

Big Ideas Math Teaching Edition

Professional development begins with the Big Ideas Math Teaching Edition. On the right hand page, opposite the Chapter Opener is a *Strands Development* chart that enables teachers to see at a glance the development of the ideas leading up to the chapter. Also included on this page are the *Pacing Guide*, the resources available for the chapter, and a short *Math in History* feature.

Strands Development

| |
|---|
| 4th & 5th Grade |
| <ul style="list-style-type: none"> Write common fractions as percents, only include halves, fourths, tenths, and hundredths. |
| 6th Grade |
| <ul style="list-style-type: none"> Use equivalent forms of fractions, decimals, and percents. Estimate the results of computations with percents, and verify reasonableness. |
| 7th Grade |
| <ul style="list-style-type: none"> Solve percent problems involving percents of increase and decrease. Solve percent problems including discounts, markups, simple interest, taxes, and tips. |

Math in History

The concept of percent goes back to Roman times. However, the percent symbol is more recent.

- ★ Percent has been used since the end of the fifteenth century in business problems such as computing interest, profit and loss, and taxes. However, the idea had its origin much earlier. When the Roman emperor Augustus levied a tax on all goods sold at auction, the rate was $\frac{1}{100}$.
- ★ In the Middle Ages, as large denominations of money came to be used, 100 became a common base for computation. Italian manuscripts of the fifteenth century contained such expressions as "20 p 100" to indicate 20%. The percent sign, %, evolved from a symbol introduced in an anonymous Italian manuscript of 1425. Instead of "per 100" or "P cento," which were common at that time, this author used the symbol $\frac{\text{p}}{\text{c}}$. The current symbol, using a slanted line, is relatively modern.



Pacing Guide for Chapter 4

| | |
|---------------------------------|----------------|
| Chapter Opener | 1 Day |
| Section 1 Activity Lesson | 1 Day 1 Day |
| Section 2 Activity Lesson | 1 Day 1 Day |
| Study Help / Quiz | 1 Day |
| Section 3 Activity Lesson | 1 Day 1 Day |
| Section 4 Activity Lesson | 1 Day 1 Day |
| Quiz / Chapter Review | 1 Day |
| Chapter Test | 1 Day |
| Standardized Test Practice | 1 Day |
| Total Chapter 4 | 13 Days |
| Year-to-Date | 68 Days |

Check Your Resources

- Record and Practice Journal
- Resources by Chapter
- Skills Review Handbook
- Assessment Book
- Worked-Out Solutions

Technology
For the
Teacher

Dynamic Classroom

The Dynamic Planning Tool
Editable Teacher's Resources at
BigIdeasMath.com

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When you turn the page, the left hand side is the Teaching Edition page and provides the *Math Background Notes*, including vocabulary review for the *What You Learned Before* page in the pupil edition. This review page reinforces the topics covered in the *Strands Development* chart. The background information discusses specific strategies for reviewing what students already know by referencing what was learned in earlier grades (based on standards).

This page layout design continues throughout the entire teaching edition. Any page you turn to will have a full-size student edition page on one side and a full-size teaching support page on the other. All teaching support pages are beige.

Next Generation SSS

MA.4.A.6.5 Relate halves, fourths, tenths, and hundredths to decimals and percents.

MA.4.A.6.3 Generate equivalent fractions and simplify fractions.

MA.6.A.5.1 Use equivalent forms of fractions, decimals, and percents to solve problems.

Additional Topics for Review

- The division algorithm
- Greatest common factor
- Simplifying fractions
- Place value

Try It Yourself

- 6%
- 100%
- 80%
- $0.35, \frac{7}{20}$
- $60\%, \frac{3}{5}$
- $52\%, 0.52$
- $0.1, \frac{1}{10}$
- $85\%, \frac{17}{20}$
- 20%, 0.2

Record and Practice Journal

- 18%
- 10%
- 58%
- 93%
- 0.625
- 0.525
- $\frac{13}{50}$
- $\frac{79}{100}$
- $\frac{13}{20}$
- 65%
- 94%
- $\frac{13}{25}$
- $\frac{31}{100}$
- 6%
- 84%
- 0.22
- 1.91

18–20.

| Percent | Decimal | Fraction |
|---------|---------|------------------|
| 45% | 0.45 | $\frac{9}{20}$ |
| 73% | 0.73 | $\frac{73}{100}$ |
| 30% | 0.3 | $\frac{3}{10}$ |

Math Background Notes

Vocabulary Review

- Numerator
- Denominator
- Equivalent fraction
- Percent

Writing Percents Using Models

- Students have been working with models and percents since Grade 4.
- Remind students that the word percent comes from per cent, or per one hundred.
- To express what percent of the model is shaded, students should count the number of blocks per hundred that are shaded.
- If time permits, you may want to provide examples of percents greater than 100. For example, two and one-half shaded hundred blocks are equal to 250% of the blocks being shaded.

Writing Percents, Decimals, and Fractions

- Students know how to convert between percents, decimals, and fractions. Students may require additional practice to achieve mastery.
- **Multiple Representations:** To convert from fractions to decimals, suggest that students convert the given fraction to an equivalent fraction with a denominator that is a power of ten. In Example 3, students can rewrite $\frac{3}{5}$ as $\frac{6}{10}$. Students that have mastered place value will realize that six-tenths can be expressed as the decimal 0.6 without having to employ the division algorithm. Alternatively, students could simply use the division algorithm to complete Example 3.

Reteaching and Enrichment Strategies provide a list of resources the teacher can use if a student needs more help or if a student thoroughly understands the topic.

Reteaching and Enrichment Strategies

| If students need help... | If students got it... |
|---|---|
| Record and Practice Journal • Fair Game Review Skills Review Handbook Lesson Tutorials | Game Closet at BigIdeasMath.com Start the next section |

Laurie's Notes, written by master teacher Laurie Boswell, are opposite the lesson plans. This feature provides insight into her professional training and years of experience to share best practices in teaching and modeling to help teachers guide students to better understanding. *Laurie's Notes* provides a daily mentor to any educator, especially novice teachers. Below, Laurie shares her thoughts about this feature.



Laurie Boswell

I have always loved math—even when I was young. And yet, early in my career, I became frustrated with many of the instructional programs for teaching mathematics. In 1992, that frustration led me to accept an offer from Ron Larson to join him and Lee Stiff in writing a high school geometry program for D.C. Heath.

When Ron asked me to join him in implementing the NCTM Focal Points in a new middle school program, I jumped at the opportunity to make changes in the way middle school mathematics is taught and learned.

In *Laurie's Notes* in the three Teaching Editions, I describe my “hands on” philosophy for teaching mathematics. Foremost in this philosophy is my belief that students can *enjoy* and *understand* mathematics. The secret is to begin each new concept with engaging, visual, tactile activities that ask simple, but deep questions.

During the time I wrote *Laurie's Notes*, I was not just imagining what might help middle school students. I was actually teaching middle school students—one class each of grades 6, 7, and 8. In other words, the suggestions I put in the notes are not theoretical suggestions from a math education professor. They represent things that I actually use in class.


I love working with other teachers. One of my favorite things to do is to conduct workshops. If you are interested in setting up a workshop with me or with one of the math consultants at Big Ideas Learning, drop us a note. We will be delighted to customize a session that is tailored to your needs.

Biography

Laurie Boswell is a mathematics teacher at the Riverside School in Lyndonville, Vermont. She is a recipient of the Presidential Award for Excellence in Mathematics Teaching. Laurie has taught math to students at all levels, elementary through college. In addition, Laurie was a Tandy Technology Scholar, and served on the NCTM Board of Directors from 2002 to 2005. She currently serves on the board of NCSM, and is a popular national speaker. Along with Dr. Ron Larson, Laurie has co-authored numerous math programs including the Big Ideas Math series.

Laurie's Notes identifies the goal of the Activity and offers motivating ideas to show mathematical relevance. Comprehensive Activity Notes, such as **FYI**, **Representation**, **Summarize**, and **Extension**, are provided on a teacher-to-teacher basis to help guide the activities and discovery process.

Laurie's Notes



Introduction

For the Teacher

- **Goal:** Students will use the percent bar model to help solve three types of percent problems.

Motivate

- Share with students that sometimes their thinking can get *scrambled up* while solving percent problems, so an egg model would be a good way to introduce the chapter!
- Use an egg carton to ask and to help visualize a few simple percent problems.
 - "What is 75% of 12?" 9
 - "3 is what percent of 12?" 25%
 - "12 is 50% of what number?" 24

Activity Notes

Activity 1

- **FYI:** You may want to begin with a quick review of fractional equivalents of the following common percents: 10%, 20%, 30%, 40%, 60%, 70%, 80%, 90%, 25%, 50%, 75%, $33\frac{1}{3}\%$, $66\frac{2}{3}\%$
- **Representation:** The percent bar model is an effective tool for estimating an answer, or judging the reasonableness of an answer if students have an understanding of fractional parts of a whole.
 - The length of the bar is 100%, the whole. Percents near 25% of the whole.
 - Students should be able to judge percents near 25% ($\frac{1}{4}$) and 75% ($\frac{3}{4}$)
 - Students should complete parts (a)–(e) using the same model.
 - When students have finished, draw a percent bar model on the board. Have volunteers share their answers.
 - Remind students that these are approximations. Check for reasonableness in their approximation. For example, 40% is closer to 50% than 25%.

Activity 2

- Use an egg carton as a visual model when discussing the three numbers in the statement "25% of 12 is 3."
- Students work with a partner to answer the questions.
- **FYI:** Some students may find it helpful to use a long strip of paper that they can fold or write on when answering questions.
- **Summarize:** In each of the questions the whole (30) was known and a part (percent) of it was found. Because all of the percents are less than 100%, all of the parts are less than 30 (the whole).
- **Extension:** "What number is 150% of 30?" 45

Next Generation SSS

MA.7.A.1.2 Solve percent problems, including problems involving discounts, simple interest, taxes, tips, and percents of increase or decrease.

Access Points

MA.7.A.5.In.c

Previous Learning

In Grade 6 students learned how to solve simple percent problems.

Activity Materials

Introduction

- egg carton (one dozen)

Start Thinking! and Warm Up

Activity 4.1 Start Thinking!
For more activity, see page 25.

Activity 4.1 Warm Up
Review skills involving \pm .

Estimate the sum or difference.

1. $162 + 98$ 2. $148 - (-69)$ 3. $-230 + 102$

Estimate the product or quotient.

4. $32(-43)$ 5. $\frac{-187}{12}$ 6. $(-49)(-12)$

Exit Ticket When can you use models to estimate percent problems?

1. ACTIVITY: Representing a Percent

Use a percent bar model to solve each problem. Draw a percent bar model to solve each problem.

What is 25% of 12? 25% of 12 = 3

What is 75% of 12? 75% of 12 = 9

What is 10% of 12? 10% of 12 = 1.2

What is 30% of 12? 30% of 12 = 3.6

What is 40% of 12? 40% of 12 = 4.8

What is 50% of 12? 50% of 12 = 6

What is 60% of 12? 60% of 12 = 7.2

What is 70% of 12? 70% of 12 = 8.4

What is 80% of 12? 80% of 12 = 9.6

What is 90% of 12? 90% of 12 = 10.8

What is 100% of 12? 100% of 12 = 12

2. ACTIVITY: Representing a Part of a Whole

The number "25% of 12" has three numbers. To find 25% problems, you use the numbers to estimate.

25% of 12 = 3

25% of 20 = 5

25% of 30 = 7.5

25% of 40 = 10

25% of 50 = 12.5

25% of 60 = 15

25% of 70 = 17.5

25% of 80 = 20

25% of 90 = 22.5

25% of 100 = 25

25% of 110 = 27.5

25% of 120 = 30

25% of 130 = 32.5

25% of 140 = 35

25% of 150 = 37.5

25% of 160 = 40

25% of 170 = 42.5

25% of 180 = 45

25% of 190 = 47.5

25% of 200 = 50

Laurie provides insights she has gained through years of teaching experience.

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Various ideas for *Differentiated Instruction* are also provided to address the visual, kinesthetic, and auditory learners, as well as the below-level and advanced learners.

Differentiated Instruction

Visual

Some students will benefit from seeing how fractions and percents relate. Draw a circle on the board. Write 100% on top of the circle and 1 underneath. Explain that both of these values describe the area of the circle. Draw one-half of a circle and one-fourth of a circle and ask students to give you two representations.

$\frac{1}{2}$ and 50%, $\frac{1}{4}$ and 25%

Laurie's Notes

Activity 3

- Encourage students to draw a percent bar model for each problem. You could also provide strips of paper that students can fold or write on.
- It is important that students be able to approximate the part in the whole model. Ask questions such as, "Is it greater than or less than one-half? Is it greater than or less than one-quarter?"
- Common Error:** In part (e) students may misread 50 as the part of 75. Help students with this by drawing a bar model to represent the whole (50).

? "How much more is needed to make 75?" 25

? "How much do I need to extend the bar to show 25?"

a length $\frac{1}{2}$ as long as 50

? "So 75 is what percent of 50?" 150%

Activity 4

- For most students, this is the most challenging of the 3 types of problems.
- Talk about the model shown. For example, The 24 is drawn first and you know it is $\frac{1}{3}$ of the whole ($33\frac{1}{3}\%$). Now draw two more thirds. Each third represents 24.
- Strategy:** You are given the part of the whole. Add parts until you have a whole. For part (d), you know 3 equal parts, so each part must be 25.
- You may need to offer a hint for part (e). Ask what 81 and 45 have in common factor. 9. From that information you can conclude the part must be 9.

45% 50%

81 90

- When students have finished, have them describe their strategy to their classmates. Hearing others' thinking is helpful.

Closure

- Use the model shown. What 3 questions could be asked? "24 is what percent of 60?"; "What is 40% of 60?"; "24 is 40% of what number?"

0% 20% 40% 60% 80% 100%

0 12 24 36 48 60

Technology for the Teacher

Dynamic Classroom

The Dynamic Planning Tool

Editable Teacher's Resources at BigIdeasMath.com

Strategies are provided that help students avoid common errors.

Teachers are offered suggestions for questioning that help guide students toward better understanding.

4.1 Record and Practice Journal

1. What number is 70% of 30? **2. What number is 60% of 30?**

22.5 12

3. What number is 15% of 30? **4. What number is 80% of 30?**

1.8 24

5. ACTIVITY: Understanding a Percent

Work with a partner. Solve the problem in the problem-solving model.

a. 10 is what percent of 20? **b. 15 is what percent of 40?**

20% 45%

c. 5 is what percent of 20? **d. 10 is what percent of 40?**

25% 45%

e. 10 is what percent of 30? **f. 75 is what percent of 30?**

62.3% 150%

6. ACTIVITY: Understanding a Percent

Work with a partner. Solve the problem in the problem-solving model.

a. 24 is 40% of what number?

72

b. 12 is 20% of what number? **c. 100 is 20% of what number?**

52 500

d. 75 is 75% of what number? **e. 81 is 45% of what number?**

100 180

What Do You Think?

1. IN 1200, 1200 IS 100%. How do you see a number in a whole percent equation? Circle a number in the equation above.

Check students' work.

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Ideas for connecting the lesson with the activity are included in *Connect*. Key Ideas are also connected to material learned in previous grades. Comprehensive *Lesson Notes*, such as **Connection**, **FYI**, **Estimate**, and **Common Error**, are provided on a teacher-to-teacher basis to help guide the lesson and discussion about the examples.

Laurie's Notes

Introduction

Connect

- **Yesterday:** Students used the percent bar model to explore three types of percent problems.
- **Today:** Students will use the percent equation to solve three types of percent problems.

Motivate

- The 2006 population of Florida was approximately 18 million (*Source:* U.S. Census Bureau) with 25% living under 18 years old. About how many people in Florida are under the age of 18? **4,500,000**

Lesson Notes

Key Idea

- Write the Key Idea.
- **Connection:** In Grade 6 students found a percent of a number by multiplying. The percent equation builds upon this idea to find the missing percent or the unknown whole. When you know two of the three quantities in this equation, you can solve for the third.
- To help students think through how the equation will be used, use a numeric example ($2 \times 4 = 8$) or a variable example ($a \cdot b = c$).
 - "If you know a and b , how do you solve for c ?" **Multiply a and b .**
 - "If you know a and c , how do you solve for b ?" **Divide c by a .**
 - "If you know b and c , how do you solve for a ?" **Divide c by b .**
- **FYI:** Students often get lost in the language of these problems. It is important to help students translate the problems and make sense of the information that is given.

Example 1

- Another way to phrase this question is "24% of 50 is what number?"
- **Estimate:** 24% is close to 25%, and 25% is $\frac{1}{4}$.
- "What is $\frac{1}{4}$ of 50?" **12.5**
- If time permits, write 24% as a decimal and work the problem again.

Example 2

- Read the example as "9.5 is a part of 25."
- "Is 9.5 more or less than half of 25?" **less**
- Draw the percent bar model explaining that it represents 25. Draw the half mark (50%) and ask how much that would represent. **12.5**
- Now draw the quarter mark (25%) and ask how much that would represent. **6.25** Through this process students should recognize that 9.5 is between 25% and 50% of 25.
- **Common Error:** Students may forget that the decimal answer to the division problem needs to be rewritten as a percent.
- Note that the percent bar model is divided into 5 equal parts instead of 4.

Goal Today's lesson is finding percents using the percent equation.

Start Thinking! and Warm Up

Lesson 6.5 Warm Up
For use with Lesson 6.5

Start Thinking!
For use with Lesson 6.5

At a soccer game, your team scored 6 goals during regular play and 4 goals on penalty kicks. Use a model to show the percent of goals that were not scored by penalty kicks.

Extra Example 1
What number is 73% of 200? **146**

Extra Example 2
36.4 is what percent of 40? **91%**

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Student-friendly and teacher-tested motivation activities start each lesson.

The *English Language Learners* (ELL) feature provides a brief description of how a teacher can assist an ELL. This feature will focus on defining vocabulary or explaining a concept in more detail, with simplified terminology. Laurie uses the *Closure* feature to wrap up an activity or lesson. This feature is used as a general concept check for the students.

Laurie's Notes

Extra Example 3
18 is 15% of what number? 120

On Your Own

1. $a = 0.1 \cdot 20$; 2
2. $a = 1.5 \cdot 40$; 60
3. $3 = p \cdot 600$; 0.5%
4. $18 = p \cdot 20$; 90%
5. $8 = 0.8 \cdot w$; 10
6. $90 = 0.18 \cdot w$; 500

Extra Example 4
Your total cost for lunch is \$18.50 for food and \$1.48 for tax.

- a. Find the percent of sales tax on the food total. 8%
- b. Find the amount of an 18% tip on the food total. \$3.33

On Your Own

7. \$5.50

English Language Learners
Vocabulary
English learners may have trouble identifying which is the *whole* and which is the *part of the whole* (w) in a percent equation. Have students write percent equations for the statements "20% of 300 is 60" and "125% of 50 is 62.5." Suggest that they start by substituting the percent p into the equation. Next, substitute the whole w . In most cases, this is the number after the word *of*. The remaining number is the part of the whole a .

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Example 3

- This type of problem, finding a whole, is a bit harder. Knowing fractional equivalents is extremely helpful in developing a sense about the size of the answer.
- "What is the part?" 39 "39 is $\frac{1}{2}$ of something."
- "How big a part is it, approximately?" about half
- Help students reason that if 39 is half of something, the whole is about 80. Only at this point does it make sense to write an equation. 39 is 52% of some number.
- **Common Error:** Students may divide 39 by 52 and ignore the remainder completely.

On Your Own

- Have students work with a partner on these problems to sketch the percent bar model and record the information. Then write the percent equation.
- Have students put their work on the board.

Example 4

- "In addition to paying for what you ordered (food and drink), what other costs are there when you eat at a restaurant?" sales tax and tip
- Review decimal operations as you work through each part.

On Your Own

- Model finding 10% and then double for 20%.

Closure

- **Exit Ticket:** Use the percent equation to answer the question, 12 is what percent of 48? 25%

Technology for the Teacher
Dynamic Classroom
The Dynamic Planning Tool
Editable Teacher's Resources at BigIdeasMath.com

Each example in the pupil edition is accompanied by teaching suggestions from Laurie.

The *Assignment Guide and Homework Check* provides suggested exercises to use for homework. Three assignment levels are given for each day: basic, average, and advanced. The *Homework Check* is a list of exercises that the teacher can use as a quick check to determine if students understand the key concepts of the lesson. It also provides teachers with a small list of exercises to discuss or go over in order to review the homework, rather than the entire assignment. The *Common Errors* feature is included at least once per exercise set. This feature identifies exercises where students may be more likely to make a mistake or perform a common error. Proven strategies of what to look for and how to address and/or fix them are provided.

Assignment Guide and Homework Check

| Level | Day 1 Activity Assignment | Day 2 Lesson Assignment | Homework Check |
|----------|---------------------------|-------------------------------|----------------|
| Basic | 4–9, 32–36 | 1–3, 11–17 odd, 18–22, 28 | 11, 15, 20, 28 |
| Average | 4–9, 32–36 | 1–3, 11–19 odd, 22–26, 28, 29 | 11, 15, 23, 28 |
| Advanced | 4–9, 32–36 | 1–3, 18, 19, 22–27, 29–31 | 24, 26, 27, 30 |

Common Errors

- **Exercises 4–17** Students may not know what number to substitute for each variable. Walk through each type of question with the students. Emphasize that the word *is* means *equals*, and *of* means *to multiply*. Tell students to write the question and then write the meaning of each word or group of words underneath.
- **Exercises 20–22** Students will mix up the whole and the part when trying to write the percent equation for the word problems. Ask them to identify each part of the equation before writing it in the equation format. For example, in Exercise 20, ask “How many total pitches did the pitcher throw?” **75** “Which variable in the percent equation does this number represent?” **The whole** Continue to ask questions for each of the variables.
- **Exercise 28** Students may not realize that the sum of the parts of a circle graph equals 100%.

Vocabulary and Concept Check

1. A part of the whole is equal to a percent times the whole.
2. greater than; Because $150\% = 1.5$, $n = 1.5 \cdot m$.
3. 55 is 20% of what number?; 275; 11

Practice and Problem Solving

4. 19.2
5. 37.5%
6. 50
7. 84
8. about 38.46%
9. 64
10. $a = 0.2 \cdot 150$; 30
11. $45 = p \cdot 60$; 75%
12. $35 = 0.35 \cdot w$; 100
13. $a = 0.32 \cdot 25$; 8
14. $29 = p \cdot 20$; 145%
15. $12 = 0.005 \cdot w$; 2400
16. $51 = p \cdot 300$; 17%
17. $102 = 1.2 \cdot w$; 85
18. The percent was not converted to a decimal or fraction.
 $a = p \cdot w$
 $= 0.35 \cdot 20$
 $= 7$
19. 30 represents the part of the whole.
 $30 = 0.6 \cdot w$
 $50 = w$
20. 54 strikes
21. \$5400
22. 5%

4.1 Record and Practice Journal

Write and solve an equation to answer the questions.

| | |
|--|--|
| 1. 60% of 20 is what number? 24 | 2. 77 is what percent of 20? 34% |
| 3. 20% of what number is 77? 150 | 4. 40% of 20 is what number? 11 |
| 5. 30 is what percent of 20? 104% | 6. 100% of what number is 20? 12 |
| 7. The gas 40% of your paycheck last month was taxes. If your paycheck is \$200, how much money do you get to pay bills each month? \$141 | |
| 8. The table shows the number of gallons of gasoline used by a car. The table shows the number of gallons of gasoline used by a car. The table shows the number of gallons of gasoline used by a car. The table shows the number of gallons of gasoline used by a car. | |
| a. How many gallons of gasoline are used? 6 gallons | |
| b. How many gallons of gasoline did you use? 10 gallons | |
| c. About how many gallons of gasoline are used? 4.8 gallons | |

Technology
for
the
Teacher
Answer Presentation Tool
QuizShow

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In each section, Ron Larson has written a complete solution for one of the problem-solving exercises. *Taking Math Deeper* gives detailed suggestions for taking the mathematics deeper.

Practice and Problem Solving

23. 26 years old
24. 70 years old
25. 56 signers
26. 70%
27. If the percent is less than 100, the percent of a number is less than the number. If the percent is equal to 100, the percent of a number will equal the number. If the percent is greater than 100, the percent of a number is greater than the number.
28. a. 80 students
b. 30 students
29. See *Taking Math Deeper*.
30. false; If W is 25% of Z , then $Z : W$ is $100 : 25$, because Z represents the whole.
31. 92%

Fair Game Review

32. 0.6 33. 0.88
34. 0.25 35. 0.36
36. A

Mini-Assessment

Write and solve an equation to answer the question.

1. 52 is what percent of 80? **65%**
2. 28 is 35% of what number? **80**
3. What number is 25% of 92? **23**
4. What percent of 250 is 60? **24%**
5. A new laptop computer costs \$900. The sales tax on the computer is \$48. What is the percent of sales tax? **6%**

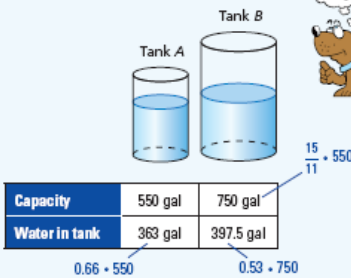
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Taking Math Deeper

Exercise 29

Any problem that has this much given information is difficult for students. Encourage students to begin by organizing the information with a table or a diagram. When organizing the information, it is a good idea to add as much other information as you can find... *before looking at the question.*

- 1 Organize the given information.
- 2 Add other information.



- 3 Now the questions are easy.
 - a. Tank A has 363 gallons of water.
 - b. The capacity of tank B is 750 gallons.
 - c. Tank B has 397.5 gallons of water.

Project

Use your school library or the Internet to research how a water tower works. How does the water get into the tower? How long does it take for the water to drain out? How often is the water completely exchanged; in other words, if a gallon goes in today when will that gallon be draining out? What other interesting things did you discover?

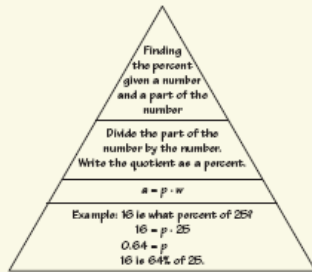
Reteaching and Enrichment Strategies

| If students need help... | If students got it... |
|--|--|
| Resources by Chapter <ul style="list-style-type: none"> • Practice A and Practice B • Puzzle Time Record and Practice Journal Practice Differentiating the Lesson Lesson Tutorials Skills Review Handbook | Resources by Chapter <ul style="list-style-type: none"> • Enrichment and Extension Start the next section |

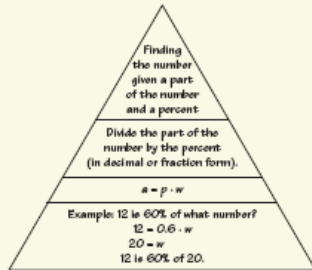
A strategy for how teachers may want to use graphic organizers is provided in each chapter. For example, some organizers may be great to introduce vocabulary, others may be nice summary tools, others may be nice to look at numerous cases in one place, and others may be good for students to complete in pairs or could be used as an assessment tool.

Sample Answers

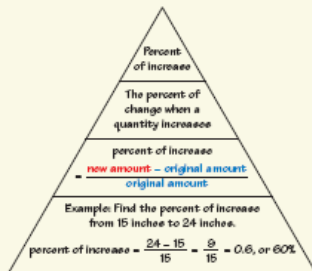
1.



2.



3.



4. Available at *BigIdeasMath.com*.

List of Organizers

Available at *BigIdeasMath.com*

- Comparison Chart
- Concept Circle
- Example and Non-Example Chart
- Formula Triangle
- Four Square
- Idea (Definition) and Examples Chart
- Information Frame
- Information Wheel
- Notetaking Organizer
- Process Diagram
- Summary Triangle**
- Word Magnet
- Y Chart

About this Organizer

A **Summary Triangle** can be used to explain a concept. Typically, the summary triangle is divided into 3 or 4 parts. In the top part, students write the concept being explained. In the middle part(s), students write any procedure, explanation, description, definition, theorem, and/or formula(s). In the bottom part, students write an example to illustrate the concept. A summary triangle can be used as an assessment tool, in which blanks are left for students to complete. Also, students can place their summary triangles on note cards to use as a quick study reference.

Many graphic organizers are used throughout the program. They are available at *BigIdeasMath.com*.

Technology
for the
Teacher

Vocabulary Puzzle Builder

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Alternative Quiz Ideas are provided for teachers who want to try something other than the traditional quiz given in the pupil edition.

Answers

1. $a = 0.28 \cdot 75; 21$
2. $42 = 0.21 \cdot w; 200$
3. $36 = p \cdot 45; 80\%$
4. $a = 0.68 \cdot 12; 8.16$
5. $66 = p \cdot 55; 120\%$
6. Increase; 200%
7. decrease; 30%
8. decrease; 61.9%
9. Increase; 43.8%
10. decrease; 17.3%
11. Increase; 100%
12. 50 text messages
13. 17 passes
14. 93.33%
15. a. 2.5% Increase
b. 7.5% Increase
16. \$16,000

Alternative Quiz Ideas

| | |
|----------------|----------------|
| 100% Quiz | Math Log |
| Error Notebook | Notebook Quiz |
| Group Quiz | Partner Quiz |
| Homework Quiz | Pass the Paper |

Partner Quiz

- Students should work in pairs. Each pair should have a small white board.
- The teacher selects certain problems from the quiz and writes one on the board.
- The pairs work together to solve the problem and write their answer on the white board.
- Students show their answers and, as a class, discuss any differences.
- Repeat for as many problems as the teacher chooses.
- For the word problems, teachers may choose to have students read them out of the book.

Assessment Book

Quiz
10 minutes

Write and solve an equation to solve the problem.

1. What number is 20% of 10?
2. 50 is what percent of 200?
3. 100 is what percent of 200?

Identify the percent of change in an increase or decrease. Show the percent of change in the correct circle of a number line.

| | |
|--------------------------------|--------------------------------|
| 4. 100 pencils to 150 pencils | 5. 10 pencils to 8 |
| 6. 100 pencils to 150 pencils | 7. 100 pencils to 150 pencils |
| 8. 100 pencils to 150 pencils | 9. 100 pencils to 150 pencils |
| 10. 100 pencils to 150 pencils | 11. 100 pencils to 150 pencils |
| 12. 100 pencils to 150 pencils | 13. 100 pencils to 150 pencils |

14. The number 100 is a number. The number 100 is a number. How many questions were on the test?

15. The number 100 is a number. The number 100 is a number. How many questions were on the test?

| Score | Percent | Grade | Level |
|-------|---------|-------|-------------------|
| 100 | 100% | A | Excellent |
| 90 | 90% | B | Very Good |
| 80 | 80% | C | Good |
| 70 | 70% | D | Fair |
| 60 | 60% | F | Needs Improvement |

16. The number 100 is a number. The number 100 is a number. How many questions were on the test?

Reteaching and Enrichment Strategies

| If students need help... | If students got it... |
|--|---|
| <p>Resources by Chapter</p> <ul style="list-style-type: none"> • Study Help • Practice A and Practice B • Puzzle Time <p>Lesson Tutorials BigIdeasMath.com Practice Quiz Practice from the Test Generator</p> | <p>Resources by Chapter</p> <ul style="list-style-type: none"> • Enrichment and Extension • School-to-Work <p>Game Closet at BigIdeasMath.com Start the next lesson</p> |

Technology for the Teacher

Answer Presentation Tool
Big Ideas Test Generator

A detailed description of the highlighted alternative quiz is provided.

Alternative Assessment Options are provided for teachers who want to try something other than the traditional quiz given at the end of a chapter in the pupil edition.

Alternative Assessment Options

Mini-Chat Student Reflective Focus Question
 Structured Interview Writing Prompt

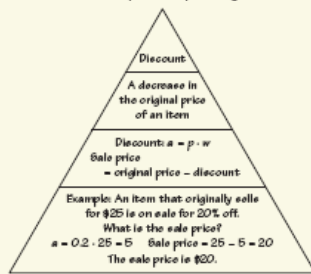
Writing Prompt

Ask students to write a story about making purchases and saving money. The students should include discounts and markups in the story. If they have money left over from their purchases, they should place it in a savings account. The students should include simple interest in the story. Then have students share their stories with the class.

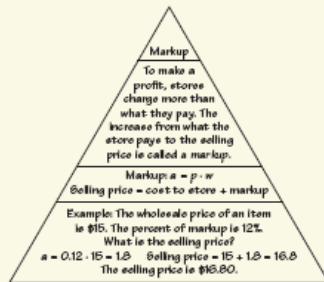
Study Help Sample Answers

Remind students to complete Graphic Organizers for the rest of the chapter.

5.



6.



7. Available at BigIdeasMath.com

Reteaching and Enrichment Strategies

| If students need help... | If students got it... |
|--|--|
| Resources by Chapter <ul style="list-style-type: none"> Study Help Practice A and Practice B Puzzle Time Lesson Tutorials BigIdeasMath.com Practice Quiz Practice from the Test Generator | Resources by Chapter <ul style="list-style-type: none"> Enrichment and Extension School-to-Work Game Closet at BigIdeasMath.com Start the Chapter Review |

Answers

- | | |
|--------------|------------|
| 1. \$27 | 2. 15% |
| 3. \$299 | 4. \$228 |
| 5. 60% | 6. \$12 |
| 7. \$120 | 8. 1 year |
| 9. 4.75% | 10. \$1110 |
| 11. \$125.95 | 12. 25% |
| 13. option 2 | 14. \$248 |

A detailed description of the highlighted alternative assessment option is provided.

Technology
For the Teacher

Answer Presentation Tool

Assessment Book

| Chapter | Quiz | Answer |
|-------------------------|-------------------------|----------|
| 1. Original price \$100 | 2. Original price \$100 | a. _____ |
| Discount 20% | Discount 10 | b. _____ |
| Sale price ? | Discount 10 | c. _____ |
| 3. Original price 1 | 4. Cost to store \$10 | d. _____ |
| Discount 20% | Markup 2% | e. _____ |
| Sale price \$14.40 | Markup price ? | f. _____ |
| 4. Cost to store \$10 | Markup 2% | g. _____ |
| Markup price \$10 | Markup 2% | h. _____ |
| Selling price \$10 | Selling price \$10 | i. _____ |
| 5. Discount percent 1 | 6. Discount percent 1 | j. _____ |
| Discount \$100 | Discount \$10 | k. _____ |
| Discount rate 1% | Discount \$10 | l. _____ |
| Discount rate 1% | Discount \$10 | m. _____ |
| Discount rate 1% | Discount \$10 | n. _____ |
| Discount rate 1% | Discount \$10 | o. _____ |
| Discount rate 1% | Discount \$10 | p. _____ |
| Discount rate 1% | Discount \$10 | q. _____ |
| Discount rate 1% | Discount \$10 | r. _____ |
| Discount rate 1% | Discount \$10 | s. _____ |
| Discount rate 1% | Discount \$10 | t. _____ |
| Discount rate 1% | Discount \$10 | u. _____ |
| Discount rate 1% | Discount \$10 | v. _____ |
| Discount rate 1% | Discount \$10 | w. _____ |
| Discount rate 1% | Discount \$10 | x. _____ |
| Discount rate 1% | Discount \$10 | y. _____ |
| Discount rate 1% | Discount \$10 | z. _____ |

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The technology package offered by Big Ideas Math provides *Additional Review Options* that make chapter review and studying fun! Check out QuizShow, the Game Closet, or Puzzle Builder.

For the Teacher
Additional Review Options

- QuizShow
- Big Ideas Test Generator
- Game Closet at *BigIdeasMath.com*
- Vocabulary Puzzle Builder
- Resources by Chapter
- Puzzle Time
- Study Help

Answers

1. $a = 0.24 \cdot 25$; 6
2. $9 = p \cdot 20$; 45%
3. $10.2 = 0.85 \cdot w$; 12
4. $a = 0.83 \cdot 20$; 16.6
5. 120 parking spaces

Next Generation Sunshine State Standards

| Section | Key Standard |
|-------------------|---|
| 4.1 | MA.7.A.1.2 Solve percent problems, including problems involving discounts, simple interest, taxes, tips and percents of increase or decrease. |
| 4.2 4.3 4.4 | MA.7.A.1.2 Solve percent problems, including problems involving discounts, simple interest, taxes, tips and percents of increase or decrease. |

NGSSS that were covered and their corresponding section.

Review of Common Errors

Exercises 1–5

- Students may not know what number to substitute for each variable. Walk through each type of question with the students. Emphasize that the word means “equals,” and “of” means “multiplied by.”
- Students may mix up the whole and the part when trying to write the percent equation for the word problems. Ask students to identify each part of the equation before writing it in the equation format.

Exercises 6–9

- Students may mix up where to place the numbers in the equation to find percent of change. When students do not put the numbers in the right place they might find a negative number in the numerator. Emphasize that students must know if it is increasing or decreasing before they can do anything else. The numerator should never have a negative answer. If students get a negative number then they need to switch the order of the numbers in the problem and then subtract.

Exercises 10 and 11

- Students may just find the markup and not the selling price. Remind them that they must add the markup onto the cost to store price.
- Remind students that the sale price is not the percent of discount multiplied by the original price.


Exercises 12–18

- Students may forget to change the percent to a decimal. Remind them that before they can put the percent into the equation they must change the percent to a fraction or a decimal.

Review of strategies that help students avoid common errors.

A *Review Game* from the Big Ideas Game Closet is listed at the end of every chapter.

Review Game
Percents of Increase and Decrease



Materials per Group

- 1 deck of cards with the jacks, queens, kings, and aces removed
- paper
- pencil
- calculator

Directions
Each group starts with 108 points. The cards are placed face down in the middle of the group. One member of the group turns a card over. If the card is red, the face value of the card is subtracted from the number of points. If the card is black, the face value of the card is added to the number of points. Group members take turns calculating the percent increase or decrease and turning cards over. The starting number of points at each player's turn is the same as the ending number of points at the previous player's turn. The group should be back to 108 points after going through all of the cards.

Who Wins?
The group with the highest mean percent increase wins. To find the mean percent increase, add the percent increases and divide the sum by 18.

For the Student Additional Practice

- Lesson Tutorials
- Study Help (textbook)
- Student Website
Multi-Language Glossary
Practice Assessments

Answers

6. Increase; 500%
7. decrease; 50%
8. decrease; 56.7%
9. increase; 228.6%
10. \$42.50
11. \$93.75
12. a. \$36
b. \$336
13. a. \$280
b. \$2280
14. 1.7%
15. 7.1%
16. 3 years
17. 6 years
18. 4%

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Detailed directions and rules of the review game are provided.

Additional practice is suggested for students that need it.

The *Test-Taking Strategies* feature relates to the chapter test. Teachers can encourage their students to use various strategies depending on the kind of test they are taking.

Test Item References

| Chapter Test Questions | Section to Review |
|------------------------|-------------------|
| 1–4, 15 | 4.1 |
| 5, 6, 16 | 4.2 |
| 7–10, 16, 17 | 4.3 |
| 11–14, 18 | 4.4 |

Test-Taking Strategies

Remind students to quickly look over the entire test before they start so that they can budget their time. Students should estimate and check for reasonableness as they work through the test. Some students will benefit from putting essential information on the back of their test before they begin.

Common Assessment Errors

- **Exercises 1–4** Students may not know what numbers to substitute for the variables. Review each type of question with students. Emphasize that the word “is” means “equals” and “of” means “multiplied by.” Ask students to identify the whole, the part of the whole, and the percent.
- **Exercises 5 and 6** Students might place the numbers in the percent of change formulas incorrectly. Remind them that they should have the difference between the greater amount and the lesser amount in the numerator, so the numerator should never be negative. Also point out that the original amount should always be in the denominator.
- **Exercises 7 and 10** Students may write the discount or markup amount as the new price instead of subtracting it from or adding it to the original price. Remind them to subtract or add as appropriate to find the sale or selling price.
- **Exercises 8 and 9** Students may treat the difference in the prices as the percent of discount or markup. Remind students that the discount or markup should be a *percent*, and that this percent is found by using the original price and the difference in prices in the percent equation.
- **Exercises 11–14** Students may forget to write the percent as a decimal, forget to convert time to years (if necessary), or use the wrong inverse operation to solve for the unknown value. Review the simple interest formula and the Division Property of Equality.

Reteaching and Enrichment Strategies

| If students need help... | If students got it... |
|--|--|
| Resources by Chapter <ul style="list-style-type: none"> • Practice A and Practice B • Puzzle Time Record and Practice Journal Practice Differentiating the Lesson Lesson Tutorials Practice from the Test Generator Skills Review Handbook | Resources by Chapter <ul style="list-style-type: none"> • Enrichment and Extension • School-to-Work Game Closet at BigIdeasMath.com Start the next chapter |

Answers

1. $a = 0.16 \cdot 150$; 24
2. $10 = 0.4 \cdot w$; 25
3. $27 = p \cdot 75$; 36%
4. $a = 0.35 \cdot 56$; 19.6
5. Increase; 150%
6. decrease; 25%
7. \$14.25
8. 60%
9. 65%
- 10.

Strategies that help students avoid common errors on the chapter test.

16. \$8.75
17. 150%
18. Year 1: \$832
Year 2: \$864
Year 3: \$896

Assessment Book

| Chapter | Test B |
|---|---|
| 4 | Test A |
| Write and solve an equation to answer the question. | |
| 1. 75 is what percent of 300? | 2. What number is 15% of 200? |
| 3. 35% of what number is 210? | 4. 70 is what percent of 350? |
| Identify the percent of change as an increase or decrease. Then find the amount of change. Round to the nearest tenth of a percent. | |
| 5. 100 to 125 | 6. 45 to 35 |
| 7. 12 subscribers to 7 subscribers | 8. 100 percent to 120 percent |
| Use the percent of change to find the new sale price. | |
| 9. A computer increased by 20%. Its 100 percent decreased by 20%. | 10. \$50 increased by 20%. 12. \$250 decreased by 20% |
| Find the price, discount, or markup. | |
| 11. Original price \$50 | 14. Original price \$100 |
| Discount 10% | Discount 10% |
| Markup 10% | Markup \$11.10 |
| 13. Original price \$40 | 15. Original price \$140 |
| Discount 10% | Discount 10% |
| Markup \$20 | Markup \$15.40 |
| 17. Original price \$20 | 18. Cost to store \$2 |
| Markup 10% | Markup 10% |
| Selling price \$22 | Selling price \$1.70 |

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At the end of every chapter there is a Standardized Test Practice. *Item Analysis* is used to examine student's responses to individual questions. Each wrong answer is analyzed and assigned a common error that is most likely.

List of Test Taking Strategies
Available at BigIdeasMath.com

- After Answering Easy Questions, Relax
- Answer Easy Questions First
- Estimate the Answer
- Read All Choices before Answering
- Read Question before Answering**
- Solve Directly or Eliminate Choices
- Solve Problem before Looking at Choices
- Use Intelligent Guessing
- Work Backwards

About this Strategy

When taking a multiple choice test, be sure to read each question carefully and thoroughly. It is also very important to read each answer choice carefully. Do not pick the first answer you think is correct. If two answer choices are the same, eliminate them both. There can only be one correct answer.

Answers

- C
- G
- 152 lb
- D

Item Analysis

- A. The student finds 30% of \$8.50 but does not subtract this amount from \$8.50.
 - B. The student thinks that 30% is equivalent to \$3.00 and subtracts this amount from \$8.50.
 - C. **Correct answer**
 - D. The student thinks that 30% is equivalent to 30 and subtracts this amount from \$8.50.
- F. The student divides incorrectly or converts measurements incorrectly to choose an incorrect box.
 - G. **Correct answer**
 - H. The student divides incorrectly or converts measurements incorrectly to choose an incorrect box.
- Gridded Response: Correct answer: 152 lb**

Common Error: The student finds only the loss, getting 152.
- A. The student chooses a proportion that will find 43% of 17.
 - B. The student chooses a proportion that will find 43% of 17.
 - C. The student chooses a proportion that will find 17% of 43.
 - D. **Correct answer**
- F. **Correct answer**
 - G. The student incorrectly thinks that $|21| = -21$, so the opposite of $|21|$ is 21.
 - H. The student incorrectly thinks that the absolute value of any number is its opposite.
 - I. The student makes an order of operations error and does not first find the sum within the absolute value bars.
- A. The student finds the minimum number of hours.
 - B. The student finds the mode of the numbers of hours.
 - C. **Correct answer**
 - D. The student finds the maximum number of hours or the middle value in the list as it is given.

Technology for the Teacher
Big Ideas Test Generator

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List of test taking strategies available at BigIdeasMath.com.

Description of the highlighted test taking strategy.