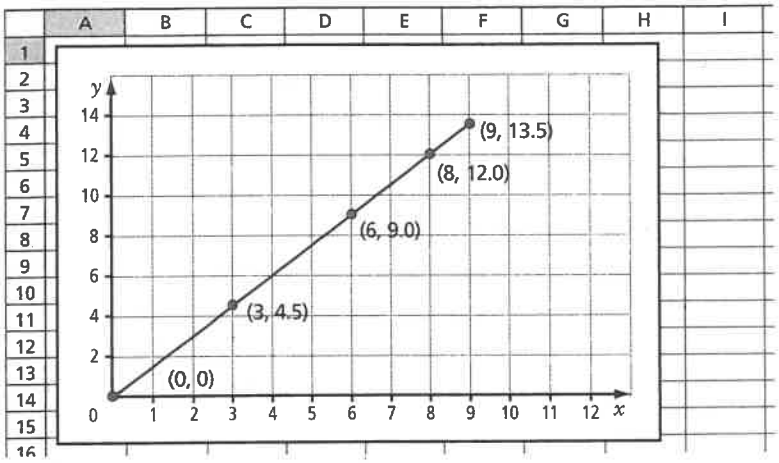
3. a) Describe a real-life situation to represent the data on this graph.



b) Explain how you would determine the equation that represents the graph. Give your explanation to a classmate.

c) Can you interpolate or extrapolate values on this graph? Explain your thinking.

WWW Web Link

For practice matching graphs and linear equations, go to www.mathlinks9.ca and follow the links.

Practise

For help with #4 to #7, refer to Example 1 on pages 232–234.

4. Ian works part-time at a movie theatre. He earns \$8.25/h. The relationship between his pay, p, and the time he works, t, can be modelled with the equation $p = 8.25t$.

a) Show the relationship on a graph.

b) Explain how you know the graph represents the equation.

c) Ian works 8 h in one week. Use two methods to determine his pay.

5. Andrea is travelling by bus at an average speed of 85 km/h. The equation relating distance, d, and time, t, is $d = 85t$.

a) Show the relationship on a graph.

b) How long does it take Andrea to travel 300 km?

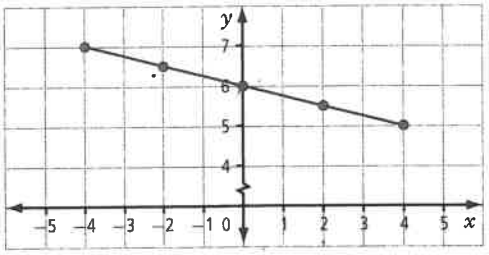
6. Choose the letter representing the graph that matches each linear equation.

a) $y = 5x$

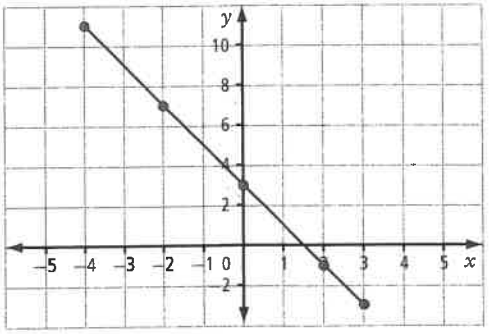
b) $y = -2x + 3$

c) $y = -\frac{x}{4} + 6$

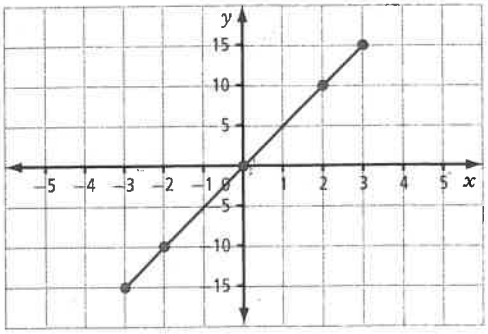
A



B



C



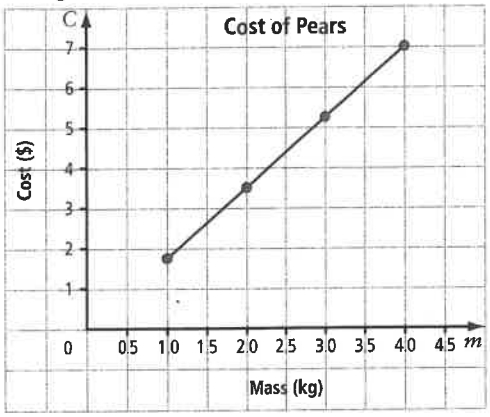
7. Create a table of values and a graph for each linear equation.

a) $x = 4$ **b)** $r = -3s + 4.5$

c) $m = \frac{k}{5} + 13$

For help with #8 to #11, refer to Example 2 on pages 234–236.

8. The graph shows the relationship between the cost, C, in dollars and the mass, m, in kilograms of pears.

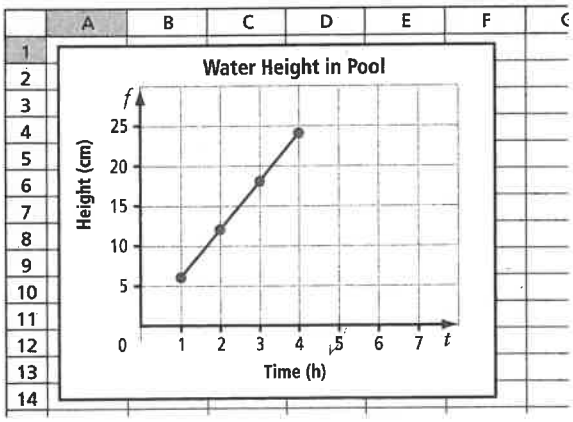


a) What is the linear equation?

b) How much could you buy for $5?

c) Is it appropriate to interpolate or extrapolate values on this graph? Explain.

9. The graph represents the relationship between the height of water in a child's pool, h, and the time, t, in hours as the pool fills.



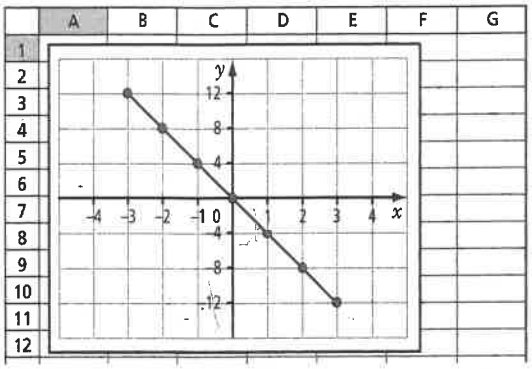
a) Determine the linear equation.

b) What is the height of the water after 5 h?

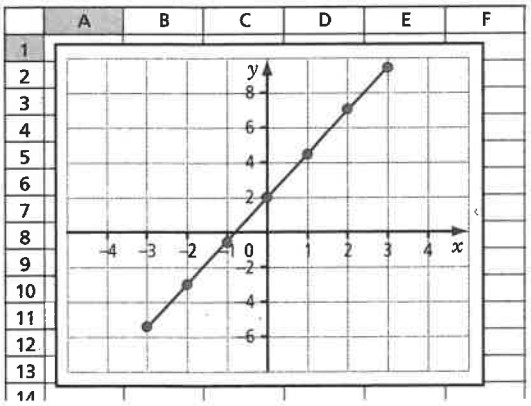
c) Is it appropriate to interpolate or extrapolate values on this graph? Explain.

10. Determine the linear equation that models each graph.

a)

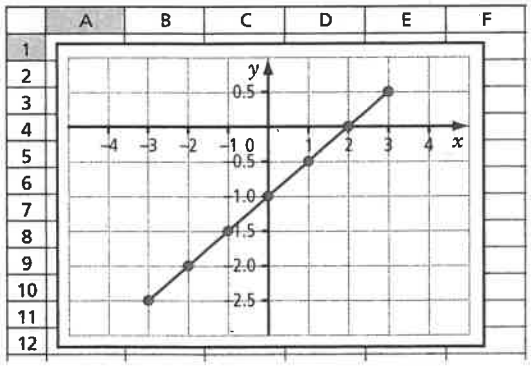


b)

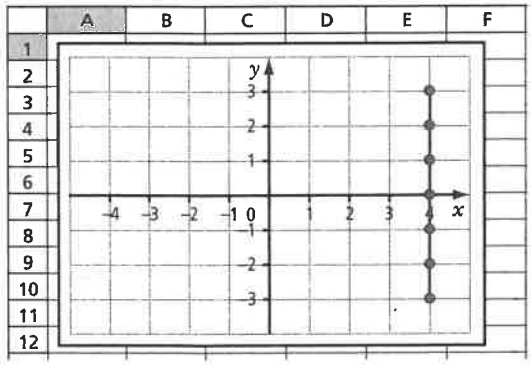


11. What linear equation does each graph represent?

a)



b)



12. Create a graph and a linear equation to represent each table of values.

a)

x	y
−3	−10
−2	−7
−1	−4
0	−1
1	2
2	5
3	8

b)

r	t
−3	−2.5
−2	−1.0
−1	0.5
0	2.0
1	3.5
2	5.0
3	6.5

c)

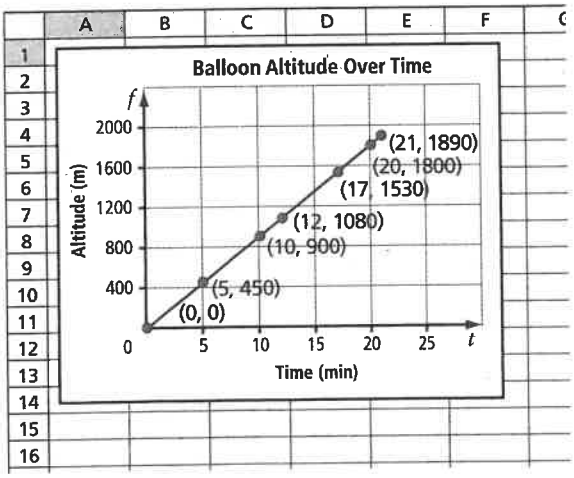
f	z
−3	−3
−2	−3
−1	−3
0	−3
1	−3
2	−3
3	−3

d)

h	n
−3	−0.75
−2	−0.5
−1	−0.25
0	0
1	0.25
2	0.5
3	0.75

Apply

13. The graph represents the altitude of a hot-air balloon the first 20 min after it was released.



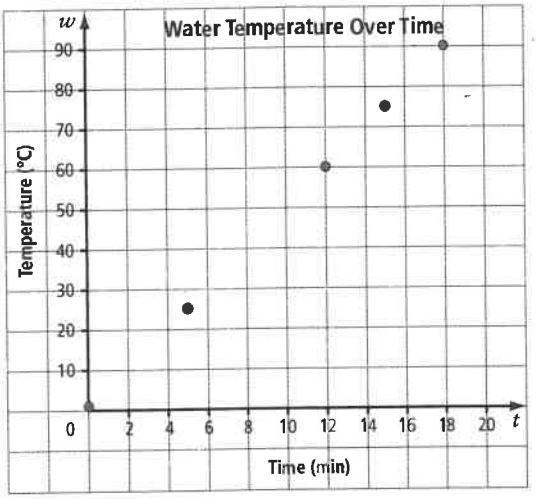
a) What was the approximate altitude of the balloon after 15 min?

b) Estimate how long it took for the balloon to rise to an altitude of 1 km.

c) What linear equation models the graph?

d) How fast is the balloon rising?

14. Sanjay conducted an experiment to determine how long it takes to heat water from 1 °C to its boiling point at 100 °C. He plotted his data on a graph.



a) Approximately how long did it take for the water to reach boiling point? Explain your reasoning.

b) What was the temperature of the water after 10 min?

c) At what rate did the water temperature increase? Explain your reasoning.

15. Paul drives from Edmonton to Calgary. He uses a table to record the data.

Time, t (h)	Distance, d (km)
0.5	55.0
0.9	99.0
1.2	132.0
1.5	165.0
2.3	253.0
2.7	297.0

a) Graph the linear relation.

b) How far did Paul drive in the first 2 h?

c) How long did it take Paul to drive 200 km?

d) Write the equation that relates time and distance.

e) What was Paul's average driving speed? What assumptions did you make?

WWW Web Link

To learn about using a graphing calculator to enter data on a table and plot the data on a graph, go to www.mathlinks9.ca and follow the links.

16. The relationship between degrees Celsius (°C) and degrees Fahrenheit (°F) is modelled by the equation $F = \frac{9}{5}C + 32$.

a) Graph the relationship for values between −50 °C and 120 °C.

b) Water boils at 100 °C. What is this temperature in degrees Fahrenheit?

c) Water freezes at 0 °C. How did you represent this on your graph?

d) At what temperature are the values for °C and °F the same?

17. Scuba divers experience an increase in pressure as they descend. The relationship between pressure and depth can be modelled with the equation $P = 10.13d + 102.4$, where P is the pressure, in kilopascals, and d is the depth below the water surface, in metres.

a) Graph the relationship for the first 50 m of diving depth.

b) What is the approximate pressure at a depth of 15 m? Verify your answer.

c) The maximum pressure a scuba diver should experience is about 500 kPa. At what depth does this occur? Verify your answer.

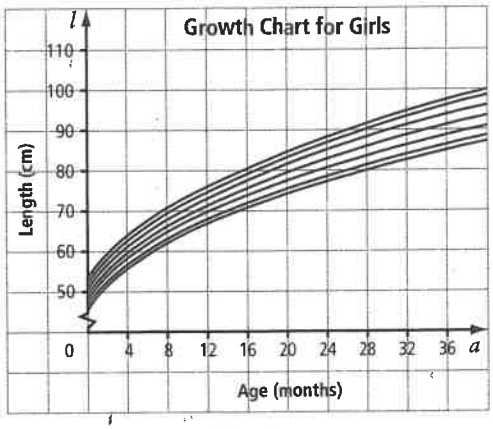
d) What does "+ 102.4" represent in the equation? How is it represented on the graph?

Did You Know?

After deep or long dives, scuba divers need to undergo decompression. They do this by ascending to the surface slowly in order to avoid decompression sickness, also known as the bends.

Extend

18. The graph shows the normal range of length for girls from birth to age 36 months.



a) For what age range does girls' growth appear to represent a linear relation?

b) For what age range, does girls' growth appear to represent a non-linear relation?

19. Janice left the school at 12 noon riding her bike at 20 km/h. Flora left school at 12:30 riding her bike at 24 km/h.

a) Draw a distance–time graph to plot the data for both cyclists during the first four hours. Use a different colour for each cyclist.

b) How can you tell from the graph that Flora has caught up to Janice?

c) About what time did Flora catch up to Janice?

d) If Janice and Flora continued to ride at their respective speeds, at what time would they again be apart by a distance of 2 km?

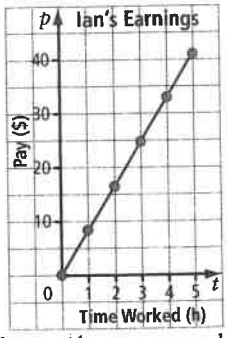
20. An online music download site offers two monthly plans. Plan A offers \$10 plus \$1 per download and Plan B offers \$1.50 per download.

a) Graph both linear relations on the same grid.

b) Explain the conditions under which each deal is better.

6.3 Graphing Linear Relations, pages 239–243

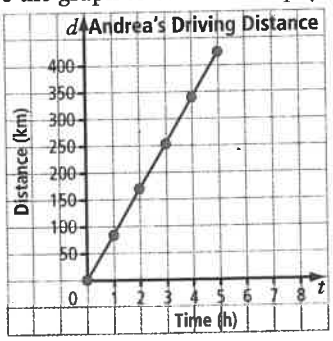
4. a)



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)

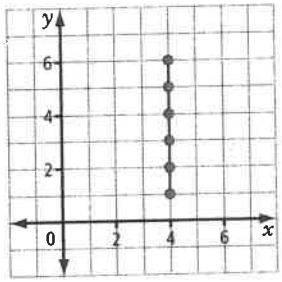


b) 3.5 h

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

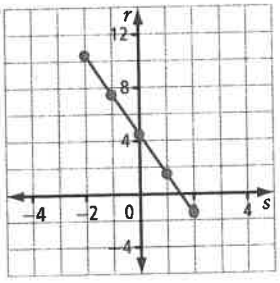
7. a)

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



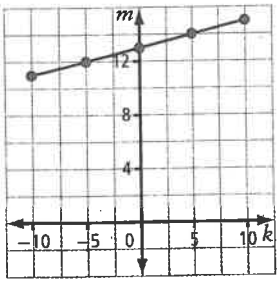
b)

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



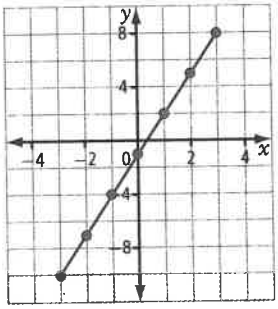
8. a) $C = 1.75m$ **b)** approximately 2.9 kg **c)** Yes, because the values exist beyond and between the points. However, a cost or mass value less than zero does not exist.

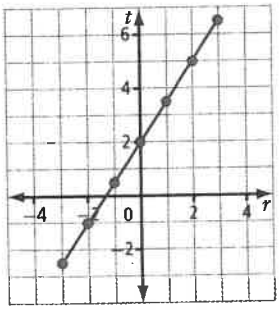
9. a) $h = 6t$ **b)** 30 cm **c)** Yes, because the values exist beyond and between the points. However, a height or time value less than zero does not exist.

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

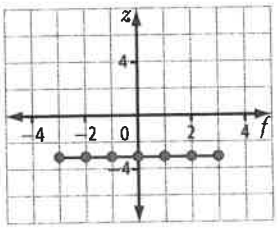
11. a) $y = 0.5x - 1$ **b)** $x = 4$

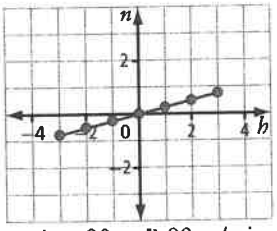
12. a) $y = 3x - 1$ **b)** $t = 1.5r + 2$





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

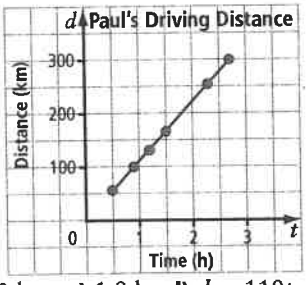




13. a) 1350 m **b)** 11 min **c)** $A = 90t$ **d)** 90 m/min

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

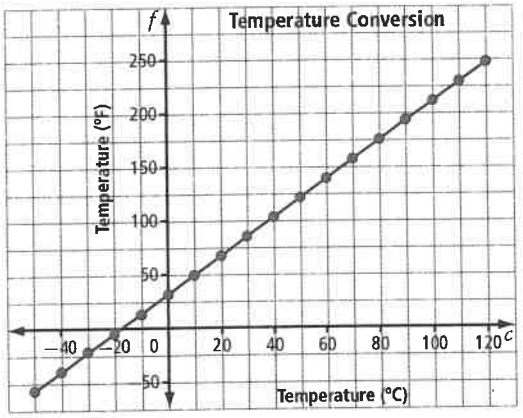
15. a)



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

16. a)

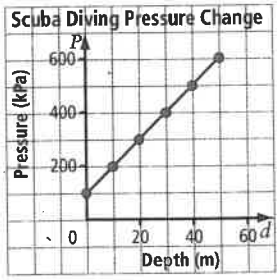
Temperature (°C)	Temperature (°F)
−50	−58
−40	−40
−30	−22
−20	−4
−10	14
0	32
10	50
20	68
30	86
40	104
50	122
60	140
70	158
80	176
90	194
100	212
110	230
120	248



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

17. a)

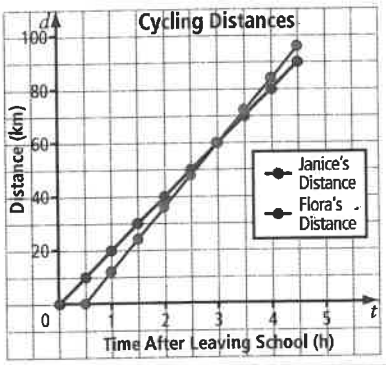
Depth, d (m)	Pressure, P (kPa)
0	102.4
10	203.7
20	305.0
30	406.3
40	507.6
50	608.9



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.

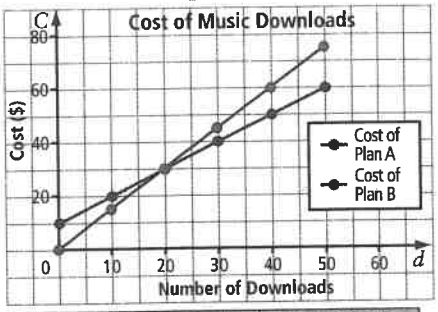
19. a)



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