Study Guide

Generalize a Pattern

Term Number, n	Term Value, v	Pattern
1	3	2(1) + 1
2	5	2(2) + 1
3	7	2(3) + 1
:	:	:
n		2(n) + 1

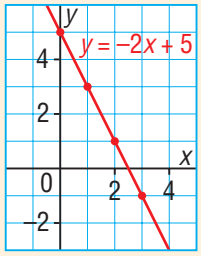
Each term value is 2 more than the preceding term value.
Start with the expression $2n$ and adjust it as necessary to produce the numbers in the table.
The expression is: $2n + 1$
The equation is: $v = 2n + 1$

Linear Relations

- The graph of a linear relation is a straight line.
  To graph a linear relation, first create a table of values.
  For example, to graph the linear relation: $y = -2x + 5$

x	y
0	5
1	3
2	1

Choose 3 values of x, then use the equation to calculate corresponding values of y.

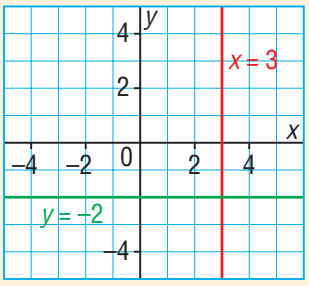


Each point on the graph is 1 unit right and 2 units down from the preceding point.

Another form of the equation of the graph above is $2x + y = 5$.

Horizontal and Vertical Lines

- The graph of the equation $x = a$, where a is a constant, is a vertical line.
  The graph of the equation $y = a$, where a is a constant, is a horizontal line.



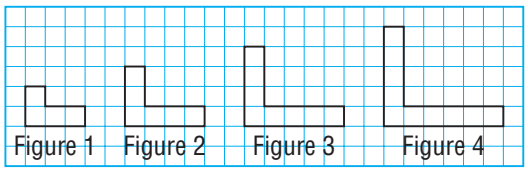
Interpolation and Extrapolation

- Interpolation is determining data points *between* given points on the graph of a linear relation.

  Extrapolation is determining data points *beyond* given points on the graph of a linear relation.
  When we extrapolate, we assume that the linear relation continues.

Review

4.1 **1.** This pattern continues.



a) Determine the perimeter of each figure.
b) Draw the next 3 figures on grid paper.
c) Make a table to show the number of each figure and its perimeter.
d) Write an expression for the perimeter in terms of the figure number, n.
e) Write an equation that relates the perimeter P to n.
f) Determine the perimeter of figure 30.
g) Determine the figure number that has perimeter 90 units.

2. The pattern in this table continues.

Term Number, n	Term Value, v
1	−5
2	−2
3	1
4	4

a) Describe the patterns in the table.
b) Use n to write an expression for the term value.
c) Write an equation that relates v and n.
d) Verify the equation by substituting a pair of values from the table.
e) Determine the value of the 21st term.
f) Which term number has a value of 106? How do you know?

3. The first number in a pattern has the value 75. As the term number increases by 1, its value decreases by 4.
a) Create a table for this pattern.
b) Write an expression for the value of the term in terms of the term number n.

4.2 **4.** Norman has $140 in his savings account. Each month he deposits $20 into this account. Let t represent the time in months and A the account balance in dollars.
a) Create a table to show several values of t and A.
b) Graph the data. Will you join the points? Explain.
c) Is this relation linear? Justify your answer.
d) Describe the pattern in the table. How are these patterns shown in the graph?
e) Write an equation that relates A and t.

5. Copy and complete each table of values. Describe the patterns in the table.
a) $y = 4x$ b) $y = 10 - 2x$ c) $y = 3x + 4$

x	y
1	
2	
3	

x	y
0	
1	
2	

x	y
−3	
−2	
−1	

6. Graph the data from each table in question 5. For each graph, explain how the patterns in the graph match the patterns in the table.

4.3 **7.** A piece of string is 25-cm long. The string is cut into 2 pieces.
a) Make a table that shows 6 possible lengths for the two pieces of string.
b) Graph the data.
i) Is the relation linear? How do you know?
ii) Should you join the dots? Explain.
c) Choose 2 variables to represent the lengths of the longer and shorter pieces.
i) Write an equation that relates the variables.
ii) How could you check your equation?

8. Graph each equation. Do you need to make a table of values each time? Explain.

a) $x = -2$ **b)** $y = 3$

c) $x = 5$ **d)** $y = -1$

9. For each equation below:

- Make a table for the given values of x.
- Graph the equation.

a) $3x + y = 9$; for $x = -3, 0, 3$

b) $2x - y = 4$; for $x = -2, 0, 2$

c) $2x + y = -6$; for $x = -4, 0, 4$

d) $x - 2y = -6$; for $x = -2, 0, 2$

10. Does each equation represent a vertical line, a horizontal line, or an oblique line? How can you tell without graphing?

a) $x = 6$ **b)** $x - y = 3$

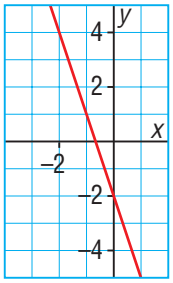
c) $y + 8 = 0$ **d)** $2x + 9 = 0$

4.4

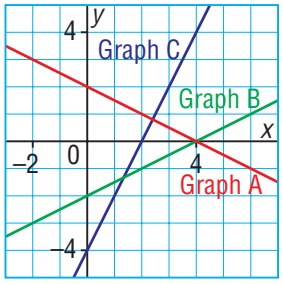
11. Which equation describes the graph below? Justify your answer.

a) $y = -2x + 3$ **b)** $y = 2x - 3$

c) $y = 3x - 2$ **d)** $y = -3x - 2$



12. Which graph represents the equation $x - 2y = 4$? How do you know?



13. Match each equation with its graph below. Explain your strategy.

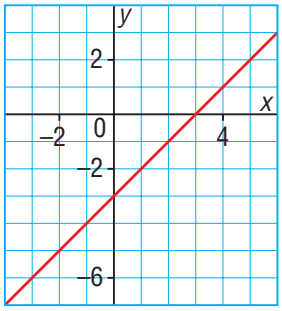
a) $x + 2y = 6$

b) $y = x - 3$

c) $y = 2x - 3$

d) $y = -4x + 5$

i)



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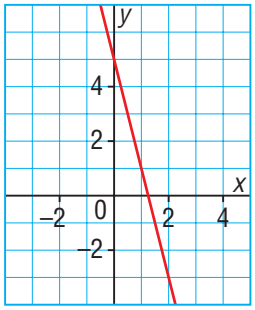

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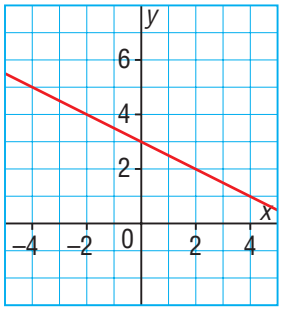

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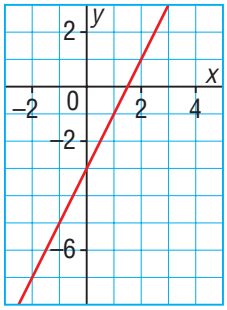
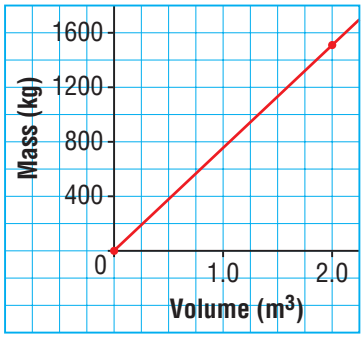


4.5 **14.** This graph shows how the mass of wheat changes with its volume.

Mass against Volume for Wheat



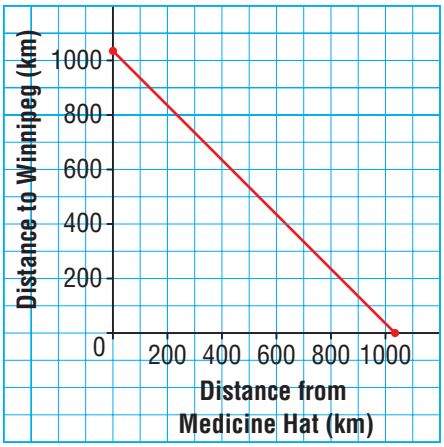
Use the graph.

a) Estimate the volume of 2000 kg of wheat.

b) Estimate the mass of 2.5 m^3 of wheat.

15. Harold and Jenny are driving from Medicine Hat to Winnipeg. The graph shows the distance travelled and the distance yet to go.

Journey from Medicine Hat to Winnipeg

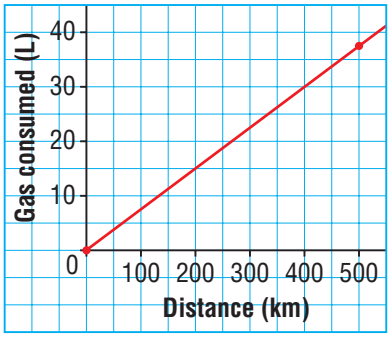


a) About how far is it from Medicine Hat to Winnipeg? How can you tell from the graph?

b) When Jenny and Harold have travelled 450 km, about how far do they still have to go?

16. The Dubois family lives in Regina. The family is planning a family holiday to the West Coast. This graph shows the gas consumption of the family's car.

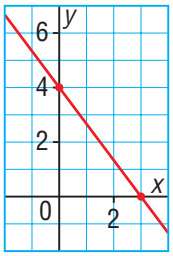
Gas Consumption



a) The distance from Regina to Vancouver is 1720 km. Estimate the volume of gasoline needed to travel from Regina to Vancouver. Explain how you did this.

b) To travel from Regina to Prince Albert, the car used about 30 L of gasoline. About how far is it between these two towns?

17. This graph represents a linear relation.



a) Estimate the value of y when:

i) $x = -4$

ii) $x = 2$

iii) $x = 5$

b) Estimate the value of x when:

i) $y = 7$

ii) $y = 2$

iii) $y = -3$

Explain how you estimated.