9.3 Linear Relationships

***MathLinks 8*, pages 352–359**

Suggested Timing
100–120 minutes

Materials
- metre stick or measuring tape
- masking tape
- different-sized tubes such as from paper towel rolls
- grid paper
- ruler

Blackline Masters
Master 2 Two Stars and One Wish
Master 8 Centimetre Grid Paper
Master 9 0.5 Centimetre Grid Paper
BLM 9–3 Chapter 9 Warm-Up
BLM 9–9 Section 9.3 Extra Practice

Mathematical Processes
- ☑ Communication (C)
- ☑ Connections (CN)
- ☑ Mental Mathematics and Estimation (ME)
- ☑ Problem Solving (PS)
- ☑ Reasoning (R)
- ☐ Technology (T)
- ☑ Visualization (V)

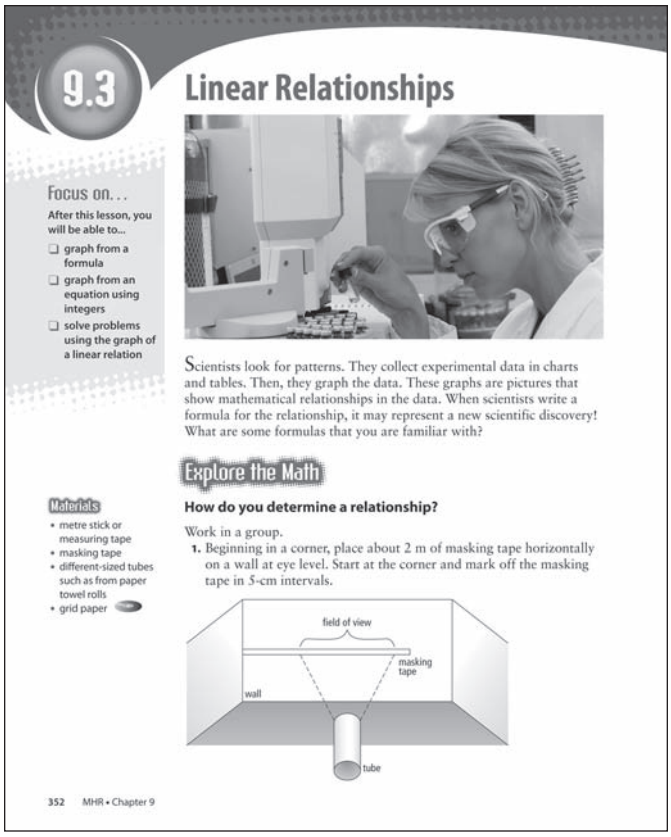
Specific Outcomes
PR1 Graph and analyze two-variable linear relations.

Category	Question Numbers
Essential (minimum questions to cover the outcomes)	1–3, 5, 7, 9, 11, 14
Typical	1–3, 5, 7, 9, 11, 14–17
Extension/Enrichment	1–3, 18–22

Planning Notes

Have students complete the warm-up questions on **BLM 9–3 Chapter 9 Warm-Up** to reinforce material learned in previous sections.

As a class, read the opening paragraph of section 9.3. Have a discussion with students about their previous experience with formulas. Ask questions such as
- What is a formula?
- What formulas have you used in school?
- Can you think of a formula you have used outside of school?


9.3 Linear Relationships

Focus on...
After this lesson, you will be able to...
- graph from a formula
- graph from an equation using integers
- solve problems using the graph of a linear relation

Scientists look for patterns. They collect experimental data in charts and tables. Then, they graph the data. These graphs are pictures that show mathematical relationships in the data. When scientists write a formula for the relationship, it may represent a new scientific discovery! What are some formulas that you are familiar with?

Explore the Math

Materials
- metre stick or measuring tape
- masking tape
- different-sized tubes such as from paper towel rolls
- grid paper

How do you determine a relationship?

Work in a group.
1. Beginning in a corner, place about 2 m of masking tape horizontally on a wall at eye level. Start at the corner and mark off the masking tape in 5-cm intervals.

field of view
masking tape
wall
tube

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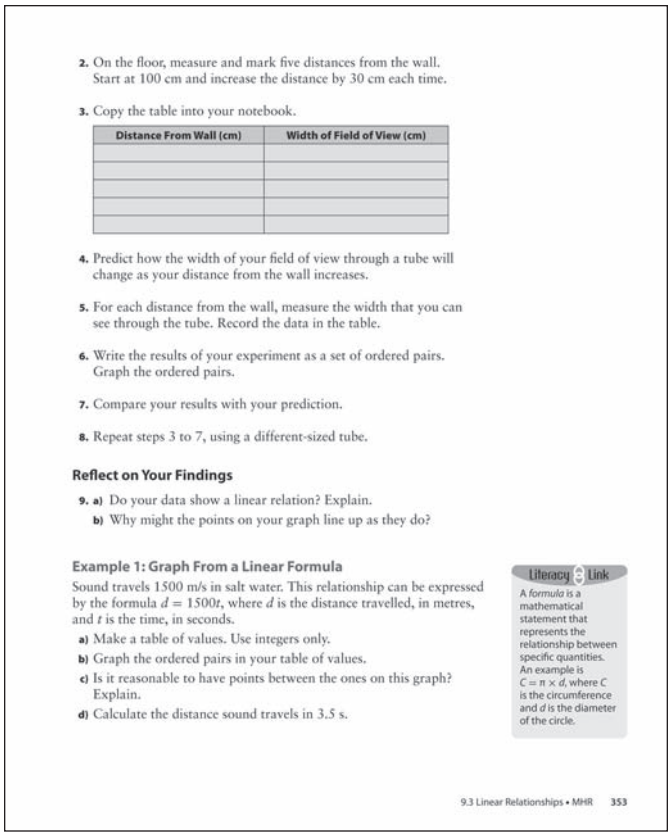
Literacy Link As a class, read the Literacy Link on page 353, which gives the definition of *formula* and an example.

Explore the Math

This exploration requires pre-planning. Have students bring in tubes of various sizes to class. Provide a few tubes (unusual ones make it more interesting) for those who do not have their own.

Before the class begins the experiment, discuss the terminology used in this activity, including *horizontally*, *field of view*, *distance from the wall*, and *ordered pairs*. Also, give some guidance to ensure the best possible results from the experiment. Demonstrate for students that if they hold the tube so that one side of their field of view is exactly in the corner, it will be easier to measure the width. Also, remind students that the accuracy with which they make and record all measurements can greatly affect their graphs. Encourage students by having a discussion on experimental error.



2. On the floor, measure and mark five distances from the wall. Start at 100 cm and increase the distance by 30 cm each time.

3. Copy the table into your notebook.

Distance From Wall (cm)	Width of Field of View (cm)

4. Predict how the width of your field of view through a tube will change as your distance from the wall increases.

5. For each distance from the wall, measure the width that you can see through the tube. Record the data in the table.

6. Write the results of your experiment as a set of ordered pairs. Graph the ordered pairs.

7. Compare your results with your prediction.

8. Repeat steps 3 to 7, using a different-sized tube.

Reflect on Your Findings

9. a) Do your data show a linear relation? Explain.
   b) Why might the points on your graph line up as they do?

Example 1: Graph From a Linear Formula

Sound travels 1500 m/s in salt water. This relationship can be expressed by the formula $d = 1500t$, where d is the distance travelled, in metres, and t is the time, in seconds.

a) Make a table of values. Use integers only.
b) Graph the ordered pairs in your table of values.
c) Is it reasonable to have points between the ones on this graph? Explain.
d) Calculate the distance sound travels in 3.5 s.

Literacy Link

A *formula* is a mathematical statement that represents the relationship between specific quantities. An example is $C = \pi \times d$, where C is the circumference and d is the diameter of the circle.

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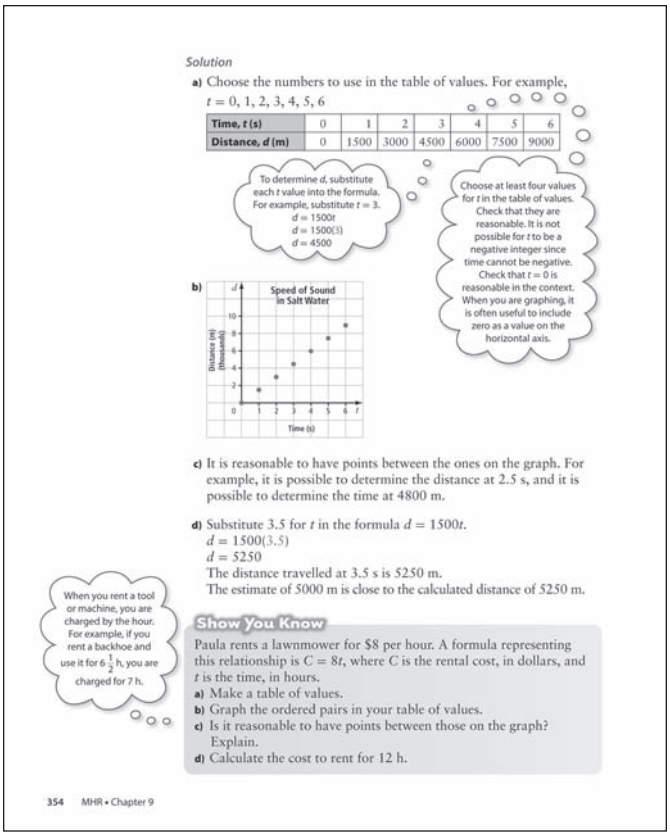

Solution

a) Choose the numbers to use in the table of values. For example, $t = 0, 1, 2, 3, 4, 5, 6$

Time, t (s)	0	1	2	3	4	5	6
Distance, d (m)	0	1500	3000	4500	6000	7500	9000

To determine d, substitute each t value into the formula. For example, substitute $t = 3$.
$d = 1500t$
$d = 1500(3)$
$d = 4500$

Choose at least four values for t in the table of values. Check that they are reasonable. It is not possible for t to be a negative integer since time cannot be negative. Check that $t = 0$ is reasonable in the context. When you are graphing, it is often useful to include zero as a value on the horizontal axis.

b)

c) It is reasonable to have points between the ones on the graph. For example, it is possible to determine the distance at 2.5 s, and it is possible to determine the time at 4800 m.

d) Substitute 3.5 for t in the formula $d = 1500t$.
$d = 1500(3.5)$
$d = 5250$
The distance travelled at 3.5 s is 5250 m.
The estimate of 5000 m is close to the calculated distance of 5250 m.

When you rent a tool or machine, you are charged by the hour. For example, if you rent a backhoe and use it for 6 $\frac{1}{2}$ h, you are charged for 7 h.

Show You Know

Paula rents a lawnmower for $8 per hour. A formula representing this relationship is $C = 8t$, where C is the rental cost, in dollars, and t is the time, in hours.
a) Make a table of values.
b) Graph the ordered pairs in your table of values.
c) Is it reasonable to have points between those on the graph? Explain.
d) Calculate the cost to rent for 12 h.

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Method 1 Divide the class into groups of four to six. Depending on the set-up of your classroom and the amount of wall space available, students may need to work in larger groups or out in the hallway. Have students complete all of the steps in their group, and then have a class discussion in which students share their responses to the Reflect on Your Findings.

Method 2 If it is not possible to perform the investigation in your classroom, you may wish to gather data for the table of values to provide to students, or use the following sample data:

Using a paper towel tube:

Distance From Wall (cm)	Width of Field of View (cm)
100	17
130	21
160	25
190	28
220	32

Using a bathroom tissue tube:

Distance From Wall (cm)	Width of Field of View (cm)
100	43
130	53
160	64
190	74
220	86

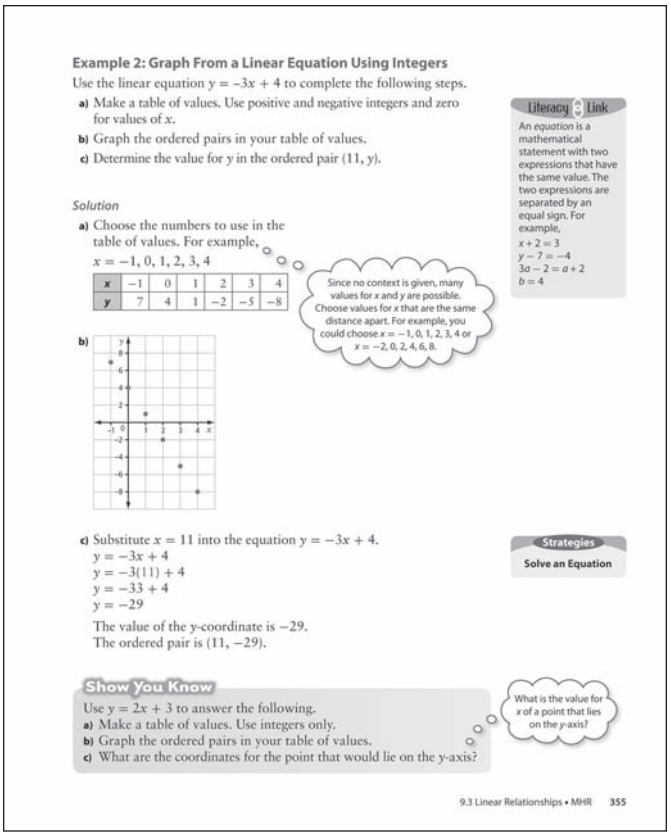
Begin your class discussion by going over the steps in the experiment. Then, as a class, make predictions about what the results might be (#4). Provide students with the data and have them write the ordered pairs and make the graph (#6). As a class, compare the actual results to the predictions (#7). Finally, discuss the Reflect on Your Findings as a class.

For their graphs, you may wish to give students **Master 8 Centimetre Grid Paper** or **Master 9 0.5 Centimetre Grid Paper**.

Example 1

In this example, students make a table of values from a simple formula. Encourage students to be consistent in how they set up the table (i.e., t should be placed in the top row of a horizontal table and d in the bottom row, or t should be in the left column of a vertical table and d in the right column).

It is important that students learn to select reasonable values for t, which is the independent variable. When selecting values for t, have students ask themselves questions like, "Can I use zero? Can I use a negative integer?" Encourage students to discuss the related information in the thought bubble with Solution, part a).



Example 2: Graph From a Linear Equation Using Integers

Use the linear equation $y = -3x + 4$ to complete the following steps.

a) Make a table of values. Use positive and negative integers and zero for values of x.

b) Graph the ordered pairs in your table of values.

c) Determine the value for y in the ordered pair $(11, y)$.

Literacy Link

An *equation* is a mathematical statement with two expressions that have the same value. The two expressions are separated by an equal sign. For example,

$x + 2 = 3$

$y - 7 = -4$

$3a - 2 = a + 2$

$b = 4$

Solution

a) Choose the numbers to use in the table of values. For example,

$x = -1, 0, 1, 2, 3, 4$

x	−1	0	1	2	3	4
y	7	4	1	−2	−5	−8

Since no context is given, many values for x and y are possible. Choose values for x that are the same distance apart. For example, you could choose $x = -1, 0, 1, 2, 3, 4$ or $x = -2, 0, 2, 4, 6, 8$.

b)

c) Substitute $x = 11$ into the equation $y = -3x + 4$.

$y = -3x + 4$

$y = -3(11) + 4$

$y = -33 + 4$

$y = -29$

The value of the y-coordinate is -29.

The ordered pair is $(11, -29)$.

Strategies

Solve an Equation

Show You Know

Use $y = 2x + 3$ to answer the following.

a) Make a table of values. Use integers only.

b) Graph the ordered pairs in your table of values.

c) What are the coordinates for the point that would lie on the y-axis?

What is the value for x of a point that lies on the y-axis?

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Also direct their attention to the other thought bubble with Solution, part a). Once values are selected for t, students must find the corresponding values for d by substituting into the formula.

Students should complete the Show You Know before going on to Example 2.

Example 2

This could be the first time that students have prepared a table for a linear relation that uses x and y as the variables and where the relation is not in a real-life context. Establish class rules regarding the number of values in the table (five or six is acceptable) and whether negative integers must be used (and if so, how many). Encourage students to always use zero for this type of equation.

Literacy Link Assist students in recalling the definition of *equation* by discussing the Literacy Link on page 355. Have students refer to the list of expressions that they recorded in section 9.2. Encourage them to use these expressions to write equations. Having these two sets side by side will emphasize for students the similarities and differences between equations and expressions.

Meeting Student Needs

- For some students, it may be better to complete this section over two periods, focusing on one example in each period. You may also wish to give students an additional set of questions for each example. If students are still not confident, review and practise the areas causing problems before moving on.
- Have students work through each example in pairs. Then, direct them to complete the Show You Know individually, checking their response against their partner's.
- You may wish to use examples of patterns and relationships that are relevant to students and their community. For example, consider having students research how many dogs are used to pull a sled. Have them determine how the number of dogs changes depending on the weight of the load, the weather conditions, length of trip, etc.

Gifted and Enrichment

- Encourage students to design and carry out an experiment that results in a linear relationship. Then, have them plot the data and attempt to express the relationship in a linear equation.

Common Errors

- Students find incorrect values for y in equations such as $y = 2x + 3$ in the Example 2 Show You Know.

R_x Remind students that they are studying linear relations and that the points should be in a line. If a point is not in the line, it is likely wrong and should be checked. Sometimes, students misunderstand $2x$. Emphasize that $2x$ means $2 \times x$, where x takes on values assigned by the student.

- Students confuse the x and y variables.

R_x Always use a consistent convention for the table of values. In a vertical table, place x in the left column and y in the right column. In horizontal table, place x in the top row and y in the bottom row. You might also have students make tables with three columns or rows. For example, in a vertical table, have them put x in the first column, put y in the second column, and write the ordered pair in the third column.

Answers

Explore the Math

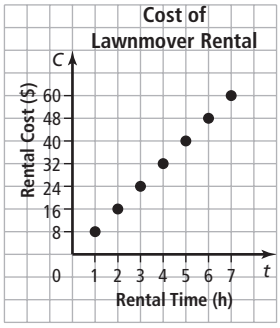
1.-9. Answers will vary.

Show You Know: Example 1

a)

Rental Time, t (h)	1	2	3	4	5	6	7
Rental Cost, C ($)	8	16	24	32	40	48	60

b)



c) Answers may vary. Example: No. It is not reasonable to have points between the values. The company charges by the hour only, not by part of an hour.

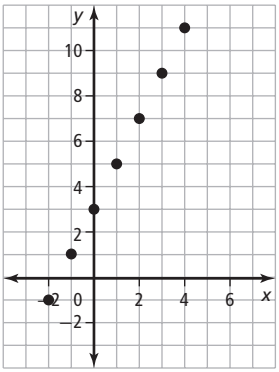
d) The cost to rent the lawnmower for 12 h is $96.

Show You Know: Example 2

a) Answers may vary. Example:

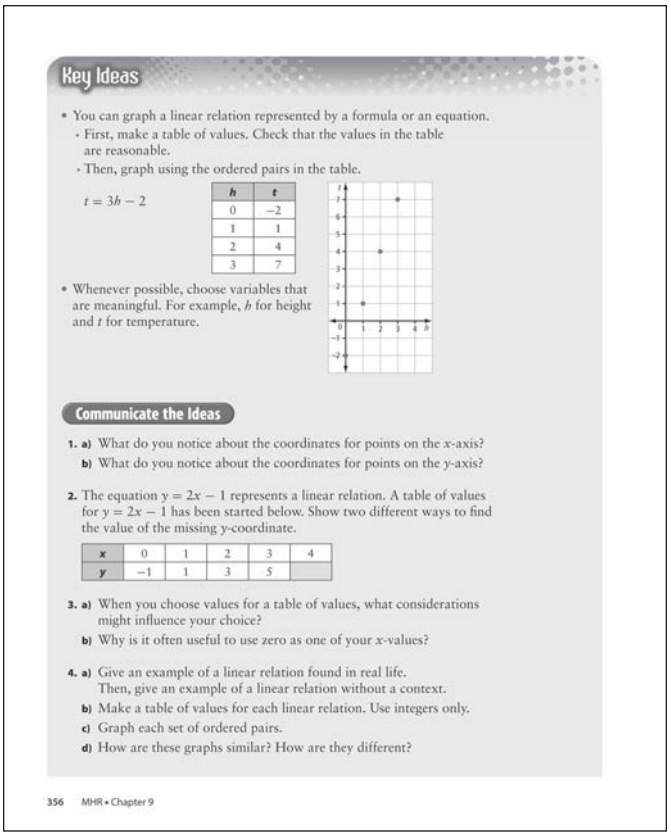
x	−2	−1	0	1	2	3	4
y	−1	1	3	5	7	9	11

b)



c) (0, 3)

Assessment	Supporting Learning
Assessment *as* Learning	
Reflect on Your Findings Ask students what the relationship is in this activity. Try to have all students explain why the points on their graph do not align perfectly.	• Provide assistance to students who need it by walking them through each step of the Explore the Math. Then, show how #3 to #6 are very similar to the steps followed in sections 9.1 and 9.2. • Students should make and record a prediction in #4. This step is an important part of the experimentation process. • Holding a class discussion for #9b) would be beneficial. It would allow students to compare their results as well as verbalize their thinking. Students who are less confident can take what they learn and apply it to the questions that follow.
Assessment *for* Learning	
Example 1 Have students do the Show You Know related to Example 1.	• Encourage students to verbalize their thinking. • You may wish to have students work with a partner. • During class discussions, model how to solve the problems. Encourage students to explain in simple language what they did in each part of the question. • It may be beneficial to assist students in recalling how to substitute into a formula. • In part c), remind students that the values for t may have been different since these values were selected. The ease of answering part c) is affected by what values for t are chosen. • Assist students in answering part d) by asking them which two values of t the value 3.5 appears between. If they answer correctly, ask them what two values of d must the answer appear between. Continue the discussion in order to narrow the value of the estimate. • Once they have completed part d), have students generalize why it is possible to have part of an hour.
Example 2 Have students do the Show You Know related to Example 2.	• Encourage students to verbalize their thinking. • You may wish to have students work with a partner. • Discuss with students that when selecting values for x, it is beneficial to choose values that differ by equal increments (e.g., 1, 2, 3, etc., or 10, 20, 30, etc., depending on the question). This will make it easier for them to see a pattern in the values of y. • It would be valuable to compare this question with Example 1. Ask students, "Why are negative values of x appropriate in Example 2?" • Some students may not know how to decide what values of x to use when negative integers are allowed. Consider guiding them to generate a standard set of numbers such as –2, –1, 0, 1, 2. They could record these numbers in their Foldable for future reference. • It is important for all students to realize that if a point lies on the x-axis, its y-coordinate is zero. Similarly, if a point lies on the y-axis, its x-coordinate is zero. • Ask students how they interpret the notation $(11, y)$ in part d) of Example 2. All students should understand that they are being asked to find y given that $x = 11$.



Key Ideas

- You can graph a linear relation represented by a formula or an equation.
  - First, make a table of values. Check that the values in the table are reasonable.
  - Then, graph using the ordered pairs in the table.

$t = 3h - 2$

h	t
0	−2
1	1
2	4
3	7

- Whenever possible, choose variables that are meaningful. For example, h for height and t for temperature.

Communicate the Ideas

1. a) What do you notice about the coordinates for points on the x-axis?
   b) What do you notice about the coordinates for points on the y-axis?
2. The equation $y = 2x - 1$ represents a linear relation. A table of values for $y = 2x - 1$ has been started below. Show two different ways to find the value of the missing y-coordinate.

x	0	1	2	3	4
y	−1	1	3	5	

3. a) When you choose values for a table of values, what considerations might influence your choice?
   b) Why is it often useful to use zero as one of your x-values?
4. a) Give an example of a linear relation found in real life. Then, give an example of a linear relation without a context.
   b) Make a table of values for each linear relation. Use integers only.
   c) Graph each set of ordered pairs.
   d) How are these graphs similar? How are they different?

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Encourage students to make their own summary for section 9.3 prior to looking at the Key Ideas in the student resource. Then, have students compare their summaries with other students' and with the Key Ideas.

Communicate the Ideas

Have students work individually to answer #1 to #3. In #1, students generalize about points that lie on the x-axis and y-axis. If students understand these generalizations rather than memorize them, there is much less chance of future confusion. In #2, students must determine the patterns in the table, thereby reinforcing what was learned previously and extending their skills beyond simple substitution. For #3, have a class discussion that includes a conclusion that students' choice of values should not be random.

You may wish to have students also complete #4. Students should understand that an equation without a context can have any values for x, whereas an equation with a context has limitations based on what makes sense in the situation.

Meeting Student Needs

- Encourage students to select at least one negative integer, zero, and at least one positive integer for all equations of the form $y = ax + b$ that are not based on a real-life context. Explain to students that if the points do not line up when graphed, students should check their values.

Answers

Communicate the Ideas

1. a) Answers may vary: Example: All points on the x-axis have zero for the value of y.

b) Answers may vary. Example: All points on the y-axis have zero for the value of x.

2. Answers may vary. Example: Method 1: Using the formula $y = 2x - 1$, substitute 4 for x, then calculate $2(4) - 1 = 7$. Method 2: Find the common difference between consecutive values of y, which is 2, and add that number to 5 to find the missing value: $5 + 2 = 7$.

3. a) Answers may vary. Example: Choose integer values that are reasonable in the context of the situation. Choose values that are an equal interval apart.

b) Answers may vary. Example: The value of zero is usually fairly simple to substitute into an equation. Also, it is often useful to include zero as a value of x to act as a starting point or midpoint for a graph.

4. a) Answers may vary. Example: $C = 4b$, where b is the number of boxes of cookies sold and C is the cost in dollars for the cookies. An example of a linear relation without a context is $y = -3x + 2$.

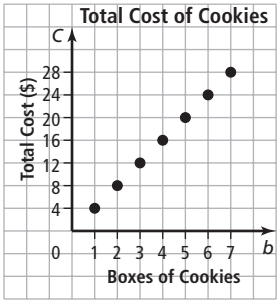
b) $C = 4b$:

Boxes of Cookies, b	1	2	3	4	5	6	7
Total Cost, C ($)	4	8	12	16	20	24	28

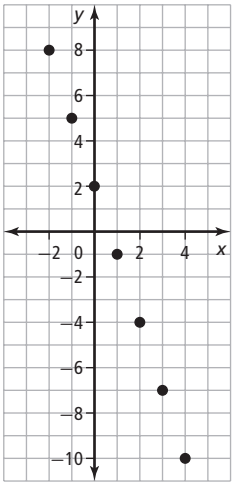
$y = -3x + 2$:

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

c) $C = 4b$:

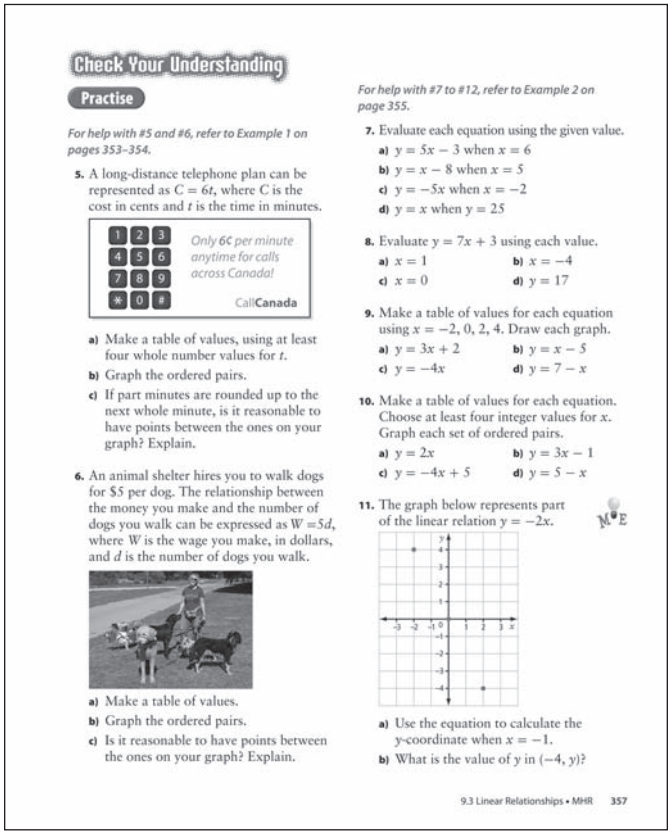


$y = -3x + 2$:



d) Answers may vary. Example: The graphs are similar because the points on both graphs appear to lie in a straight line. The graphs are different because the relationship to do with the cost of cookies does not have any values that are negative and the linear relationship without a context in real life has values that are negative.

Assessment	Supporting Learning
Assessment *as* Learning	
Communicate the Ideas Have all students complete questions #1 to #3. Check student responses for conceptual understanding.	• Consider having students work in pairs or small groups. • Alternatively, have students work individually to answer the questions and then share their responses with a classmate. You may wish to make this an opportunity for peer evaluation. Distribute **Master 2 Two Stars and One Wish**, on which students write two aspects of their peer's work that they like and one that requires improvement. • Have students share their answers in a class discussion. • Ensure that all students find two ways to determine the missing coordinate in #2. Having students demonstrate their solutions on the board may be helpful to other learners. • A class discussion about #3 would be beneficial in setting up students for success with the Practise and Apply questions.



Check Your Understanding

Practise

For help with #5 and #6, refer to Example 1 on pages 353–354.

5. A long-distance telephone plan can be represented as $C = 6t$, where C is the cost in cents and t is the time in minutes.

a) Make a table of values, using at least four whole number values for t.
b) Graph the ordered pairs.
c) If part minutes are rounded up to the next whole minute, is it reasonable to have points between the ones on your graph? Explain.

6. An animal shelter hires you to walk dogs for $5 per dog. The relationship between the money you make and the number of dogs you walk can be expressed as $W = 5d$, where W is the wage you make, in dollars, and d is the number of dogs you walk.

a) Make a table of values.
b) Graph the ordered pairs.
c) Is it reasonable to have points between the ones on your graph? Explain.

For help with #7 to #12, refer to Example 2 on page 355.

7. Evaluate each equation using the given value.
a) $y = 5x - 3$ when $x = 6$
b) $y = x - 8$ when $x = 5$
c) $y = -5x$ when $x = -2$
d) $y = x$ when $y = 25$

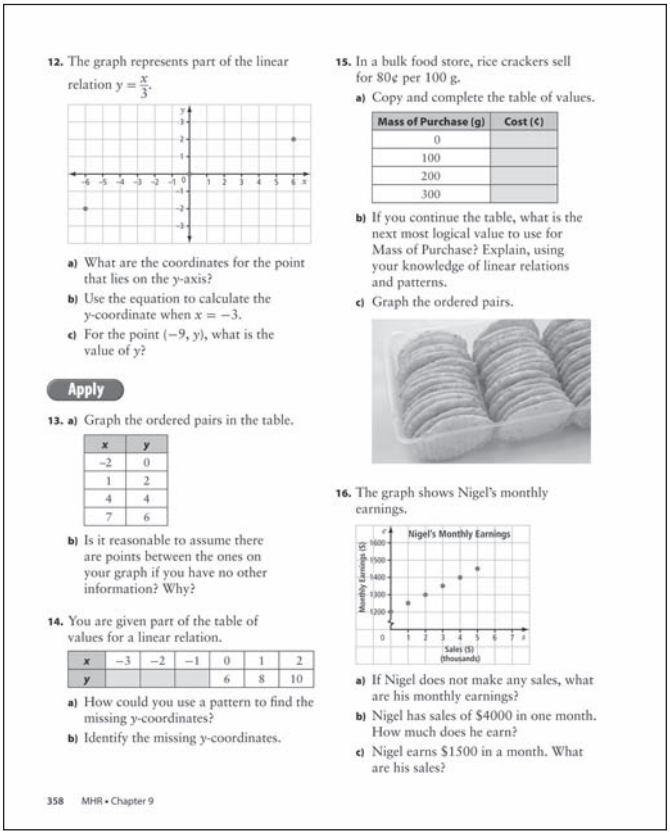
8. Evaluate $y = 7x + 3$ using each value.
a) $x = 1$ b) $x = -4$
c) $x = 0$ d) $y = 17$

9. Make a table of values for each equation using $x = -2, 0, 2, 4$. Draw each graph.
a) $y = 3x + 2$ b) $y = x - 5$
c) $y = -4x$ d) $y = 7 - x$

10. Make a table of values for each equation. Choose at least four integer values for x. Graph each set of ordered pairs.
a) $y = 2x$ b) $y = 3x - 1$
c) $y = -4x + 5$ d) $y = 5 - x$

11. The graph below represents part of the linear relation $y = -2x$.

a) Use the equation to calculate the y-coordinate when $x = -1$.
b) What is the value of y in $(-4, y)$?



12. The graph represents part of the linear relation $y = \frac{x}{3}$.

a) What are the coordinates for the point that lies on the y-axis?
b) Use the equation to calculate the y-coordinate when $x = -3$.
c) For the point $(-9, y)$, what is the value of y?

Apply

13. a) Graph the ordered pairs in the table.

x	y
−2	0
1	2
4	4
7	6

b) Is it reasonable to assume there are points between the ones on your graph if you have no other information? Why?

14. You are given part of the table of values for a linear relation.

x	−3	−2	−1	0	1	2
y				6	8	10

a) How could you use a pattern to find the missing y-coordinates?
b) Identify the missing y-coordinates.

15. In a bulk food store, rice crackers sell for 80¢ per 100 g.
a) Copy and complete the table of values.

Mass of Purchase (g)	Cost (¢)
0	
100	
200	
300	

b) If you continue the table, what is the next most logical value to use for Mass of Purchase? Explain, using your knowledge of linear relations and patterns.
c) Graph the ordered pairs.

16. The graph shows Nigel's monthly earnings.

a) If Nigel does not make any sales, what are his monthly earnings?
b) Nigel has sales of $4000 in one month. How much does he earn?
c) Nigel earns $1500 in a month. What are his sales?

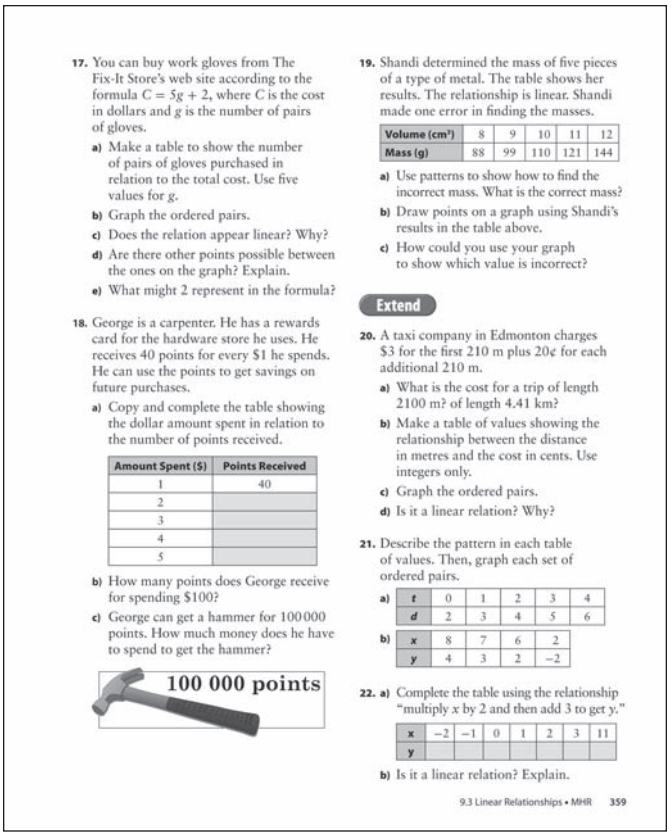
Check Your Understanding

Practise

Offer students a choice between #5 and #6. Then, assign #7a) and b), #9a) and b), and #11 to assess whether students understand the work associated with Example 2.

Apply

Have students complete #14, and then have them either choose two or three of the contextual questions (#15 to #19) or assign your choice of these questions. Students could work individually or in small groups. In #14, students use patterns in the table, an algebraic expression, or a graph to find the missing values.



17. You can buy work gloves from The Fix-It Store's web site according to the formula $C = 5g + 2$, where C is the cost in dollars and g is the number of pairs of gloves.

a) Make a table to show the number of pairs of gloves purchased in relation to the total cost. Use five values for g.

b) Graph the ordered pairs.

c) Does the relation appear linear? Why?

d) Are there other points possible between the ones on the graph? Explain.

e) What might 2 represent in the formula?

18. George is a carpenter. He has a rewards card for the hardware store he uses. He receives 40 points for every $1 he spends. He can use the points to get savings on future purchases.

a) Copy and complete the table showing the dollar amount spent in relation to the number of points received.

Amount Spent ($)	Points Received
1	40
2	
3	
4	
5	

b) How many points does George receive for spending $100?

c) George can get a hammer for 100 000 points. How much money does he have to spend to get the hammer?

19. Shandi determined the mass of five pieces of a type of metal. The table shows her results. The relationship is linear. Shandi made one error in finding the masses.

Volume (cm^3)	8	9	10	11	12
Mass (g)	88	99	110	121	144

a) Use patterns to show how to find the incorrect mass. What is the correct mass?

b) Draw points on a graph using Shandi's results in the table above.

c) How could you use your graph to show which value is incorrect?

Extend

20. A taxi company in Edmonton charges $3 for the first 210 m plus 20¢ for each additional 210 m.

a) What is the cost for a trip of length 2100 m? of length 4.41 km?

b) Make a table of values showing the relationship between the distance in metres and the cost in cents. Use integers only.

c) Graph the ordered pairs.

d) Is it a linear relation? Why?

21. Describe the pattern in each table of values. Then, graph each set of ordered pairs.

a)

t	0	1	2	3	4
d	2	3	4	5	6

b)

x	8	7	6	2
y	4	3	2	−2

22. a) Complete the table using the relationship "multiply x by 2 and then add 3 to get y."

x	−2	−1	0	1	2	3	11
y							

b) Is it a linear relation? Explain.

Extend

In #20, students must convert 4.41 km to 4410 m since that is the unit used by the company to price its fares. You may wish to provide students with this conversion.

Both #21 and #22 represent general relationships common in mathematics.

Meeting Student Needs

- It may be beneficial for your students to work in pairs to complete the Practise questions for Example 1 immediately after working on that example. They might then follow the same process for Example 2. Then, have students complete the Apply activities independently.
- Encourage all students to draw graphs with and without grid paper. The latter can be viewed as a sketch of the situation.
- Students should be able to answer questions on linear relations using patterns, expressions, and graphs. If some students always restrict themselves to only one method, ask them to provide two methods for solving a specific question.
- Provide **BLM 9–9 Section 9.3 Extra Practice** to students who would benefit from more practice.

ELL

- Assign students questions that are less language based, such as # 7 to #12.

Common Errors

- Some students may become frustrated when they are unable to see the pattern immediately.

R_x Encourage students to compare successive terms to find the difference. Once they have the difference, they can add (if it is positive) or subtract (if it is negative).

- Students place their points between the grid lines.

R_x Students may not truly understand the meaning of an ordered pair. Encourage word descriptions of an ordered pair, particularly if the question has a context. Then, discuss how each coordinate represents a specific quantity or item. Have students draw a dashed vertical line from the value on the x-axis and a dashed horizontal line from the value on the y-axis. Make sure that they understand that the lines should meet at the point.

Assessment	Supporting Learning
Assessment *for* Learning	
Practise and Apply Have students do questions #5, #7, #9, #11, and #14. Students who have no problems with these questions can go on to the remaining Apply questions.	• If students find the assigned Practise questions challenging, additional instruction on Examples 1 and 2 may be necessary. Coach students through #5 and then observe as they attempt #6. Similarly, work through #7 and #9, then assign #8 and #10. • Each of #5, #7, #9, and #11 deals with a different aspect of the section. Encourage students to make note of the questions that are most challenging in the What I Need to Work On section of their Foldable for future reference. • In #11a), have students look at the graph and tell whether when $x = 1$, the corresponding value of y is positive, zero, or negative. Then, have them determine where the point would be if y is positive, zero, or negative. Support students by having them verbalize several ways to solve #11b). • Students who find #14 challenging should be encouraged to verbalize what pattern they see in each of the rows of the table. Ask how they could use the patterns to complete the missing boxes.
Assessment *as* Learning	
Math Learning Log Have students respond to the following prompts: • What part of the work on linear relations did you find most interesting? • Do you prefer working with questions in context? Why? • I learned that linear relations …	• Point out that questions can have a real-life context or be more traditional math questions with little or no context. Ask why it is beneficial to work on both kinds of questions. • You may wish to ask students where they think they would use linear relations in their day-to-day routines. • Encourage students to use the What I Need to Work On section of their chapter Foldable to note what they continue to have difficulties with.