4.4 Combining Percents

***MathLinks 8*, pages 144–149**

Suggested Timing
80–100 minutes

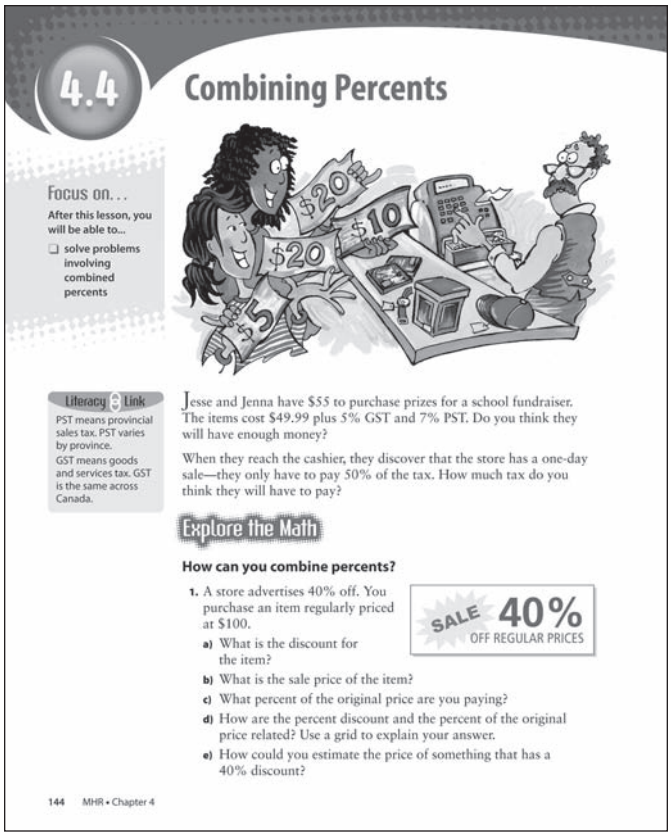
Materials
- sample advertisements featuring percent-off sales
- base ten blocks or hundred grids (optional)
- calculator

Blackline Masters
Master 10 Hundred Grids
BLM 4–3 Chapter 4 Warm-Up
BLM 4–12 Section 4.4 Extra Practice
BLM 4–13 Section 4.4 Math Link

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

Specific Outcomes
N3 Demonstrate an understanding of percents greater than or equal to 0%.

Category	Question Numbers
Essential (minimum questions to cover the outcomes)	1–4, 6, 8, 10, Math Link
Typical	1–4, 6, 8–12, Math Link
Extension/Enrichment	1–3, 13, 14, Math Link



4.4 Combining Percents

Focus on...
After this lesson, you will be able to...
- ❑ solve problems involving combined percents

Literacy Link
PST means provincial sales tax. PST varies by province.
GST means goods and services tax. GST is the same across Canada.

Jesse and Jenna have $55 to purchase prizes for a school fundraiser. The items cost $49.99 plus 5% GST and 7% PST. Do you think they will have enough money?

When they reach the cashier, they discover that the store has a one-day sale—they only have to pay 50% of the tax. How much tax do you think they will have to pay?

Explore the Math

How can you combine percents?

1. A store advertises 40% off. You purchase an item regularly priced at $100.
   a) What is the discount for the item?
   b) What is the sale price of the item?
   c) What percent of the original price are you paying?
   d) How are the percent discount and the percent of the original price related? Use a grid to explain your answer.
   e) How could you estimate the price of something that has a 40% discount?

SALE 40% OFF REGULAR PRICES

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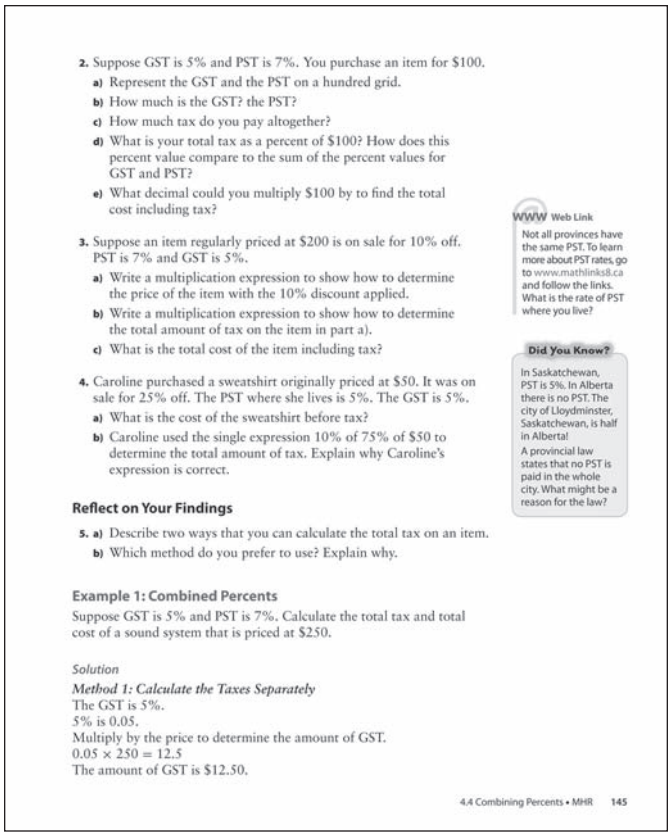
Planning Notes

Have students complete the warm-up questions on **BLM 4–3 Chapter 4 Warm-Up** to reinforce material learned in previous sections.

As a class, read and discuss the scenario. Since many problems involving combined percents and percents of percents are connected with consumer events such as taxes and percent-off sales, consider showing and discussing some sample advertisements highlighting these features. Look for ads that make claims such as "We pay the tax!" or "20 percent off already discounted items."

Ask students to predict whether Jesse and Jenna will have enough money. Consider having students test their prediction after covering the content of section 4.4.

Literacy Link As a class, read the Literacy Link on page 144 and have students identify the PST rate (if applicable) and the GST rate where they live.



2. Suppose GST is 5% and PST is 7%. You purchase an item for $100.
   a) Represent the GST and the PST on a hundred grid.
   b) How much is the GST? the PST?
   c) How much tax do you pay altogether?
   d) What is your total tax as a percent of $100? How does this percent value compare to the sum of the percent values for GST and PST?
   e) What decimal could you multiply $100 by to find the total cost including tax?

3. Suppose an item regularly priced at $200 is on sale for 10% off. PST is 7% and GST is 5%.
   a) Write a multiplication expression to show how to determine the price of the item with the 10% discount applied.
   b) Write a multiplication expression to show how to determine the total amount of tax on the item in part a).
   c) What is the total cost of the item including tax?

4. Caroline purchased a sweatshirt originally priced at $50. It was on sale for 25% off. The PST where she lives is 5%. The GST is 5%.
   a) What is the cost of the sweatshirt before tax?
   b) Caroline used the single expression 10% of 75% of $50 to determine the total amount of tax. Explain why Caroline's expression is correct.

WWW Web Link
Not all provinces have the same PST. To learn more about PST rates, go to www.mathlinks8.ca and follow the links. What is the rate of PST where you live?

Did You Know?
In Saskatchewan, PST is 5%. In Alberta there is no PST. The city of Lloydminster, Saskatchewan, is half in Alberta! A provincial law states that no PST is paid in the whole city. What might be a reason for the law?

Reflect on Your Findings

5. a) Describe two ways that you can calculate the total tax on an item.
   b) Which method do you prefer to use? Explain why.

Example 1: Combined Percents

Suppose GST is 5% and PST is 7%. Calculate the total tax and total cost of a sound system that is priced at $250.

Solution

Method 1: Calculate the Taxes Separately

The GST is 5%.
5% is 0.05.
Multiply by the price to determine the amount of GST.
$0.05 \times 250 = 12.5$
The amount of GST is $12.50.

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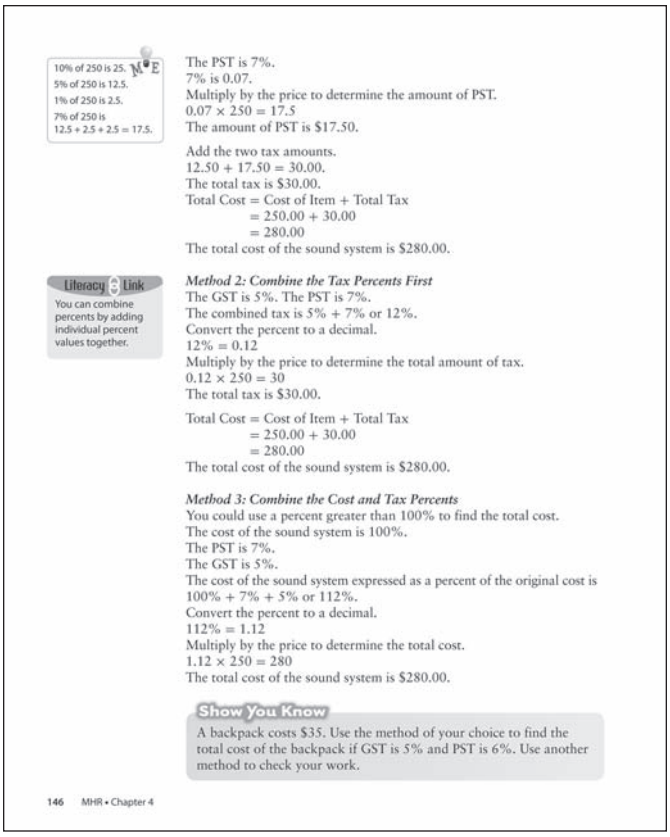

10% of 250 is 25.
5% of 250 is 12.5.
1% of 250 is 2.5.
7% of 250 is
12.5 + 2.5 + 2.5 = 17.5.

The PST is 7%.
7% is 0.07.
Multiply by the price to determine the amount of PST.
$0.07 \times 250 = 17.5$
The amount of PST is $17.50.

Add the two tax amounts.
$12.50 + 17.50 = 30.00$.
The total tax is $30.00.
Total Cost = Cost of Item + Total Tax
$= 250.00 + 30.00$
$= 280.00$
The total cost of the sound system is $280.00.

Literacy Link
You can combine percents by adding individual percent values together.

Method 2: Combine the Tax Percents First

The GST is 5%. The PST is 7%.
The combined tax is 5% + 7% or 12%.
Convert the percent to a decimal.
12% = 0.12
Multiply by the price to determine the total amount of tax.
$0.12 \times 250 = 30$
The total tax is $30.00.

Total Cost = Cost of Item + Total Tax
$= 250.00 + 30.00$
$= 280.00$
The total cost of the sound system is $280.00.

Method 3: Combine the Cost and Tax Percents

You could use a percent greater than 100% to find the total cost.
The cost of the sound system is 100%.
The PST is 7%.
The GST is 5%.
The cost of the sound system expressed as a percent of the original cost is 100% + 7% + 5% or 112%.
Convert the percent to a decimal.
112% = 1.12
Multiply by the price to determine the total cost.
$1.12 \times 250 = 280$
The total cost of the sound system is $280.00.

Show You Know
A backpack costs $35. Use the method of your choice to find the total cost of the backpack if GST is 5% and PST is 6%. Use another method to check your work.

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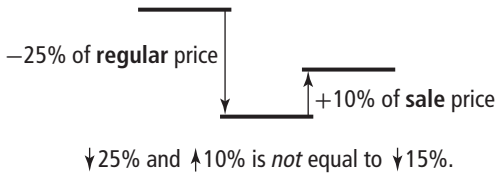
Explore the Math

In this exploration, students are introduced to combining percents in the context of consumer purchases. Students are led through multiple steps that should lead to an understanding of the impact of combined percents. Note that in #4, many students may think that 25% off together with 10% added on must be the same as 15% off. This is a difficult concept. Explain that 25% off and 10% added on represent percents of different wholes, and that percents of different wholes cannot be combined. Consider using the following visual representation to help foster understanding:



↓25% and ↑10% is *not* equal to ↓15%.

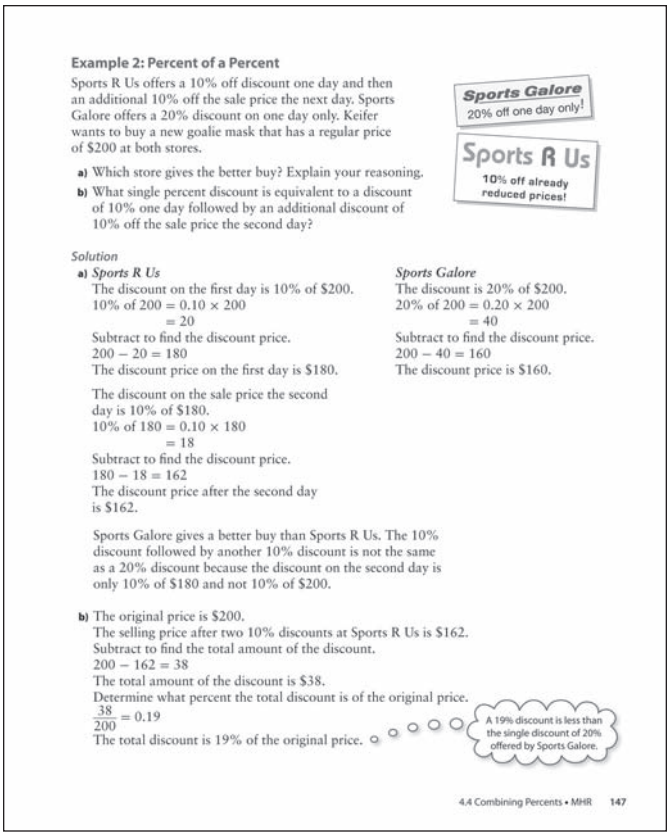
Explain that the values (in the example) cannot be combined into a single percent because they represent percents of different numbers. Have students discuss their findings as a class.

Method 1 Have students work in pairs on all questions. Discuss the answers as a class. Have students consider and list the different methods for calculating tax, decide which method they prefer, and provide justification.

Method 2 Make the questions concrete by bringing in actual items or pictures of items that cost close to the prices suggested and putting sales notes, PST rates, and GST rates on them. Divide the class into two large groups. Have one group work on #1 and the second work on #2. When the group members have completed the two questions, have the team members coach members of the other group in how to do that type of question.

- Encourage students to use visuals to show how they know their answer is correct and to suggest some mental math and estimation techniques that might help in solving or checking the reasonableness of answers.
- Encourage students to show more than one way to do the calculations.
- Use the same teams to solve #3 and #4, and then share their solutions and methods.

As a class, discuss the findings. Have students consider and list the different methods for calculating tax, decide which method they prefer, and provide justification.



Example 2: Percent of a Percent

Sports R Us offers a 10% off discount one day and then an additional 10% off the sale price the next day. Sports Galore offers a 20% discount on one day only. Keifer wants to buy a new goalie mask that has a regular price of $200 at both stores.

a) Which store gives the better buy? Explain your reasoning.

b) What single percent discount is equivalent to a discount of 10% one day followed by an additional discount of 10% off the sale price the second day?

Sports Galore
20% off one day only!

Sports R Us
10% off already reduced prices!

Solution

a) *Sports R Us*

The discount on the first day is 10% of $200.
10% of 200 = 0.10 × 200
= 20
Subtract to find the discount price.
200 − 20 = 180
The discount price on the first day is $180.

The discount on the sale price the second day is 10% of $180.
10% of 180 = 0.10 × 180
= 18
Subtract to find the discount price.
180 − 18 = 162
The discount price after the second day is $162.

Sports Galore

The discount is 20% of $200.
20% of 200 = 0.20 × 200
= 40
Subtract to find the discount price.
200 − 40 = 160
The discount price is $160.

Sports Galore gives a better buy than Sports R Us. The 10% discount followed by another 10% discount is not the same as a 20% discount because the discount on the second day is only 10% of $180 and not 10% of $200.

b) The original price is $200.
The selling price after two 10% discounts at Sports R Us is $162.
Subtract to find the total amount of the discount.
200 − 162 = 38
The total amount of the discount is $38.
Determine what percent the total discount is of the original price.
$\frac{38}{200} = 0.19$
The total discount is 19% of the original price.

A 19% discount is less than the single discount of 20% offered by Sports Galore.

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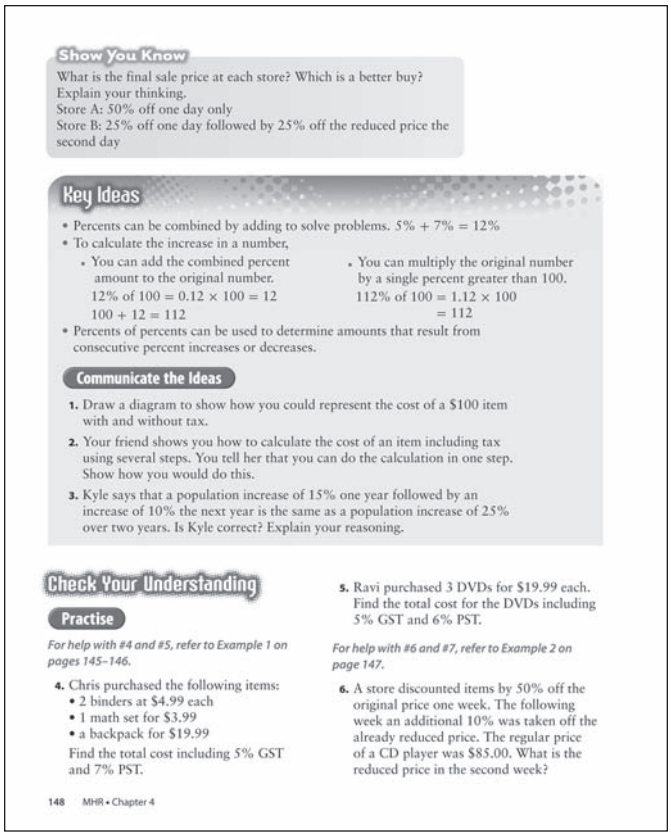

Show You Know

What is the final sale price at each store? Which is a better buy? Explain your thinking.
Store A: 50% off one day only
Store B: 25% off one day followed by 25% off the reduced price the second day

Key Ideas

- Percents can be combined by adding to solve problems. 5% + 7% = 12%
- To calculate the increase in a number,
  - You can add the combined percent amount to the original number.
    12% of 100 = 0.12 × 100 = 12
    100 + 12 = 112
  - You can multiply the original number by a single percent greater than 100.
    112% of 100 = 1.12 × 100
    = 112
- Percents of percents can be used to determine amounts that result from consecutive percent increases or decreases.

Communicate the Ideas

1. Draw a diagram to show how you could represent the cost of a $100 item with and without tax.
2. Your friend shows you how to calculate the cost of an item including tax using several steps. You tell her that you can do the calculation in one step. Show how you would do this.
3. Kyle says that a population increase of 15% one year followed by an increase of 10% the next year is the same as a population increase of 25% over two years. Is Kyle correct? Explain your reasoning.

Check Your Understanding

Practise

For help with #4 and #5, refer to Example 1 on pages 145–146.

4. Chris purchased the following items:
   - 2 binders at $4.99 each
   - 1 math set for $3.99
   - a backpack for $19.99

   Find the total cost including 5% GST and 7% PST.

5. Ravi purchased 3 DVDs for $19.99 each. Find the total cost for the DVDs including 5% GST and 6% PST.

For help with #6 and #7, refer to Example 2 on page 147.

6. A store discounted items by 50% off the original price one week. The following week an additional 10% was taken off the already reduced price. The regular price of a CD player was $85.00. What is the reduced price in the second week?

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Example 1

Example 1 demonstrates three methods for solving a combined tax problem: calculating the taxes separately, combining the tax percents first, and combining the cost and tax percents. Discuss each method with students. Have them consider the similarities and differences. Emphasize checking answers by doing a question using one method, then checking it using the second. Also have students use mental math techniques for checking the reasonableness of answers.

Literacy Link Direct students to the Literacy Link on page 146 that explains what a combined percent is. Combining percents can be helpful when estimating the cost of an item after tax.

Consider breaking the class into groups of three to do the Show You Know. Have students in each group use a different method and then compare answers.

Example 2

Example 2 demonstrates how to find the final sale price of an item whose price changes in two ways in competing stores. Use the visual on page 147 to demonstrate why Sports Galore has the better buy.

Meeting Student Needs

- For #4b), you may need to explain the expression *10% of 75% of $50* to students. Explain that Caroline is paying 11% combined tax on the sale price of the sweatshirt. The sweatshirt costs 75% of its original price ($50). You may need to show this visually using one or more hundred grids.

ELL

- English language learners may benefit from making a list of terms associated with money, such as *discount*, *additional discount off the sale price*, *original price*, *total discount*, *final sale price*, and *25% off the reduced price*. Have them write the meaning of each term. As a class, discuss the meaning of each term and then have students make revisions, if necessary, before adding the notes about the terms to section 4.4 in their chapter Foldable.
- English language learners may have difficulty with terms such as *purchase*, *backpack*, and *goalie mask*. Have students add any new terms to their dictionary.

Gifted and Enrichment

- Have students access the Web Link on page 145 in the student resource and compare PST rates across Canada. Encourage them to speculate about why PST rates may differ from province to province.

- Challenge students to research why no PST is paid in Lloydminster (provincial sales tax exemption is intended to level the playing field for businesses on the Saskatchewan side of Lloydminster).

Common Errors

- Some students may incorrectly convert a percent to a decimal.

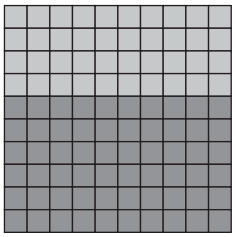
R_x Remind students to convert a percent to a decimal by dividing by 100, so that 20% is 0.20, not 20.0.

Answers

Explore the Math

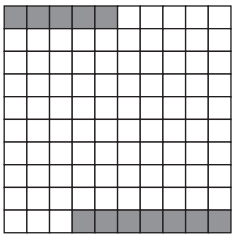
1. a) \$40 **b)** \$60 **c)** 60%

d) The sum of the percent discount and percent of the original price add to 100%.



e) Calculate 50% of the original price, then add 10% of the original price.

2. a) GST



b) GST: \$5; PST: \$7

c) \$12

d) 12%; The total tax as a percent is equal to the sum of the percent rates for the PST and GST.

e) 1.12

3. a) 200×0.9 **b)** $1.12 \times 200 \times 0.9$ **c)** \$201.60

4. a) \$37.50

b) 75% of \$50 represents the cost after the discount before tax. Then calculating 10% of the discounted price represents the combined PST and GST tax rates.

5. a) For the first method, calculate the PST and GST taxes separately, and then add them together. For the second method, combine the GST and PST tax rates, as percents, and then use this combined rate to calculate the total tax.

b) Answers will vary. Example: I prefer the second method because it is easier to add the two tax rates, as percents, than it is to add the amounts of these two taxes in monetary values.

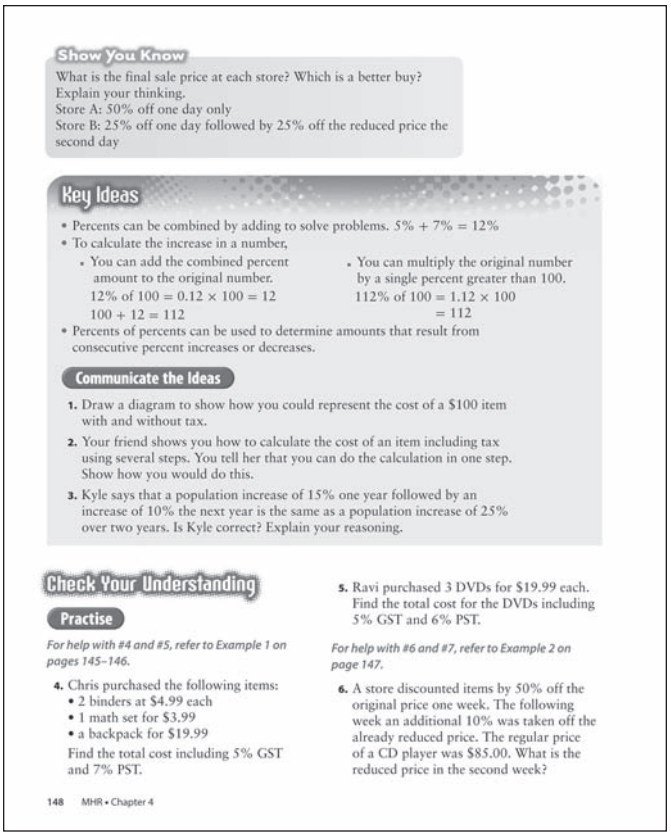
Show You Know: Example 1

Look for one method to determine the total cost and a second method to verify the answer, which is \$38.85.

Show You Know: Example 2

Store A: 50% discount; Store B: 43.75% discount; Store A is offering a better deal.

Assessment	Supporting Learning
Assessment *as* Learning	
Reflect on Your Findings Listen as students discuss what they discovered during the Explore the Math. Try to have students generalize the conclusion about their findings.	• For #2, encourage students who struggle with numeracy to combine the cost of the item and the taxes in one multiplication process. For example, they could multiply by 1.12, where the taxes are 5% and 7%, respectively. • For #2e), students may need prompting to discover the idea that they need to multiply by 112%. • For #4, most students may need prompting to discover the idea that 25% off means that 75% remains. This can be shown visually on a hundred grid. • Have students record different ways of estimating the total cost of an item including taxes. Have students verbalize the process and then add their notes to their chapter Foldable.
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. • Some students may need to be coached through the process of changing a percent to a decimal and may benefit from using a calculator. • Give students a similar problem to solve. Allow them to work with a partner and talk through their thinking. • Have students share any different methods they have for finding the final sale price of an item including taxes. Have them add any additional methods to their chapter Foldable.
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. • Give students a similar problem to solve. Allow them to work with a partner and talk through their thinking.



Show You Know

What is the final sale price at each store? Which is a better buy? Explain your thinking.
Store A: 50% off one day only
Store B: 25% off one day followed by 25% off the reduced price the second day

Key Ideas

- Percents can be combined by adding to solve problems. 5% + 7% = 12%
- To calculate the increase in a number,
  - You can add the combined percent amount to the original number.
    12% of 100 = 0.12 × 100 = 12
    100 + 12 = 112
  - You can multiply the original number by a single percent greater than 100.
    112% of 100 = 1.12 × 100
    = 112
- Percents of percents can be used to determine amounts that result from consecutive percent increases or decreases.

Communicate the Ideas

1. Draw a diagram to show how you could represent the cost of a $100 item with and without tax.
2. Your friend shows you how to calculate the cost of an item including tax using several steps. You tell her that you can do the calculation in one step. Show how you would do this.
3. Kyle says that a population increase of 15% one year followed by an increase of 10% the next year is the same as a population increase of 25% over two years. Is Kyle correct? Explain your reasoning.

Check Your Understanding

Practise

For help with #4 and #5, refer to Example 1 on pages 145–146.

4. Chris purchased the following items:
   - 2 binders at $4.99 each
   - 1 math set for $3.99
   - a backpack for $19.99

   Find the total cost including 5% GST and 7% PST.

5. Ravi purchased 3 DVDs for $19.99 each. Find the total cost for the DVDs including 5% GST and 6% PST.

For help with #6 and #7, refer to Example 2 on page 147.

6. A store discounted items by 50% off the original price one week. The following week an additional 10% was taken off the already reduced price. The regular price of a CD player was $85.00. What is the reduced price in the second week?

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The Key Ideas summarize combining percents, calculating the increase in a number, and using percents of percents. As a class, discuss the methods to calculate the increase in a number. Students might suggest using 1.00 to represent the original cost of an item and adding the tax portion as decimals. Have students use examples to clarify the difference between combined percents and percents of percents. An example of combined percents might be adding two taxes such as PST and GST. An example of percents of percents might be discounting an item 10% off the original price and then discounting it a further 10% off the already reduced price. Have students prepare their own summary of the Key Ideas in the notes in their chapter Foldable. Suggest that they provide an example for each point in the Key Ideas.

Communicate the Ideas

These questions allow students to show their understanding of combining percents and percents of percents. In #1, students draw a diagram to represent combining percent. In #2, they calculate the cost of an item in one step. In #3, students explain why percents of different population sizes cannot be combined. Have students share their answers for #3 in a class discussion.

Meeting Student Needs

- Students may need to be reminded that the value 112% converts to 1.12 as a decimal.

ELL

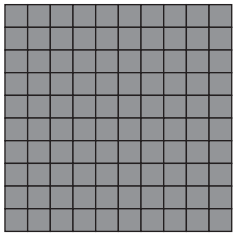
- Explain the term *population increase* using an example of a local animal population with which students may be familiar.

Answers

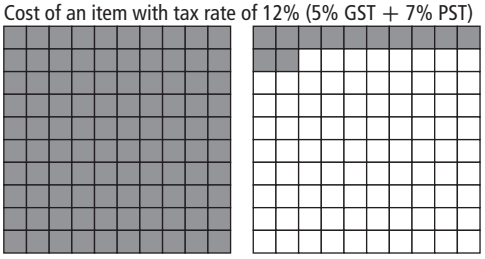
Communicate the Ideas

1. Answers will vary. Example:

Cost of an item without tax



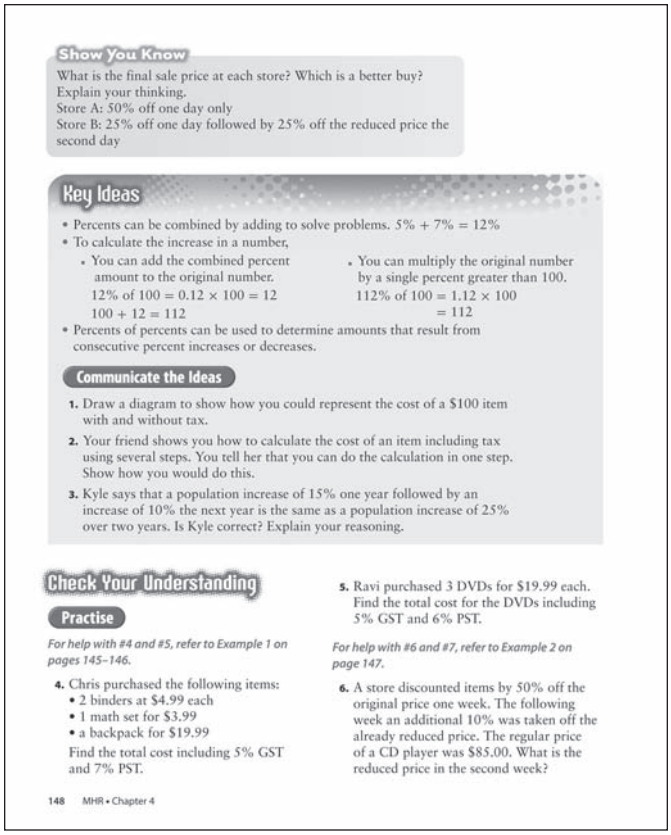
Cost of an item with tax rate of 12% (5% GST + 7% PST)



2. Mentally combine the tax rates with 100%. If the tax rates sum to 12%, then add this to 100%, which represents the cost of the item before taxes. Simply multiply the cost of the item by 112% as a decimal. For example, if the cost of the item is $200, then the single calculation is 1.12 × $200 = $224.

3. No, Kyle is incorrect. The 10% increase is applied to the new population that has already increased by 15%. The two consecutive increases of 15% and 10% are equivalent to a 26.5% single increase: 1.15 × 1.10 = 1.265.

Assessment	Supporting Learning
Assessment *as* Learning	
Communicate the Ideas Have students complete #1 to #3. Use student responses to assess their understanding of combining percents and percents of percents. Encourage them to share their answer to #2 with a partner and listen to each other's explanation.	• Check each student's answers to the questions. These are key questions; make sure students understand the concepts before proceeding. • Encourage students who need help with #1 to use base ten blocks or hundred grids to show their understanding. • For #2, encourage students who prefer doing the calculations in more than one step to answer the question using the method of their choice. • Encourage students who need help with their explanation for #3 to use a drawing or hundred grids and words to show the population of caribou after each year.



Show You Know

What is the final sale price at each store? Which is a better buy? Explain your thinking.
Store A: 50% off one day only
Store B: 25% off one day followed by 25% off the reduced price the second day

Key Ideas

- Percents can be combined by adding to solve problems. 5% + 7% = 12%
- To calculate the increase in a number,
  - You can add the combined percent amount to the original number.
    12% of 100 = 0.12 × 100 = 12
    100 + 12 = 112
  - You can multiply the original number by a single percent greater than 100.
    112% of 100 = 1.12 × 100
    = 112
- Percents of percents can be used to determine amounts that result from consecutive percent increases or decreases.

Communicate the Ideas

1. Draw a diagram to show how you could represent the cost of a $100 item with and without tax.
2. Your friend shows you how to calculate the cost of an item including tax using several steps. You tell her that you can do the calculation in one step. Show how you would do this.
3. Kyle says that a population increase of 15% one year followed by an increase of 10% the next year is the same as a population increase of 25% over two years. Is Kyle correct? Explain your reasoning.

Check Your Understanding

Practise

For help with #4 and #5, refer to Example 1 on pages 145–146.

4. Chris purchased the following items:
   - 2 binders at $4.99 each
   - 1 math set for $3.99
   - a backpack for $19.99

   Find the total cost including 5% GST and 7% PST.

5. Ravi purchased 3 DVDs for $19.99 each. Find the total cost for the DVDs including 5% GST and 6% PST.

For help with #6 and #7, refer to Example 2 on page 147.

6. A store discounted items by 50% off the original price one week. The following week an additional 10% was taken off the already reduced price. The regular price of a CD player was $85.00. What is the reduced price in the second week?

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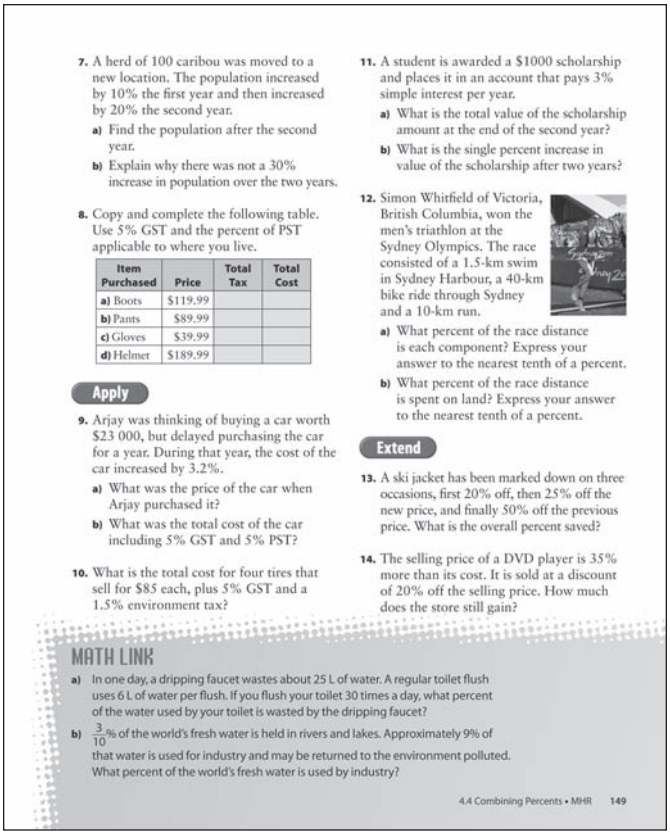

7. A herd of 100 caribou was moved to a new location. The population increased by 10% the first year and then increased by 20% the second year.
   a) Find the population after the second year.
   b) Explain why there was not a 30% increase in population over the two years.

8. Copy and complete the following table. Use 5% GST and the percent of PST applicable to where you live.

Item Purchased	Price	Total Tax	Total Cost
a) Boots	$119.99		
b) Pants	$89.99		
c) Gloves	$39.99		
d) Helmet	$189.99		

Apply

9. Arjay was thinking of buying a car worth $23 000, but delayed purchasing the car for a year. During that year, the cost of the car increased by 3.2%.
   a) What was the price of the car when Arjay purchased it?
   b) What was the total cost of the car including 5% GST and 5% PST?

10. What is the total cost for four tires that sell for $85 each, plus 5% GST and a 1.5% environment tax?

11. A student is awarded a $1000 scholarship and places it in an account that pays 3% simple interest per year.
    a) What is the total value of the scholarship amount at the end of the second year?
    b) What is the single percent increase in value of the scholarship after two years?

12. Simon Whitfield of Victoria, British Columbia, won the men's triathlon at the Sydney Olympics. The race consisted of a 1.5-km swim in Sydney Harbour, a 40-km bike ride through Sydney and a 10-km run.
    a) What percent of the race distance is each component? Express your answer to the nearest tenth of a percent.
    b) What percent of the race distance is spent on land? Express your answer to the nearest tenth of a percent.

Extend

13. A ski jacket has been marked down on three occasions, first 20% off, then 25% off the new price, and finally 50% off the previous price. What is the overall percent saved?

14. The selling price of a DVD player is 35% more than its cost. It is sold at a discount of 20% off the selling price. How much does the store still gain?

MATH LINK

a) In one day, a dripping faucet wastes about 25 L of water. A regular toilet flush uses 6 L of water per flush. If you flush your toilet 30 times a day, what percent of the water used by your toilet is wasted by the dripping faucet?

b) $\frac{3}{10}$% of the world's fresh water is held in rivers and lakes. Approximately 9% of that water is used for industry and may be returned to the environment polluted. What percent of the world's fresh water is used by industry?

4.4 Combining Percents • MHR 149

Check Your Understanding

Practise

Encourage students to use mental math strategies to solve problems involving percents. Note that #4 and #5, and #6 and #7, are pairs of similar questions. Consider assigning or allowing students to choose one question from each pair initially. You might assign the second question from each pair to those who would benefit from extra practice.

When doing #8, encourage students to estimate and then calculate the total tax and cost.

Apply

These questions provide a range of contexts for students to solve problems involving combined percents and percents of percents. You may need to remind students that all taxes are calculated separately.

Extend

These questions allow students to solve more complex problems involving percents. Encourage students to show more than one method.

Math Link

The Math Link provides an opportunity for students to solve problems involving percents.

Meeting Student Needs

- Some students may find it helpful to organize the information for #10 in a chart.
- Provide **BLM 4–12 Section 4.4 Extra Practice** to students who would benefit from more practice.

ELL

- Ensure students understand the terms *caribou*, *delayed*, *environment tax*, *scholarship*, *downtown core*, *ski jacket*, *faucet*, and *industry*.
- For #12, use the visual to help explain the three components of a triathlon (swimming, biking, and running).

Gifted and Enrichment

- Allow students to use spreadsheet software and develop appropriate formulas to calculate tax.
- Challenge students to solve the following problem: A forest has 120 000 trees. Each year 20% of the trees are cut down, and 15 000 new trees are planted. How many trees are in the forest at the end of the fourth year? Have students use a table.

Year	Number of Trees	Number of Trees Cut	Number of Trees Remaining	Number of Trees Planted	Number of Trees at Year End
1	120 000			15 000	
2					
3					
4					

- For the Math Link, provide other examples of domestic uses of water, and have students calculate the percent of the water used daily that is wasted by a dripping faucet. Choose from uses such as the following: shower (5 min) uses 100 L; automatic dishwasher uses 40 L; dishwashing by hand uses 35 L; hand washing (with tap running) uses 8 L; brushing teeth with tap running) uses 10 L. Have students present their findings.

Common Errors

- Some students may try to add percent of percent values.

R_x Model solving a percent of percent problem using a two-step process. Step 1 involves multiplying the item by the first percent. Step 2 involves multiplying the value of the item after the completion of step 1 by the second percent.

Answers

Math Link

a) approximately 13.9%

b) 0.027% or $\frac{27}{1000}$

Assessment	Supporting Learning
Assessment *for* Learning	
Practise Have students do #4 and #6. Students who have no problems with these questions can go on to #8 and the Apply questions.	• Provide additional coaching with Example 1 to students who need help with #4. Have them use the method they feel most comfortable with to solve the problem. Clarify any misunderstandings. Coach students through #4, and then have them complete #5 on their own. Check back with students several times to make sure that they understand the concepts. • Provide additional coaching with Example 2 to students who need help with #6. Have them explain their thinking; clarify any misunderstandings. Consider coaching students through #6 by using a two-step process: multiply the item by the first percent, and then multiply the value of the item after step 1 by the second percent. Have students complete #7 on their own.
Math Link The Math Link on page 149 is intended to help students work toward the chapter problem wrap-up titled Wrap It Up! on page 153.	• It is recommended that all students complete the Math Link. • Consider having concrete and kinesthetic learners measure the volume of water from a dripping tap over a set amount of time and then extrapolate how much that would be over a 24-hour period to give them a concrete understanding of the amount of water that is wasted. • Students who need help getting started could use **BLM 4–13 Section 4.4 Math Link**, which provides scaffolding.
Assessment *as* Learning	
Math Learning Log Have students describe a method they could use to determine the percent of water that is wasted in their household. • To determine the percent of a number, you …	• Depending on students' learning style, have them provide oral or written answers. • Encourage students to use the What I Need to Work On tab of their chapter Foldable to note what they continue to have difficulties with.