Modeling Linear Relationships

A rental car company offers a rental package for a midsize car. The cost is comprised of a fixed $30 administrative fee for the cleaning and maintenance of the car plus a rental cost of $35 per day.

1. Using x for the number of days and y for the total cost in dollars, construct a function to model the relationship between the number of days and the total cost of renting a midsize car.

2. The same company is advertising a deal on compact car rentals. The linear function $y = 30x + 15$ can be used to model the relationship between the number of days (x) and the total cost (y) of renting a compact car.

    a.   What is the fixed administrative fee?

   b.   What is the rental cost per day?

1. Recall that Lenore was investigating two wireless access plans. Her friend in Europe says that he uses a plan in which he pays a monthly fee of 30 euros plus 0.02 euros per minute of use.

    a. Construct a table of values for his plan's monthly cost based on 100 minutes of use for the month, 200 minutes of use, and so on up to 1,000 minutes of use. (The charge of 0.02 euros per minute of use is equivalent to 2 euros per 100 minutes of use.)

    b. Plot these 10 points on a carefully labeled graph, and draw the line that contains these points.

    c. Let x represent minutes of use and y represent the total monthly cost in euros. Construct a linear function that determines monthly cost based on minutes of use.

    d. Use the function to calculate the cost under this plan for 750 minutes of use. If you were to add this point to the graph, would it be above the line, below the line, or on the line?

2. A shipping company charges a $4.45 handling fee in addition to $0.27 per pound to ship a package.

    a. Using x for weight in pounds and y for the cost of shipping in dollars, write a linear function that determines the cost of shipping based on weight.

    b. Which line (solid, dotted, or dashed) on the graph below represents the shipping company's pricing method? Explain.
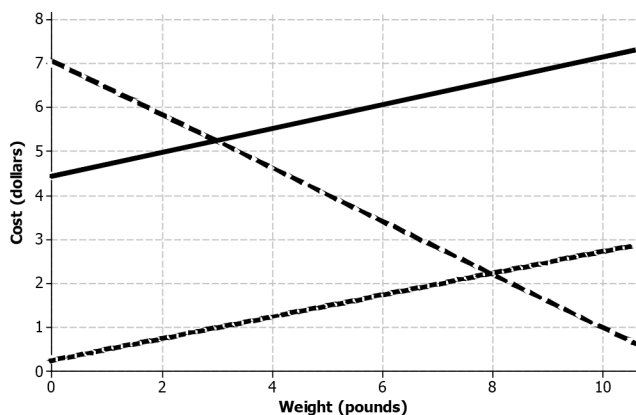
3. Kelly wants to add new music to her MP3 player. Another subscription site offers its downloading service using the following: Total Monthly Cost $= 5.25 + 0.30$(number of songs).

    a. Write a sentence (all words, no math symbols) that the company could use on its website to explain how it determines the price for MP3 downloads for the month.

    b. Let x represent the number of songs downloaded and y represent the total monthly cost in dollars. Construct a function to model the relationship between the number of songs downloaded and the total monthly cost.

    c. Determine the cost of downloading 10 songs.

4. Li Na is saving money. Her parents gave her an amount to start, and since then she has been putting aside a fixed amount each week. After six weeks, Li Na has a total of $82 made of her own savings in addition to the amount her parents gave her. Fourteen weeks from the start of the process, Li Na has $118.

    a. Using x for the number of weeks and y for the amount in savings (in dollars), construct a linear function that describes the relationship between the number of weeks and the amount in savings.

    b. How much did Li Na's parents give her to start?

    c. How much does Li Na set aside each week?

    d. Draw the graph of the linear function below (start by plotting the points for $x = 0$ and $x = 20$).
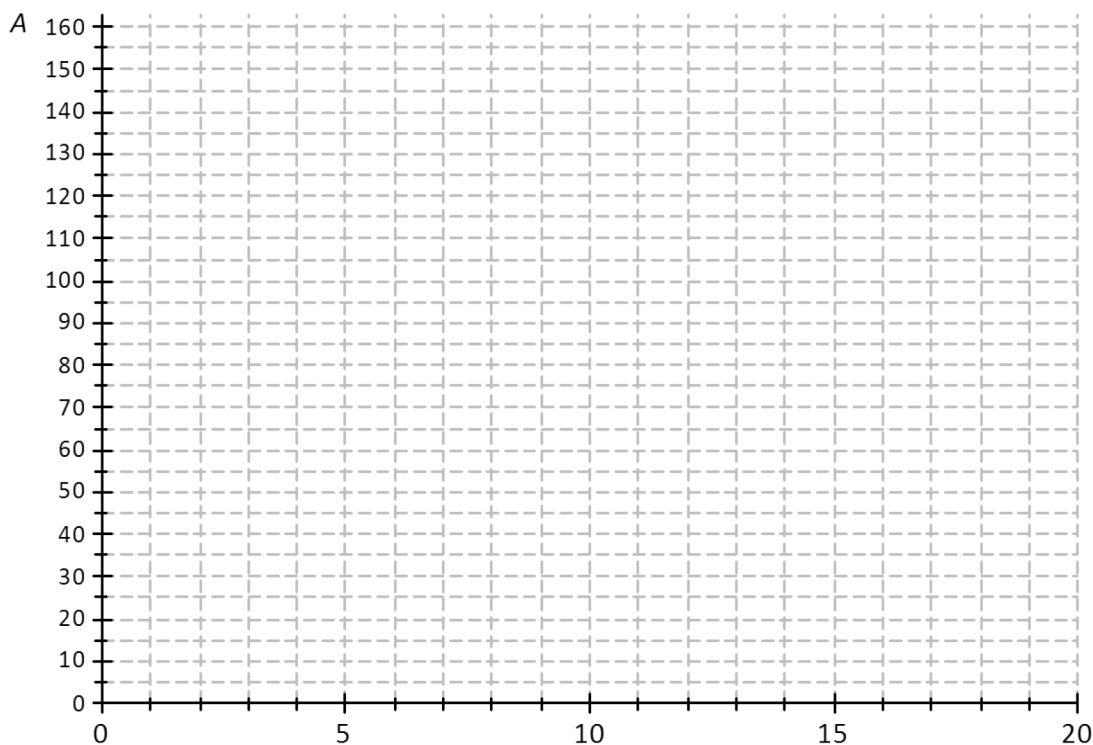
A rental car company offers a rental package for a midsize car. The cost is comprised of a fixed $30 administrative fee for the cleaning and maintenance of the car plus a rental cost of $35 per day.

1. Using x for the number of days and y for the total cost in dollars, construct a function to model the relationship between the number of days and the total cost of renting a midsize car.

   $y = 35x + 30$

2. The same company is advertising a deal on compact car rentals. The linear function $y = 30x + 15$ can be used to model the relationship between the number of days (x) and the total cost (y) of renting a compact car.

   a. What is the fixed administrative fee?

   *The administrative fee is $15.*

   b. What is the rental cost per day?

   It costs $30 per day to rent the compact car.

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1. Recall that Lenore was investigating two wireless access plans. Her friend in Europe says that he uses a plan in which he pays a monthly fee of 30 euros plus 0.02 euros per minute of use.

   a. Construct a table of values for his plan's monthly cost based on 100 minutes of use for the month, 200 minutes of use, and so on up to 1,000 minutes of use. (The charge of 0.02 euros per minute of use is equivalent to 2 euros per 100 minutes of use.)

Number of Minutes	Total Monthly Cost (€)
100	32.00
200	34.00
300	36.00
400	38.00
500	40.00
600	42.00
700	44.00
800	46.00
900	48.00
1,000	50.00

   b. Plot these 10 points on a carefully labeled graph, and draw the line that contains these points.
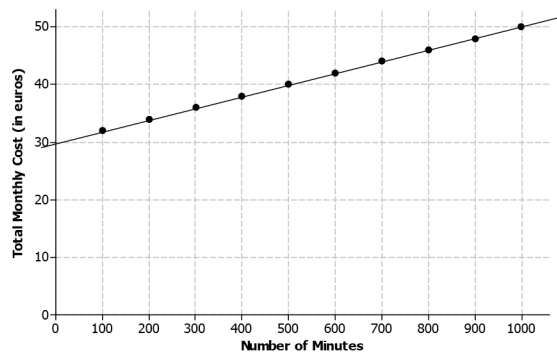
c. Let x represent minutes of use and y represent the total monthly cost in euros. Construct a linear function that determines monthly cost based on minutes of use.

$y = 30 + 0.02x$

d. Use the function to calculate the cost under this plan for 750 minutes of use. If you were to add this point to the graph, would it be above the line, below the line, or on the line?

*The cost for 750 minutes would be €45. The point (750, 45) would be on the line.*

2. A shipping company charges a $\$4.45$ handling fee in addition to $\$0.27$ per pound to ship a package.

a. Using x for weight in pounds and y for the cost of shipping in dollars, write a linear function that determines the cost of shipping based on weight.

$y = 4.45 + 0.27x$

b. Which line (solid, dotted, or dashed) on the graph below represents the shipping company's pricing method? Explain.

The solid line would be the correct line. Its initial value is 4.45, and its slope is 0.27. The dashed line shows the cost decreasing as weight increase, so that is not correct. The dotted line starts at an initial value that is too low.
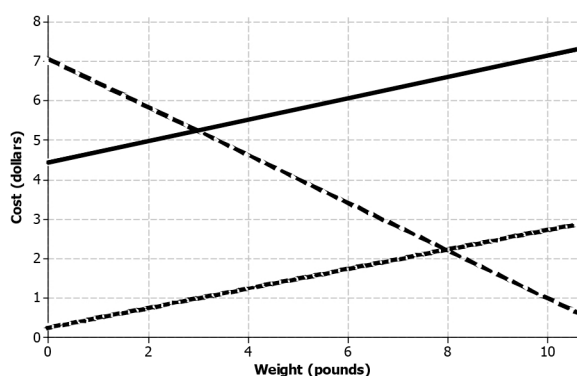
3. Kelly wants to add new music to her MP3 player. Another subscription site offers its downloading service using the following: $\text{Total Monthly Cost} = 5.25 + 0.30(\text{number of songs})$.

a. Write a sentence (all words, no math symbols) that the company could use on its website to explain how it determines the price for MP3 downloads for the month.

"We charge a $\$5.25$ subscription fee plus 30 cents per song."

b. Let x represent the number of songs downloaded and y represent the total monthly cost in dollars. Construct a function to model the relationship between the number of songs downloaded and the total monthly cost.

$y = 5.25 + 0.30x$

c. Determine the cost of downloading 10 songs.

$5.25 + 0.30(10) = \$8.25$

4. Li Na is saving money. Her parents gave her an amount to start, and since then she has been putting aside a fixed amount each week. After six weeks, Li Na has a total of $82 made of her own savings in addition to the amount her parents gave her. Fourteen weeks from the start of the process, Li Na has $118.

a. Using x for the number of weeks and y for the amount in savings (in dollars), construct a linear function that describes the relationship between the number of weeks and the amount in savings.

The points $(6, 82)$ and $(14, 118)$ have been given.

So, the rate of change is $\frac{118-82}{14-6} = \frac{36}{8} = 4.5$.

Using the rate of change and $(6, 82)$:

$82 = 4.5(6) + b$
$82 = 27 + b$
$55 = b$

The function is $y = 4.5x + 55$.

b. How much did Li Na's parents give her to start?

Li Na's parents gave her $55 to start.

c. How much does Li Na set aside each week?

Li Na is setting aside $4.50 every week for savings.

d. Draw the graph of the linear function below (start by plotting the points for $x = 0$ and $x = 20$).