Chapter 6

6.1 Representing Patterns, pages 217–219

4. a) Example: Every time an octagon is added the number of sides increases by 6.

b)

Number of Octagons, *n*	Number of Sides, *s*
1	8
2	14
3	20
4	26

c) $s = 6n + 2$; s represents number of sides, n represents number of octagons **d)** 104 **e)** 120

5. a)

Figure Number, *n*	Number of Circles, *c*
1	5
2	8
3	11

b) Example: Three circles are added for each subsequent figure. **c)** $c = 3n + 2$; c represents number of circles, n represents figure number **d)** 53 **e)** 36

6. a)

Figure Number, *n*	Number of Green Tiles, *t*
1	8
2	12
3	16

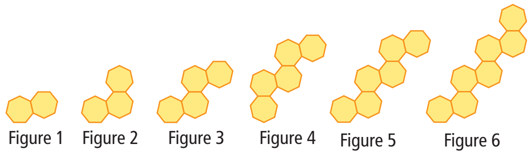
b) Example: Four green tiles are added for each subsequent figure. **c)** $t = 4n + 4$; t represents number of green tiles, n represents figure number **d)** 100 **e)** 43

7. a)

Term, *t*	Value, *v*
1	7
2	16
3	25
4	34
5	43

b) $v = 9t - 2$ **c)** 1105 **d)** 40

8. a) Each subsequent term has one additional heptagon.



b)

Figure Number, *n*	Perimeter, *P* (cm)
1	12
2	17
3	22
4	27
5	32
6	37

c) $P = 5n + 7$; P represents perimeter in centimetres, n represents figure number **d)** 67 cm **e)** 22

9. a)

Term, *t*	Value, *v*
1	−5
2	−8
3	−11
4	−14
5	−17

b) $v = -3t - 2$ **c)** −149 **d)** 39

10. a) $y = 3x + 13$ **b)** $p = 7r + 17$ **c)** $t = 2.7k - 4$ **d)** $w = -3.5f + 3$

11. a) $s = 4t + 2$, s represents number of seats, t represents number of tables **b)** 22 **c)** Example: Substitute $t = 5$ into the equation and solve for s. **d)** 7

12. a)

Number of T-Shirts, *n*	Cost, *C* ($)
0	125
5	200
10	275
15	350
35	650
55	950

b) $C = 15n + 125$; C represents cost, n represents number of T-shirts. The numerical coefficient is the cost for each additional T-shirt. **c)** $5795 **d)** 148

13. a) $t = 2s - 4$; t represents number of tiles, s represents size of frame **b)** 56 **c)** 100 cm by 100 cm

14. a)

Sighting Number, n	Year, y
1	1758
2	1834
3	1910
4	1986
5	2062
6	2138
7	2214

b) 2062 **c)** $y = 76n + 1682$; y represents year, n represents sighting number **d)** No. By substituting $y = 2370$ into the equation and solving for n, a decimal answer results. Therefore, the comet will not appear in 2370.

15. a) 127 **b)** Substitute $y = 45\,678$ into the equation $y = 3x + 1$, and solve for x. If x is a whole number, then 45 678 is 1 more than a multiple of 3.

16. a) $l = 4.5(n - 1)$; l represents length of row, n represents number of trees **b)** 46 trees will not be evenly spaced because the number of trees has a decimal in the answer.

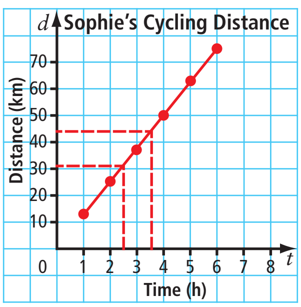
17. a)

Number of Rebounds, n	Rebound Heights, h (m)
0	2
1	$1\frac{1}{3} \approx 1.33$
2	$\frac{8}{9} \approx 0.89$
3	$\frac{16}{27} \approx 0.59$
4	$\frac{32}{81} \approx 0.39$
5	$\frac{64}{243} \approx 0.26$

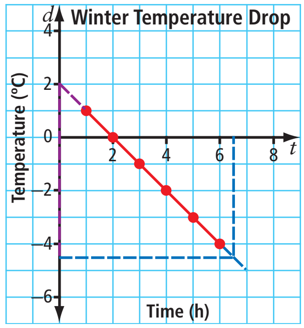
b) 0.39 m **c)** No, this relation is not linear. The rebound heights do not decrease at a constant rate with each bounce.

6.2 Interpreting Graphs, pages 226–230

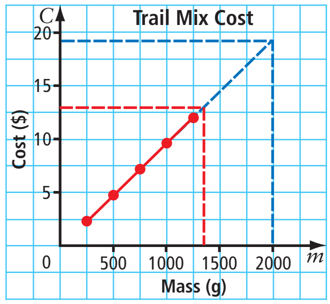
4. a) 14 km, interpolation **b)** 7 h
5. a) 14 **b)** 1.5
6. a) −3.5 **b)** −2.5
7. a)



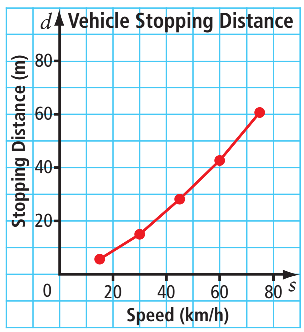
b) 31 km **c)** 3.5 h
8. a) 29 m **b)** 10.2 min
9. a) approximately 15.5 **b)** approximately 2.6
10. a) 2 **b)** 4
11. a)



b) −4.5 °C **c)** 12 noon
12. a)



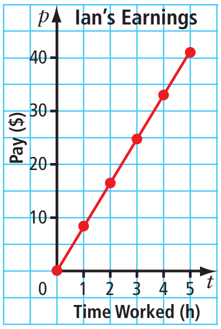
b) $19 **c)** 1400 g
13. a) It is reasonable to interpolate and extrapolate the graph. The submarine can be underwater for a fraction of a minute, and the graph shows a linear relationship. **b)** 3.5 min **c)** 160 m
14. a) Yes, the graph is linear, and it is reasonable to determine the income from the number of programs as long as the number of programs is a whole number. **b)** $250, interpolation **c)** 5000
15. a) 1 h **b)** 1.8 h **c)** 3.2 h
16. a) Yes, the graph is linear, and it is reasonable to determine the cost from the number of minutes used. **b)** $55 **c)** 45 min
17. a) The cost for renting four days is $280. The cost per day is $70. Divide the cost for four days by the number of days. **b)** 6 days
18. a) 5.3 s **b)** 143 m **c)** The skydiver is accelerating at a constant rate.
19. a)



b) As the speed increases the stopping distance also increases. **c)** Example: 2 m, 36 m, 80 m **d)** Example: 20 km/h, 65 km/h, 85 km/h **e)** Example: 17 m, 26 m **f)** The graph is not a straight line because the rate of deceleration of the car is different for different speeds of the car.

6.3 Graphing Linear Relations, pages 239–243

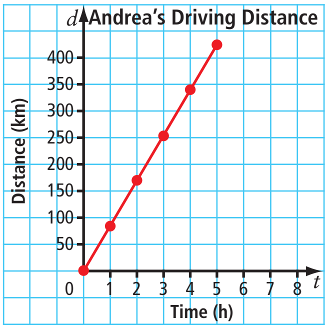
4. a)



b) The graph represents the equation because his pay increases at a rate of \$8.25 for each hour worked. The rate at which his pay increases is the coefficient in the equation.

c) \$66; substitute $t = 8$ into the equation and solve for p, or use the graph to estimate his pay using extrapolation.

5. a)

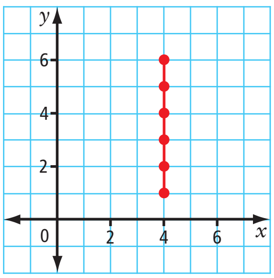


b) 3.5 h

6. a) C **b)** B **c)** A

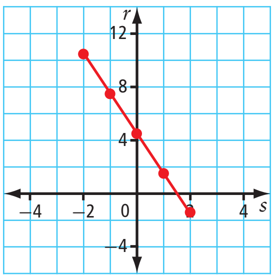
7. a)

x	y
4	0
4	1
4	2
4	3
4	4



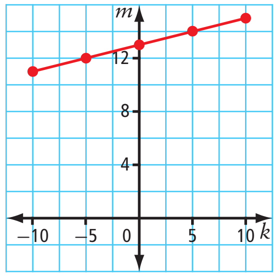
b)

s	r
–2	10.5
–1	7.5
0	4.5
1	1.5
2	–1.5



c)

k	m
–10	11
–5	12
0	13
5	14
10	15



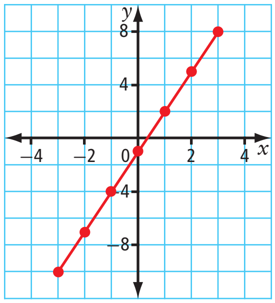
8. a) $C = 1.75m$ **b)** approximately 2.9 kg **c)** Yes, because the values exist beyond and between the points. However, a cost or mass value less than zero does not exist.

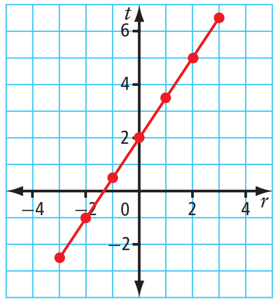
9. a) $h = 6t$ **b)** 30 cm **c)** Yes, because the values exist beyond and between the points. However, a height or time value less than zero does not exist.

10. a) $y = -4x$ **b)** $y = 2.5x + 2$

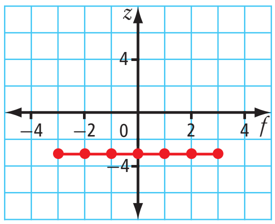
11. a) $y = 0.5x - 1$ **b)** $x = 4$

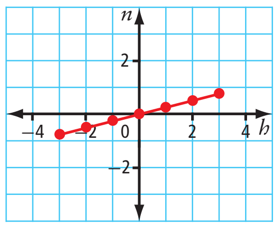
12. a) $y = 3x - 1$ **b)** $t = 1.5r + 2$





c) $z = -3$ **d)** $n = 0.25h$

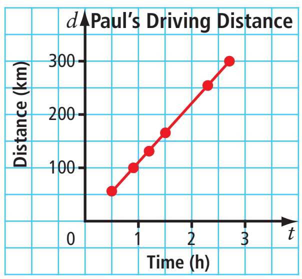




13. a) 1350 m **b)** 11 min **c)** $A = 90t$ **d)** 90 m/min

14. a) $t = 20$ min **b)** T = 50 °C **c)** 5 °C/min

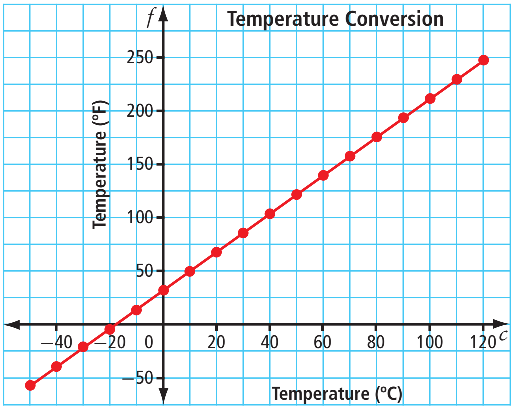
15. a)



b) 220 km **c)** 1.8 h **d)** $d = 110t$ **e)** 110 km/h

16. a)

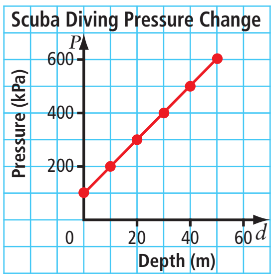
Temperature (°C)	Temperature (°F)
−50	−58
−40	−40
−30	−22
−20	−4
−10	14
0	32
10	50
20	68
30	86
40	104
50	122
60	140
70	158
80	176
90	194
100	212
110	230
120	248



b) 212 °F **c)** This is the point where the graph intersects the *y*-axis. **d)** −40°

17. a)

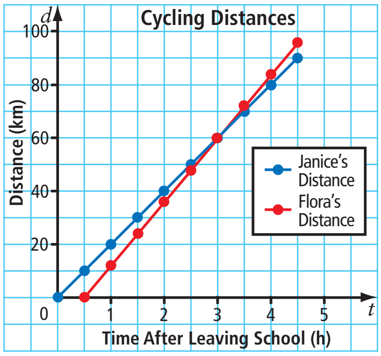
Depth, *d* (m)	Pressure, *P* (kPa)
0	102.4
10	203.7
20	305.0
30	406.3
40	507.6
50	608.9



b) 250 kPa is the approximate pressure using interpolation **c)** 39.25 m **d)** 102.4 kPa is the air pressure at sea level ($d = 0$).

18. a) Girls' growth appears to be linear at greater than 24 months of age. **b)** Girls' growth appears to be non-linear prior to 24 months of age.

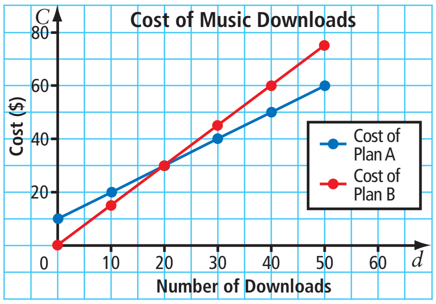
19. a)



Time, *t* (h)	Janice's Distance, *j* (km)	Flora's Distance, *f* (km)
0	0	n/a
0.5	10	0
1	20	12
1.5	30	24
2	40	36
2.5	50	48
3	60	60
3.5	70	72
4	80	84
4.5	90	96

b) This is where the two lines intersect. **c)** At 3:00 p.m. or after 3 h **d)** At 3:30 p.m. or after 3.5 h

20. a)



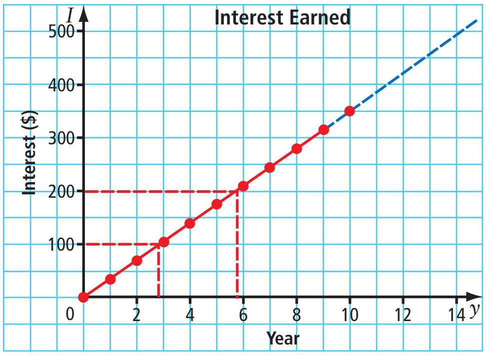
Number of Downloads, *d*	Cost of Plan A, *A* ($)	Cost of Plan B, *B* ($)
0	10	0
10	20	15
20	30	30
30	40	45
40	50	60
50	60	75

b) If you purchase fewer than 20 songs per month, Plan B is a better deal. If you purchase more than 20 songs per month, Plan A is a better deal.

21. a)

Year, *y*	Interest, *I* ($)
0	0
1	35
2	70
3	105
4	140
5	175
6	210
7	245
8	280
9	315
10	350

b) \$350



c) 2.85 years, 5.7 years **d)** approximately 14 years

Chapter 6 Review, pages 244–245

1. linear relation
2. extrapolation
3. constant
4. linear equation
5. interpolate
6. a)

Figure Number, *n*	Number of Toothpicks, *T*
1	4
2	7
3	10
4	13
5	16
6	19

b) Three toothpicks or one square is added in each figure.
c) $T = 3n + 1$ **d)** 31 **e)** The numerical coefficient of n is 3, and this is the number of toothpicks added in each figure.

7. a)

Time, *t* (weeks)	Savings, *s* (\$)
0	56
1	71
2	86
3	101
4	116
5	131

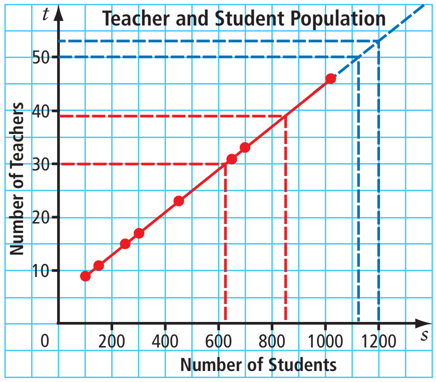
b) $s = 15t + 56$ **c)** \$581 **d)** 29.6 or 30 weeks

8. a)

Pairs of Shoes Sold, *s*	Earnings, *E* (\$)
0	50
1	52
2	54
3	56
4	58
5	60
6	62
7	64
8	66
9	68
10	70

b) $E = 2s + 50$ **c)** \$74; You can extrapolate using a graph, or substitute and solve using the equation.
9. a) \$70 **b)** 2800 trees
10. a) 84 kPa, 70 kPa **b)** 825 m, 3000 m
c) Yes, because values of air pressure and altitude both exist beyond and between points on the graph.

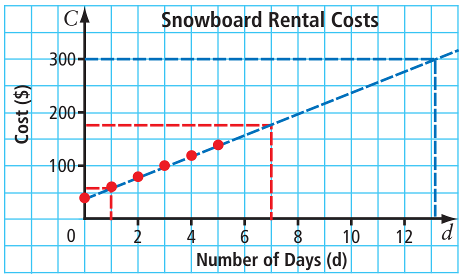
11. a)



b) 38 teachers, 54 teachers
c) 600 students, 1100 students

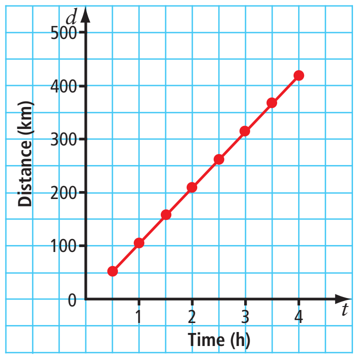
12. a)

Number of Days, *d*	Cost, *C* (\$)
0	40
1	60
2	80
3	100
4	120
5	140



b) \$60, \$180 **c)** A snowboard would become cheaper to buy after 13 days. **d)** Substitute the known value into the equation and solve for the unknown value.

13.

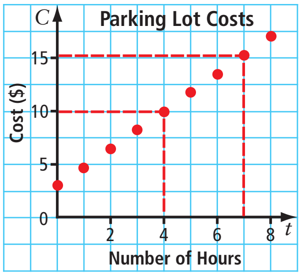


a) Example: You are driving from Toronto to Ottawa at a speed of 105 km/h. **b)** Example: $d = 105t$
c) The numerical coefficient in this equation is 105. This represents the speed at which the car is travelling per hour. The constant is zero.

14. a)

Number of Hours, *t*	Cost, *C* ($)
0	3.00
1	4.75
2	6.50
3	8.25
4	10.00
5	11.75
6	13.50
7	15.25
8	17.00

b)



c) \$10.00 **d)** 7 h **e)** $C = 1.75t + 3$