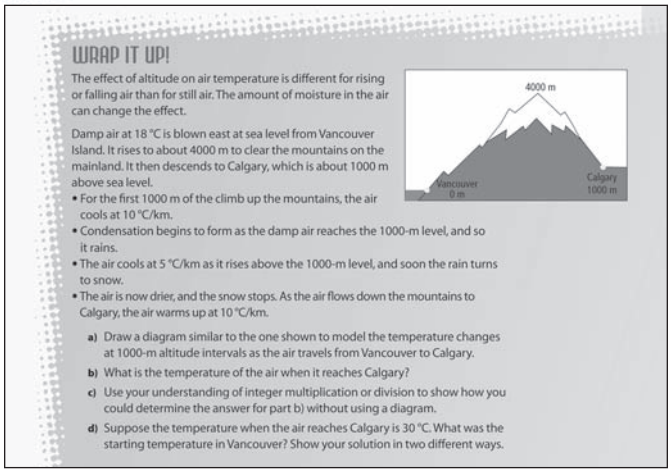
Wrap It Up!



WRAP IT UP!

The effect of altitude on air temperature is different for rising or falling air than for still air. The amount of moisture in the air can change the effect.

Damp air at 18 °C is blown east at sea level from Vancouver Island. It rises to about 4000 m to clear the mountains on the mainland. It then descends to Calgary, which is about 1000 m above sea level.

- For the first 1000 m of the climb up the mountains, the air cools at 10 °C/km.
- Condensation begins to form as the damp air reaches the 1000-m level, and so it rains.
- The air cools at 5 °C/km as it rises above the 1000-m level, and soon the rain turns to snow.
- The air is now drier, and the snow stops. As the air flows down the mountains to Calgary, the air warms up at 10 °C/km.

a) Draw a diagram similar to the one shown to model the temperature changes at 1000-m altitude intervals as the air travels from Vancouver to Calgary.

b) What is the temperature of the air when it reaches Calgary?

c) Use your understanding of integer multiplication or division to show how you could determine the answer for part b) without using a diagram.

d) Suppose the temperature when the air reaches Calgary is 30 °C. What was the starting temperature in Vancouver? Show your solution in two different ways.

4000 m
Vancouver 0 m
Calgary 1000 m

***MathLinks 8*, page 321**

Suggested Timing
80–100 minutes

Materials
- red and blue integer chips

Blackline Masters
Master 1 Project Rubric
BLM 8–1 Chapter 8 Math Link Introduction
BLM 8–7 Section 8.2 Math Link
BLM 8–10 Section 8.4 Math Link
BLM 8–13 Chapter 8 Wrap It Up!

Specific Outcomes
N7 Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically

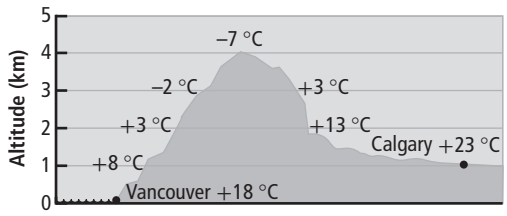
Planning Notes

Throughout the Math Links and Sports Link in this chapter, students have been solving problems using multiplication and division of integers. Introduce this chapter problem and clarify the assessment criteria. You may wish to have students work in pairs or small groups to complete the Wrap It Up!

Answers

Wrap It Up!

a)



b) 23 °C

c) The air cools 10 °C as it rises to 1000 m, and cools another 3 × 5 °C as it rises from 1000 m to 4000 m. The air then warms by 3 × 10 °C as it descends to Calgary. Thus, the temperature at Calgary can be represented by $18 + (-10) + 3 \times (-5) + 3 \times 10 = 23$.

d) Method 1: Use the same method as in part c) to add up the changes in temperature from Calgary back to Vancouver. $30 + 3 \times (-10) + 3 \times 5 + 10 = 25$. Method 2: Part a) shows that the temperature of the air increases by 5 °C as it blows f rom Vancouver to Calgary. Therefore, if the temperature of the air is 30 °C at Calgary, it was 25 °C in Vancouver.

Assessment	Supporting Learning
Assessment *of* Learning	
Wrap It Up! This chapter problem wrap-up gives students an opportunity to apply their knowledge of multiplication and division of integers in a real-world situation. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this Wrap It Up! Page 436 in this TR provides notes on how to use the rubric for this Wrap It Up!	• You may wish to have students review the work they have completed in the Math Links in sections 8.2 and 8.4 and the Sports Link in section 8.5 before they begin. • If students have not completed the Math Links, you may wish to provide them with **BLM 8–1 Math Link Introduction**, **BLM 8–7 Section 8.2 Math Link**, and **BLM 8–10 Section 8.4 Math Link**. • You may wish to have students use **BLM 8–13 Chapter 8 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 complete and correct responses
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 complete and correct responses with a minor communication or calculation error *or* • provides complete and correct responses to parts b), c), and d) *or* • provides complete and correct responses with one justification missing
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 complete and correct responses for parts a) and b), and part c) addresses either multiplication or division *or* • provides complete and correct responses to parts b) and c) *or* • provides complete and correct responses to parts a) and d)
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 complete and correct responses to parts a) and b) with no work shown for part b) *or* • provides complete and correct responses to parts a) and d) with no work shown
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**	• provides an initial correct start to one part of the problem

Math Games

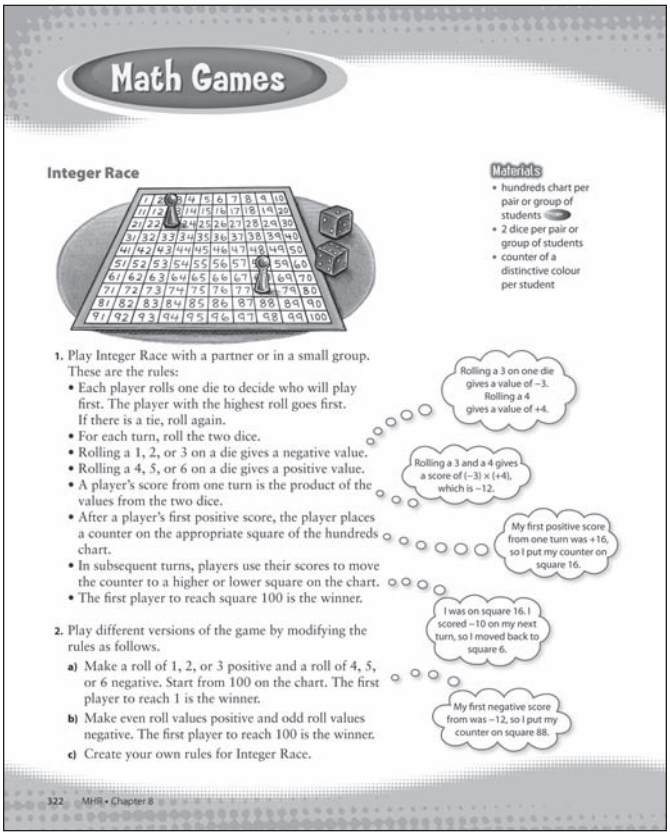
***MathLinks 8*, page 322**

Suggested Timing
30–40 minutes

Materials
- two dice per pair or group of students
- counter of a distinctive colour per student
- red and blue integer chips (optional)

Blackline Masters
Master 11 Hundred Chart

Specific Outcomes
N7 Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically.


Math Games

Integer Race

Materials
- hundreds chart per pair or group of students
- 2 dice per pair or group of students
- counter of a distinctive colour per student

1. Play Integer Race with a partner or in a small group. These are the rules:
- Each player rolls one die to decide who will play first. The player with the highest roll goes first. If there is a tie, roll again.
- For each turn, roll the two dice.
- Rolling a 1, 2, or 3 on a die gives a negative value.
- Rolling a 4, 5, or 6 on a die gives a positive value.
- A player's score from one turn is the product of the values from the two dice.
- After a player's first positive score, the player places a counter on the appropriate square of the hundreds chart.
- In subsequent turns, players use their scores to move the counter to a higher or lower square on the chart.
- The first player to reach square 100 is the winner.

2. Play different versions of the game by modifying the rules as follows.
a) Make a roll of 1, 2, or 3 positive and a roll of 4, 5, or 6 negative. Start from 100 on the chart. The first player to reach 1 is the winner.
b) Make even roll values positive and odd roll values negative. The first player to reach 100 is the winner.
c) Create your own rules for Integer Race.

Rolling a 3 on one die gives a value of −3. Rolling a 4 gives a value of +4.

Rolling a 3 and a 4 gives a score of (−3) × (+4), which is −12.

My first positive score from one turn was +16, so I put my counter on square 16.

I was on square 16. I scored −10 on my next turn, so I moved back to square 6.

My first negative score from was −12, so I put my counter on square 88.

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Planning Notes

Before having students play the game, you may wish to read the directions with the class and have a small group of students do a demonstration round to show how to play the game.

For #2c), one possible variation could be to make prime numbers (1, 2, 3, and 5) positive, and non-prime numbers (4 and 6) negative.

Meeting Student Needs

- Partner students with others of similar skill. Pairing students who have similar abilities will make the game more interesting.

Assessment	Supporting Learning
Assessment *for* Learning	
Integer Race Have students play the game with a partner.	• Encourage students to use integer chips to help with counting. • For #2c), suggest students modify one rule at a time.

Challenge in Real Life

***MathLinks 8*, page 323**

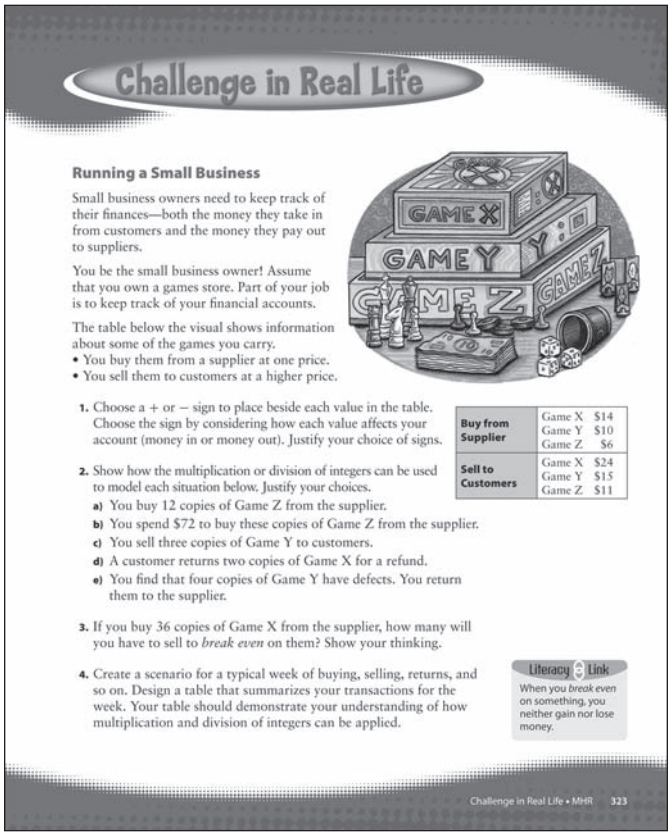
Suggested Timing
40–50 minutes

Materials
- ruler
- red and blue integer chips

Blackline Masters
Master 1 Project Rubric

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

Specific Outcomes
N7 Demonstrate an understanding of multiplication and division of integers, concretely, pictorially and symbolically.



Challenge in Real Life

Running a Small Business

Small business owners need to keep track of their finances—both the money they take in from customers and the money they pay out to suppliers.

You be the small business owner! Assume that you own a games store. Part of your job is to keep track of your financial accounts.

The table below the visual shows information about some of the games you carry.
- You buy them from a supplier at one price.
- You sell them to customers at a higher price.

Buy from Supplier	Game X	$14
	Game Y	$10
	Game Z	$6
Sell to Customers	Game X	$24
	Game Y	$15
	Game Z	$11

1. Choose a + or − sign to place beside each value in the table. Choose the sign by considering how each value affects your account (money in or money out). Justify your choice of signs.
2. Show how the multiplication or division of integers can be used to model each situation below. Justify your choices.
   a) You buy 12 copies of Game Z from the supplier.
   b) You spend $72 to buy these copies of Game Z from the supplier.
   c) You sell three copies of Game Y to customers.
   d) A customer returns two copies of Game X for a refund.
   e) You find that four copies of Game Y have defects. You return them to the supplier.
3. If you buy 36 copies of Game X from the supplier, how many will you have to sell to *break even* on them? Show your thinking.
4. Create a scenario for a typical week of buying, selling, returns, and so on. Design a table that summarizes your transactions for the week. Your table should demonstrate your understanding of how multiplication and division of integers can be applied.

Literacy Link
When you *break even* on something, you neither gain nor lose money.

Challenge in Real Life • MHR 323

Planning Notes

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

1. Start with a discussion about what it is like to own a business. Some students may have insight into how businesses keep track of expenses; ask them for their input. Consider introducing the term *markup* to describe the difference in price between what a business purchases items for and the price that the business sells the item to the public for. Have students identify the amount of markup for Games X, Y, and Z.
2. Discuss #1 with students. Many students will use positive integers for the sale prices and negative integers for the supplier prices. Discuss their reasons for doing so. Allow other responses, as long as students provide a good reason.
3. You may wish to do #2 together as a model, then have students continue with the rest of the challenge on their own.
4. Clarify that the task is to
   - use multiplication and division of integers to model buying and selling situations
   - justify the models
   - use integers to solve a problem
   - create a buying and selling table to show business transactions for one week
5. Review the **Master 1 Project Rubric** with students so that they will know what is expected.

Literacy Link For #3, point out that when you *break even*, you neither gain nor lose money.

Meeting Student Needs

- Have students research the way that an actual business keeps records. Ask what terms are used to suggest negative and positive integers. Students may suggest terms for *negative*, such as *in the red*, *loss*, or *cost*. For *positive*, they may suggest terms such as *in the black*, *profit*, or *sale*.

Gifted and Enrichment

- Invite students to research the actual markup on games from a local games store. Have them complete the challenge using real values.
- Challenge students to complete #3 using 20 games. (Cost of 20 games: $+20 \times -14 = -280$. The games cost \$280. Number of games to sell to make \$280: $+280 \div 24 \approx 11.7$. You cannot sell 11.7 games so you cannot break even. If you sell 12 games, you will make a slight profit.)

Answers

Running a Small Business

1. Money into the account is represented with a positive integer, and money out of the account with a negative integer: –\$14, –\$10, –\$6, +\$24, +\$15, +\$11. Justification may vary. Example: Purchases from suppliers decrease the account balance, while sales to customers increase it.

2. Justifications may vary.

a) $+12 \times (-\$6) = -\$72$. Multiplying the cost per game by the number of games bought gives the total cost.

b) $-\$72 \div (-6) = +12$. Dividing the total cost by the cost per game gives the number of games bought.

c) $+3 \times (+15) = +45$. Multiplying the number of games sold by the price per game gives the total received.

d) $+2 \times (-24) = -48$. Multiplying the number of games returned by the amount refunded per game gives the total amount refunded to the customer.

e) $+4 \times (+10) = +40$. Multiplying the number of games you return by the supplier's price per game gives the total amount the supplier refunds to you. Alternatively, you could multiply the change in the number of games you bought by the cost per game: $-4 \times (-10) = +40$.

3. Cost of 36 games: $+36 \times (-14) = -504$. Number of game sales needed to make \$504: $+504 \div 24 = 21$; 21 games need to be sold.

4. Answers may vary. Encourage students to multiply and divide positive and negative integers.

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

Assessment	Supporting Learning
Assessment *for* Learning	
Running a Small Business Discuss the challenge with the class. Have students brainstorm the types of things business owners need to do to keep track of their finances. Discuss the typical events that take place in a store over the course of a week (e.g., buying, selling, returns). Relate these events to positive and negative integers.	• Encourage students to use integer chips to solve the problems. • Help students recall how to use integers to indicate positive and negative events. • Remind students that they must show a multiplication or division integer statement for each part of #2. • You may need to discuss keeping track of financial accounts since some students may not be familiar with this process. • Ask students to consider the events that will go into their table in #4.
Assessment *of* Learning	
Running a Small Business Introduce the challenge to the class. Have students work on #2 and #3 and share their answers with a partner. Then, have them complete #4 independently.	• Remind students that they must create a scenario for a typical week in a store and show how multiplication and division of integers can be applied. • **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this challenge. Page 440 provides notes on how to use the rubric for this 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 correct and complete solutions
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 correct and complete responses with weak justification (missing no more than two responses) *or* • provides correct and complete responses, with weak communication for #3 *or* • provides correct and complete responses, with a calculation error in #2
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 responses for #1 to #3 *or* • provides a correct and complete response to #4 *or* • provides a correct and complete response to #1 and partial answers to #2 to #4
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 responses to #1 and #2, with one error in #2 *or* • provides a correct and complete response to #3 *or* • provides a correct and complete response to #4 with no evidence of integer multiplication or division Note: Justification may be weak or absent.
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**	• provides a correct and complete response to #1

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