Mathematical Reasoning

Weekly Focus: percent
Weekly Skill: percent statement, interest, percent change

LESSON 8: Percentages

Lesson Summary: First, students will solve a word problem about calories. In Activities 1 and 2, they will practice various percent problems, first with computation and then word problems. In Activity 3, students will review the formula for calculating interest. In Activity 4, students will do word problems in the workbook. In Activity 5, they will do an application problem about Facebook's stock price. There is also an extra word problem at the end. Estimated time for the lesson is two hours.

Materials Needed for Lesson 8:

- 2 Worksheets with answers on percent computation (attached)
- *Mathematical Reasoning Test Preparation for the 2014 GED Test* Student Book Pages 14-15
- Video on interest formula (length 6:10) required for teachers and recommended for students
- *Mathematical Reasoning Test Preparation for the 2014 GED Test* Student Workbook p. 26-29
- Facebook information chart and questions (attached)
- Exit ticket (attached)
- <u>Teacher Note:</u> You may have students complete only part of the worksheets in class and assign the rest as homework or extra practice depending on your students' needs.

Objectives: Students will be able to:
- Solve computation and word problems using percent
- Solve problems using percent interest paid
- Do problems about a stock in the stock market

ACES Skills Addressed: N, CT, EC
CCRS Mathematical Practices Addressed: Look for and express regularity in repeated reasoning, Mathematical Fluency
Levels of Knowing Math Addressed: Intuitive, Abstract, Communication and Application

Notes:
You can add more examples if you feel students need them before they work. Any ideas that concretely relates to their lives make good examples.

For more practice as a class, feel free to choose some of the easier problems from the worksheets to do together. The "easier" problems are not necessarily at the beginning of each worksheet. Also, you may decide to have students complete only part of the worksheets in class and assign the rest as homework or extra practice.

The GED Math test is 115 minutes long and includes approximately 46 questions. The questions have a focus on quantitative problem solving (45%) and algebraic problem solving (55%).

Students must be able to understand math concepts and apply them to new situations, use logical reasoning to explain their answers, evaluate and further the reasoning of others, represent real world

problems algebraically and visually, and manipulate and solve algebraic expressions.

This computer-based test includes questions that may be multiple-choice, fill-in-the-blank, choose from a drop-down menu, or drag-and-drop the response from one place to another.

The purpose of the GED test is to provide students with the skills necessary to either further their education or be ready for the demands of today's careers.

Lesson 8 Warm-up: Solve the calories problem	Time: 10 Minutes

Write on the board: You eat the following for lunch: a McDonald's Big Mac (600 calories), a Coke (200 calories), and Snickers candy bar (200 calories). Then you go home and shovel snow, which burns 400 calories an hour.

Basic Questions:
- If you shovel snow for one hour, what portion (fraction) of the calories that you ate have you burned? *(400/1000 =40/100= 4/10 = 2/5)*
- What percent? *(40%)*

Extension Questions:
- How long would you have to shovel snow if you wanted to burn 120% of what you ate for lunch? *(120% of 1000 calories = 1.2 x 1000 = 1200 calories so it takes 3 hours)*
- If your caloric intake for the day is 2700 calories, what percent of your daily intake does a Big Mac take up? *(600/2700 = 2/9 = 0.22 = 22%). Review converting fractions to decimals to percent if necessary.*

Lesson 8 Activity 1: The Percent Statement	Time: 20-25 Minutes

 A percent of the whole is equal to the part. *Example: 25% of 80 = 20.* With this statement, you can solve many percent problems. You are usually given two of the numbers and need to solve for the third.

Example A: Last year, Wanda paid $825 in rent. This year her landlord increased the rent to $850. What is the percent increase?

- In this case, we are given the whole ($825) and the part ($25) and need to find the %. *We set up the equation as x •825 = 25. Now we solve for x by dividing 25/825= 1/33 = 0.03= 3%).*
- Some students also like to use "the parts of 3" to solve this type of problem: $\frac{25}{825} = \frac{x}{100}$. They set up percent questions with the 3 known numbers and solve for the unknown. X/100 is used to represent percent.

Example B: Andy grew up in a town whose population has decreased by 42 people, which represents a 5% decrease. What was the population before the decrease?

- This time we are given the part (42) and the percent (5%) and we need to solve for the whole. Set up the equation as 0.05x = 42 and solve. X= 42/0.05 = 840 people before.

Example C: Your restaurant bill is $17.40 and you want to tip 20%. How much should you leave for a tip?

- This time we have the percent (20%) and the whole ($17.40) so we multiply them by each other to get $17.40 x 0.2 = $3.48 for a tip.
- Some students may have solved by using 10% of $17.40 (1.74) because that is easy to do and then doubled it to get 20%. Encourage students to solve problems using alternative ways and shortcuts (if they make sense) because it encourages students' number sense.
- Point out that they can save a step if they want to figure the total amount to leave by multiplying $17.40 x 1.20 = $20.88

Note to teacher: In the first example, the dot symbol is used for multiplication. Teach the students that this symbol replaces the x because in algebra we often use x for a missing number. In the second example, the number is written next to the x. Explain that, in algebra, a number with a letter implies multiplication.

Do **worksheet 8.1** for computation practice. Do 1 or 2 together to help students set up the percent statement each time. The word problems will be next.

Lesson 8 Activity 2: Percent Word Problems	Time: 20 Minutes

Have students work independently in the **student book, pages 14-15 Questions 1-11.** (Question 12 deals with interest payments, which will be explained in the next lesson). Circulate to help. Review any questions that students found challenging. Choose a few problems to have students volunteer to do on the board and explain.

Note to teacher: The word problems in this lesson mimic the Drop Down feature of the online GED test. On the actual test, students click on the drop down arrow to choose the correct response choice.

Lesson 8 Homework	Time: 5 Minutes

As extra practice on converting fractions, decimals, and percent, give students the **8.2 homework sheet** to do at home. Do one example in class if you have time. This paper is also a handy reference and it is a good idea for students to memorize the equivalents, too.

Worksheet Lesson 8.1

Round your answer to two decimal points if required.

1) What is 9 percent of 84 ?

6) What is 48 percent of 11 ?

2) 46 is 96 percent of what ?

7) What percent of 93 is 92 ?

3) What percent of 85 is 14 ?

8) What is 75 percent of 22 ?

4) 75 is 34 percent of what ?

9) What is 96 percent of 38 ?

5) 34 is 77 percent of what ?

10) 66 is 70 percent of what ?

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Worksheet 8.1 Answers

1) What is 9 percent of 84 ?

      7.56

6) What is 48 percent of 11 ?

      5.28

2) 46 is 96 percent of what ?

      47.92

7) What percent of 93 is 92 ?

      98.92 %

3) What percent of 85 is 14 ?

      16.47 %

8) What is 75 percent of 22 ?

      16.5

4) 75 is 34 percent of what ?

      220.59

9) What is 96 percent of 38 ?

      36.48

5) 34 is 77 percent of what ?

      44.16

10) 66 is 70 percent of what ?

      94.29

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Worksheet 8.2 Homework

Common Percent Table

Fraction	Decimal	Percent
		5 %
	0.1	
	0.125	
$\frac{1}{5}$		
		25 %
		30 %
	0.333	
$\frac{3}{8}$		
	0.4	
	0.5	
$\frac{3}{5}$		
$\frac{5}{8}$		
		66.6 %
	0.7	
	0.75	
		80 %
		90 %

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Worksheet 8.2 Homework Answers

Fraction	Decimal	Percent
$\frac{1}{20}$	0.05	5 %
$\frac{1}{10}$	0.1	10 %
$\frac{1}{8}$	0.125	12.5 %
$\frac{1}{5}$	0.2	20 %
$\frac{1}{4}$	0.25	25 %
$\frac{3}{10}$	0.3	30 %
$\frac{1}{3}$	0.333	33.3 %
$\frac{3}{8}$	0.375	37.5 %
$\frac{2}{5}$	0.4	40 %
$\frac{1}{2}$	0.5	50 %
$\frac{3}{5}$	0.6	60 %
$\frac{5}{8}$	0.625	62.5 %
$\frac{2}{3}$	0.666	66.6 %
$\frac{7}{10}$	0.7	70 %
$\frac{3}{4}$	0.75	75 %
$\frac{4}{5}$	0.8	80 %
$\frac{9}{10}$	0.9	90 %

Lesson 16 Activity 3: Interest payments	**Time: 10-15 Minutes**

Determining how much interest is owed on a loan (or paid on savings) depends on 3 factors: the amount of money borrowed (**the principal**), **the interest rate** (in decimal or fraction form), and the **length of time** (in years) **the money is borrowed**. Use the formula to solve for the missing number.

The formula is I = prt for Interest = principal x rate x time.

<u>Example A:</u> Raoul wants to buy a new car. He has some of the money but wants to borrow $5,000 for 6 months and will be charged 12% interest. How much interest will he pay?

- $5000 x 0.12 x 0.5 = $300 in interest, or:
- 5000 x 12/100 x ½ = $300

<u>Example B:</u> The Johnson family paid 6.5% interest on a 2-year loan and the interest payment came to $130. How much was the loan amount?
- The formula is $130 = (p)(0.065)(2). Now solve for p = $\frac{130}{0.065 x 2} = \frac{130}{0.13} = $1,000$

<u>Practice:</u>

1. How much interest is paid on a $34,100 loan at 4% interest for 3 years? ($4092)
2. How much interest is paid on a $7,400 loan at 10.5% interest for 4 ¼ years? ($3302.25)
3. How much interest is paid on a $1,900 loan at 5.9% interest for 2 ¾ years? ($308.28)

There will more practice in the word problems.

Lesson 8 Activity 4: Word Problems	**Time: 25-30 Minutes**

Do the word problems in the **workbook pages 26-29.** Circulate to help and have students volunteer to do some of the more challenging problems on the board.

Lesson 8 Activity 5: Application	Time: 10 Minutes

Percentage is often used to describe changes in the value of stocks of publicly traded companies. Once such company is Facebook, which became public in 2012. Read the information and graph to answer the two questions.

Answers: *(1) Facebook's value went down every day during its first 3 weeks on the stock market. (2) $42.00 − $26.70 ÷ $42.00 = 36.43%. The value of the stock decreased by 36.43% in its first 3 weeks on the market.*

Do you want to know more? Check out more IPOs of well-known companies on the yummymath.com website.

Curious about the current price of Facebook? Check out the Nasdaq site:

http://www.nasdaq.com/symbol/nflx/interactive-chart

Lesson 8 Exit Ticket (attached below)	Time: 5 Minutes

Hand out or project the exit ticket and have students race to complete the answer and write it on the board.

Answers: 1) $41.47; 2) around $3.46; 3) answers may vary

Lesson 8 Extra Problem	Time: 5 Minutes

Write on the board: Socks are priced at 3 for $7.95. Individual pairs are $2.79.

Basic Question:
- How much per pair of socks in the 3 for $7.95? *($2.65)*

Extension Questions:
- If you have a coupon for 20% off for 1 pair and only need 1 pair, should you use your coupon or should you buy the 3-pack? *(Buy 1 pair only because 20% off $2.79 = 0.8 x 2.79 = $2.23)*
- How much will you pay for 1 pair (still using your coupon) if tax is 7%? *($2.23 x 1.07 = $2.39)*

What's happened since the IPO?

On May 18th, 2012, Facebook began to sell stock to the public. When a company first opens itself up to public investors it creates an **I**nitial **P**ublic **O**ffering … an IPO. This is one way that a company can raise money and then be able to pay for improvements, new hires, and even buy out competitors.

The anticipated IPO of Facebook caused a lot of hype as stock investors, mutual funds, and banks considered whether this was a good opportunity to invest in a solid and promising company.

Let's check how Facebook is doing and start keeping a record. Maybe we can predict the future and decide whether this is a good investment.

Date	Open	High	Low	Close
6/5/12	$26.70	$27.76	$25.75	$25.869
6/4/12	$27.20	$27.65	$26.44	$26.90
6/1/12	$28.89	$29.15	$27.39	$27.72
5/31/12	$28.55	$29.67	$26.83	$29.60
5/30/12	$28.70	$29.55	$27.86	$28.19
5/29/12	$31.48	$31.69	$28.65	$28.84
5/25/12	$32.90	$32.95	$31.11	$31.91
5/24/12	$32.95	$33.21	$31.77	$33.03
5/23/12	$31.37	$32.50	$31.36	$32.00
5/22/12	$32.61	$33.59	$30.94	$31.00
5/21/12	$36.53	$36.66	$33.00	$34.03
5/18/12	$42.00	$45.00	$38.00	$38.23

1. **How did the price of Facebook stock change from its opening on 5/18/12 until the close on 6/5/12?**

2. **By what percent did the stock value change from its IPO date until 6/5/12?**

(This worksheet is adapted from yummymath.com)
To find the most current data go to this link. http://www.nasdaq.com/symbol/fb/historical

Exit Ticket

1) What would the total amount of this restaurant check be with a 20% tip?

2) If two people split the check in half, each person would be tipping how much?

3) How did you find the answers?

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*** CREDIT CARD VOUCHER ***

         Open Door Cafe

      Twin Cities, MN 55000

        (555) 555 5555

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DATE:                    01/01/2022

TIME:                      11:11

CARD                         MC
TYPE:

ACCT:          XXXX XXXX XXXX
                         1111

TRANS          HYU8789798234
KEY:

AUTH      12345
CODE:

EXP DATE:                 XX/XX

CHECK:                     1111

TABLE:                    11/11

SERVER:          34 MONIKA

Guest 1 (tax incl.)       $15.64

Guest 2 (tax incl.)       $18.92


Subtotal:                 $34.56
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