Did You Know?

Have you ever seen a walking race? You may have thought the walking style of the racers seemed rather strange. Race walkers must follow two rules:

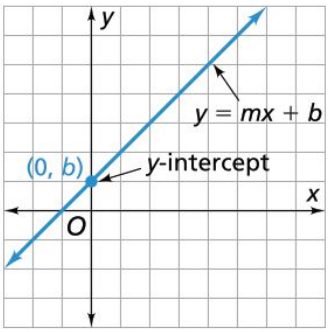
- The walker must always have one foot in contact with the ground.
- The walker's leg must be straight from the time it strikes the ground until it passes under the body.

A champion race walker can cover a mile in about 6.5 minutes. It takes most people 15 to 20 minutes to walk a mile.

2.3 Comparing Costs

Comparing Relationships

All of the linear relationships you have studied so far can be written in the form $y = mx + b$, or $y = b + mx$. In this equation, y depends on x.

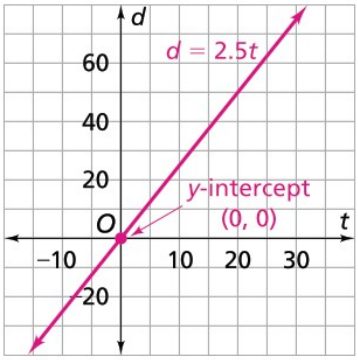


In Problem 2.2, you found the points at which Emile's and Henri's graphs cross the y-axis. These points are called the *y-intercepts*. The **y-intercept** is the point where the line crosses the y-axis, or when $x = 0$. The coordinates of the y-intercept for the graph shown above are $(0, b)$. To save time, we sometimes refer to the number b, rather than the coordinates of the point $(0, b)$, as the y-intercept.

A **coefficient** is the number that multiplies a variable in an equation. The m in $y = mx + b$ is the coefficient of x, so mx means m times x.

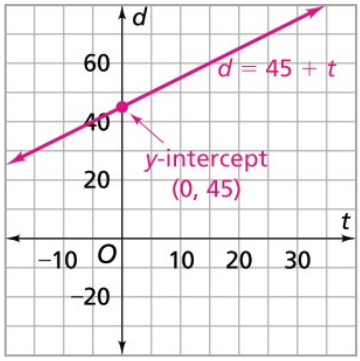
- You can represent the distance d_{Emile} that Emile walks after t seconds with the equation, $d_{\text{Emile}} = 2.5t$. The y-intercept is (0, 0), and the coefficient of t is 2.5. You multiply Emile's walking rate by the time t he walks. He starts at a distance of 0 meters.

Emile



- You can represent the distance d_{Henri} that Henri is from where Emile started with the equation, $d_{\text{Henri}} = 45 + t$, where t is the time in seconds. The y-intercept is (0, 45), and the coefficient of t is 1.

Henri



A **solution of an equation** is an ordered pair that makes the equation true and lies on the graph of the line.

- Is (0, 45) a solution of the equation $d_{\text{Henri}} = 45 + t$? Explain.
- What would t be if $(t, 48)$ is a solution? Explain.
- What would d be if $(10, d)$ is a solution? Explain.

In this Problem, you will look at situations represented by an equation or a table.

Problem 2.3

Ms. Chang's class decides to give T-shirts to each person who participates in the walkathon. They receive bids for the cost of the T-shirts from two different companies. Mighty Tee charges \$49 plus \$1 per T-shirt. No-Shrink Tee charges \$4.50 per T-shirt. Ms. Chang writes the following equations to represent the relationships relating cost to the number of T-shirts:

$$C_{\text{Mighty}} = 49 + n$$

$$C_{\text{No-Shrink}} = 4.5n$$

The number of T-shirts is n. C_{Mighty} is the cost in dollars for Mighty Tee. $C_{\text{No-Shrink}}$ is the cost in dollars for No-Shrink Tee.

A

1. For each equation, explain what information the y-intercept and the coefficient of n represent. What is the independent variable? What is the dependent variable?
2. For each company, what is the cost for 12 T-shirts? For 20 T-shirts?
3. Lani calculates that the school has about \$120 to spend on T-shirts. From which company will \$120 buy the most T-shirts? Explain your answer.
4. **a.** For what number of T-shirts is the cost of the two companies equal? What is that cost? Explain how you found the answers.
   b. How can this information be used to decide which plan to choose?
5. **a.** Explain why the relationship between the cost and the number of T-shirts for each company is linear.
   b. In each equation, what is the pattern of change between the two variables? That is, by how much does C change for every 1 unit that n increases?
   c. How is this situation similar to the previous two Problems?

Problem 2.3 continued

B The following table represents the costs from another company, The Big T.

T-Shirt Costs

n	*C*
0	34
3	41.5
5	46.5
8	54
10	59

1. Compare the costs for this company to the costs for the two companies in Question A.
2. Is the relationship between the two variables in this plan linear? If so, what is the pattern of change between the two variables?
3. **a.** Would the point (20, 84) lie on the graph of this cost plan? Explain.
   b. What information about the number of T-shirts and cost do the coordinates of the point (20, 84) represent?
   c. What equation relates C and n?
   d. Would (20, 80) be a solution of the equation? Would (14, 69) be a solution? Explain.

ACE Homework starts on page 38.