Name _____ Date _____

Constant Rate

Vicky reads at a constant rate. She can read 5 pages in 9 minutes. We want to know how many pages, p, Vicky can read after t minutes.

a. Write a linear equation in two variables that represents the number of pages Vicky reads in any given time interval.

b. Complete the table below. Use a calculator and round answers to the tenths place.

t (time in minutes)	Linear equation:	p (pages read)
0		
20		
40		
60		

c. About how long would it take Vicky to read 25 pages? Explain.

1. A train travels at a constant rate of 45 miles per hour.
   a. What is the distance, d, in miles, that the train travels in t hours?
   b. How many miles will it travel in 2.5 hours?

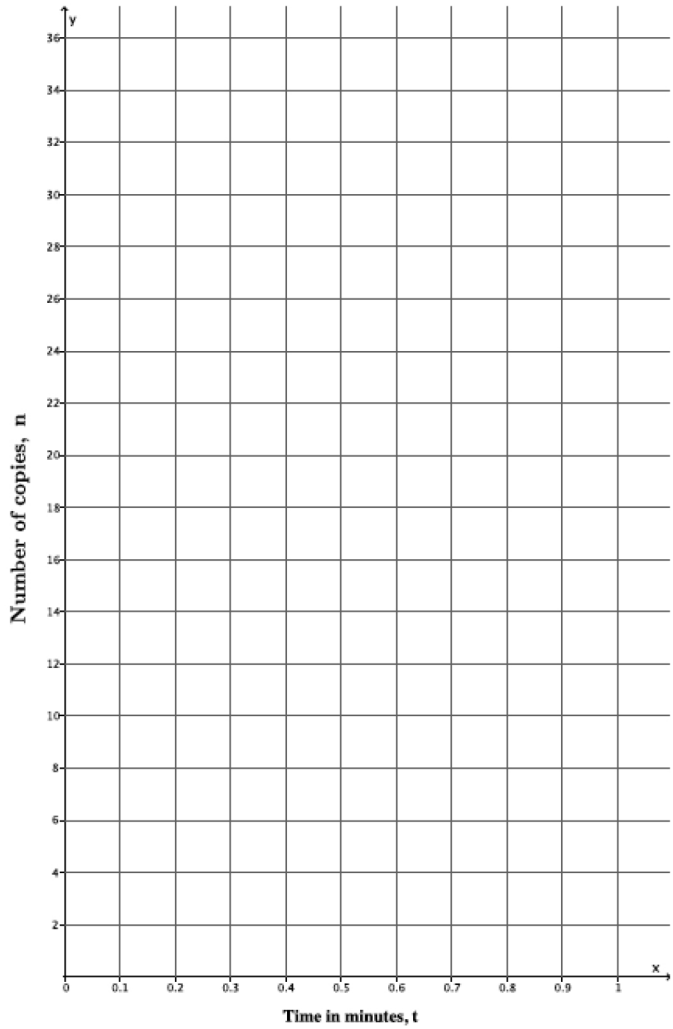
2. Water is leaking from a faucet at a constant rate of $\frac{1}{3}$ gallons per minute.
   a. What is the amount of water, w, in gallons per minute, that is leaked from the faucet after t minutes?
   b. How much water is leaked after an hour?

3. A car can be assembled on an assembly line in 6 hours. Assume that the cars are assembled at a constant rate.
   a. How many cars, y, can be assembled in t hours?
   b. How many cars can be assembled in a week?

4. A copy machine makes copies at a constant rate. The machine can make 80 copies in $2\frac{1}{2}$ minutes.
   a. Write an equation to represent the number of copies, n, that can be made over any time interval, t.
   b. Complete the table below.

t (time in minutes)	Linear equation:	n (number of copies)
0		
0.25		
0.5		
0.75		
1		

c. Graph the data on a coordinate plane.



d. The copy machine runs for 20 seconds, then jams. About how many copies were made before the jam occurred? Explain.

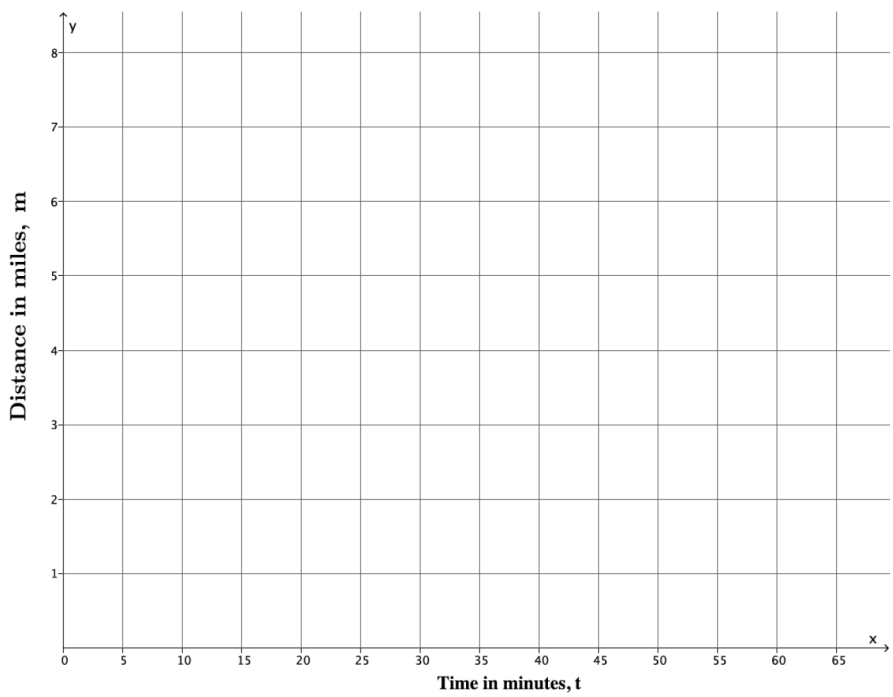
5. Connor runs at a constant rate. It takes him 34 minutes to run 4 miles.

   a. Write the linear equation in two variables that represents the number of miles Connor can run in any given time interval, t.

   b. Complete the table below. Use a calculator and round answers to the tenths place.

t (time in minutes)	Linear equation:	m (distance in miles)
0		
15		
30		
45		
60		

   c. Graph the data on a coordinate plane.



   d. Connor ran for 40 minutes before tripping and spraining his ankle. About how many miles did he run before he had to stop? Explain.

Vicky reads at a constant rate. She can read 5 pages in 9 minutes. We want to know how many pages, p, Vicky can read after t minutes.

a. Write a linear equation in two variables that represents the number of pages Vicky reads in any given time interval.

Let C represent the constant rate that Vicky reads in pages per minute. Then,

$\frac{5}{9} = C$, *and* $\frac{p}{t} = C$; *therefore,* $\frac{5}{9} = \frac{p}{t}$.

$$\frac{5}{9} = \frac{p}{t}$$
$$9p = 5t$$
$$\frac{9}{9}p = \frac{5}{9}t$$
$$p = \frac{5}{9}t$$

b. Complete the table below. Use a calculator and round answers to the tenths place.

t (time in minutes)	Linear equation: $p = \frac{5}{9}\mathrm{t}$	p (pages read)
0	$p = \frac{5}{9}(0)$	0
20	$p = \frac{5}{9}(20)$	$\frac{100}{9} \approx 11.1$
40	$p = \frac{5}{9}(40)$	$\frac{200}{9} \approx 22.2$
60	$p = \frac{5}{9}(60)$	$\frac{300}{9} \approx 33.3$

c. About how long would it take Vicky to read 25 pages? Explain.

It would take her a little over 40 minutes. After 40 minutes, she can read about 22.2 pages, and after 1 hour she can read about 33.3 pages. Since 25 pages is between 22.2 and 33.3, it will take her between 40 and 60 minutes to read 25 pages.

Students practice writing two-variable equations that represent a constant rate.

1. A train travels at a constant rate of 45 miles per hour.

a. What is the distance, d, in miles, that the train travels in t hours?

Let C be the constant rate the train travels. Then, $\frac{45}{1} = C$, *and* $\frac{d}{t} = C$; *therefore,* $\frac{45}{1} = \frac{d}{t}$.

$$\frac{45}{1} = \frac{d}{t}$$
$$d = 45t$$

b. **How many miles will it travel in 2.5 hours?**

$$\begin{aligned} d &= 45(2.5) \\ &= 112.5 \end{aligned}$$

The train will travel 112.5 miles in 2.5 hours.

2. **Water is leaking from a faucet at a constant rate of $\frac{1}{3}$ gallons per minute.**

a. **What is the amount of water, w, in gallons per minute, that is leaked from the faucet after t minutes?**

Let C be the constant rate the water leaks from the faucet in gallons per minute. Then,

$\frac{\frac{1}{3}}{1} = C$, *and* $\frac{w}{t} = C$; *therefore,* $\frac{\frac{1}{3}}{1} = \frac{w}{t}$.

$$\begin{aligned} \frac{\frac{1}{3}}{1} &= \frac{w}{t} \\ w &= \frac{1}{3}t \end{aligned}$$

b. **How much water is leaked after an hour?**

$$\begin{aligned} w &= \frac{1}{3}t \\ &= \frac{1}{3}(60) \\ &= 20 \end{aligned}$$

The faucet will leak 20 gallons in one hour.

3. **A car can be assembled on an assembly line in 6 hours. Assume that the cars are assembled at a constant rate.**

a. **How many cars, y, can be assembled in t hours?**

Let C be the constant rate the cars are assembled in cars per hour. Then,

$\frac{1}{6} = C$, *and* $\frac{y}{t} = C$; *therefore,* $\frac{1}{6} = \frac{y}{t}$.

$$\begin{aligned} \frac{1}{6} &= \frac{y}{t} \\ 6y &= t \\ \frac{6}{6}y &= \frac{1}{6}t \\ y &= \frac{1}{6}t \end{aligned}$$

b. **How many cars can be assembled in a week?**

A week is $24 \times 7 = 168$ hours. So, $y = \frac{1}{6}(168) = 28$. Twenty-eight cars can be assembled in a week.

4. A copy machine makes copies at a constant rate. The machine can make 80 copies in $2\frac{1}{2}$ minutes.

a. Write an equation to represent the number of copies, n, that can be made over any time interval, t.

Let C be the constant rate that copies can be made in copies per minute. Then,

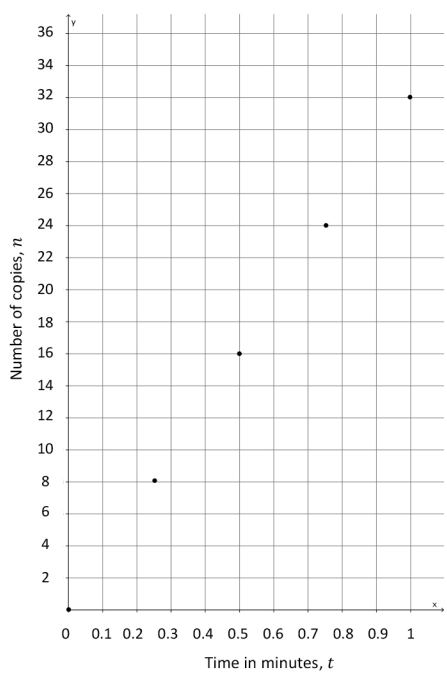
$\frac{80}{2\frac{1}{2}} = C$, *and* $\frac{n}{t} = C$; *therefore,* $\frac{80}{2\frac{1}{2}} = \frac{n}{t}$.

$$\frac{80}{2\frac{1}{2}} = \frac{n}{t}$$
$$2\frac{1}{2}n = 80t$$
$$\frac{5}{2}n = 80t$$
$$\frac{2}{5} \cdot \frac{5}{2}n = \frac{2}{5} \cdot 80t$$
$$n = 32t$$

b. Complete the table below.

t (time in minutes)	Linear equation: $n = 32t$	n (number of copies)
0	$n = 32(0)$	0
0.25	$n = 32(0.25)$	8
0.5	$n = 32(0.5)$	16
0.75	$n = 32(0.75)$	24
1	$n = 32(1)$	32

c. Graph the data on a coordinate plane.



d. **The copy machine runs for 20 seconds, then jams. About how many copies were made before the jam occurred? Explain.**

Since 20 seconds is 0.3 of a minute, then the number of copies made will be between 8 and 16 because 0.3 is between 0.25 and 0.5.

5. **Connor runs at a constant rate. It takes him 34 minutes to run 4 miles.**

a. **Write the linear equation in two variables that represents the number of miles Connor can run in any given time interval, t.**

Let C be the constant rate that Connor runs in miles per minute, and let m represent the number of miles he ran in t minutes. Then,

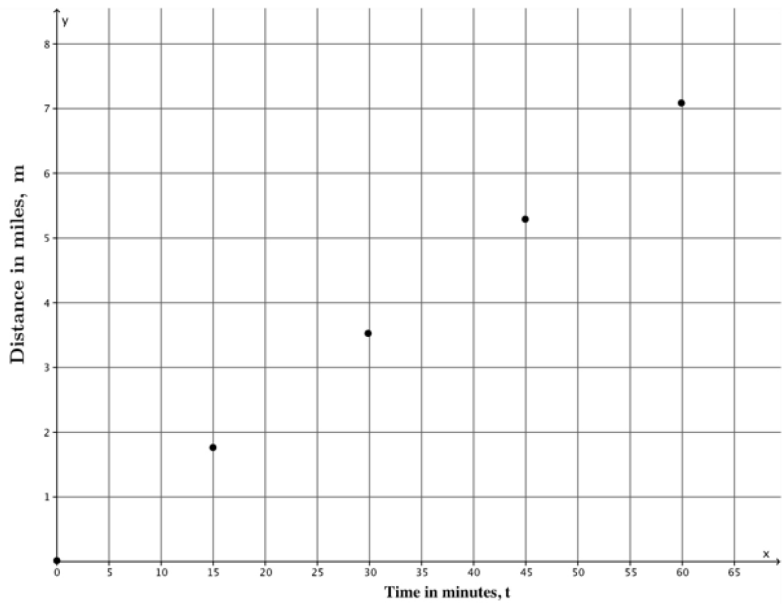
$\frac{4}{34} = C$, *and* $\frac{m}{t} = C$; *therefore,* $\frac{4}{34} = \frac{m}{t}$.

$$\begin{aligned} \frac{4}{34} &= \frac{m}{t} \\ 34m &= 4t \\ \frac{34}{34}m &= \frac{4}{34}t \\ m &= \frac{4}{34}t \\ m &= \frac{2}{17}t \end{aligned}$$

b. **Complete the table below. Use a calculator and round answers to the tenths place.**

t (time in minutes)	Linear equation: $m = \frac{2}{17}t$	m (distance in miles)
0	$m = \frac{2}{17}(0)$	0
15	$m = \frac{2}{17}(15)$	$\frac{30}{17} \approx 1.8$
30	$m = \frac{2}{17}(30)$	$\frac{60}{17} \approx 3.5$
45	$m = \frac{2}{17}(45)$	$\frac{90}{17} \approx 5.3$
60	$m = \frac{2}{17}(60)$	$\frac{120}{17} \approx 7.1$

c. **Graph the data on a coordinate plane.**



d. **Connor ran for 40 minutes before tripping and spraining his ankle. About how many miles did he run before he had to stop? Explain.**

Since Connor ran for 40 minutes, he ran more than 3.5 miles, but less than 5.3 miles. Since 40 is between 30 and 45, then we can use those reference points to make an estimate of how many miles he ran in 40 minutes, probably about 5 miles.