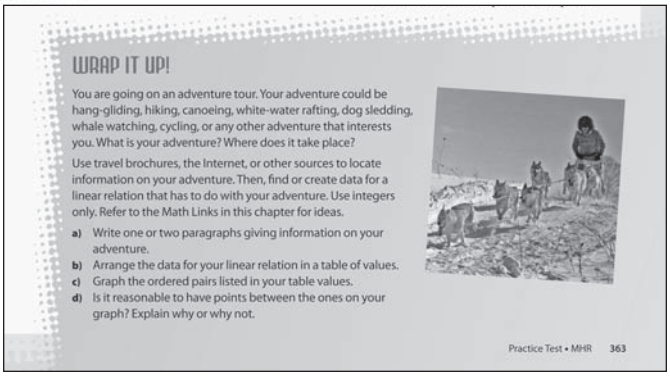
Wrap It Up!



WRAP IT UP!

You are going on an adventure tour. Your adventure could be hang-gliding, hiking, canoeing, white-water rafting, dog sledding, whale watching, cycling, or any other adventure that interests you. What is your adventure? Where does it take place?

Use travel brochures, the Internet, or other sources to locate information on your adventure. Then, find or create data for a linear relation that has to do with your adventure. Use integers only. Refer to the Math Links in this chapter for ideas.

a) Write one or two paragraphs giving information on your adventure.
b) Arrange the data for your linear relation in a table of values.
c) Graph the ordered pairs listed in your table values.
d) Is it reasonable to have points between the ones on your graph? Explain why or why not.

Practice Test • MHR 363

***MathLinks 8*, page 363**

Suggested Timing
80–100 minutes

Materials
- grid paper
- ruler

Blackline Masters
Master 1 Project Rubric
Master 8 Centimetre Grid Paper
Master 9 0.5 Centimetre Grid Paper
BLM 9–1 Chapter 9 Math Link Introduction
BLM 9–6 Section 9.1 Math Link
BLM 9–8 Section 9.2 Math Link
BLM 9–11 Chapter 9 Wrap It Up!

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

Planning Notes

Introduce the problem and clarify the assessment criteria. Make this Wrap It Up! as realistic as possible. In this activity, students select an adventure that interests them. Ensure that students do not select the same adventure. Perhaps, have students sign up for their adventure prior to getting started.

Meeting Student Needs

- Students who are not confident in their ability to handle the Wrap It Up! should revisit the Math Links.
- If students have difficulty selecting an adventure, have a brief class discussion and record possible adventures on the board. Review the types of tours listed in the chapter opener, and discuss places in the world students might like to visit.
- Give students some computer lab time to search the Internet for possible adventure/eco tours. Students might type *adventure tours* into a search engine and perhaps add a country name. Have students record the type of tour and the Internet address. Add the collected information to the list generated during the class discussion.
- Brainstorm the kinds of data students might collect and graph. The data might include cost per day, distances travelled, supplies needed, etc. Add the suggestions to the list.

Assessment	Supporting Learning
Assessment *of* Learning	
Wrap It Up! This chapter problem wrap-up gives students an opportunity to apply and display their knowledge of linear relations. It is important for students to show an understanding of patterns, tables of values, and graphs in a real-life situation. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this Wrap It Up! Page 489 in this TR provides notes on how to use this rubric for the Wrap It Up!	• It is not necessary, but helpful, for students to complete both of the Math Links to assist them in their work on the chapter problem. • If students have not completed the Math Links earlier, you may wish to provide them with **BLM 9–1 Chapter 9 Math Link Introduction**, **BLM 9–6 Section 9.1 Math Link**, and **BLM 9–8 Section 9.2 Math Link**. • You may wish to have students use **BLM 9–11 Chapter 9 Wrap It Up!**, which provides scaffolding for the chapter problem wrap-up.

The chart below shows the **Master 1 Project Rubric** for tasks such as the Wrap It Up! and provides notes that specify how to identify the level of specific answers for the project.

Score/Level	Holistic Descriptor	Specific Question Notes
5 (Standard of Excellence)	❑ Applies/develops **thorough** strategies and mathematical processes making **significant** comparisons/connections that demonstrate a **comprehensive** understanding of how to develop a complete solution ❑ Procedures are **efficient and effective** and may contain a **minor mathematical error** that does not affect understanding ❑ Uses **significant** mathematical language to explain their understanding and provides **in-depth** support for their conclusion	• provides a complete and correct response
4 (Above Acceptable)	❑ Applies/develops **thorough** strategies and mathematical processes for making **reasonable** comparisons/connections that demonstrate a **clear** understanding ❑ Procedures are **reasonable** and may contain a **minor mathematical error** that may hinder the understanding in one part of a complete solution ❑ Uses **appropriate** mathematical language to explain their understanding and provides **clear** support for their conclusion	• provides a complete response with labelling errors on the graph *or* • provides a complete response with weak or absent justification in part d) *or* • provides complete responses to parts b), c), and d), based on a discrepancy in the context given in part a)
3 (Meets Acceptable)	❑ Applies/develops **relevant** strategies and mathematical processes making **some** comparisons/connections that demonstrate a **basic** understanding ❑ Procedures are **basic** and may contain a **major error or omission** ❑ Uses **common** language to explain their understanding and provides **minimal** support for their conclusion	• completes parts a), b), and c) *or* • completes parts b), c), and d) and justifies part d) with a reasonable argument but the response lacks an original context
2 (Below Acceptable)	❑ Applies/develops **some relevant** mathematical processes making **minimal** comparisons/connections that lead to a **partial solution** ❑ Procedures are **basic** and may contain **several major mathematical errors** ❑ Communication is **weak**	• completes parts a) and b) *or* • completes parts b) and c) with no context given
1 (Beginning)	❑ Applies/develops an **initial start** that may be **partially correct** or could have led to a correct solution ❑ Communication is **weak or absent**	• completes part a) *or* • provides a table of values with no context

Math Games

***MathLinks 8*, pages 364**

Suggested Timing
20–30 minutes

Materials
- paper clip

Blackline Masters
BLM 9–12 Friends and Relations Spinner
BLM 9–13 Friends and Relations Game Cards
BLM 9–14 Friends and Relations Record Sheet

Specific Outcomes
PR1 Graph and analyze two-variable linear relations.
PR2 Model and solve problems using linear equations of the form:
- $ax = b$
- $\frac{x}{a} = b, a \neq 0$
- $ax + b = c$
- $\frac{x}{a} + b = c, a \neq 0$
- $a(x + b) = c$

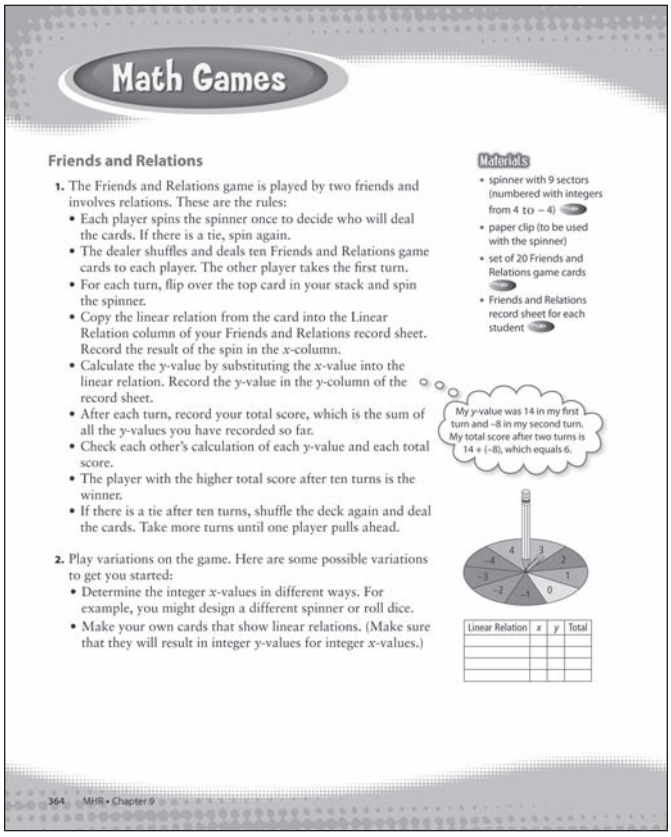
concretely, pictorially and symbolically, where a, b and c are integers.

Planning Notes

Before students begin, you may wish to read the directions with the class.

Have students work in pairs to play the game. Note that each student needs his or her own record sheet, and that each pair of students requires a spinner, a paper clip for the spinner, and a set of cards.

The game provides students with the opportunity to apply their learning from the chapter to a game situation. Students take linear relations from a card and evaluate them for values of x that they obtain from a spinner. They then record their results in a table.


Math Games

Friends and Relations

1. The Friends and Relations game is played by two friends and involves relations. These are the rules:
- Each player spins the spinner once to decide who will deal the cards. If there is a tie, spin again.
- The dealer shuffles and deals ten Friends and Relations game cards to each player. The other player takes the first turn.
- For each turn, flip over the top card in your stack and spin the spinner.
- Copy the linear relation from the card into the Linear Relation column of your Friends and Relations record sheet. Record the result of the spin in the x-column.
- Calculate the y-value by substituting the x-value into the linear relation. Record the y-value in the y-column of the record sheet.
- After each turn, record your total score, which is the sum of all the y-values you have recorded so far.
- Check each other's calculation of each y-value and each total score.
- The player with the higher total score after ten turns is the winner.
- If there is a tie after ten turns, shuffle the deck again and deal the cards. Take more turns until one player pulls ahead.

2. Play variations on the game. Here are some possible variations to get you started:
- Determine the integer x-values in different ways. For example, you might design a different spinner or roll dice.
- Make your own cards that show linear relations. (Make sure that they will result in integer y-values for integer x-values.)

Materials
- spinner with 9 sectors (numbered with integers from 4 to −4)
- paper clip (to be used with the spinner)
- set of 20 Friends and Relations game cards
- Friends and Relations record sheet for each student

My y-value was 14 in my first turn and −8 in my second turn. My total score after two turns is 14 + (−8), which equals 6.

Linear Relation	x	y	Total

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Have students create a variation of the game. Brainstorm some ideas as a class. For example, the game could be modified to include graphing by restricting the relation to one type (first card drawn) and using this for the entire game. Students could then take the points from the table and graph them.

Common Errors

- Some students may miscalculate values of y, or the sum of the values of y.

R$_x$ Direct partners to check each other's work.

Assessment	Supporting Learning
Assessment *for* Learning	
Friends and Relations Have students work in pairs to play the game. This game could be used as an assessment before the practice test or as part of the chapter review.	• Some students may find it challenging to evaluate two-step equations. For these students, you may wish to limit the number of cards that involve equations of the form $y = ax + b$ and have them focus on equations of the form $y = ax$ and $y = x + a$. • Students who need additional assistance with evaluating equations and recording their results in the table should review the examples in the chapter and be provided additional problems.

Challenge in Real Life

***MathLinks 8*, page 365**

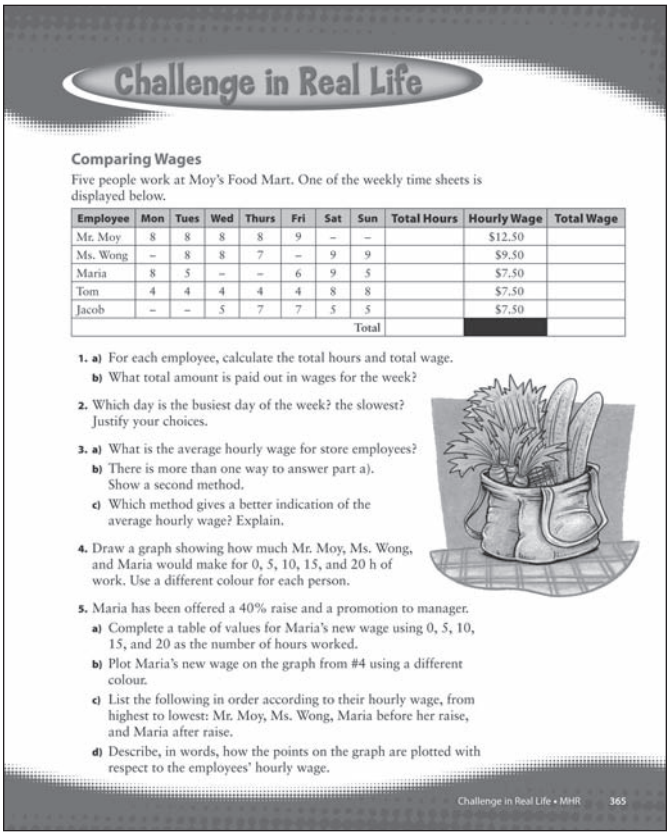
Suggested Timing
80–100 minutes

Materials
- grid paper
- ruler
- computer graphing software or graphing calculator (optional)

Blackline Masters
Master 1 Project Rubric
Master 8 Centimetre Grid Paper
Master 9 0.5 Centimetre Grid Paper

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.



Challenge in Real Life

Comparing Wages

Five people work at Moy's Food Mart. One of the weekly time sheets is displayed below.

Employee	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	Total Hours	Hourly Wage	Total Wage
Mr. Moy	8	8	8	8	9	–	–		$12.50	
Ms. Wong	–	8	8	7	–	9	9		$9.50	
Maria	8	5	–	–	6	9	5		$7.50	
Tom	4	4	4	4	4	8	8		$7.50	
Jacob	–	–	5	7	7	5	5		$7.50	
							Total			

1. a) For each employee, calculate the total hours and total wage.
   b) What total amount is paid out in wages for the week?
2. Which day is the busiest day of the week? the slowest? Justify your choices.
3. a) What is the average hourly wage for store employees?
   b) There is more than one way to answer part a). Show a second method.
   c) Which method gives a better indication of the average hourly wage? Explain.
4. Draw a graph showing how much Mr. Moy, Ms. Wong, and Maria would make for 0, 5, 10, 15, and 20 h of work. Use a different colour for each person.
5. Maria has been offered a 40% raise and a promotion to manager.
   a) Complete a table of values for Maria's new wage using 0, 5, 10, 15, and 20 as the number of hours worked.
   b) Plot Maria's new wage on the graph from #4 using a different colour.
   c) List the following in order according to their hourly wage, from highest to lowest: Mr. Moy, Ms. Wong, Maria before her raise, and Maria after raise.
   d) Describe, in words, how the points on the graph are plotted with respect to the employees' hourly wage.

Challenge in Real Life • MHR 365

Activity Planning Notes

You may wish to use the following steps to introduce and complete this challenge:

1. Begin with discussing how staffing schedules work. Ask students for possible reasons that daily staffing levels might change. For example, days like Monday may need fewer staff because people have done most of their shopping over the weekend, so the store saves money by having fewer employees to pay.
2. Go over some of the vocabulary such as the term *busiest*, which refers to having a lot of customers so that more staff is needed. Explain that understaffing a store may lead to a loss of customers because of long lineups at the cash register and insufficient sales assistance. This must be balanced against having too many costly staff with little to do during a "slow" day.
3. Review how to graph relations. For example, in this situation, encourage students to put Hours Worked on the horizontal axis and Wages on the vertical axis. Have students find the greatest values for each before setting maximum values for the horizontal and vertical axes. You may wish to provide students with **Master 8 Centimetre Grid Paper** or **Master 9 0.5 Centimetre Grid Paper**, on which to draw their graphs. Alternatively, students may wish to use graphing software or a graphing calculator to make their graphs.
4. Once students have finished their graphs, have them work in pairs to compose possible answers to #5. Lead students toward an understanding that the greater the vertical distance between points on the graph, the higher the rate of pay.

5. Clarify that the task is to
   - complete the table of wages
   - use the table of wages to consider what days have more and fewer customers
   - calculate an average wage for store employees
   - create a graph that shows wages earned based on hours worked
   - use the graph to analyse the comparative wage rates
6. Review the **Master 1 Project Rubric** with students so that they will know what is expected.

Meeting Student Needs

Gifted and Enrichment

- Ask students to compare the various lines to see if there is a pattern.

Answers

Comparing Wages

1. a), b)

Employee	Total Hours	Total Wage
Mr. Moy	41	$512.50
Ms. Wong	41	$389.50
Maria	33	$247.50
Tom	36	$270.00
Jacob	29	$217.50
Total	180	$1637.00

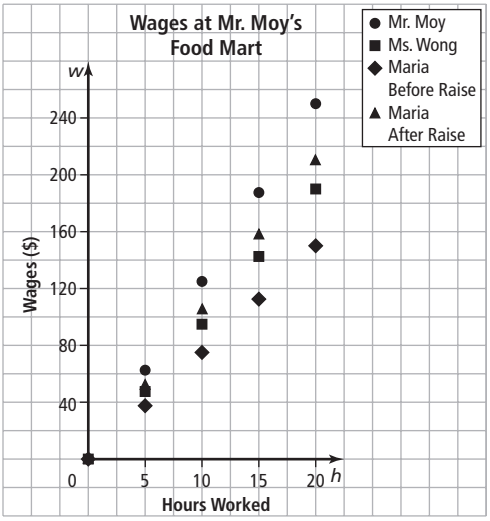
2. It appears that Saturday is the busiest day because it has the most staff hours recorded. Monday must be the slowest day because it has the fewest staff hours and fewer people work that day.

3. a) Answers may vary. Examples:
- The mean hourly wage rate is $\frac{12.50 + 9.50 + 7.50 + 7.50 + 7.50}{5} = \$8.90$.
- The mode is $7.50. (Accept this answer only if the issue of removing outliers is brought up.)

b) Answers will vary. Examples:
- Take the total wage and divide by the number of employees.
- Calculate the median.
- Remove any outlier and then calculate the median or mode.
- Take each of the wages paid out and $\frac{12.50 + 9.50 + 7.50}{3} \approx \$9.83$.

c) Answers will vary. Examples:
- The mode is a good indication of the average hourly wage because three out of four workers receive this amount. One of the people who receives more appears to be an owner so this wage might be considered an outlier.
- If you take out Mr. Moy's wage and calculate the mean of the other four workers, the average hourly wage is $8.00. This is a good indication since it excludes the high wage of the owner but includes Ms. Wong, who makes more than the others. Averaging these salaries shows a higher rate than the bottom three employees receive, which is fair.

4., 5 b)



5. a) Maria's new hourly wage is $10.50.

Hours Worked	Wages
0	$0.00
5	$52.50
10	$105.00
15	$157.50
20	$210.00

c) Mr. Moy, Maria after raise, Ms. Wong, Maria before raise

d) The points lie along a straight line. The vertical distance between the points becomes greater as the hourly wage increases.

This challenge can be used for either Assessment *for* Learning or Assessment *of* Learning.

Assessment	Supporting Learning
Assessment *for* Learning	
Comparing Wages Discuss the challenge as a class. Have students work individually on #1 to #4. Have them work in pairs to complete #5.	• For a second challenge, complete with teaching notes and student exemplars, go to www.mathlinks8.ca, access the online Teacher Centre, go to Assessment, and then follow the links.
Assessment *of* Learning	
The Earth's Core Introduce the challenge to the class. Have students work individually on #1 to #5.	• **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this challenge. Page 494 provides notes on how to use this rubric for the challenge. • To view student exemplars, go to www.mathlinks8.ca, access the online Teacher Centre, go to Assessment, and then follow the links.

The chart below shows the **Master 1 Project Rubric** for tasks such as the Challenge in Real Life and provides notes that specify how to identify the level of specific answers for this project.

Score/Level	Holistic Descriptor	Specific Question Notes
5 **(Standard of Excellence)**	❑ Applies/develops **thorough** strategies and mathematical processes making **significant** comparisons/connections that demonstrate a **comprehensive** understanding of how to develop a complete solution ❑ Procedures are **efficient and effective** and may contain a **minor mathematical error** that does not affect understanding ❑ Uses **significant** mathematical language to explain their understanding and provides **in-depth** support for their conclusion	• provides a complete and correct solution that may contain a minor calculation error that does not change the final outcome
4 **(Above Acceptable)**	❑ Applies/develops **thorough** strategies and mathematical processes for making **reasonable** comparisons/connections that demonstrate a **clear** understanding ❑ Procedures are **reasonable** and may contain a **minor mathematical error** that may hinder the understanding in one part of a complete solution ❑ Uses **appropriate** mathematical language to explain their understanding and provides **clear** support for their conclusion	• provides a complete response to #1, #2, #3a), #4, and #5 but is unable to do #3b) and #3c) *or* • provides a complete response that contains weak communication in #2, #3c), or #5c) (two of the three are correct) *or* • provides a complete and correct response with a calculation error that hinders the final solution *or* • provides a complete solution but the graph is unlabelled
3 **(Meets Acceptable)**	❑ Applies/develops **relevant** strategies and mathematical processes making **some** comparisons/connections that demonstrate a **basic** understanding ❑ Procedures are **basic** and may contain a **major error or omission** ❑ Uses **common** language to explain their understanding and provides **minimal** support for their conclusion	• provides correct and complete #1, #2, and #3 and partial starts to #4 and #5 *or* • provides correct and complete #1, #2, and #4 *or* • provides correct and complete #1, #2, and #5 *or* • provides correct and complete #4 and #5
2 **(Below Acceptable)**	❑ Applies/develops **some relevant** mathematical processes making **minimal** comparisons/connections that lead to a **partial solution** ❑ Procedures are **basic** and may contain **several major mathematical errors** ❑ Communication is **weak**	• provides correct and complete #1 and #2 *or* • provides correct and complete #1 and #3 *or* • correctly completes #4 *or* • correctly completes #5
1 **(Beginning)**	❑ Applies/develops an **initial start** that may be **partially correct** or could have led to a correct solution ❑ Communication is **weak or absent**	• correctly completes #1, #2, or #3 *or* • correctly responds to #4 or #5a) regarding two people

For student exemplars, go to www.mathlinks8.ca and follow the links.