Unit 7

Percent

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Lesson 1

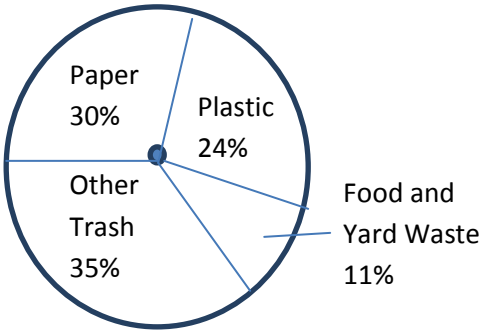
Understanding Percents

Vocabulary

Ratio: _____

Percent: _____

Writing Percents as Fractions:



The circle graph shows an estimate of the percent of each type of trash in landfills.

Write the percents for each of the following as a fraction in simplest form:

Type of Trash	Percent	Fraction in Simplest Form	Percent as a Decimal
Paper			
Plastic			
Food and Yard Waste			
Other Trash			

Write each ratio as a percent:

1) According to the U.S. Census, 26 out of every 100 people living in Illinois were younger than 18.

2) At a recent triathlon, 180 women competed for every 100 women who competed ten years earlier.

3) During his baseball career, Babe Ruth had a base hit about 34 out of every 100 times he came to bat.

4) In a recent year, 94.5 out of 100 households in the United States had access to the Internet.

5) About 1 out of 5 luxury cars manufactured in the United States is white.

6) About $\frac{1}{200}$ of travelers use scheduled buses.

7) In Finland, almost 4 out of 5 people have cell phone.

I. Write each percent as a fraction in simplest form

Examples:

8) 29%

9) 43%

10) 40%

11) 125%

12) 28%

13) 64%

14) 250%

15) 4.5%

Try These:

16) 31%

17) 25%

18) 30%

19) 120%

20) 16%

21) 75%

22) 100%

23) 4%

II. Write each percent as a decimal

Examples:

24) 50%

25) 25%

26) .40%

27) 75%

28) 15%

29) 2.8%

30) 85%

31) 1.25%

Try These:

32) 5%

33) 20%

34) 100%

35) 3.4%

36) 10%

37) 12%

38) 55%

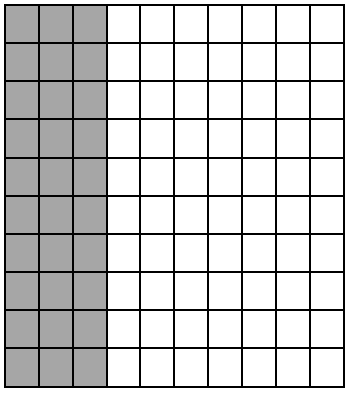
39) 106%

III. Critical Thinking

a) Which has a lesser value and why? $\frac{1}{4}$ or 30%

b) Explain how a student can receive an 86% on a test with 50 questions.

Lesson 1 – Homework



1) Write the percent and the fraction in simplest form for the model shown at the left.

Percent: _____ Fraction: _____

2) Write a percent that is between $\frac{1}{2}$ *and* $\frac{3}{4}$

3) Circle the number that does not have the same value as the other three. Explain your reasoning.

$\frac{2}{5}$	40%	$\frac{20}{100}$	$\frac{10}{25}$

_____

_____

_____

Write each ratio or fraction as a percent.

4) 25 out of 100 5) 3:20 6) 3.5 out of 100

Write each percent as a fraction in simplest form:

7) 65% 8) 20.5% 9) 110%

Write each percent as a decimal:

10) 45% 11) 2.8% 12) 80%

Lesson 2

Working with Mental Percents

Vocabulary:

Percent: _____

Estimate: _____

PART I:

Mental Math in Percent Problems: 10%		
1. 10% of 75	2. 10% of 300	3. 10% of 450
4. 10% of 18	5. 10% of 750	6. 10% of 6,600

Mental Math in Percent Problems: 5%		
7. 5% of 60	8. 5% of 200	9. 5% of 40
10. 5% of 100	11. 5% of 90	12. 5% of 1,200

13. What is 10% of 60?	14. 20% of 80	15. 40% of 70
16. 5% of 200	17. 60% of 820	18. 10% of 80
19. 30% of 30	20. 40% of 90	21. 75% of 80

PART II: Estimation

What if we aren't working with 5%, 10% or 20%? In these cases, ***estimate.***

Example: **Find 22.8% of 162.**

Examples:

1. 32% of 34

2. 17% of 942

3. 11% of 98

4. The Yankees had 57,435 fans at the stadium. Of those fans, 81% of them were actually rooting for the Yankees. Estimate how many fans were rooting for the Yankees.

5. Jenna took a test that had 50 questions in total. She got 62% of them correct. About how many questions were answered correctly?

Try These:

1. 4.8% of 40

2. 33.3% of 85

3. 91% of 13

4. There are 1,289 students enrolled at Seneca. 38% of the students are in seventh grade. Estimate how many students are seventh graders.

5. Larry earned 1% cash back on all of his purchases. He purchased items for $3.94, $7.11, $6.87, and $21.03. Estimate how much money he will earn back.

What would you estimate the following percents to be?

1. 85.78%
2. 13.26%
3. 41%

Use *mental math* for the following percent problems.

4. 10% of 560
5. 5% of 60
6. 20% of 55

Determine the best estimate.

7. 27.8% of 462
8. 21% of 29
9. 63.3% of 54

10. Joe had 119 catches this year. If 19% of his catches are touchdowns, about how many touchdowns does he have?

11. Maria took a test that had 50 questions. She got 78% of them correct. About how many questions were right?

12. Jessica went shopping for the holidays and purchased jeans for $45.75, a sweater for $36.20, and a hat and scarf for $18.35. She had a 20% off coupon. Estimate how much the coupon will save her.

Lesson 3

Three Cases of Percents

$$\frac{is}{of} = \frac{\%}{100} \quad \textbf{OR} \quad \frac{part}{whole} = \frac{\%}{100}$$

Vocabulary

Percent Proportion: _____

Example 1: The first type of problem is when the percent is given & the whole. (Find the part).

Example: Find 80% of 75.

1. 6% of 150 is what number?

2. 75% of 60 is what number?

Example 2: The second type of problem is when the percent is given & the part. (Find the whole).

Example: 60 is 80% of what number?

5. 99 is 180% of what number?

6. 36 is 60% of what number?

Example 3: The third type of problem is when the part and whole are given. (Find the percent).

Example: 60 is what percent of 75?

7. 30 is what percent of 150?

8. What percent of 30 is 12?

$$\frac{is}{of} = \frac{\%}{100} \quad \textbf{OR} \quad \frac{part}{whole} = \frac{\%}{100}$$

9. Nick answered 90% of the questions on his math correctly. If he answered 45 of the questions correctly how many questions were on the test?

10. The Jets played 8 games. If they lost 2, and there were no ties, what percent of the games did they **WIN**?

11. Of the 200 bicycles at a vacation resort, 40 are *not yet* rented.

A) What percent are **not** rented?

B) What percent **are** rented?

12. There are 330 seventh graders at Seneca Middle School. The number of seventh graders is 30% of the number of students enrolled in the school. How many students are enrolled at Sequoya?

13. Joe has 50 CD's. 28 are rap, 22 are rock. What percent of Joe's CD's are rock?

$$\frac{is}{of} = \frac{\%}{100} \quad \textbf{OR} \quad \frac{part}{whole} = \frac{\%}{100}$$

Directions: Set up a proportion and solve. Round your answer to the nearest tenth.

1. What percent of 30 is 12?	2. 19 is what percent of 250?	3. What is 0.7% of 45?
4. 60 is what percent of 250?	5. 20% of 88 is what number?	6. 28 is 98% of what number?

7. A hockey team won 6 games and lost 4. What percent of the games did they win?

8. James received a bonus that is 40% of the monthly salary. If his monthly salary is $800, how much was his bonus?

9. Of the 300 golf clubs Ray has at his miniature golf stand, 60 are being used. What percent of the golf clubs are **not being used**?

Lesson 4

Percent Change

Vocabulary

Percent of change: _____

Percent of increase: _____

Percent of decrease: _____

Percent of discount/markdown: _____

Percent markup: _____

Step 1: Find the amount of the change (Increase or decrease)

Step 2: Substitute the given information into the proportion:

$$\frac{Change}{Original} = \frac{\%}{100}$$

Examples:

1. In the US, during the 20th century, the average life expectancy **increased** from 50 to 75 years. Find the **percent of increase.**

2. Your friend diets and goes from 125 pounds to 110 pounds. What was her **percentage** weight **loss**?

3. Eric bought a sweatshirt from Hollister for $30. If it originally cost $40, what was his percent of discount? (Round to the nearest percent)

4. In last week's game, the basketball team scored 30 points. This week they scored 24 points. What percent of last week's score was the decrease?

5. Shannon is selling some embroidered jackets on a Web site. She wants to price the jackets 25% over her cost, which is $35. Find the selling price for a jacket.

6. At a supermarket, a certain item has increased from 75 cents per pound to 81 cents per pound. What is the percent markup in the cost of the item?

7. What is the markup rate on a $230 game system that sells for $345?

Lesson 4 - Homework

1. Best Buy decreased the cost of a Sony flat screen monitor from $525 to $430. What is the percent of decrease?

2. Vinny swam 50 laps on Wednesday and 55 laps on Friday. The increase is what percent of Wednesday's laps?

3. Find the selling price for a $700 computer if the store has a 30% markup rate.

4. Write a percent of increase problem where the percent of increase is greater than 100%.

5. Bicycle Bob rented 60 bikes on Saturday, and 180 on Sunday.

A. What is the percent increase of bikes rented?

B. What might account for the increase in rentals on Sunday?

6. Jared and Sydney are solving the following problem. *The price of a movie ticket rose from $5.75 to $6.25. What is the percent of increase for the price of a ticket?* Who is correct? Explain.

Jared

$$\frac{0.50}{5.75} = 0.087 = 8.7\%$$

Sydney

$$\frac{0.50}{6.25} = 0.08 = 8\%$$

Lesson 5
Deconstructing Percents

Deconstructing percents or decimals is finding the decimal or percent that you will actually pay for the item.

When would you add the percent or decimal Tax or Tip	When would you subtract the percent or decimal Sale or Discount
Examples: 7% Tax = 1.07 or 107% 20% Tip = 1.2 or 120%	Examples: 40% Sale = 60% or 0.60 15% Discount = 85% or 0.85

Examples: Rewrite each as a *final percent*

1. Tax of 12%

2. Discount of 12%

3. Tip of 18%

4. On sale for 18% off

5. 25% markup

6. 35% markdown

7. 20% gratuity

8. Pay a fine of 30%

9. 5% rebate

10. An item depreciated 10% in value

11. 20% commission

12. 10% coupon

Determine if the following represent tax/tip or discount & state the percent change.

12. 123%

13. 84%

14. 56%

15. 106%

16. 200%

17. 66.7%

Write each decimal as a deconstructed percent.

18. 1.5

19. 0.94

20. 1.0825

21. 0.35

Write each decimal as a deconstructed percent.

22. x + 0.05x

23. $a - 0.2a$

24. y – 0.086y

25. m + 0.3m

Lesson 5 - Homework

Rewrite each percent as a final percent:

	A) If there was a tax/tip of that amount.	**B) If there was a discount of that amount.**
Ex. 22%	**A)** 122% (100 + 22)	**B)** 78% (100 – 22)
1. 7%		
2. 13%		
3. 65%		
4. 100%		

Rewrite each percent as a final equivalent:

	A) Tax/Tip DECIMAL.	**B) Discount DECIMAL.**
Ex. 22%	**A)** 1.22 (1.0 + .22)	**B)** 0.78 (1.0 - .22)
5. 7%		
6. 13%		
7. 65%		
8. 100%		

Solve the following using deconstructed percents or decimals:

9. You have lunch at Chili's and decide to leave a 20% tip, what is the final decimal that you will pay?

10. A Twilight DVD is 30% off the original price, what is the percent you pay for it?

11. If you pay 9% tax on a sweatshirt at Hollister, what is the decimal that you pay?

12. A coat is going on sale for 30% off, and you will have to pay 6% in tax, what is the *final percent* you will pay for the coat?

Lesson 6

Percent Error

Vocabulary

Relative Error: _____

Percent Error: _____

Relative Error Formula:

$$\frac{|measured - actual|}{actual}$$

Percent Error Formula:

$$\frac{|measured - actual|}{actual} \bullet 100$$

Examples:

Find the **Relative Error** of the following Round to the nearest thousandth if necessary:

1. Measured = 30 Actual = 35

2. Actual = 22 Measured = 23

Find the **Percent Error** of the following Round to the nearest thousandth if necessary:

3. Measured = 152 Actual = 156

4. Actual = 5 Measured = 4

Try These:

Find the **Relative Error & Percent Error** of the following Round to the nearest thousandth if necessary:

5. Actual = 62 Measured = 67

6. Measured = 6 Actual = 10

Word Problems:

1. Joshua uses his thermometer and measures to find the boiling point of ethyl alcohol to be 75^{o} C. He looks in a reference book and finds that the actual boiling point of ethyl alcohol is 80^{o}C. What is the relative error? What is his percent error?

2. The density of water is known to be 1.00 g/mL. Kayla measured and found the density of water to be 1.075 g/mL. What is the relative error? What is her percent error?

3. The Handbook of Chemistry and Physics lists the actual density of a certain liquid to be 0.7988 g/mL. Taylor experimentally measures and finds this liquid to have a density of 0.7925 g/mL. The teacher allows up to +/- 0.5% error to make an "A" on the lab. Did Fred make an "A"? Prove your answer.

4. An object has an actual mass of 35.0 grams. On Anthony's balance, it measured to be 34.85 grams. What is the percent error of his balance?

5. What is the percent error in using 3.14 as an approximation for π (which is 3.14159265358979323846...) ?

Lesson 6 – Homework

Relative Error Formula:

$$\frac{|measured - actual|}{actual}$$

Percent Error Formula:

$$\frac{|measured - actual|}{actual} \cdot 100$$

Find the **Relative Error & Percent Error** of the following Round to the nearest thousandth if necessary:

1. Actual = 85 Measured = 72
2. Measured = 2 Actual = 4

1) A carpenter measures the length of a board as 50.5 centimeters. The actual measure of the length was 50.1 centimeters. Find the relative error in the carpenter's measure to the *nearest thousandth.*

2) The actual length of the diagonal of a rectangle is 85. Sarah drew the same dimensional rectangle and measured the diagonal to be 87. Find, to the *nearest hundredth,* her relative error.

3) Eli bought new carpet for his living room. He measured the area of the living room to be 174.2 square feet. The actual area was 149.6 square feet. What is the relative error of the area to the nearest ten-thousandth?

4) A dairy sells milk in gallon (16 cups) containers. The containers are filled by machine and the amount of milk may vary slightly. A quality control employee selects a container at random and **measures** of the amount of milk as 16.25 cups. Find the percent of error to the *nearest tenth* of a percent.

5) To calculate the area of her rectangular garden, Jill measured the length as 8 feet and the width to be 5 feet. The actual length of the garden is 8.2 feet by 4.7 feet. What is the percent of error in her area calculation to the nearest hundredth? (HINT: find the area of each first)