure number?
- A large bucket contains 5 liters of water. More water is then added at a rate of 4.5 liters per minute.
    - Write the linear relationship between the number of minutes  $x$  and the corresponding volume  $y$  of the bucket, in liters.
    - How long (in minutes) will it take to fill the bucket (maximum capacity 95 liters)?
  - Solve the following equations for  $x$ .
    - $3x-4=x-7$
    - $-0.5x+7+2x=10$
    - $2(x-3)=5x-8$
  - Find the zero (or root) of  $f(x)=-5x+7$ .

## III. INVESTIGATIVE PROBLEM

- Situation:** Suppose you wish to purchase a \$250-VCR, so you get a full-time summer job in a restaurant for one month. Your salary is \$5.25 per hr., but you must pay for the gas required to commute to work by car (\$20/month).
  - Derive the equation of the linear function relating the number of hours  $x$  to the money earned  $y$  (in dollars).
  - How many hours must you work in order to afford purchasing the VCR?
  - Explain how you solved this problem by functional exploration.
  - Show how you solved this problem by symbol manipulation.