

## Lesson 4.1

## Unit 4 Homework Key

**Define variables and create equations for each of the following linear situations.**

1. It will cost \$45 to replace the chain on your bicycle plus \$15 per hour of labor.

$t = \text{total cost}$  and  $h = \text{hours of labor}$ ;  $t = 15h + 45$

2. It takes you 11 minutes for every 2 miles you run.

$m = \text{minutes}$  and  $r = \text{miles ran}$ ;  $m = \frac{11}{2}r$

3. You spend 5 minutes on every 2 questions on the test.

$m = \text{minutes}$  and  $q = \text{questions}$ ;  $m = \frac{5}{2}q$

4. It takes you 9 minutes for every 2 toilets to clean, and you have already spent 45 minutes cleaning the house.

$m = \text{minutes cleaning}$  and  $t = \text{toilets cleaned}$ ;  $m = \frac{9}{2}t + 45$

5. Your parents pay you \$5 for every hour you babysit.

$m = \text{money earned}$  and  $h = \text{hours of babysitting}$ ;  $m = 5h$

6. The musical cast started with \$1200 in donations and earns \$45 for every 6 tickets sold.

$m = \text{total money earned}$  and  $t = \text{number of tickets sold}$ ;  $m = \frac{45}{6}t + 1200$

7. At the beginning of the year, you receive 20 free participation points. You can lose 2 participation points every time you forget to bring your supplies to class.

$p = \text{participation points}$  and  $s = \text{number of times supplies forgotten}$ ;  $p = -2s + 20$  OR  $p = 20 - 2s$

8. Student council ordered one pizza for every 4 students that are attending the after school dance.

$p = \text{number of pizzas ordered}$  and  $s = \text{number of students attending}$ ;  $p = \frac{1}{4}s$

9. Which of the problems above are proportional and how do you know?

Problems 2, 3, 5, and 8 because they have no initial value (or initial value of zero).

**Use the given equation to solve the linear questions.**

10. If a roller coaster starts 12 meters above the ground and climbs 2 meters every second ( $s$ ), the roller coaster's height ( $h$ ) would be based on the equation  $h = 2s + 12$ . How long would it take to reach the top of the hill that is 80 meters above the ground?

$s = 34 \text{ seconds}$

11. If it is going to cost you \$525 dollars to start a lawn care business with your friend, but you will earn an average of \$73 for every 4 yards ( $y$ ), your profit ( $p$ ) is based on the equation  $p = \frac{73}{4}y - 525$ . How much profit would you make if you were scheduled to mow 48 yards the first summer?

$p = \$351$

12. It was raining at a rate of 1 inch every 3 hours. If it rained at that constant rate for 6 hours ( $h$ ), how many inches of rain ( $r$ ) would there be if you followed the equation  $r = \frac{1}{3}h$ ?

$r = 2 \text{ inches}$

13. It costs \$550 for buses to transport students to the C. A. N. D. L. E. S. Holocaust Museum in Terre Haute, Indiana. If the museum charges \$5 for every 2 students ( $s$ ), the total cost ( $c$ ) of the trip is based on the equation  $c = \frac{5}{2}s + 550$ . How much would it cost to bring 196 students?

$$c = \$1040$$

14. School policy states that there must be one teacher for every 24 students. If there are 120 students attending the field trip, how many teachers would be necessary to chaperone if you followed the equation  $t = \frac{1}{24}s$ ?

$$t = 5 \text{ teachers}$$

15. If you spent \$10.35 total ( $t$ ) purchasing songs online for \$1.15 each, how many songs did you buy ( $s$ ) if you followed the equation  $t = 1.15s$ ?

$$s = 9 \text{ songs}$$

16. If a rose bush is planted when it is 14 inches tall and it grows three inches every five days ( $d$ ), its height ( $h$ ) is based on the equation  $h = \frac{3}{5}d + 14$ . How many days would it take for the rose bush to become 50 inches tall?

$$d = 60 \text{ days}$$

17. The average computer consumes 130 watts of power per hour. If your energy bill shows you used a total of 845 watts ( $w$ ) for a single day, for how many hours ( $h$ ) was your computer running if you followed the equation  $w = 130h$ .

$$6.5 \text{ hours}$$

18. Which of the above problems represent proportional situations and how do you know?

**Problems 12, 14, 15, and 17 because they have no initial value.**

**Create an equation to solve the following linear questions.**

19. A mama bird must gather 5 worms for every 2 baby birds in order to provide them with adequate nutrition. If she has 6 baby birds, how many worms must she find?

$$w = \frac{5}{2}b \quad w = 15 \text{ worms}$$

20. At the Charleston Bowling Lanes, it costs \$2 to rent shoes plus \$1.50 per game of bowling. How many games would you be able to bowl for \$11?

$$c = 1.5g + 2 \quad g = 6 \text{ games}$$

21. In the Tour De France Lance Armstrong pedaled at an average pace of 49 kilometers per hour. If the race is 3479 kilometers long, how long did Lance spend cycling?

$$d = 49t \quad t = 71 \text{ hour}$$

22. You've been working on your math homework for 25 minutes already. If it takes about 10 minutes for every 3 problems, how long will you have spent on homework if you only have 6 problems left?

$$m = \frac{10}{3}p + 25 \quad m = 45 \text{ minutes}$$

23. A famous fashion designer spent \$9.5 million on fabric for her new spring line. If she earns approximately \$1.2 million for each dress she sells, how many dresses will she have to sell to make a profit of \$14.5 million?

$$p = 1.2d - 9.5 \quad d = 20 \text{ dresses}$$

24. Your parents put a down payment on your car, but they are requiring you to pay the monthly payment of \$85. If you will have to pay a total of \$2125 for the car, how long will it take you to pay it off?

$$t = 85m \quad m = 25 \text{ months}$$

25. The Pick Your Burgers restaurant spent \$98,145 on food, utilities, and labor this month. If the average table of 4 customers spent \$73, how much profit did the restaurant make if they served 7092 customers?

$$p = \frac{73}{4}c - 98145 \quad p = \$31,284 \text{ profit}$$

26. On average, it takes 5 bales of hay to feed 2 horses. If you have 9 horses, how many bales of hay will you have to purchase?

$$b = \frac{5}{2}h \quad b = 22.5 \text{ bales of hay}$$

**Answer the following questions comparing linear function equations and descriptions.**

You are deciding which gas company to choose as you travel across the country on a long vacation with your family. Here is the information about the cost ( $c$ ) for gallons of gas ( $g$ ) for each company.

<b>Gas Up</b> Charges \$4.01 for each gallon of gas	<b>Automart</b> Charges \$81 for 20 gallons of gas
<b>The Fuel Shop</b> Cost is modeled by the equation $c = 4.03g$	<b>Full Tank</b> Cost is modeled by the equation $c = 4.10g$

27. Which company charges the most per gallon of gas? How do you know?

Full Tank at \$4.10

28. Which company charges the least per gallon of gas? How do you know?

Gas Up at \$4.01

29. How much would each company charge you for 12 gallons of gas? Which is the cheapest?

Gas Up: \$48.12      Automart: \$48.60      The Fuel Shop: \$48.36      Full Tank: \$49.20

Gas Up is the cheapest

30. If you had \$100 to spend on gas, how many gallons could you buy from each gas station?

Gas Up:  $\approx 24.94 \text{ gal}$       Automart:  $\approx 24.81 \text{ gal}$       The Fuel Shop:  $\approx 24.81 \text{ gal}$       Full Tank:  $\approx 24.39 \text{ gal}$

Gas Up is the cheapest

Dr. Kal is studying how age and gender affect calorie expenditure. Here is the information about the number of calories burned ( $c$ ) based on the number of miles ( $m$ ) walked in a day.

<b>Paul (25)</b> Burns 1390 calories plus 1040 calories from walking 10 miles	<b>Ishmael (58)</b> Burns 1305 calories plus 220 calories from walking 2 miles
<b>Jerika (31)</b> Calorie expenditure is based on the equation $c = 98m + 1225$	<b>Pamela (62)</b> Calorie expenditure is based on the equation $c = \frac{205}{2}m + 1189$

31. Who burns the most calories per mile, and how do you know?

Ishmael  $110 \frac{\text{cal}}{\text{mile}}$  (list rates of calorie burning)

32. Who burns the least calories per mile, and how do you know?

Jerika  $90 \frac{\text{cal}}{\text{mile}}$  (list rates of calorie burning)

33. Who burns the most calories without walking, and how do you know?

Paul 1390 cal because it is the highest initial value

34. How far would each person have to walk (to the nearest hundredth) to burn 2000 calories?

Paul: 5.87 miles      Ishmael: 6.32 miles      Jerika: 7.91 miles      Pamela: 7.91 miles

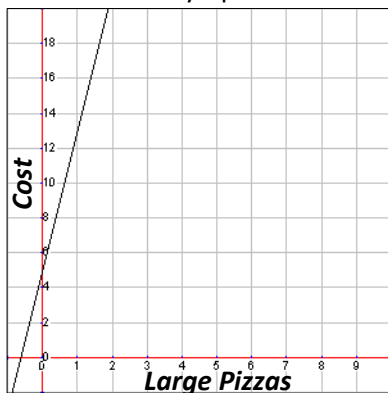
35. If each person walks 10 miles, who burns the most calories for that day?

Paul

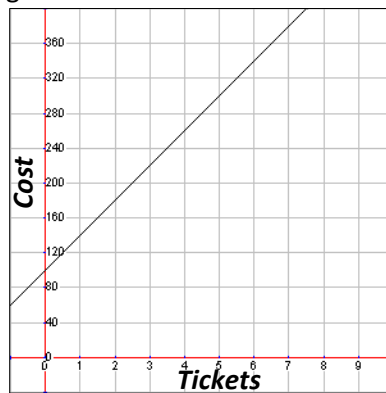
## Lesson 4.2

Create a graph for each of the following linear situations or equations.

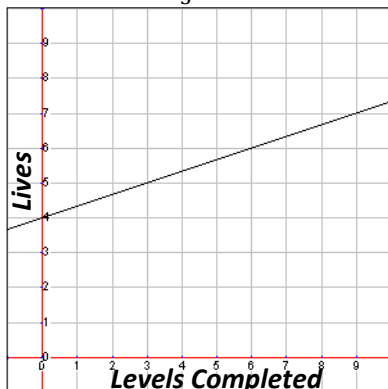
1. At Pizza Hut It costs \$8 for each large pizza plus \$5 for a delivery tip.



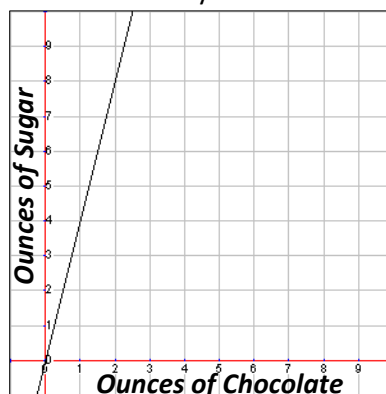
2. It costs \$40 per ticket to Six Flags plus \$100 for gas there and back.



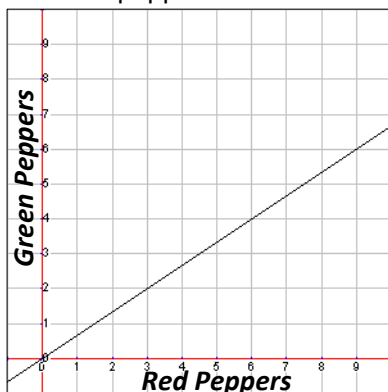
3. The number of lives ( $l$ ) based on the number of levels completed ( $c$ ) is determined by the following equation:  $l = \frac{1}{3}c + 4$



4. When making fudge, four ounces of sugar are needed for every ounce of chocolate.



5. For every 2 green peppers used in a salsa there are 3 red peppers used.

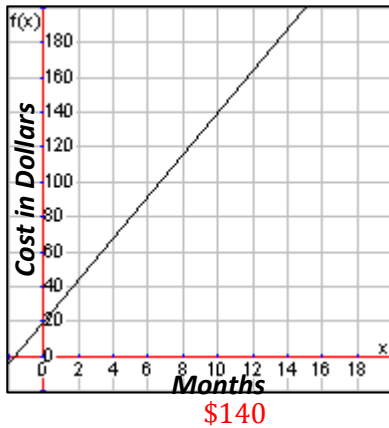


6. Mutant alien frogs from Zappax have a number of feet ( $f$ ) based on the number of toes they are born with ( $t$ ) according to the following equation:  $f = \frac{1}{7}t$ .

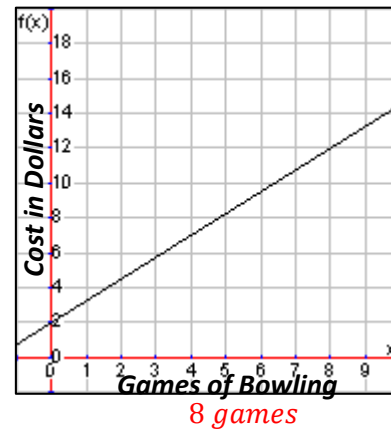


Use the given graph to solve the linear questions.

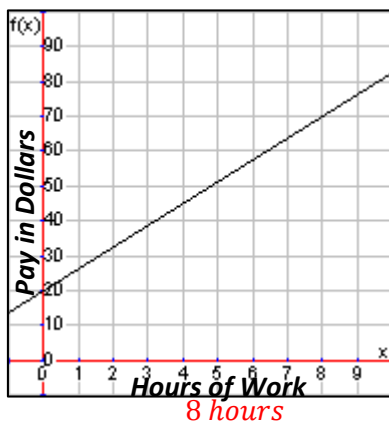
7. How much will it cost for ten months of internet service?



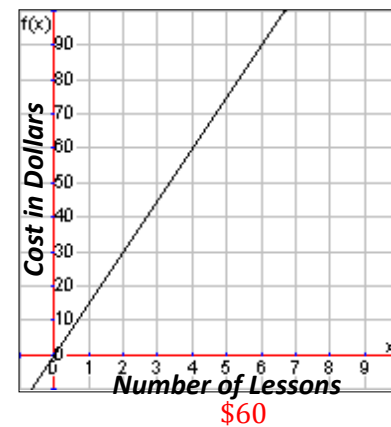
8. How many games of bowling can you play if you can spend \$12?



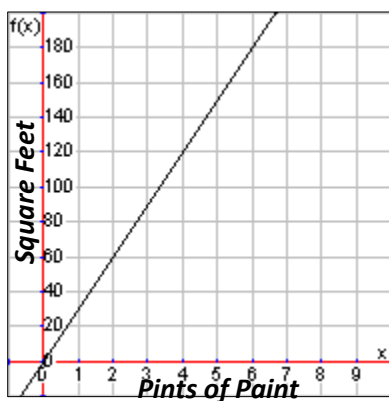
9. How many hours would you have to work to earn \$70?



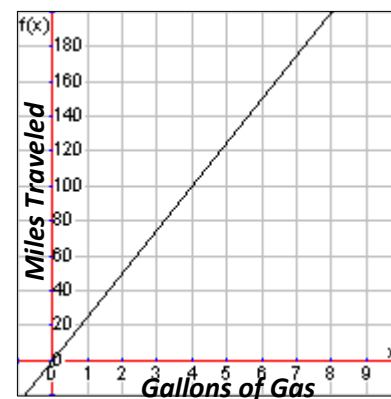
10. How much would it cost for four lessons?



11. How many pints of paint should you buy if you have to paint 120 square feet?



12. How many miles can you travel if you have four gallons of gas left in your tank?

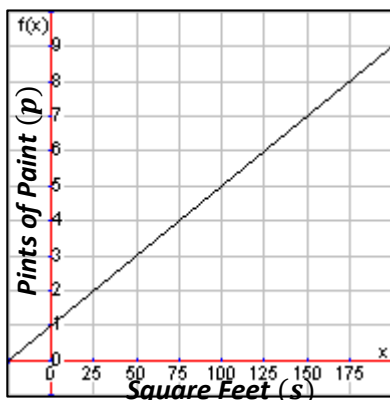


13. Which of the above graphs are proportional situations and how do you know?

Problems 10, 11, and 12 because they have an initial value of zero (go through the origin).

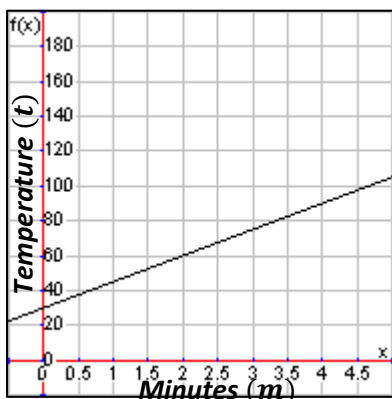
Create an equation for the following linear graphs.

14. Number of pints of paint ( $p$ ) needed for a certain number of square feet ( $s$ )



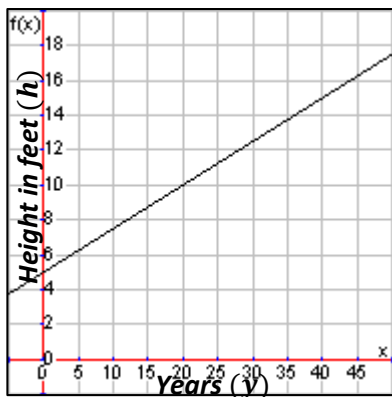
$$p = \frac{1}{25}s + 1$$

16. Temperature ( $t$ ) of water per minute ( $m$ ) of time on the stove



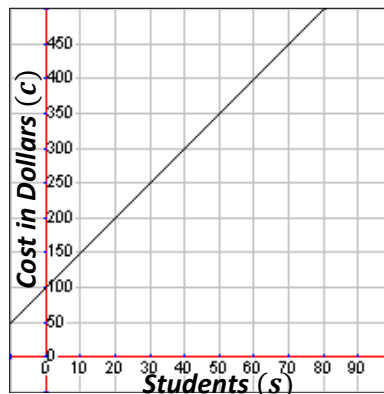
$$t = 15m + 30$$

18. A tree's height ( $h$ ) based on the number of years ( $y$ ) since being transplanted



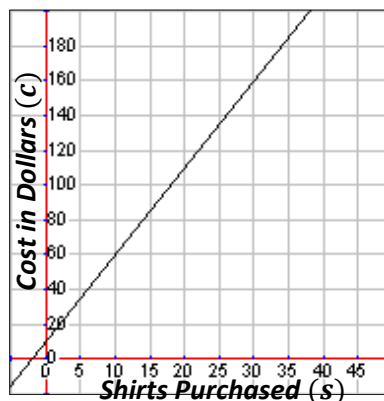
$$h = \frac{1}{4}y + 5$$

15. The cost ( $c$ ) of a field trip based on the number of students ( $s$ ) attending



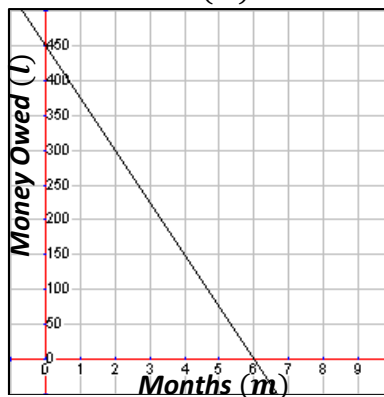
$$c = 5s + 100$$

17. Cost ( $c$ ) of an order depending on the number of shirts ( $s$ ) purchased



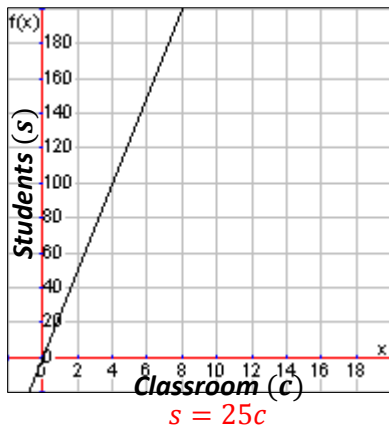
$$c = 5s + 10$$

19. Money you owe on your loan ( $l$ ) for your first car over time in months ( $m$ )

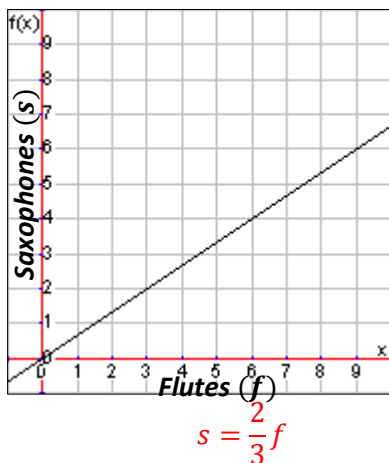


$$l = -50m + 450$$

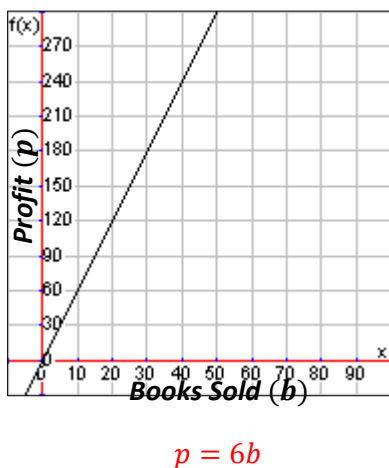
20. Number of students ( $s$ ) in every classroom ( $c$ )



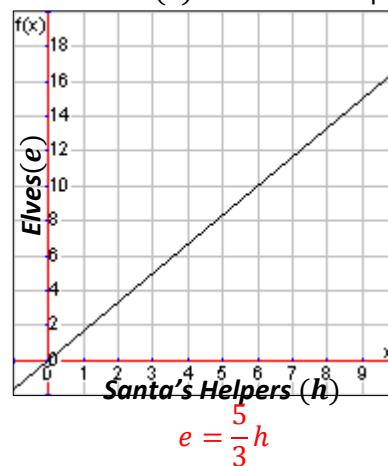
22. Number of saxophones ( $s$ ) compared to the number of flutes ( $f$ ) in an orchestra



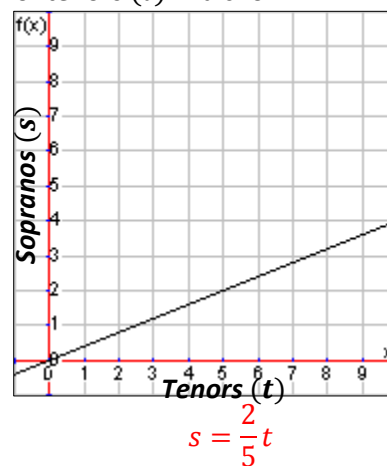
24. Amount of profit ( $p$ ) based on the number of books sold ( $b$ )



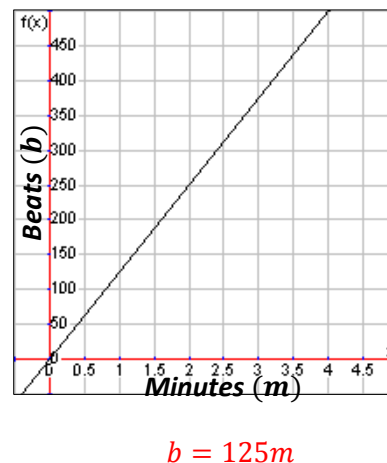
21. Number of elves ( $e$ ) for Santa's helpers ( $h$ )



23. Number of sopranos ( $s$ ) compared to the number of tenors ( $t$ ) in a choir.



25. Number of beats ( $b$ ) per minute ( $m$ ) in a hip-hop song



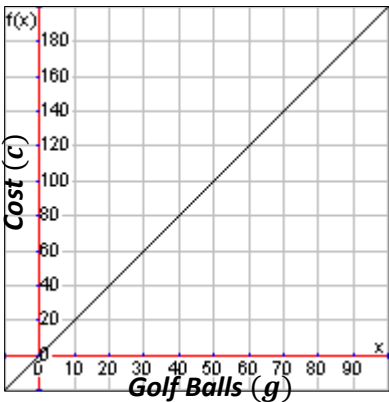
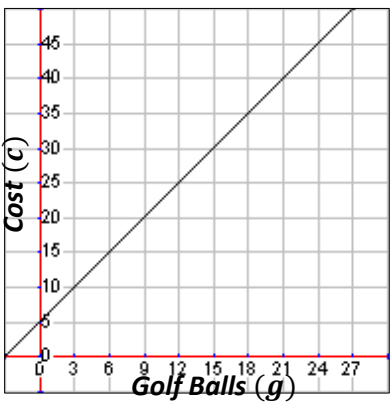
26. Which of the graphs from problems 14 to 25 are proportional and how do you know?

Problems 20 to 25 because they have initial values of zero.



**Answer the following questions comparing linear function equations, graphs and descriptions.**

Various golf ball manufacturers offer deals for packs of golf balls. Here is the information about the total cost ( $c$ ) for golf balls ( $g$ ) including shipping costs.

<p><b>Callaway</b> Charges a fee of \$10 for shipping and \$5 for 3 golf balls</p>	<p><b>Nike</b> Cost is modeled by the equation <math>c = \frac{5}{2}g + 5</math></p>
<p><b>Titleist</b></p>  <p>The graph shows a linear function on a coordinate plane. The x-axis is labeled 'Golf Balls (g)' and ranges from 0 to 90 with major grid lines every 10 units and minor grid lines every 2 units. The y-axis is labeled 'Cost (c)' and ranges from 0 to 180 with major grid lines every 20 units and minor grid lines every 4 units. A line starts at the origin (0,0) and passes through points such as (30, 60), (60, 120), and (90, 180).</p>	<p><b>Top-Flight</b></p>  <p>The graph shows a linear function on a coordinate plane. The x-axis is labeled 'Golf Balls (g)' and ranges from 0 to 27 with major grid lines every 3 units and minor grid lines every 1 unit. The y-axis is labeled 'Cost (c)' and ranges from 0 to 45 with major grid lines every 5 units and minor grid lines every 1 unit. A line starts at the y-intercept (0, 5) and passes through points such as (9, 20), (18, 35), and (27, 50).</p>

27. Which manufacturer has the cheapest cost per golf ball, and how do you know?

Callaway and Top-Flight tie at  $\approx \$1.67$  per ball (Titleist \$2 per ball and Nike \$2.50 per ball)

28. Which manufacturer has the cheapest shipping fee, and how do you know?

Titleist \$0 shipping, it's the y-intercept or initial value

29. How many golf balls could you buy at each company for \$200? Which manufacture would give you the most golf balls for that amount of money?

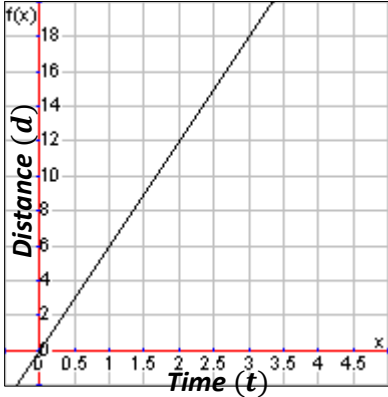
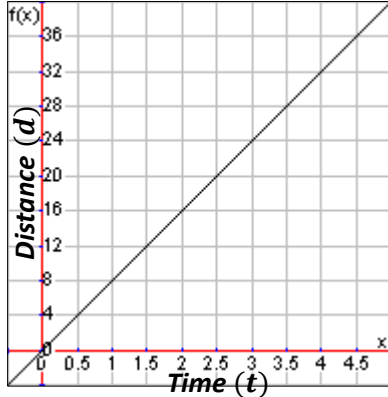
Cal: 114 golf balls      Nike: 78 golf balls      Titleist: 100 golf balls      Top-Flight: 117 golf balls  
Top-Flight

30. Which manufacturer would be the cheapest if you wanted to buy 30 golf balls?

Top-Flight \$55

**Answer the following questions comparing proportional function equations, graphs and descriptions.**

Scientists are studying how location affects the speed of a bottlenose dolphin. Here is the information about the distance ( $d$ ) in kilometers a dolphin traveled in terms of time ( $t$ ) in hours.

<b>Dolphin in Gulf of Mexico</b> Swims 11 kilometers in 2 hours	<b>Dolphin in Mediterranean Sea</b> Distance is modeled by the equation $d = \frac{35}{4}t$
<b>Dolphin in Indian Ocean</b> 	<b>Dolphin in North Atlantic Ocean</b> 

31. Which location has the fastest dolphin?

*Med Sea 8.75 kph*

32. Which location has the slowest dolphin?

*Gulf of Mex 5.5 kph*

33. How far could each dolphin travel in 4 hours? Which location has the dolphin that went the farthest?

*Gulf: 22 miles      Med Sea: 35 miles      Indian: 24 miles      North Atl: 32 miles, Med Sea farthest*

34. How long would it take each dolphin to swim 100 kilometers? Which location has the dolphin that finished in the shortest amount of time?

*Gulf:  $\approx 18.2$  hours*

*Med Sea:  $\approx 11.4$  hours*

*Indian:  $\approx 16.7$  hours*

*North Atl: 12.5 hours*

*Med Sea fastest*

## Lesson 4.3

Create a table for each of the following linear situations, equations or graphs.

1. Game Start charges \$45 ( $c$ ) for 2 video games ( $g$ ) purchased.

$g$	4	8	12	16	20
$c$	\$90	\$180	\$270	\$360	\$450

2. Susie's hair is 16 inches long and it grows 2 inches in length ( $l$ ) every 3 months ( $m$ )

$m$	3	6	9	12	15
$l$	18	20	22	24	26

3. The height ( $h$ ) of a tree in feet after a number of years ( $y$ ) is determined by the following equation:

$$h = \frac{1}{3}y + 7.$$

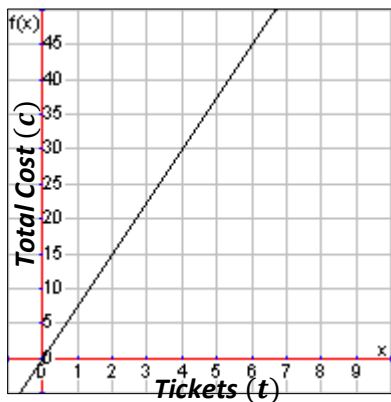
$y$	3	6	9	12	15
$h$	8	9	10	11	12

4. At Peter's Pizza Palace the total cost ( $c$ ) for pizzas ( $p$ ) can be determined by using the following

$$\text{equation: } c = \frac{9}{2}p.$$

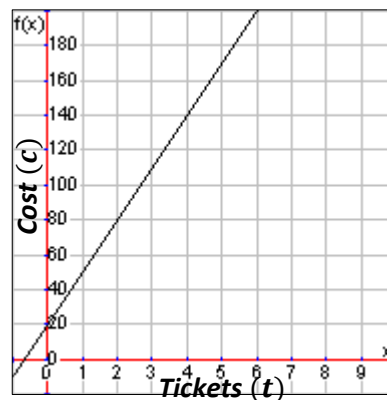
$p$	2	4	6	8	10
$c$	\$9	\$18	\$27	\$36	\$45

5. The graph shows the total cost ( $c$ ) per ticket ( $t$ ) for a student to go to the movies.



$t$	2	4	6	8	10
$c$	\$15	\$30	\$45	\$60	\$75

6. The graph shows the cost ( $c$ ) for tickets ( $t$ ) to see Taylor Swift in concert.



$t$	1	2	3	4	5
$c$	\$50	\$80	\$110	\$140	\$170

**Create an equation for the following linear tables.**

7. The total cost ( $c$ ) for miles ( $m$ ) traveled in a taxi.

$m$	2	4	6	8	10
$c$	\$4.50	\$6	\$7.50	\$9	\$10.50

$$c = 0.75m + 3$$

9. The total cost ( $c$ ) to buy guitar picks ( $p$ ).

$p$	5	10	15	20	25
$c$	\$2	\$4	\$6	\$8	\$10

$$c = 0.40p$$

11. The number of frogs ( $f$ ) ordered for students ( $s$ ) in science class.

$s$	9	15	21	27	33
$f$	7	9	11	13	15

$$f = \frac{1}{3}s + 4$$

13. The distance traveled ( $d$ ) in time in hours ( $h$ ).

$h$	2	3	4	5	6
$d$	14	21	28	35	42

$$d = 7h$$

15. The total weight of an aquarium ( $a$ ) holding gallons ( $g$ ) of water.

$g$	100	110	120	130	140
$a$	930	1015	1100	1185	1270

$$a = 8.5g + 80$$

8. The total cost ( $c$ ) per tournament ( $t$ )

$t$	2	4	6	8	10
$c$	\$225	\$400	\$575	\$750	\$925

$$c = 87.5t + 50$$

10. The money earned ( $m$ ) in a number of weeks ( $w$ ).

$w$	2	4	6	8	10
$m$	\$10	\$20	\$30	\$40	\$50

$$m = 5w$$

12. The total cost ( $c$ ) per hole of golf ( $g$ ).

$g$	9	18	27	36	45
$c$	\$15	\$30	\$45	\$60	\$75

$$c = \frac{5}{3}g$$

14. The amount of profit ( $p$ ) of a stand selling lemon shake-ups ( $l$ ).

$l$	250	300	350	400	450
$p$	\$50	\$200	\$350	\$500	\$650

$$p = 3l - 700$$

16. The length ( $l$ ) of a bungee cord that is stretched depending on the weight ( $w$ ) of the jumper.

$w$	100	110	120	130	140
$l$	80	83	86	89	92

$$l = 0.3w + 50$$

17. Which of problems 8 to 16 represent proportions and how do you know?

Problems 9, 10, 12, and 13 because they have an initial value of zero.

Use the given tables to solve the linear questions.

18. How many calories ( $c$ ) would you burn in a day if you walked 2 miles ( $m$ )?

$m$	4	5	6	7	8
$c$	1800	1900	2000	2100	2200

$$c = 1600$$

20. How many cups of cheese ( $c$ ) would you need for an 32-inch pizza ( $p$ )?

$p$	8	12	16	20	24
$c$	2	3	4	5	6

$$4.5 \text{ cups}$$

22. How much would it cost ( $c$ ) to buy 13 shirts ( $s$ ) at Kohl's?

$s$	2	4	6	8	10
$c$	\$10	\$30	\$50	\$70	\$90

$$c = \$120$$

24. How many CDs ( $c$ ) would an artist need to sell in order to make a profit ( $p$ ) of \$3,000?

$c$	50	60	70	80	90
$p$	\$2250	\$2300	\$2350	\$2400	\$2450

$$c = 200$$

19. How many minutes ( $m$ ) would it take for a pot of water to reach a temperature ( $t$ ) of 210°F?

$m$	1	2	3	4	5
$t$	85	110	135	160	185

$$m = 6$$

21. How many months ( $m$ ) could you afford the cost ( $c$ ) of your own cell phone if you have \$190?

$m$	2	4	6	8	10
$c$	\$34	\$58	\$82	\$106	\$130

$$m = 15$$

23. How many songs ( $s$ ) could your purchase for \$45 ( $c$ )?

$s$	4	6	8	10	12
$c$	\$6	\$9	\$12	\$15	\$18

$$30 \text{ songs}$$

25. How much profit ( $p$ ) would Harry's Hot Dogs make if they sold 400 hot dogs ( $h$ ) in a month?

$h$	200	225	250	275	300
$p$	100	150	200	250	300

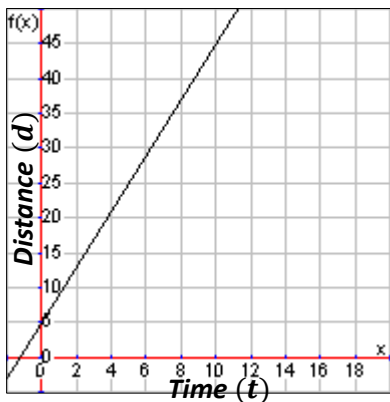
$$p = \$500$$

26. Which of problems 18 to 25 are proportional and how do you know?

Problems 20 and 23 because they initial values of zero.

**Answer the following questions comparing linear function equations, graphs, tables and descriptions.**

Your neighborhood friends have decided to have a running race down the street. Here is the information about the distance ( $d$ ) (including a head start in some cases) in terms of time ( $t$ ) in seconds.

<b>Mitchell</b> Runs 5 meters in 2 seconds and has a 10 meter head start	<b>Kyra</b> Distance is modeled by the equation $d = \frac{9}{2}t + 3$												
<b>Gloria</b> 	<b>Hashim</b> <table border="1"><tr><td><math>t</math></td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td></tr><tr><td><math>d</math></td><td>77</td><td>84</td><td>91</td><td>98</td><td>105</td></tr></table>	$t$	20	22	24	26	28	$d$	77	84	91	98	105
$t$	20	22	24	26	28								
$d$	77	84	91	98	105								

27. Which runner has the fastest pace, and how do you know?

Kyra at  $\approx 4.5$  meters per second (list other speeds)

28. Which runner has the biggest head start, and how do you know?

Mitchell at 10 meters (show work of getting initial values)

29. How far could each runner go in 10 seconds? Who would go the farthest?

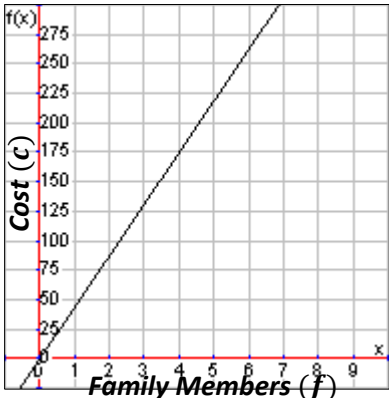
Mitchell: 35 m      Kyra: 48 m      Gloria: 45 m      Hashim: 42 m  
Kyra would go the farthest

30. Who would win the race if the race was 15 meters long?

Gloria would win with a time of 2.5 seconds

**Answer the following questions comparing proportional function equations, graphs, tables and descriptions.**

Your family is deciding which activity to participate in while on your vacation in San Diego. Here is the information about the cost ( $c$ ) for admission for all of your family members ( $f$ ).

<b>City Tour</b> Charges \$30 per family member	<b>San Diego Zoo</b> Cost is modeled by the equation $c = \frac{75}{2}f$												
<b>SeaWorld</b> 	<b>Kayaking</b> <table border="1"><tr><td><math>f</math></td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td></tr><tr><td><math>c</math></td><td>65</td><td>130</td><td>195</td><td>260</td><td>325</td></tr></table>	$f$	2	4	6	8	10	$c$	65	130	195	260	325
$f$	2	4	6	8	10								
$c$	65	130	195	260	325								

31. Which activity is the cheapest per family member, and how do you know?

City tour at \$30 per family member (list other costs per person)

32. Which activity is the most expensive per family member, and how do you know?

SeaWorld at \$43.75 per family member (list other costs per person)

33. How many people could you bring to each activity if you budgeted \$400? Which activity allows you to bring the most people for that amount of money?

City Tour: 13 people    SD Zoo: 10 people    SeaWorld: 9 people    Kayak: 12 people

City tour allows most people (note you have to always round down since you can't pay for a partial person)

34. How much would it cost at each activity to bring a family of 4? Which activity is the cheapest for that many people?

City Tour: \$120    SD Zoo: \$150    SeaWorld: \$175    Kayak: \$130 people

City tour allows most people