Proportions and Percent

MODULE 5

COMMON CORE

ESSENTIAL QUESTION

How can you use proportional relationships and percent to solve real-world problems?

LESSON 5.1

Percent Increase and Decrease

COMMON CORE 7.RP.3

LESSON 5.2

Rewriting Percent Expressions

COMMON CORE 7.RP.3, 7.EE.2, 7.EE.3

LESSON 5.3

Applications of Percent

COMMON CORE 7.RP.3, 7.EE.3

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Real-World Video

A store may have a sale with deep discounts on some items. They can still make a profit because they first markup the wholesale price by as much as 400%, then markdown the retail price.

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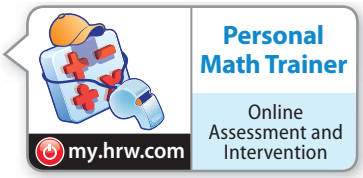
Are YOU Ready?

Complete these exercises to review skills you will need for this module.



Percents and Decimals

EXAMPLE

$147\% = 100\% + 47\%$ — Write the percent as the sum of 1 whole and a percent remainder.

$= \frac{100}{100} + \frac{47}{100}$ — Write the percents as fractions.

$= 1 + 0.47$ — Write the fractions as decimals.

$= 1.47$ — Simplify.

Write each percent as a decimal.

1. 22% _____ **2.** 75% _____ **3.** 6% _____ **4.** 189% _____

Write each decimal as a percent.

5. 0.59 _____ **6.** 0.98 _____ **7.** 0.02 _____ **8.** 1.33 _____

Find the Percent of a Number

EXAMPLE

30% of 45 = ?

30% = 0.30 — Write the percent as a decimal.

$\begin{array}{r} 45 \\ \times 0.3 \\ \hline 13.5 \end{array}$ — Multiply.

Find the percent of each number.

9. 50% of 64 _____ **10.** 7% of 30 _____ **11.** 15% of 160 _____

12. 32% of 62 _____ **13.** 120% of 4 _____ **14.** 6% of 1,000 _____

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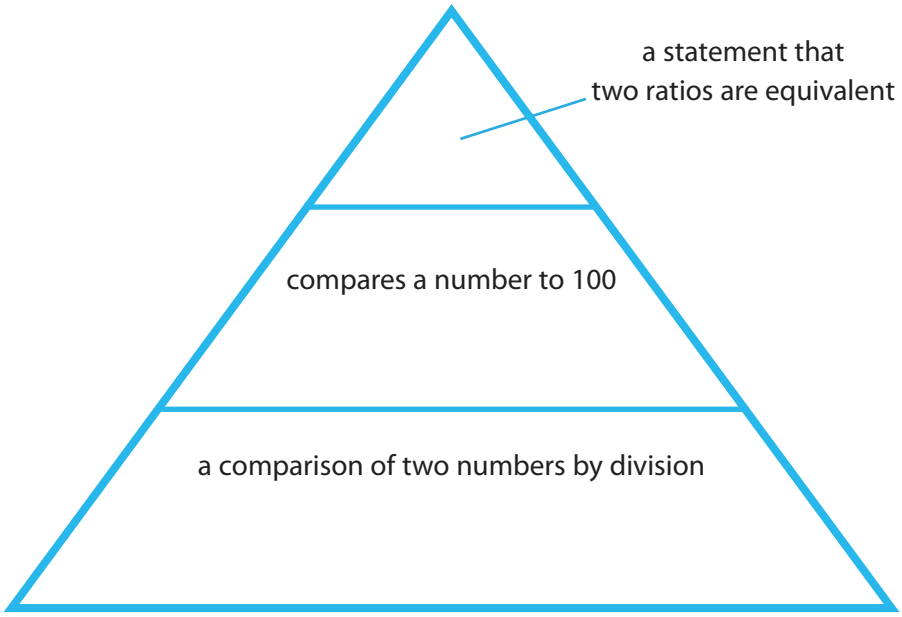
Reading Start-Up

Visualize Vocabulary

Use the ✔ words to complete the triangle. Write the review word that fits the description in each section of the triangle.



Vocabulary

Review Words

- ✔ proportion *(proporción)*
- ✔ percent *(porcentaje)*
- rate *(tasa)*
- ✔ ratio *(razón)*
- unit rate *(tasa unitaria)*

Preview Words

- percent decrease *(porcentaje de disminución)*
- percent increase *(porcentaje de aumento)*
- principal *(capital)*
- simple interest *(interés simple)*

Understand Vocabulary

Complete the sentences using the preview words.

1. A fixed percent of the principal is _____.
2. The original amount of money deposited or borrowed is the _____.
3. A _____ is the amount of increase divided by the original amount.

Active Reading

Tri-Fold Before beginning the module, create a tri-fold to help you learn the concepts and vocabulary in this module. Fold the paper into three sections. Label the columns "What I Know," "What I Need to Know," and "What I Learned." Complete the first two columns before you read. After studying the module, complete the third.

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MODULE 5

Unpacking the Standards

Understanding the Standards and the vocabulary terms in the Standards will help you know exactly what you are expected to learn in this module.

COMMON CORE 7.RP.3

Use proportional relationships to solve multistep ratio and percent problems.

Key Vocabulary

proportion *(proporción)*
An equation that states that two ratios are equivalent.

ratio *(razón)*
A comparison of two quantities by division.

percent *(porcentaje)*
A ratio that compares a part to the whole using 100.

What It Means to You

You will use proportions to solve problems involving ratio and percent.

UNPACKING EXAMPLE 7.RP.3

Find the amount of sales tax if the sales tax rate is 5% and the cost of the item is $40.

$$5\% = \frac{5}{100} = \frac{1}{20}$$

Multiply $\frac{1}{20}$ times the cost to find the sales tax.

$$\frac{1}{20} \times 40 = 2$$

The sales tax is $2.

COMMON CORE 7.EE.2

Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

Key Vocabulary

expression *(expresión)*
A mathematical phrase containing variables, constants and operation symbols.

What It Means to You

You will find helpful ways to rewrite an expression in an equivalent form.

UNPACKING EXAMPLE 7.EE.2

A store advertises that all bicycle helmets will be sold at 10% off the regular price. Find two expressions that represent the value of the sale price p for the helmets that are on sale.

Sale price = original price minus 10% of the price

$$= p - 0.10p$$

Equivalently,

$$p - 0.10p = p(1 - 0.10) = 0.90p$$

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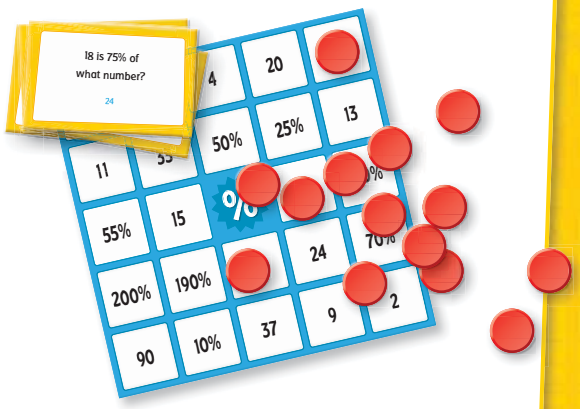
Game 5.1

PERCENTO!

INSTRUCTIONS

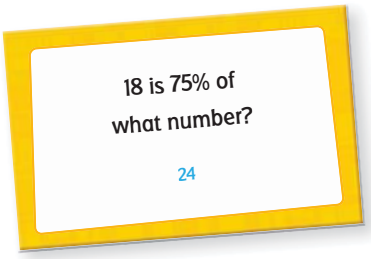
Playing the Game



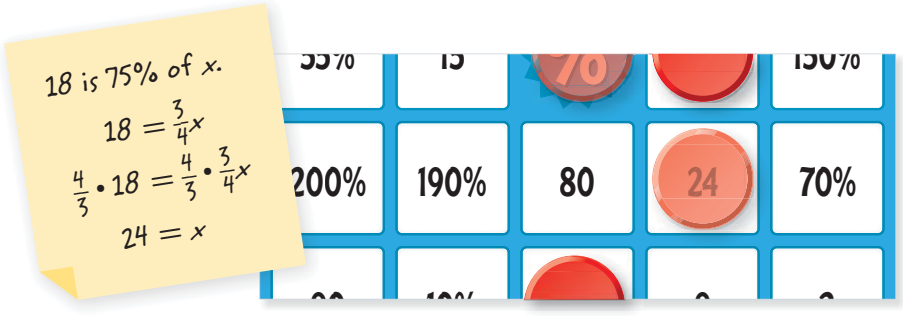
STEP 1 One student is the caller. This student gets the caller cards. Each caller card contains a percent problem and its answer.

STEP 2 Each player gets a *Percento!* board and 20–25 counters. The center is a free space. Players should cover the center square before play begins.

STEP 3 On each turn, the caller reads aloud a problem to the players. The caller does not read the answer.



STEP 4 The players solve the problem read by the caller. Then they find the answer on their *Percento!* board and cover that square.



STEP 5 The caller places the cards that have been read in a discard pile.

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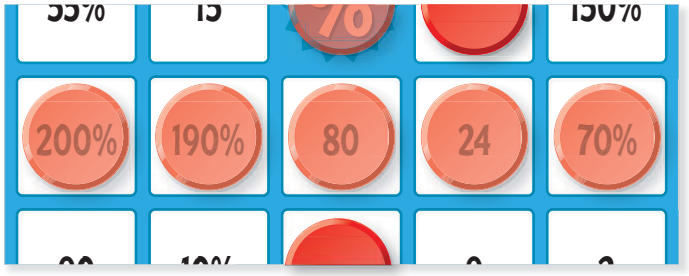
Winning the Game

A player who covers five squares in a row horizontally, vertically, or diagonally says, "Percento!" The caller uses the cards in the discard pile to check that this player has calculated correctly. If so, that player is the winner. If not, play continues until someone else says, "Percento!"



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LESSON 5.1

Percent Increase and Decrease

COMMON CORE 7.RP.3

Use proportional relationships to solve multistep ratio and percent problems.

ESSENTIAL QUESTION

How do you use percents to describe change?

EXPLORE ACTIVITY Real World

COMMON CORE 7.RP.3

Finding Percent Increase

Percents can be used to describe how an amount changes.

$$\text{Percent Change} = \frac{\text{Amount of Change}}{\text{Original Amount}}$$

The change may be an increase or a decrease. **Percent increase** describes how much a quantity increases in comparison to the original amount.

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EXAMPLE 1 **Amber got a raise, and her hourly wage increased from $8 to $9.50. What is the percent increase?**

STEP 1 Find the amount of change.

Amount of Change = Greater Value − Lesser Value

Substitute values. = ☐ − ☐

Subtract. = ☐

STEP 2 Find the percent increase. Round to the nearest percent.

Percent Change = $\frac{\text{Amount of Change}}{\text{Original Amount}}$

Substitute values. = $\frac{\square}{8.00}$

Divide. = _____

Write as a percent and round. ≈ _____

Reflect

1. What does a 100% increase mean?

_____

_____

YOUR TURN

2. The price of a pair of shoes increases from $52 to $64. What is the percent increase to the nearest percent? _____

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Finding Percent Decrease

When the change in the amount decreases, you can use a similar approach to find percent decrease. **Percent decrease** describes how much a quantity decreases in comparison to the original amount.

EXAMPLE 2

Real World

COMMON CORE 7.RP.3

David moved from a house that is 89 miles away from his workplace to a house that is 51 miles away from his workplace. What is the percent decrease in the distance from his home to his workplace?

STEP 1 Find the amount of change.

Amount of Change = Greater Value − Lesser Value

$= 89 - 51$ *Substitute values.*

$= 38$ *Subtract.*

STEP 2 Find the percent decrease. Round to the nearest percent.

$$\text{Percent Change} = \frac{\text{Amount of Change}}{\text{Original Amount}}$$

$= \frac{38}{89}$ *Substitute values.*

≈ 0.427 *Divide.*

$= 43\%$ *Write as a percent and round.*

Math Talk
Mathematical Practices

How can you use the benchmark fractions $\frac{1}{3}$ and $\frac{1}{2}$ to check that the answer is reasonable?

Reflect

3. **Critique Reasoning** David considered moving even closer to his workplace. He claims that if he had done so, the percent of decrease would have been more than 100%. Is David correct? Explain your reasoning.

_____

_____

_____

YOUR TURN

4. The number of students in a chess club decreased from 18 to 12. What is the percent decrease? Round to the nearest percent. _____

5. Officer Brimberry wrote 16 tickets for traffic violations last week, but only 10 tickets this week. What is the percent decrease? _____

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Using Percent of Change

Given an original amount and a percent increase or decrease, you can use the percent of change to find the new amount.

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EXAMPLE 3

Real World

COMMON CORE 7.RP.3

The grizzly bear population in Yellowstone National Park in 1970 was about 270. Over the next 35 years, it increased by about 115%. What was the population in 2005?

STEP 1 Find the amount of change.

$1.15 \times 270 = 310.5$ Find 115% of 270. Write 115% as a decimal.

≈ 311 Round to the nearest whole number.

STEP 2 Find the new amount.

New Amount = Original Amount + Amount of Change

$= 270 + 311$ Substitute values.

$= 581$ Add.

Add the amount of change because the population increased.

The population in 2005 was about 581 grizzly bears.

Reflect

6. Why will the percent of change always be represented by a positive number?

_____

_____

_____

7. **Draw Conclusions** If an amount of $100 in a savings account increases by 10%, then increases by 10% again, is that the same as increasing by 20%? Explain.

_____

_____

_____

YOUR TURN

A TV has an original price of $499. Find the new price after the given percent of change.

8. 10% increase _____ **9.** 30% decrease _____

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Guided Practice

Find each percent increase. Round to the nearest percent. (Explore Activity Example 1)

1. From \$5 to \$8 _____

2. From 20 students to 30 students _____

3. From 86 books to 150 books _____

4. From \$3.49 to \$3.89 _____

5. From 13 friends to 14 friends _____

6. From 5 miles to 16 miles _____

7. Nathan usually drinks 36 ounces of water per day. He read that he should drink 64 ounces of water per day. If he starts drinking 64 ounces, what is the percent increase? Round to the nearest percent. (Explore Activity Example 1) _____

Find each percent decrease. Round to the nearest percent. (Example 2)

8. From \$80 to \$64 _____

9. From 95 °F to 68 °F _____

10. From 90 points to 45 points _____

11. From 145 pounds to 132 pounds _____

12. From 64 photos to 21 photos _____

13. From 16 bagels to 0 bagels _____

14. Over the summer, Jackie played video games 3 hours per day. When school began in the fall, she was only allowed to play video games for half an hour per day. What is the percent decrease? Round to the nearest percent. (Example 2) _____

Find the new amount given the original amount and the percent of change. (Example 3)

15. \$9; 10% increase _____

16. 48 cookies; 25% decrease _____

17. 340 pages; 20% decrease _____

18. 28 members; 50% increase _____

19. \$29,000; 4% decrease _____

20. 810 songs; 130% increase _____

21. Adam currently runs about 20 miles per week, and he wants to increase his weekly mileage by 30%. How many miles will Adam run per week? (Example 3) _____

ESSENTIAL QUESTION CHECK-IN

22. What process do you use to find the percent change of a quantity?

_____

_____

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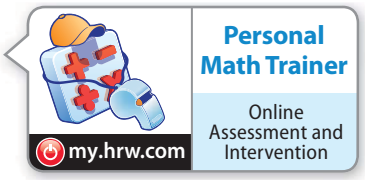
Name _____ Class _____ Date _____

5.1 Independent Practice

COMMON CORE 7.RP.3



23. Complete the table.

Item	Original Price	New Price	Percent Change	Increase or Decrease
Bike	$110	$96		
Scooter	$45	$56		
Tennis Racket	$79		5%	Increase
Skis	$580		25%	Decrease

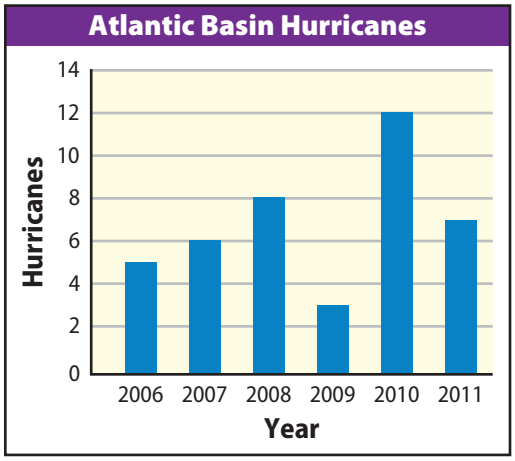
24. **Multiple Representations** The bar graph shows the number of hurricanes in the Atlantic Basin from 2006–2011.

a. Find the amount of change and the percent of decrease in the number of hurricanes from 2008 to 2009 and from 2010 to 2011. Compare the amounts of change and percents of decrease.

_____

_____

_____



b. Between which two years was the percent of change the greatest? What was the percent of change during that period?

_____

25. **Represent Real-World Problems** Cheese sticks that were previously priced at "5 for $1" are now "4 for $1". Find each percent of change and show your work.

a. Find the percent decrease in the number of cheese sticks you can buy for $1.

_____

b. Find the percent increase in the price per cheese stick.

_____

_____

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26. Percent error calculations are used to determine how close to the true values, or how accurate, experimental values really are. The formula is similar to finding percent of change.

$$\text{Percent Error} = \frac{|\text{Experimental Value} - \text{True Value}|}{\text{True Value}} \times 100$$

In chemistry class, Charlie records the volume of a liquid as 13.3 milliliters. The true volume is 13.6 milliliters. What is his percent error? Round to the nearest percent. _____

H.O.T. FOCUS ON HIGHER ORDER THINKING

27. **Look for a Pattern** Leroi and Sylvia both put $1,000 in a savings account. Leroi decides he will put in an additional $100 each month. Sylvia decides to put in an additional 10% of the amount in the account each month.

a. Who has more money after the first additional deposit? Explain.

_____

_____

b. Who has more money after the second additional deposit? Explain.

_____

_____

c. How do you think the amounts in the two accounts will compare after a year?

_____

_____

_____

28. **Critical Thinking** Suppose an amount increases by 50%, then decreases by 50%. Will the amount after the decrease be the same as the original amount? Explain your reasoning.

_____

_____

_____

29. **Look for a Pattern** Ariel deposited $600 into a bank account. Each Friday she will withdraw 10% of the money in the account to spend. Ariel thinks her account will be empty after 10 withdrawals. Do you agree? Explain.

_____

_____

_____

Work Area

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LESSON 5.2

Rewriting Percent Expressions

COMMON CORE 7.EE.2

Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *Also 7.RP.3, 7.EE.3*

ESSENTIAL QUESTION

How can you rewrite expressions to help you solve markup and markdown problems?

EXPLORE ACTIVITY Real World

COMMON CORE 7.EE.2, 7.RP.3, 7.EE.3

Calculating Markups

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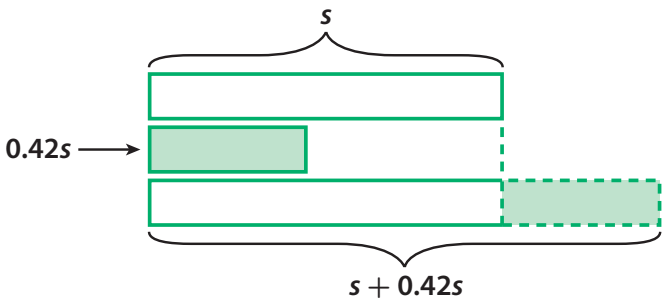
A *markup* is one kind of percent increase. You can use a bar model to represent the *retail price* of an item, that is, the total price including the markup.

EXAMPLE 1 **To make a profit, stores mark up the prices on the items they sell. A store manager buys skateboards from a supplier for *s* dollars. What is the retail price for skateboards that the manager buys for $35 and $56 after a 42% markup?**

STEP 1 Draw a bar for the cost of the skateboard *s*.

Then draw a bar that shows the markup: _____% of *s*, or 0.42*s*.



These bars together represent the cost plus the markup, $s +$ _____.

STEP 2 Retail price = Original cost + Markup

$= \quad s \quad + \quad 0.42s$

$= \quad 1s \quad + \quad 0.42s$ Identity Property of Multiplication

$= \quad$ _____ Distributive Property

STEP 3 Use the expression to find the retail price of each skateboard.

$s = \$35 \rightarrow$ Retail price $= 1.42(\$35) \quad =$ ☐

$s = \$56 \rightarrow$ Retail price $= 1.42($\$☐$) \quad =$ ☐

Reflect

1. Write an equation showing that the relationship between the supplier price, *s*, and the retail price, *r*, is proportional. What is the constant of proportionality?

_____

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EXPLORE ACTIVITY *(cont'd)*

YOUR TURN

2. Rick buys remote control cars to resell. He applies a markup of 10%.

a. Write two expressions that represent the retail price of the cars.

_____

b. If Rick buys a remote control car for $28.00, what is his selling price?

_____

3. An exclusive clothing boutique triples the price of the items it purchases for resale.

a. What is the boutique's markup percent? _____

b. Write two expressions that represent the retail price of the clothes.

_____

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Calculating Markdowns

An example of a percent decrease is a *discount*, or *markdown*. A price after a markdown may be called a sale price. You can also use a bar model to represent the price of an item including the markdown.

EXAMPLE 2

Real World

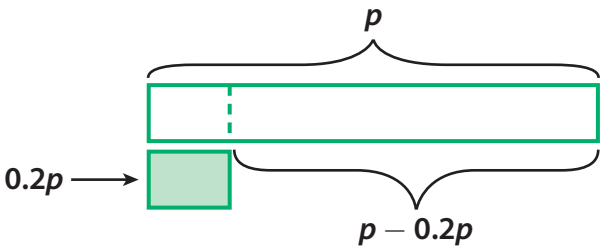
COMMON CORE 7.EE.2, 7.RP.3, 7.EE.3

A discount store marks down all of its holiday merchandise by 20% off the regular selling price. Find the discounted price of decorations that regularly sell for $16 and $23.

STEP 1 Use a bar model.

Draw a bar for the regular price p.

Then draw a bar that shows the discount: 20% of p, or $0.2p$.



The difference between these two bars represents the price minus the discount, $p - 0.2p$.

Animated Math

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STEP 2 Sale price = Original price − Markdown

$= p - 0.2p$

$= 1p - 0.2p$ Identity Property of Multiplication

$= 0.8p$ Distributive Property

STEP 3 Use the expression to find the sale price of each decoration.

$p = \$16 \rightarrow$ Retail price $= 0.8(\$16) = \$12.80$

$p = \$23 \rightarrow$ Retail price $= 0.8(\$23) = \$18.40$

Math Talk
Mathematical Practices
How do the expressions $1p - 0.2p$ and $0.8p$ for the sale price shed light on the problem?

Reflect

4. **Analyze Relationships** Is the relationship between the original price p and the retail price r proportional? Justify your answers.

_____

_____

YOUR TURN

5. A bicycle shop marks down each bicycle's selling price b by 24% for a holiday sale.

a. Draw a bar model to represent the problem.

b. What is a single term expression for the sale price? _____

6. Jane sells pillows. For a sale, she marks them down 5%.

a. Write two expressions that represent the sale price of the pillows.

_____

b. If the original price of a pillow is $15.00, what is the sale price?

_____

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Guided Practice

1. Dana buys dress shirts from a clothing manufacturer for s dollars each, and then sells the dress shirts in her retail clothing store at a 35% markup. (Explore Activity Example 1)

a. Write the markup using a decimal. _____

b. Write an expression for the retail price of the dress shirt. _____

c. What is the retail price of a dress shirt that Dana purchased for $32.00? _____

d. How much was added to the original price of the dress shirt? _____

List the markup and retail price of each item. Round to two decimal places when necessary. (Explore Activity Example 1)

	Item	Price	Markup %	Markup	Retail Price
2.	**Hat**	$18	15%		
3.	**Book**	$22.50	42%		
4.	**Shirt**	$33.75	75%		
5.	**Shoes**	$74.99	33%		
6.	**Clock**	$48.60	100%		
7.	**Painting**	$185.00	125%		

Find the sale price of each item. Round to two decimal places when necessary. (Example 2)

8. Original price: $45.00; Markdown: 22%

_____

9. Original price: $89.00; Markdown: 33%

_____

10. Original price: $23.99; Markdown: 44%

_____

11. Original price: $279.99, Markdown: 75%

_____

ESSENTIAL QUESTION CHECK-IN

12. How can you determine the sale price if you are given the regular price and the percent of markdown?

_____

_____

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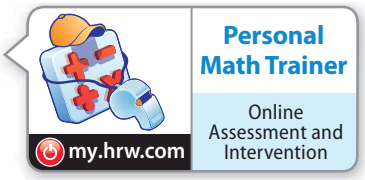
Name _____ Class _____ Date _____

5.2 Independent Practice

COMMON CORE 7.RP.3, 7.EE.2, 7.EE.3



13. A bookstore manager marks down the price of older hardcover books, which originally sell for b dollars, by 46%.

a. Write the markdown using a decimal. _____

b. Write an expression for the sale price of the hardcover book.

_____

c. What is the sale price of a hardcover book for which the original retail price was $29.00? _____

d. If you buy the book in part **c**, how much do you save by paying the sale price? _____

14. Raquela's coworker made price tags for several items that are to be marked down by 35%. Match each Regular Price to the correct Sale Price, if possible. Not all sales tags match an item.

Regular Price $3.29	Regular Price $4.19	Regular Price $2.79	Regular Price $3.09	Regular Price $3.77

Sale Price $2.01	Sale Price $2.45	Sale Price $1.15	Sale Price $2.72	Sale Price $2.24

15. **Communicate Mathematical Ideas** For each situation, give an example that includes the original price and final price after markup or markdown.

a. A markdown that is greater than 99% but less than 100%

_____

b. A markdown that is less than 1%

_____

c. A markup that is more than 200%

_____

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16. **Represent Real-World Problems** Harold works at a men's clothing store, which marks up its retail clothing by 27%. The store purchases pants for $74.00, suit jackets for $325.00, and dress shirts for $48.00. How much will Harold charge a customer for two pairs of pants, three dress shirts, and a suit jacket? Use estimation to explain why your answer is reasonable.

17. **Analyze Relationships** Your family needs a set of 4 tires. Which of the following deals would you prefer? Explain.

(I) Buy 3, get one free **(II)** 20% off **(III)** $\frac{1}{4}$ off

H.O.T. FOCUS ON HIGHER ORDER THINKING

18. **Critique Reasoning** Margo purchases bulk teas from a warehouse and marks up those prices by 20% for retail sale. When teas go unsold for more than two months, Margo marks down the retail price by 20%. She says that she is *breaking even*, that is, she is getting the same price for the tea that she paid for it. Is she correct? Explain.

19. **Problem Solving** Grady marks down some $2.49 pens to $1.99 for a week and then marks them back up to $2.49. Find the percent of increase and the percent of decrease to the nearest tenth. Are the percents of change the same for both price changes? If not, which is a greater change?

20. **Persevere in Problem Solving** At Danielle's clothing boutique, if an item does not sell for eight weeks, she marks it down by 15%. If it remains unsold after that, she marks it down an additional 5% each week until she can no longer make a profit. Then she donates it to charity.

Rafael wants to buy a coat originally priced $150, but he can't afford more than $110. If Danielle paid $100 for the coat, during which week(s) could Rafael buy the coat within his budget? Justify your answer.

Work Area

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LESSON 5.3

Applications of Percent

COMMON CORE 7.RP.3

Use proportional relationships to solve multistep ratio and percent problems. *Also 7.EE.3*

ESSENTIAL QUESTION

How do you use percents to solve problems?

EXPLORE ACTIVITY Real World

COMMON CORE 7.RP.3, 7.EE.3

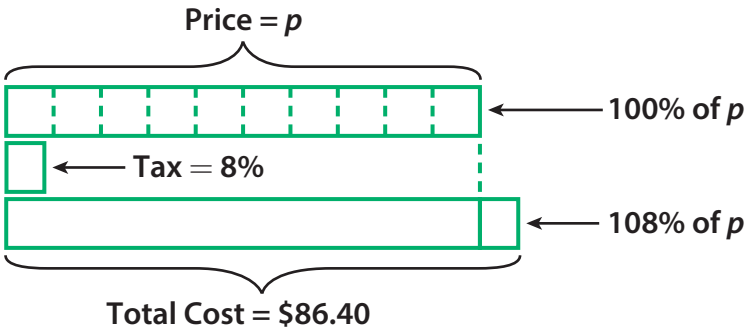
Finding an Original or Final Amount

Sales tax, which is the tax on the sale of an item or service, is a percent of the purchase price that is collected by the seller. The relationship between an original amount and the amount after a percent change is a proportional relationship. For a given sales tax rate, you can use proportional reasoning to find the total cost if you know the price, or the price if you know the total cost.

EXAMPLE 1 **Marcus bought a varsity jacket. The total cost, including an 8% sales tax, was $86.40. What was the price *p* of the jacket?**

You can draw a bar model to visualize the problem.

Because 100% is not evenly divisible by 8%, you can more easily use a proportion or an equation to solve the problem.



Method 1 Use a proportion comparing ratios of price to total cost.

$$\frac{\text{percent}}{100} = \frac{\text{dollars}}{108} \qquad \frac{100}{108} = \frac{p}{\square}$$

$$86.40 \times \frac{100}{108} = 86.40 \times \frac{p}{86.40}$$

$$\frac{\square}{108} = p$$

$$_____ = p$$

Method 2 Use an equation relating price and total cost.

Total Cost = 108% of Price

$$_____ = 1.08p$$

$$\frac{86.40}{1.08} = \frac{1.08p}{1.08}$$

$$_____ = p$$

The price of the jacket, before sales tax, was $_____.

Check: If the jacket's price is $80, the total cost with tax is

$$1.08(80) = \$\ \square.$$

Math On the Spot my.hrw.com

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EXPLORE ACTIVITY *(cont'd)*

YOUR TURN

1. Sharon wants to buy a shirt that costs $20. The sales tax is 5%. How much is the sales tax? What is her total cost for the shirt? _____

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Finding Simple Interest

When you deposit money in a savings account, your money usually earns interest. When you borrow money, you must pay back the original amount of the loan plus interest. **Simple interest** is a fixed percent of the *principal*. The **principal** is the original amount of money deposited or borrowed.

EXAMPLE 2

Real World

COMMON CORE 7.RP.3, 7.EE.3

Terry deposits $200 into a bank account that earns 3% simple interest per year. What is the total amount in the account after 2 years?

STEP 1 Find the amount of interest earned in one year. Then calculate the amount of interest for 2 years.

Write 3% as a decimal: *0.03*

Interest Rate	×	Initial Deposit	=	Interest for 1 year
0.03	×	$200	=	$6

Interest for 1 year	×	2 years	=	Interest for 2 years
$6	×	2	=	$12

Math Talk
Mathematical Practices
Is interest *I* earned on $200 proportional to time *t* in years? If so, write the equation.

STEP 2 Add the interest for 2 years to the initial deposit to find the total amount in his account after 2 years.

Initial deposit	+	Interest for 2 years	=	Total
$200	+	$12	=	$212

The total amount in the account after 2 years is $212.

Reflect

2. Write an equation relating the total amount *a* in Terry's account to the number of years, *t*. Is the relationship proportional? Explain.

_____

3. Commission and interest problems have some similarities. A salesperson receives a percent of the selling price of the item(s) sold, called a commission. Nadia earns a salary of $3,300 per month selling furniture, plus a 3.25% commission. Calculate Nadia's total earnings in a month when her sales totaled $29,600. Show your work.

_____

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YOUR TURN

4. Ariane borrows $400 on a 4-year loan. She is charged 5% simple interest per year. How much interest is she charged for 4 years? What is the total amount she has to pay back? _____

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Using Multiple Percents

Some situations require applying more than one percent to a problem. For example, when you dine at a restaurant, you might pay a tax on the meal, and pay a tip to the wait staff. The tip is usually paid on the amount before tax. When you pay tax on a sale item, you pay tax only on the discounted price.

EXAMPLE 3 Problem Solving

COMMON CORE 7.EE.3, 7.RP.3

The Maxwell family goes out for dinner, and the price of the meal is $60. The sales tax on the meal is 7%, and they also want to leave a 15% tip. What is the total cost of the meal?

Analyze Information

Identify the important information.

- The bill for the meal is *$60*.
- The sales tax is 7%, or *0.07*.
- The tip is 15%, or *0.15*.

The total cost will be the sum of the bill for the meal, the sales tax, and the tip.

Formulate a Plan

Calculate the sales tax separately, then calculate the tip, and then add the products to the bill for the meal to find the total.

Solve

Sales tax: $0.07 \times \$60 = \$4.20$ Tip: $0.15 \times \$60 = \$9.00$

Meal + Sales tax + Tip = Total cost

$\$60 + \$4.20 + \$9 = \$73.20$

The total cost is $73.20.

Justify and Evaluate

Estimate the sales tax and tip. Sales tax is about 10% plus 15% for tip gives 25%. Find 25% of the bill: $0.25 \times \$60 = \$15$. Add this to the bill: $\$60 + \$15 = \$75$. The total cost should be about $75.

Math Talk
Mathematical Practices
Write an equation and a proportion you could use to find the total cost *c* given the price *p*.

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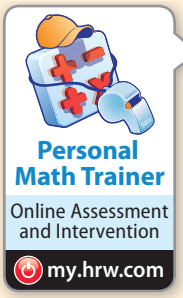

YOUR TURN

5. Samuel orders four DVDs from an online music store. Each DVD costs $9.99. He has a 20% discount code, and sales tax is 6.75%. What is the total cost of his order?

_____

Guided Practice

1. 5% of $30 = _____

2. 15% of $70 = _____

3. 0.4% of $100 = _____

4. 150% of $22 = _____

5. 1% of $80 = _____

6. 200% of $5 = _____

7. Brandon buys a radio for $43.99 in a state where the sales tax is 7%. (Explore Activity Example 1)

a. How much does he pay in taxes? _____

b. What is the total Brandon pays for the radio? _____

8. Luisa received $108 for a necklace she sold on an online auction. The auction site took a fee of 10% of the selling price. What was the selling price of the necklace? (Explore Activity Example 1) _____

9. Joe borrowed $2,000 from the bank at a rate of 7% simple interest per year. How much interest did he pay in 5 years? (Example 2) _____

10. Sonia works at a sporting goods store. She earns $415 per week plus a 5.25% commission on her sales. One week, her sales are $2,200. What is her total income for the week? (Example 2) _____

11. Martin finds a shirt on sale for 10% off at a department store. The original price was $20. Martin must also pay 8.5% sales tax. (Example 3)

a. How much is the shirt before taxes are applied? _____

b. How much is the shirt after taxes are applied? _____

12. Teresa's restaurant bill comes to $29.99 before tax. If the sales tax is 6.25% and she tips the waiter 20%, what is the total cost of the meal? (Example 3) _____

ESSENTIAL QUESTION CHECK-IN

13. How can you determine the total cost of an item including tax if you know the price of the item and the tax rate?

_____

_____

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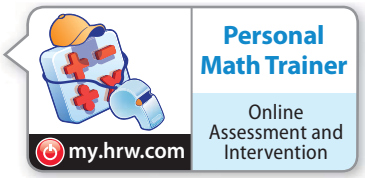
Name _____ Class _____ Date _____

5.3 Independent Practice

COMMON CORE 7.RP.3, 7.EE.3



14. Emily takes her friend Darren out to eat for his birthday. She pays a total of $45, which includes a 20% tip. There is no tax. Find the cost of the meals before the tip.

_____

15. The Jayden family eats at a restaurant that is having a 15% discount promotion. Their meal costs $78.65 before the discount, and they leave a 20% tip. If the tip applies to the cost of the meal before the discount, what is the total cost of the meal?

_____

16. A jeweler buys a ring from a jewelry maker for $125. He marks up the price by 135% for sale in his store. What is the selling price of the ring with 7.5% sales tax?

_____

17. Luis wants to buy a skateboard that usually sells for $79.99. All merchandise is discounted by 12%. What is the total cost of the skateboard if Luis has to pay a state sales tax of 6.75%?

_____

18. Kedar earns a monthly salary of $2,200 plus a 3.75% commission on the amount of his sales at a men's clothing store. What would he earn this month if he sold $4,500 in clothing? Round to the nearest cent.

_____

19. Danielle earns a 7.25% commission on everything she sells at the electronics store where she works. She also earns a base salary of $750 per week. What were her sales last week if her total earnings for the week were $1,076.25?

_____

20. Francois earns a weekly salary of $475 plus a 5.5% commission on sales at a gift shop. How much would he earn in a week if he sold $700 in goods? Round to the nearest cent.

_____

21. Sandra is 4 feet tall. Pablo is 10% taller than Sandra, and Michaela is 8% taller than Pablo.

a. Explain how to find Michaela's height with the given information.

_____

_____

_____

_____

_____

_____

b. What is Michaela's approximate height in feet and inches?

_____

22. Troy is buying a car that costs $15,000. He plans to get a 5-year loan to pay for it. He can get a loan for $15,000 or he can pay $3,000 from his savings and get a loan for the rest. The savings account pays 2% simple interest per year. The simple interest rate for the loan is 0.5% per year.

a. How much interest over a 5-year period will Troy receive on his $3,000 if he does not withdraw that money from his savings account? _____

b. How much more interest will he pay to borrow $15,000 than $12,000? Why is the $15,000 option reasonable?

_____

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23. **Multistep** Eric downloads the coupon shown and goes shopping at Gadgets Galore, where he buys a digital camera for $95 and an extra battery for $15.99.

a. What is the total cost if the coupon is applied to the digital camera?

_____

b. What is the total cost if the coupon is applied to the extra battery?

_____

c. To which item should Eric apply the discount? Explain.

_____

d. Eric has to pay 8% sales tax after the coupon is applied. How much is his total bill?

_____

24. Kim takes some furniture to a consignment store. The store sells used items and takes a fee of 20% of the selling price. The remaining percent of the selling price goes to the seller, Kim.

a. What percent of the selling price p is the amount the seller gets?

_____

b. Kim receives a check from the consignment store for $592. What was the selling price of the furniture?

_____

H.O.T. FOCUS ON HIGHER ORDER THINKING

25. **Analyze Relationships** Marcus can choose between a monthly salary of $1,500 plus 5.5% of sales or $2,400 plus 3% of sales. He expects sales between $5,000 and $10,000 a month. Which salary option should he choose? Explain.

_____

_____

_____

26. **Multistep** In chemistry class, Bob recorded the volume of a liquid as 13.2 mL. The true volume was 13.7 mL. Use the formula to find the percent error of Bob's measurement to the nearest tenth of a percent.

$$\text{Percent Error} = \frac{|\text{Experimental Value} - \text{True Value}|}{\text{True Value}} \times 100$$

_____

Work Area

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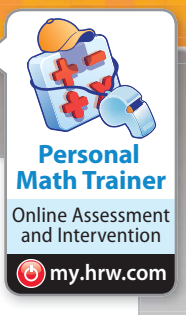
MODULE QUIZ

Ready to Go On?



5.1 Percent Increase and Decrease

Find the percent change from the first value to the second.

1. 36; 63 _____

2. 50; 35 _____

3. 40; 72 _____

4. 92; 69 _____

5.2 Markup and Markdown

Use the original price and the markdown or markup to find the retail price.

5. Original price: $60; Markup: 15%; Retail price: _____

6. Original price: $32; Markup: 12.5%; Retail price: _____

7. Original price: $50; Markdown: 22%; Retail price: _____

8. Original price: $125; Markdown: 30%; Retail price: _____

5.3 Applications of Percent

9. Mae Ling earns a weekly salary of $325 plus a 6.5% commission on sales at a gift shop. How much would she make in a work week if she sold $4,800 worth of merchandise? _____

10. Ramon earns $1,735 each month and pays $53.10 for electricity. To the nearest tenth of a percent, what percent of Ramon's earnings are spent on electricity each month? _____

11. James, Priya, and Siobhan work in a grocery store. James makes $7.00 per hour. Priya makes 20% more than James, and Siobhan makes 5% less than Priya. How much does Siobhan make per hour? _____

12. The Hu family goes out for lunch, and the price of the meal is $45. The sales tax on the meal is 6%, and the family also leaves a 20% tip on the pre-tax amount. What is the total cost of the meal? _____

ESSENTIAL QUESTION

13. Give three examples of how percents are used in the real-world. Tell whether each situation represents a percent increase or a percent decrease.

_____

_____

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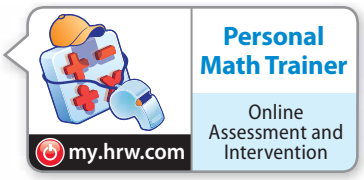
COMMON CORE

MODULE 5 MIXED REVIEW

Assessment Readiness



Selected Response

1. Zalmon walks $\frac{3}{4}$ of a mile in $\frac{3}{10}$ of an hour. What is his speed in miles per hour?

Ⓐ 0.225 miles per hour
Ⓑ 2.3 miles per hour
Ⓒ 2.5 miles per hour
Ⓓ 2.6 miles per hour

2. Find the percent change from 70 to 56.

Ⓐ 20% decrease Ⓒ 25% decrease
Ⓑ 20% increase Ⓓ 25% increase

3. The rainfall total this year was 10.2 inches, which is 20% less than last year's rainfall total. What was last year's rainfall total?

Ⓐ 8.16 inches Ⓒ 12.75 inches
Ⓑ 12.24 inches Ⓓ 20.4 inches

4. A pair of basketball shoes was originally priced at $80, but was marked up 37.5%. What was the retail price of the shoes?

Ⓐ $50 Ⓒ $110
Ⓑ $83 Ⓓ $130

5. The sales tax rate in Jan's town is 7.5%. If she buys 3 lamps for $23.59 each and a sofa for $769.99, how much sales tax does she owe?

Ⓐ $58.85 Ⓒ $67.26
Ⓑ $63.06 Ⓓ $71.46

6. The day after a national holiday, decorations were marked down 40%. Before the holiday, a patriotic banner cost $5.75. How much did the banner cost after the holiday?

Ⓐ $1.15 Ⓒ $3.45
Ⓑ $2.30 Ⓓ $8.05

7. Dustin makes $2,330 each month and pays $840 for rent. To the nearest tenth of a percent, what percent of Dustin's earnings are spent on rent?

Ⓐ 84.0% Ⓒ 56.4%
Ⓑ 63.9% Ⓓ 36.1%

8. A scuba diver is positioned at −30 feet. How many feet will she have to rise to change her position to −12 feet?

Ⓐ −42 ft Ⓒ 18 ft
Ⓑ −18 ft Ⓓ 42 ft

9. A bank offers an annual simple interest rate of 8% on home improvement loans. Tobias borrowed $17,000 over a period of 2 years. How much did he repay altogether?

Ⓐ $1,360 Ⓒ $18,360
Ⓑ $2,720 Ⓓ $19,720

Mini-Task

10. The granola Summer buys used to cost $6.00 per pound, but it has been marked up 15%.

a. How much did it cost Summer to buy 2.6 pounds of granola at the old price?

_____

b. How much does it cost her to buy 2.6 pounds of granola at the new price?

_____

c. Suppose Summer buys 3.5 pounds of granola. How much more does it cost at the new price than at the old price?

_____

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