Math 10

Lesson 3-8 Love those functions and linear relations

I. Assignment

2. Here is a list of some chemical elements and their atomic numbers:
   hydrogen (1), oxygen (8), iron (26),
   chlorine (17), carbon (6), silver (47)
   For each association below, use these data to represent a relation in different ways.
   a) has an atomic number of
   b) is the atomic number of

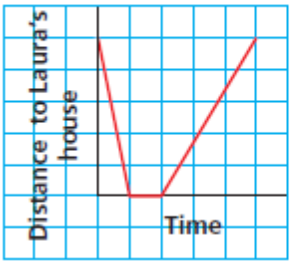
3. Which sets of ordered pairs represent functions? What strategies did you use to find out?
   a) {(4, 3), (4, 2), (4, 1), (4, 0)}
   b) {(2, 4), (–2, 4), (3, 9), (–3, 9)}
   c) {(2, 8), (3, 12), (4, 16), (5, 20)}
   d) {(5, 5), (5,–5), (–5, 5), (–5,–5)}

4. Write in function notation.
   a) $y = -4x + 9$ b) $C = 12n + 75$
   c) $D = -20t + 150$ d) $P = 4s$

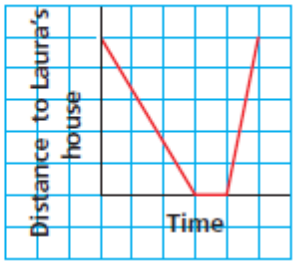
5. The function $P(n) = 5n - 300$ describes the profit, P dollars, for a school dance when n students attend.
   a) Write the function as an equation in 2 variables.
   b) Identify the independent variable and the dependent variable. Justify your choices.
   c) Determine the value of $P(150)$.
   d) Determine the value of n when $P(n) = 700$.

6.
   a) Laura cycles home from school, then walks back to school. Which graph best matches this situation? Explain your choice.

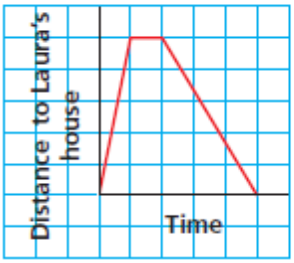
Graph A



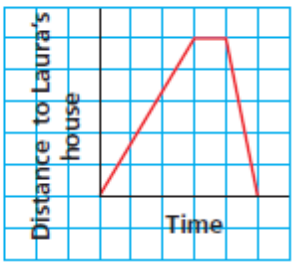
Graph B



Graph C

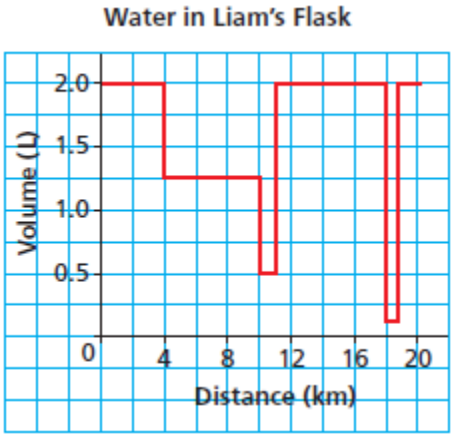


Graph D



   b) Choose one of the graphs in part a that did not describe Laura's journey. Describe a possible situation for the graph.

7. This graph shows the volume of water in Liam's flask as he hikes the Trans Canada trail.
   a) Describe what is happening for each line segment of the graph.
   b) How many times did Liam fill his flask?
   c) How much water was in Liam's flask at the start of his hike?
   d) Identify the dependent and independent variables.

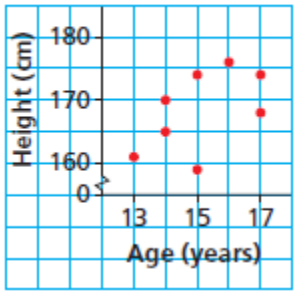


8. The data shows how the temperature of boiling water as it cools is related to time.
   a) Graph the data. Did you join the points? Why or why not?
   b) Does the graph represent a function? How can you tell?

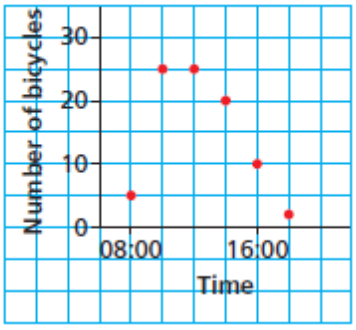
Time (min)	Temperature (°C)
0	89
5	78
10	69
15	62
20	57
25	53
30	50

9. Which of these graphs represents a function? Justify your answer. Write the domain and range for each graph.

a) Heights and Ages of 8 Students

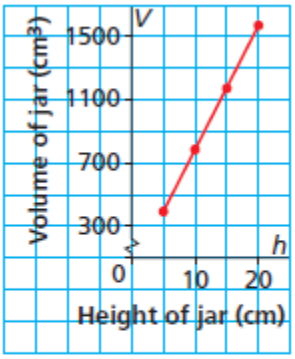


b) Number of Bicycles at School

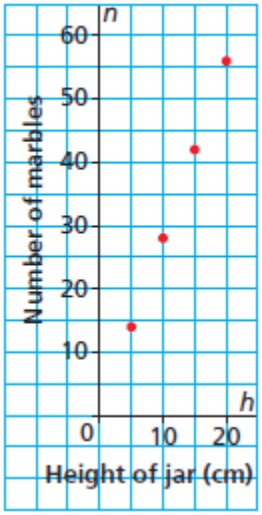


10. For the graphs below:
    a) What does each graph represent?
    b) Identify the independent and dependent variables.
    c) Write the domain and range for each graph. Estimate when necessary. Are there any restrictions on the domain and range? Explain.
    d) Why are the points joined on one graph but not on the other?

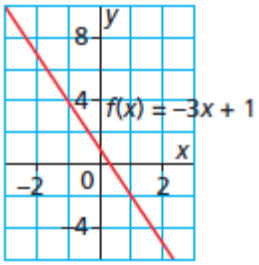
i) Graph A



ii) Graph B



11. This is a graph of the function $f(x) = -3x + 1$.
    a) Determine the range value when the domain value is 1.
    b) Determine the domain value when the range value is 4.



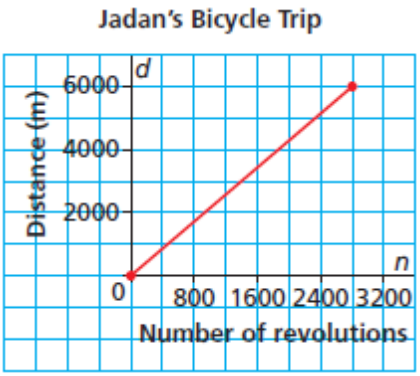
12. Sketch a graph of a function that has each domain and range.
    a) domain: $-1 \le x \le 5$; range: $0 \le y \le 3$
    b) domain: $x \le 1$; range: $-2 \le y \le 2$

13. Which sets of ordered pairs represent linear relations? Explain your answers.
    a) {(1, 5), (5, 5), (9, 5), (13, 5)}
    b) {(1, 2), (1, 4), (1, 6), (1, 8)}
    c) {(–2, –3), (–1, –2), (2, 1), (4, –3)}

14.
    a) For each equation, create a table of values when necessary, then graph the relation.
        i) $x = 3$
        ii) $y = 2x^2 + 3$
        iii) $y = 2x + 3$
        iv) $y = 3$
        v) $y = 3x$
        vi) $x + y = 3$
    b) Which equations in part a represent linear relations? How do you know?

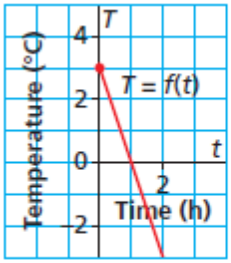
15. Isabelle manages her diabetes by taking insulin to control her blood sugar. The number of units of insulin taken, *N*, is given by the equation $N = \frac{1}{15}g$, where *g* represents the number of grams of carbohydrates consumed.
    a) Explain why the equation represents a linear relation.
    b) State the rate of change. What does it represent?

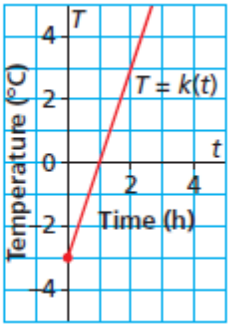
16. This graph shows the distance, *d* metres, travelled by Jadan on her bicycle as a function of the number of wheel revolutions, *n*, as she rode from Whitehorse to the Grey Mountain Road lookout in the Yukon.

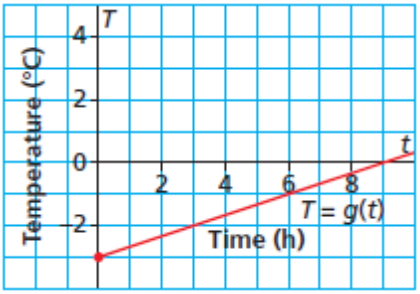


a) How far was Jadan from the lookout when she started her bicycle trip?
b) Write the domain and range.
c) Determine the rate of change. What does it represent?
d) Use your answer to part c to determine the diameter of a bicycle wheel.

17. These graphs show the temperature, *T* degrees Celsius, as a function of time, *t* hours. Match each graph with its vertical intercept and rate of change.

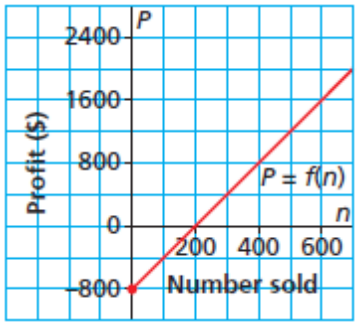
a)


b)


c)


i) $-3°C; \frac{1}{3}$ °C/h
ii) 3°C; −3°C/h
iii) −3°C; 3°C/h

18. This graph shows the profit, *P* dollars, on a company's sale of *n* baseball caps.



a) How many baseball caps have to be sold before the company begins to make a profit?
b) What is the profit on the sale of each baseball cap?
c) How many caps have to be sold to make each profit?
i) $600 ii) $1200
d) In part c, when the profit doubles why does the number of baseballs caps sold not double?