Program Information								
	[Lesson Title] ***Calculating Real-World Percentages***			**TEACHER NAME** **Julie Thumann**		**PROGRAM NAME** **Cincinnati City Schools**	
	[Unit Title] ***Number Operations***			**NRS EFL(s)** **3 – 5**		**TIME FRAME** **Two, 75-minute classes**	

Instruction								
	OBR ABE/ASE Standards – Mathematics							
	Numbers (N)		**Algebra (A)**		**Geometry (G)**		**Data (D)**	
	Numbers and Operation		Operations and Algebraic Thinking		Geometric Shapes and Figures		Measurement and Data	
	The Number System		Expressions and Equations	**A.4.1** **A.5.8**	Congruence		Statistics and Probability	
	Ratios and Proportional Relationships	**N.3.32** **N.4.11** **N.4.12**	Functions		Similarity, Right Triangles. And Trigonometry		**Benchmarks identified in red are priority benchmarks. Please see the Curriculum Alignments available on the Teacher Resource Center for a complete list of priority benchmarks and related Ohio ABLE lesson plans.*	
	Number and Quantity				Geometric Measurement and Dimensions			
					Modeling with Geometry			
	Mathematical Practices (MP)							
	✓	Make sense of problems and persevere in solving them. (MP.1)			✓	Use appropriate tools strategically. (MP.5)		

✓	Reason abstractly and quantitatively. (MP.2)	☐	Attend to precision. (MP.6)	
✓	Construct viable arguments and critique the reasoning of others. (MP.3)	☐	Look for and make use of structure. (MP.7)	
☐	Model with mathematics. (MP.4)	☐	Look for and express regularity in repeated reasoning. (MP.8)	

LEARNER OUTCOME(S)

- Relate fractions, decimals, and percents
- Compute percent of change
- Calculate simple interest
- Use percents to solve real-world problems

ASSESSMENT TOOLS/METHODS

- Student answers to in-class assignments
- Student responses to teacher questions, class discussion
- Checks for understanding
- Summative assessment: *Lesson 2.2 Calculate Real-World Percentages* from Common Core Achieve: Mastering Essential Test Readiness Skills (Mathematics)

LEARNER PRIOR KNOWLEDGE

- Fluency of fraction, decimal, and percent conversion
- Apply ratios and proportions to solve real-life problems

INSTRUCTIONAL ACTIVITIES

1. Warm-up: Cubing: *Fraction, Decimal, Percent Conversion* handout
    a. Label the sides of each cube with the following fractions:
        i. 1/2
        ii. 3/5
        iii. 7/10
        iv. 1/10
        v. 1/100
        vi. 2/5
    b. Provide each group with a cube and the *Fraction, Decimal,*

RESOURCES

Cubes for student use (attached)
Cube Pattern [PDF file]. (n.d.). Retrieved from http://printables.atozteacherstuff.com/download/cube_outline.pdf

Student copies of *Fraction, Decimal, Percent Conversions* handout (attached)

Student copies of *Math Talk Bookmark* (attached)
Math Talk Bookmark. (n.d.). Retrieved from

	Percent Conversions handout. c. Students work in pairs or small groups. One student rolls the cube and the pair or small group works together to convert the fraction into a decimal and percent. The pairs or small groups continue until all fractions are converted into decimals and percents. Record answers on the *Fraction, Decimal, Percent Conversions* handout. d. Review correct answers and ask students to explain how they figured out their answers (use phrases from the *Math Talk Bookmark* to solicit student responses and check student understanding). i. Discuss key concept of ratios. 1. A ratio, often written as a fraction, describes a part of a whole. A percent is a ratio of a number to 100. Just like a fraction and a percent, a decimal represents a part of a whole. 2. Lesson vocabulary: a. Percentages are important because you will frequently work problems that involve taking a part over a whole, and often you must interchange the use of percents, decimals, and fractions in your calculations. What are some real-life problems that deal with these concepts? (Discuss answers) b. Introduce lesson vocabulary. Ask students to record terms and definitions in their notebooks. i. Discount – a decrease or reduction in price ii. Percent – a ratio of a number to 100 iii. Simple Interest – a charge paid on an original principal iv. Principal – an amount of money invested or borrowed v. Interest rate – the amount that is charged or earned during a certain amount of time 3. Pass out the *Percent Foldable* handout and use Explicit Instruction to	https://www.pinterest.com/pin/30751209929886153/ Student notebooks Projector/ability to project Whiteboard or chalkboard Student copies of *Percent Foldable* (attached) Student copies of the *Simple Interest Foldable* (attached) TI-30XS calculators for student use Classroom Strategies: Think Alouds. (n.d.). Retrieved from http://www.adlit.org/strategies/22735/ Student copies of *Calculating Real-World Percentages* Assessment (attached) Individual white boards and dry erase markers for student use *Common core achieve: Mastering essential test readiness skills* (Mathematics). (2015). Columbus, OH: McGraw-Hill Education. Computers with Internet access for student use

	work through the Model Problems and Practice Problems. a. Model folding instructions for a shutter foldable and provide supplies for students to create the foldable. a. Demonstrate how to solve the Model Problems using a think-aloud strategy b. Once you feel students understand how to solve the Model Problems, ask students to participate in the problem-solving process (use phrases from the *Math Talk Bookmark* to solicit student responses and check student understanding). Provide students time to complete the practice questions independently or with a partner. 4. Now, pass out the *Simple Interest Foldable* and instruct students to fold their paper vertically. Students with also need calculators. a. Students will flip the foldable to the back and write the definition for interest in the space provided. i. What is Interest? – Interest is the amount of money paid or earned for the use of money. ii. Turn the foldable over and discuss the Simple Interest formula and what each letter in the formula represents. iii. Now, reread the definition for Interest rate students have previously recorded in their notebooks. iv. Compare and contrast the *Percent Foldable* to the *Simple Interest Foldable?* – How are the formulas alike? How are they different? b. With regard to ALL FORMULAS, you are able to solve for any part of the formula that is missing when you plug-in what information is given. This is called solving for the unknown variable which we just practiced using our percent foldable. Now we will apply this concept to the formula for Simple Interest. i. Open the foldable, and work the first two problems as a class.	Zike, D. (n.d.). *Teaching Mathematics with Foldables*. Retrieved from https://blogs.edutech.nodak.edu/badlandsreadingcouncil/files/2012/03/math-foldables.pdf

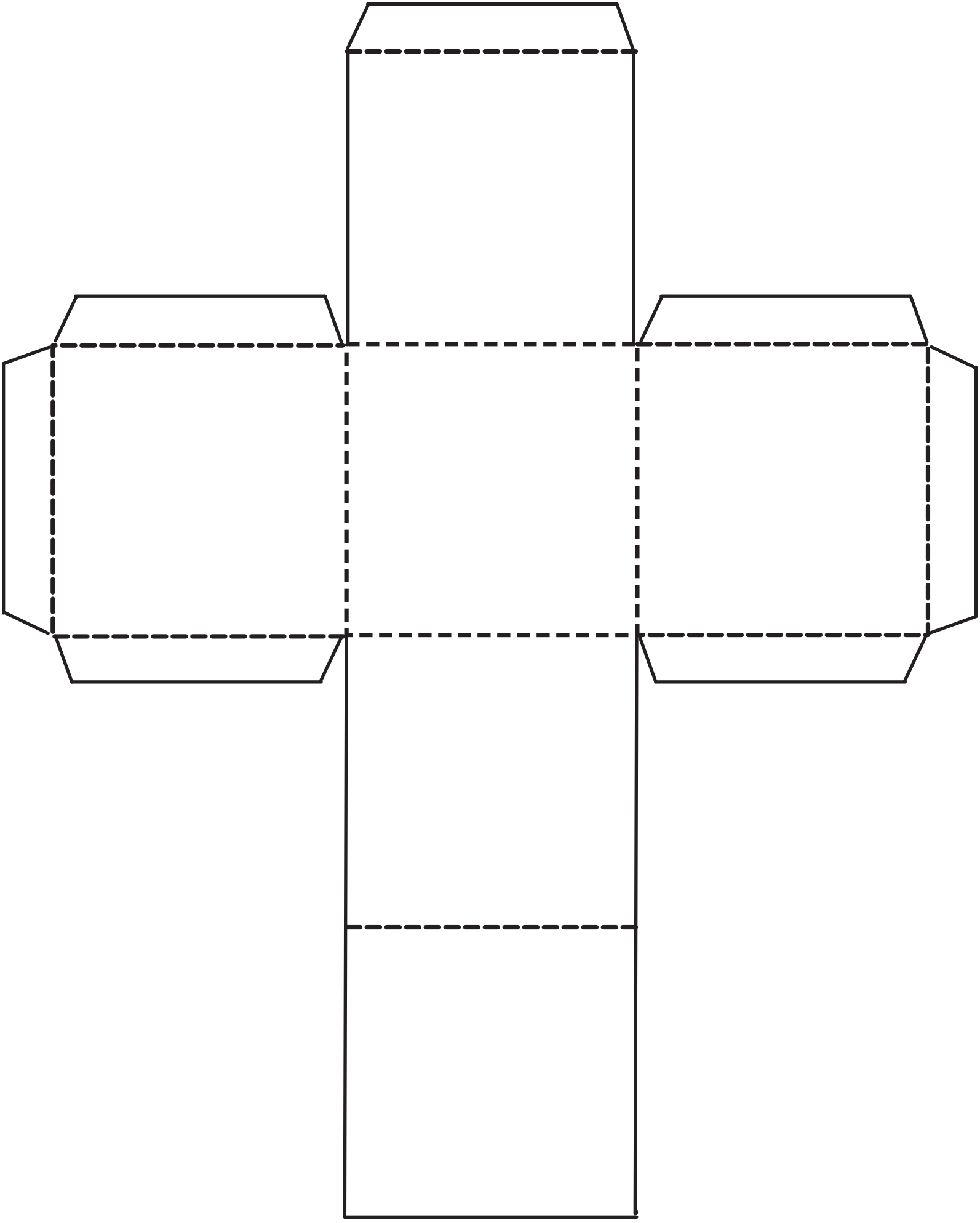
	ii. Ask for a volunteer to read the problem aloud. iii. Ask students, "What are we solving for? What is the missing information?" iv. Write the formula on the board, and then plug-in the information provided. For example, what does the $54,500 represent? Have students circle the number and label it - principal. What does 11% represent? Have students circle 11% and label – rate. What does the number $47,960 represent? Have students circle this number and label – interest. What part of the formula is missing? Now, let's solve for the time. v. Solve together and discuss (use phrases from the *Math Talk Bookmark* to solicit student responses and check student understanding). vi. Use the same labeling format for the second example and solve for "r". vii. Allow students time to solve the next two examples, and then discuss answers by asking students to write their answers and work on the board. c. Remind students – with regard to ALL FORMULAS, you are able to solve for any part of the formula that is missing when you plug-in what information is given. d. To prove this concept, write the following formula on the board: A = lw (A=132 cm squared, w = 11 cm, l =?) i. Solve for the unknown variable "l" on an exit slip and return to teacher before you leave class for your break. *5.* Pass out the *Calculating Real-World Percentages* Assessment (students may use the TI-30XS calculator) *a.* Allow students 30 minutes to complete the assessment and then review and discuss answers 6. Lesson Summary: Point out to students the various percentages they encountered in this lesson: sports, statistics, mortgage rates, increase	

	in cost of gas/electricity/rent/food, and sale/discounts at a store. Invite students to share other examples. Remind students to refer to their *Percent Foldable* handout in their notebooks or folders. This handout models the steps to calculating percents, compute percent change, find a discount, calculate simple interest, and use percents to solve real-world problems. 7. Summative Assessment: Have student complete Lesson 2.2 Calculate Real-World Percentages from Common Core Achieve: Mastering Essential Test Readiness Skills (Mathematics) pgs. 54 – 61. 8. Extension activity: a. Go to OhioMeansJobs i. Select "Get Started" under Individuals ii. Select "Online Training" iii. Select "Access Learning Express Anonymously" 1. Select "Continue" iv. Select "Prepare for Your GED® Test" v. Select "Build Your Basic Skills" vi. Select "Build Your Math Skills" 1. Select one or more of the following: a. Percents: Level 2, Practice Set 1 b. Percents: Level 2, Practice Set 2 c. Percents: Level 2, Practice Set 3 d. Percents: Level 2, Practice Set 4	
	DIFFERENTIATION • Provide students with partially complete handout, graphic organizer, and/or foldables • Display written vocabulary terms and definitions • Allow students to work individually, in pairs, or in class groups • Offer a partially completed version of the *Simple Interest Foldable* • Offer a partially completed version of the *Percent Foldable*	

Reflection	**TEACHER REFLECTION/LESSON EVALUATION**
	ADDITIONAL INFORMATION

Cube Pattern

Cut on solid lines - Fold on dashed lines



In your group, roll the cube, record the fraction in the fraction box, and convert the fraction into the correct decimal and percent. The first example has been done for you. Be sure to show your work in the boxes below!

Fraction	Decimal	Percent
1/2	**2/100 = 0.50**	**0.50 = 50/100 = 50%**

Math Talk

- I agree/disagree with you because...
- What I heard you say was...
- What key words helped you solve this?
- Can you explain this to me?
- What were you thinking here?
- How did you solve it?
- What did you start with?
- Why did you choose that operation?
- What strategy did you use?
- Why did you choose that strategy?
- How did you know your answer was right?
- Prove your answer is right.
- How else can you solve it?
- How did this help you understand?
- How is this like other problems you've solved?

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- How is this like other problems you've solved?

Tax & Discount

Percent Change

$$\frac{|\text{new} - \text{original}|}{\text{original}} \cdot 100$$

is/of

Tax or Discount

Percent Foldable

Model Problems

(a) At Big City School, there are a total of 4,500 students. 90% ride mass transit to school. How many students ride mass transit?

(b) 30% of the girls take band. 120 of the girls take band. How many girls *do not* take band?

Practice Problems

1. There are 80 students in a class. Sixteen of those students are men. What percent of the class are women?

2. 15% of the school staff went to the football game. If 45 staff members attended the football game, how many staff members *did not* attend?

Model Problem

Find the final price of a pair of boots that are on sale for 15% off, plus a 6.75% sales tax, if the original price of the boots was $62.

Practice Problem

A tool that regularly sells for $18.50 is on sale for 20% off. Jackie must pay a 6.75% sales tax. What is the final price?

Model Problem

How much sales tax, at a rate of 5%, must you pay on the purchase of a computer hard drive that costs $229?

Practice Problem

What is the sales price of a shirt that originally costs $34.99, if it is 25% off?

Model Problem

The cost of paint used in a redecorating job is $65.70. This is a reduction from its original cost of $82.13. What is the percent decrease in the cost of paint to the nearest percent?

Practice Problem

In 2000 a stock was $4.50 a share. In 2003 the stock decreased to $2.15. What was the percent change, to the *nearest tenth*?

Model Problems

(a) At Big City School, there are a total of 4,500 students. 90% ride mass transit to school. How many students ride mass transit?

$\frac{X}{4500} = \frac{90}{100}$ $X = 4050$

(b) 30% of the girls take band. 120 of the girls take band. How many girls *do not* take band?

$\frac{120}{X} = \frac{30}{100}$

$X = 400$ total students

$400 - 120 =$ 280 do not take band

Practice Problems

1. There are 80 students in a class. Sixteen of those students are men. What percent of the class are women?

$\frac{16}{80} = \frac{X}{100}$ $100 - 20$

20% 80%

2. 15% of the school staff went to the football game. If 45 staff members attended the football game, how many staff members *did not* attend?

$\frac{45}{X} = \frac{15}{100}$

$X = 300$

$300 - 45 =$ 255 did not attend

Model Problem

Find the final price of a pair of boots that are on sale for 15% off, plus a 6.75% sales tax, if the original price of the boots was $62.

$\frac{X}{62} = \frac{15}{100}$ $X = \$9.30$

$62 - 9.30 = \$52.70$

$\frac{X}{52.70} = \frac{6.75}{100}$

$X = \$3.56$

$52.70 + 3.56 =$ $56.26

Practice Problem

A tool that regularly sells for $18.50 is on sale for 20% off. Jackie must pay a 6.75% sales tax. What is the final price?

$\frac{X}{18.50} = \frac{20}{100}$ $X = \$3.70$

$18.50 - 3.70 = \$14.80$

$\frac{X}{14.80} = \frac{6.75}{100}$ $X = \$1.00$

$\$14.80 + \$1 =$ $15.80

Model Problem

How much sales tax, at a rate of 5%, must you pay on the purchase of a computer hard drive that costs $229?

$\frac{X}{229} = \frac{5}{100}$

$X = 11.45$

$229 + 11.45 =$ $240.45

Practice Problem

What is the sales price of a shirt that originally costs $34.99, if it is 25% off?

$\frac{X}{34.99} = \frac{25}{100}$

$X = \$8.75$

$34.99 - 8.75 =$ $26.94

Model Problem

The cost of paint used in a redecorating job is $65.70. This is a reduction from its original cost of $82.13. What is the percent decrease in the cost of paint to the nearest percent?

$\frac{|65.70 - 82.13|}{82.13} \cdot 100$

20%

Practice Problem

In 2000 a stock was $4.50 a share. In 2003 the stock decreased to $2.15. What was the percent change, to the *nearest tenth*?

$\frac{|4.50 - 2.15|}{4.50} \cdot 100$

52.2%

NAME _____

WHAT IS INTEREST ?

SIMPLE INTEREST

INTEREST

I

the amount of money paid or earned for the use of money

=

PRINCIPAL

P

the original amount of money invested or borrowed

RATE

r

A rate, expressed as a percentage of the principal, which is charged or paid for the use of money

TIME

t

time, in years

SOLVE FOR t:

If you borrow $54,500 at 11% simple interest, and the interest owed is $47,960, for how many years did you take out this loan?

I = P • r • t

SOLVE FOR r:

If you borrow $26,000 for 4 years, and your simple interest owed is $8,840, what is the annual interest rate for your loan?

I = P • r • t

SOLVE FOR P:

EX 3) If you take out a loan at 9% simple interest for 5 years, and the interest you owe is $10,350, what was the original amount of this loan?

I = P • r • t

SOLVE FOR I:

An education loan of $58,400 for 10 years has an annual rate of 9.5%. What is the simple interest owed on this loan? What is the total amount of money that will be repaid on this loan?

I = P • r • t

WHAT IS INTEREST ?

Interest is the amount of money paid or earned for the use of money.

NAME Sample Key

SIMPLE INTEREST

INTEREST

$$I = P \cdot r \cdot t$$

the amount of money paid or earned for the use of money

PRINCIPAL P

the original amount of money invested or borrowed

RATE r

A rate, expressed as a percentage of the principal, which is charged or paid for the use of money

TIME t

time, in years

SOLVE FOR t:

If you borrow $54,500 at 11% simple interest, and the interest owed is $47,960, for how many years did you take out this loan?

I = P • r • t

$I = P \cdot r \cdot t$

$47{,}960 = (54{,}500)(0.11)(t)$

$47{,}960 = (5{,}995)(t)$

$\div 5{,}995 \quad \div 5{,}995$

$t = 8$ years

SOLVE FOR r:

If you borrow $26,000 for 4 years, and your simple interest owed is $8,840, what is the annual interest rate for your loan?

I = P • r • t

$I = P \cdot r \cdot t$

$8{,}840 = (26{,}000)(r)(4)$

$8{,}840 = (104{,}000)(r)$

$\div 104{,}000 \quad \div 104{,}000$

$r = 0.085$

$r = 8.5\%$

SOLVE FOR P:

EX 3) If you take out a loan at 9% simple interest for 5 years, and the interest you owe is $10,350, what was the original amount of this loan?

I = P • r • t

$I = P \cdot r \cdot t$

$10{,}350 = (P)(0.09)(5)$

$10{,}350 = (0.45)(P)$

$\div 0.45 \quad \div 0.45$

$P = \$23{,}000$

SOLVE FOR I:

An education loan of $58,400 for 10 years has an annual rate of 9.5%. What is the simple interest owed on this loan? What is the total amount of money that will be repaid on this loan?

I = P • r • t

$I = P \cdot r \cdot t$

$I = (58{,}400)(0.095)(10)$

$I = \$55{,}480$ (interest)

$I + P = \$55{,}480 + \$58{,}400$

$= \$113{,}880$ (total repaid)

Calculating Real-World Percentages

Directions: Read each situation, and choose the option that best completes each sentence.

1. In a neighborhood, 27 of the 45 children are in elementary school. What percent of the children in the neighborhood are in elementary school?
   A. 20%
   B. 40%
   C. 60%
   D. 166%

2. Verizon Wireless is offering 25% off all merchandise. Customers will save _____of the original price during the sale.
   A. 1/4
   B. 1/2
   C. 2/3
   D. 3/4

3. City Electric provides electricity for 1/8 of the homes in Center City. City Electric provides electricity for _____% of homes.
   A. 8
   B. 10.5
   C. 12.5
   D. 80

4. In a survey, 0.22 of the respondents answered "Yes" to the question, "Would you consider voting for a candidate from a third party? _____ of respondents answered "No."
   A. 11/50
   B. 39/50
   C. 78/10
   D. 22/10

5. The Pit-bulls boys' basketball team won 9 of its 13 games. The Pit-bulls won approximately_____% of the games.
    A. 61.5
    B. 66.7
    C. 69.2
    D. 76.9

6. At Sylvan Learning Center, 75% of employees work as instructors. There are 300 employees at Sylvan Learning Center. _____ employees work as instructors.
    A. 150
    B. 175
    C. 200
    D. 225

7. Cherelle earns $552 per week. Of the amount, 12% is deducted for taxes. $_____ is deducted each week.
    A. 6.62
    B. 55.20
    C. 66.24
    D. 485.76

8. Titus received a raise from $24,580.00 per year to $25, 317.40 per year. He received a raise of _____%.
    A. 2
    B. 3
    C. 7.4
    D. 29

9. Cynthia paid $425 for a new table, plus 6% sales tax. She paid a total of $_____.
    A. 25.50
    B. 27.50
    C. 450.50
    D. 475.50

10. A sofa is regularly priced at $659 but is on sale for 20% off. The sale price of the sofa is $_____.
    A. 639.00
    B. 527.20
    C. 450.80
    D. 131.80

11. A computer company received 420 customer service calls in one day. Forty-five percent of the calls were about software issues. _____ of the calls were about software issues.
    A. 19
    B. 189
    C. 229
    D. 231

12. Lucas invested $5,000.00 in an account that earns 5% interest annually. She will earn $_____in interest over nine months.
    A. 5,250.00
    B. 1,875.00
    C. 250.00
    D. 187.50

13. Ashley increased the number of push-ups she could do in one minute from 20 to 24. Which calculations will result in the percent of increase?
    A. 100/20 = 4x
    B. 100(20) = 4x
    C. 100/4 = 20x
    D. 100(4) = 20x

14. Paige decreased her time in the mile run from 10 minutes to 9.5 minutes. Paige decreased her time by _____%.
    A. 95
    B. 5.05
    C. 5
    D. .9

15. Marcus purchased a car for $6,500.00. He received and interest rate of 12.5%. If he pays $2,437.50 in interest, then for how many years did he have the loan?
    A. .33
    B. 12.6
    C. 1.6
    D. 3

Calculating Real-World Percentages

Answer Key

1. C
2. A
3. C
4. B
5. C
6. D
7. C
8. B
9. C
10. B
11. B
12. D
13. D
14. C
15. D