

# UNIT 7

## PERCENTS—CONVERSIONS AND APPLICATIONS

### CCM6+7+

Name: \_\_\_\_\_

Math Teacher: \_\_\_\_\_

Projected Test Date: \_\_\_\_\_

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**ALL OF THIS UNIT IS CALCULATOR ACTIVE!**

**CCM6 Plus 7 Plus Unit 8 Vocabulary: Percents & Percent Applications**

|                   |  |
|-------------------|--|
| balance           | the principal plus the interest  |
| cent              | a cent is equivalent to 1/100 of a dollar in US circulation  |
| discount          | the amount of decrease in price  |
| interest (i)      | an amount that is collected or paid for the use of money   |
| markup            | the amount of increase in price  |
| percent           | ratio that compares a number to 100  |
| percent decrease  | when the amount decreases  |
| percent error     | percentage value that tells how close or how far off a measured (experimental) value is from the predicted (accepted) value  |
| percent increase  | when the amount increases  |
| percent of change | an amount, stated as a percent, that a number increases or decreases   |
| principal (p)     | the amount of money deposited, borrowed, or invested   |
| rate (r)          | rate of interest per year (as a decimal); interest rates are typically expressed as percents, so they must be written as decimals to be used in the formula $i = prt$    |
| ratio             | a comparison of two quantities using division  |
| simple interest   | the formula to calculate simple interest is $i = prt$ , where $i$ is the interest, $p$ is the principal, $r$ is the interest rate per year, and $t$ is the time in years |
| time (t)          | time, in years, that the money earns interest  |
| sales tax         | a percentage added to any purchase; money goes to government   |
| tip               | a percentage added to a bill to reward a server for good service, like in a restaurant or to a hair dresser  |
| discount          | a percent of the price subtracted off the asking price   |
| commission        | a percentage given to an employee to encourage sales, like for realtors or salespersons  |

## Percents Overview

A percent is simply a ratio of a number out of \_\_\_\_\_.

So 82% means:

What would 82% equal as a fraction and a decimal?

Try this with other percents...fill out the chart below to find the missing forms of numbers that are equivalent.

EACH ROW IS EQUIVALENT!

| PERCENT | FRACTION (simplified) | DECIMAL |
|---------|-----------------------|---------|
| 15%     |                       |         |
|         | $\frac{4}{5}$         |         |
|         |                       | 1.04    |
| 8%      |                       |         |
|         | $1\frac{1}{8}$        |         |
|         |                       | 0.4     |

## Blood Profiles Chart



| Blood Diagnosis    | Red | White | Yellow |
|--------------------|-----|-------|--------|
| Normal             | 6   | 2     | 2      |
| Sickle Cell Anemia | 5   | 4     | 1      |
| Malaria            | 2   | 4     | 4      |
| Leukemia           | 3   | 5     | 2      |
| Mystery Disease    | 4   | 2     | 4      |

- ❖ *Red* represents the red blood cells.
- ❖ *White* represents the white blood cells.
- ❖ *Yellow* represents the platelets.

Use the Blood Profiles Chart above to find the fraction and percent of red blood cells, white blood cells, and platelets in each of the diagnoses below.

| Blood Diagnosis    | Red      |         | White    |         | <del>Red</del> | Yellow  |
|--------------------|----------|---------|----------|---------|----------------|---------|
|                    | Fraction | Percent | Fraction | Percent | Fraction       | Percent |
| Normal             |          |         |          |         |                |         |
| Sickle Cell Anemia |          |         |          |         |                |         |
| Malaria            |          |         |          |         |                |         |
| Leukemia           |          |         |          |         |                |         |
| Mystery Disease    |          |         |          |         |                |         |

A = red B = white C = yellow

# Blood Count! – Are You at Risk?



Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

| Patient | Sampling | Percentages | Diagnosis | Explanation |
|---------|----------|-------------|-----------|-------------|
|         | R/A      |             |           |             |
|         | W/B      |             |           |             |
|         | Y/C      |             |           |             |
|         | R/A      |             |           |             |
|         | W/B      |             |           |             |
|         | Y/C      |             |           |             |
|         | R/A      |             |           |             |
|         | W/B      |             |           |             |
|         | Y/C      |             |           |             |
|         | R/A      |             |           |             |
|         | W/B      |             |           |             |
|         | Y/C      |             |           |             |
|         | R/A      |             |           |             |
|         | W/B      |             |           |             |
|         | Y/C      |             |           |             |

| <i>Patient</i> | <i>Sampling</i> | <i>Percentages</i> | <i>Diagnosis</i> | <i>Explanation</i> |
|----------------|-----------------|--------------------|------------------|--------------------|
|                | R/A             |                    |                  |                    |
|                | W/B             |                    |                  |                    |
|                | Y/C             |                    |                  |                    |
|                | R/A             |                    |                  |                    |
|                | W/B             |                    |                  |                    |
|                | Y/C             |                    |                  |                    |
|                | R/A             |                    |                  |                    |
|                | W/B             |                    |                  |                    |
|                | Y/C             |                    |                  |                    |
|                | R/A             |                    |                  |                    |
|                | W/B             |                    |                  |                    |
|                | Y/C             |                    |                  |                    |
|                | R/A             |                    |                  |                    |
|                | W/B             |                    |                  |                    |
|                | Y/C             |                    |                  |                    |

*Other Comments:*

**PURPOSEFUL PERCENTS**

**Find the following benchmark percentages. Use these percentages to calculate the remaining percentages.**

| 100% | 50% | 25% | 10% | 5% | $2\frac{1}{2}\%$ | 1% |
|------|-----|-----|-----|----|------------------|----|
| \$28 |     |     |     |    |                  |    |

- A. 60% of \$28 = \_\_\_\_\_      B. 30% of \$28 = \_\_\_\_\_
- C. 75% of \$28 = \_\_\_\_\_      D. 15% of \$28 = \_\_\_\_\_
- E. 9% of \$28 = \_\_\_\_\_      F. 95% of \$28 = \_\_\_\_\_
- G.  $7\frac{1}{2}\%$  of \$28 = \_\_\_\_\_      H. 150% of \$28 = \_\_\_\_\_

**Class Problem**

There are 1200 students at Start Middle School.

- How many students make up 1% of the student body?
- How many students make up 10% of the student body?
- How many students make up 25% of the student body?
- If 30% of the students are 7<sup>th</sup> graders, how many 7<sup>th</sup> graders are there?
- If 27% of the students play a school sport, how many students play school sports?
- If 84% of the students bought a school yearbook, how many yearbooks were purchased?

Using Ratios and Rates with Percents

**Percent Modeling-Finding the Whole Given a Part**

**Problem:**

*There are 14 candies in a bag that is 20% full. How many candies are in a full bag?*

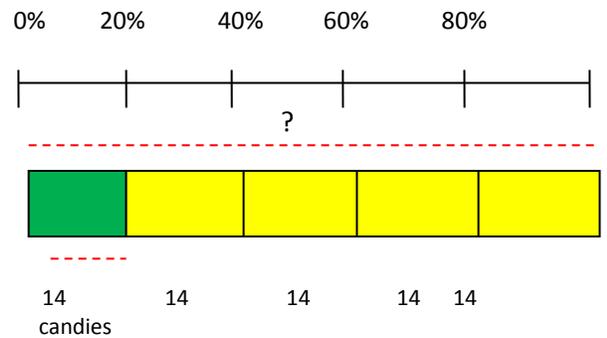
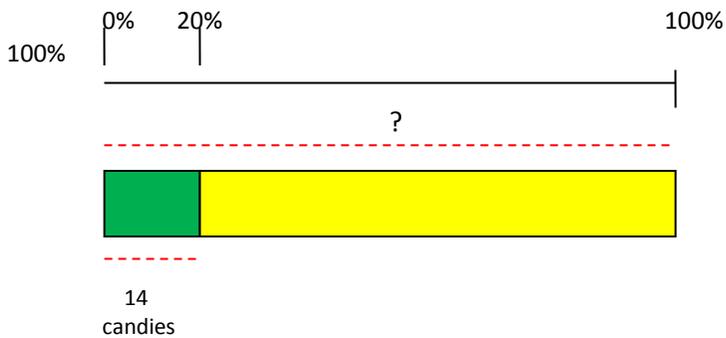
**Step 1: Identify the information**

**Whole:** unknown (How many candies in a full bag?)

**Part:** 14 candies

**Percent:** 20%

**Step 2: Create a diagram**



**Answer:**

**If there are 14 candies in 20%, then I can fill in that amount in the other 20% sections of the bar. Then I can add all the quantities:  $14 + 14 + 14 + 14 + 14 = 70$**

**Practice—Draw a Tape Diagram or a Double Number Line to solve:**

1. 25% of what number is 10?

4. 10% of what number is 16?

2. 40 is 40% of what number?

5. 530 is 50% of what number?

3. 9 is 30% of what number?

6. 25% of what number is 54?

Solve Percentage Problems with Proportions and Equations

THE PROPORTION: 
$$\frac{\textit{part}}{\textit{whole}} = \frac{\%}{100}$$

THE EQUATION: convert “is” to =, convert “of” to •, convert a percent to a decimal.

**Solve each problem. Round to the nearest tenth or tenth of a percent.**

1) What percent of 29 is 3?

2) What percent of 33.5 is 21?

3) What percent of 55 is 34?

4) 41% of 78 is what?

5) 28% of 63 is what?

6) 58% of what is 63.4?

7) 1 is what percent of 52.6?

8) What percent of 38 is 15?

9) 4% of 73 is what?

10) What is 12% of 17.5?

11) 79% of 67 miles is what?

12) What is 59% of 14 m?



## Percent Problems Application Notes

|   |  |
|---|--|
| There are two methods to solve percent problems.  | 1) proportions<br>2) equations   |
| There are three types of percent problems.  | 1) missing percent<br>2) missing part<br>3) missing whole  |
| Sometimes the problem is a multi-step which means we may have to work more than one problem to complete it. | Examples: Finding sale price<br>Finding the total cost   |
| New vocabulary:   | <b>Discount:</b> the amount saved<br><b>Tax:</b> a fee on purchased items<br><b>Tip:</b> extra payment to service provider (also called gratuity)<br><b>Commission:</b> a percentage of money that a sales person receives after making a sale (also applies to agents)<br><b>Mark Up:</b> the amount an item is increased for sale to make a profit<br><b>Mark Down:</b> same as discount   |
| Tips to solving Percent Application Problems:   | 1) recognize the important information<br>2) make a plan (proportion or equation)<br>3) identify what the question is asking<br>4) solve<br>5) make sure you answer the question and the answer make sense   |
| Example 1: Percent Problem about prices   | A car dealer makes a 12% commission on each car he sells. How much commission does he make if he sells a car for \$42,000?<br><br>1) Important info: 12% commission on \$42,000<br>2) equation (could also use proportion)<br>3) How much will he make?<br>4) $.12 \cdot 42000 = \$5040$<br>5) He makes \$5040 commission  |
| Example 2:  | There are 6 red scooters (40% of the scooters are red) in a store. How many scooters are there total in the store?<br><br>1) Important info: 6 red is 40% of total<br>2) proportion (could also use equation)<br>3) How many total scooters?<br>4) $\frac{40}{100} = \frac{6}{x}$ , $x = 15$<br>5) There are 15 scooters total   |
| Example 3:  | An ad shows a DVD player on sale for 25% off the original price. If its original price was \$242, what is the sale price?<br>1) Important info: 25% off of 242<br>2) equation<br>3) What is the sale price?<br>4) $.25 \cdot 242 = 60.5$ , \$60.50<br>5) \$60.50 is not the sale price, it is the amount saved. We must subtract \$60.50 from the original price to find the sale price of \$181.50.<br><br>Another option is to use 75% instead of 25% in our equation. Since the discount amount is 25%, we are paying 75% of the original price. Using 75% allows students to skip the last step of subtraction. The equation is $.75 \cdot 242 = \$181.50$ . |

**Percent Applications with Tips/Discounts/Taxes****COMMON APPLICATIONS WITH PERCENTS...USE a CALCULATOR!**

| <b>Big Idea</b> | <b>What is it?</b>  | <b>Problem</b>   | <b>Solution</b>                  |
|-----------------|---|--|----------------------------------|
| <b>TAX</b>      | TAX \$ is _____ to the final price.   | You go to the store and buy a pair of jeans that cost \$32.59. Sales tax in Raleigh, NC is 6.75%.<br><br>a) How much extra will you pay in tax?<br><br>b) What is your final price to pay?   | a)<br><br>b)                     |
| <b>TIP</b>      | TIP \$ is _____ to the final bill.  | You go out to Buffalo Brothers for dinner with a few friends. Your bill (including tax) is \$28.73. You want to leave a 20% tip.<br><br>a) What is your tip \$?<br><br>b) What is your total cost?   | a)<br><br>b)                     |
| <b>DISCOUNT</b> | DISCOUNT means there is a _____ so you _____ the \$ from the price.                                       | Hooray! American Eagle is having a sale on jeans! All pairs are 25% off! If jeans regularly cost \$39.95, what will you pay for a pair of jeans?<br><br>a) How much \$ is taken off due to the discount?<br><br>b) What will you pay?                  | a)<br><br>b)                     |
| <b>mixed</b>    | In reality, sometimes there are DISCOUNTS and you still have to pay TAX—this stuff combines in real life! | Bath and Body works is having a 35% off sale on Tervis cups. Normally they cost \$18.95.<br>a) What is the discount?<br><br>b) What is the sale price?<br><br>c) If sales tax is 6.75%, what will you pay in taxes?<br><br>d) What is your final cost? | a)<br><br>b)<br><br>c)<br><br>d) |

**Mark Up and Discount Homework**

**Find each Mark Up and Selling Price. Round to nearest 100<sup>th</sup> when necessary.**

- |                                      |                                    |  |                                       |
|--------------------------------------|------------------------------------|--|---------------------------------------|
| 1. Cost: \$1.50<br>% of mark up: 70% | 2. Cost: \$38<br>% of mark up: 58% | 3. Cost: \$111.00<br>% of mark up: 50% | 4. Cost: \$18.00<br>% of mark up: 35% |
|--------------------------------------|------------------------------------|--|---------------------------------------|

5. A beach store pays \$11.40 for each beach umbrella. The store's percent of mark up is 75%. What is the mark up?

6. A clothing store pays \$56 for a jacket. The store's percent of mark up is 75%. What is the mark up?

**Find each Discount and Sale Price. Round to nearest 100<sup>th</sup> when necessary.**

- |   |   |   |  |
|---|---|---|--|
| 7. Regular price: \$100<br>% of discount: 27% | 8. Regular price: \$24.50<br>% of discount: 20% | 9. Regular price: \$700<br>% of discount: 30% | 10. Regular price: \$8.49<br>% of discount: 5% |
|---|---|---|--|

11. An \$11 shirt is on sale for 10%. What is the discount?

12. A video store's regular price of a video is \$25.95, and it's on sale for 20% off. What is the discount?

# Simple Interest

## Interest Formula

$$I = Prt$$

I = Interest

P = Principal – Starting Amount

r = rate – Percentage **converted into a decimal**

t = time – amount in years

Meghan put \$240 in a savings account at 5% interest per year. How much money will Meghan have at the end of one year?



Ellis needed a loan to purchase a car. He went to the bank and asked for \$10,000. The bank gave Ellis the money at a rate of 6.5% simple interest for 4 years. How much interest will Ellis have to pay the bank?

Remember... "I is perty!"

### Simple Interest Riddle

COMPLETE THE INTEREST PROBLEMS BELOW TO SOLVE THE RIDDLE.

*WHAT DID THE BOY DO TO HOLD THE GIRL'S INTEREST?*

$$\text{Interest} = \text{Principal} \bullet \text{Rate} \bullet \text{Time}$$

$$I = prt$$

Important things to remember; change the % to decimal, time is in years.

| PRINCIPAL  | INTEREST RATE | TIME       | SIMPLE INTEREST | BALANCE<br>P+I |
|------------|---------------|------------|-----------------|----------------|
| \$800      | 10%           | 3 YRS      | \$240           | _____<br>O     |
| \$2455     | 3%            | _____<br>B | \$441.90        | _____<br>E     |
| _____<br>D | 4.25%         | 3 YRS      | \$663           | _____<br>C     |
| \$18,500   | _____<br>T    | 42 MONTHS  | \$4,532.50      | _____<br>H     |
| \$16,400   | 6%            | _____<br>K | _____<br>P      | \$19,352       |

\_\_\_\_ E    O \_\_\_\_ NE \_\_\_\_ A    \_\_\_\_ AN \_\_\_\_  
 23032.50    2952    2896.90    5200    6    3

A \_\_\_\_ C \_\_\_\_ UN \_\_\_\_!  
 5863    1040    7

## Percent of Change Application

|                                     |   |
|-------------------------------------|---|
| Review: ways to find percent change | 1) set up proportion<br>2) divide then convert to percentage  |
| Review: percent problems            | 1) missing the part<br>2) missing the whole<br>3) missing the percent<br>*Most of the questions will relate to percent problems also*   |
| Example 1                           | <p>What is the total cost of an item that is marked \$20.00 if the sales tax is 8%?</p> <p>Tax means increase. To solve this problem, we first need to find what 8% of \$20 is. We can use either method to solve.</p> <p><math>x = 1.6</math>, which means \$1.60.</p> <p>The total cost is <math>\\$20 + \text{tax } (\\$1.60) = \\$21.60</math>.</p>   |
| Example 2                           | <p>A sweater is 30% off and the sale price is \$49. How much is the original price of the sweater?</p> <p>For this problem, we need to find the original price which is missing the whole. Again, there are different ways to solve, but I would use a proportion. Since the sale price is how much we actually paid, then <math>\\$49 = 70\%</math> of the original. 30% off means we are taking 30% away and still paying 70%. <math>\frac{70}{100} = \frac{49}{x}</math>, and <math>x = \\$70</math>. Does it make sense that our original price would be more than \$49? Why?</p> |
| Example 3                           | <p>The price of a gallon of gasoline increased from \$2.50 a gallon to \$2.75 a gallon. What was the percent of increase?</p> <p>This is an example of missing the percent. No matter what method, we still have to find how much the amount changed from \$2.50 to \$2.75. The amount of change is \$.25.</p> <p>After solving a proportion or fraction, make sure the answer is in percent form. <math>\frac{.25}{2.50} = \frac{x}{100} \rightarrow x = 10\%</math> increase.</p>   |

**DO THE DOO...Difference Over Original! Then convert answer to a percent! (or make a proportion)**

The average size of Mrs. Townsend's math classes has increased from 26 to 30 over the past 15 years. What is the percent of change?

## Percent Increase or Decrease Worksheet

Decide whether the change is an increase or decrease  $\uparrow\downarrow$  and find the

percent using the formula  $\frac{\text{change}}{\text{original}}$ .

1. Before: 10  
After: 12

2. Before: 15  
After: 12

3. Before: 75  
After: 60

4. Before: 110  
After: 143

5. Before: 90  
After: 200

6. Before: 260  
After: 160

7. 1994 Cost: \$171.33  
1995 Cost: \$201.59

8. Regular Price: \$31.99  
Sale Price: \$22.39

9. Start Price: \$521.73  
End Price: 413.68

10. 2004 Cost: \$18.77  
2005 Cost: \$19.17

11. Original Number: 45  
New Number: 72

12. Original Number: 45  
New Number: 18

## Percent of Change – Given the %, Find the Missing Number

Use the  $\frac{\text{change}}{\text{original}} = \frac{\%}{100}$  proportion, fill in what you know and solve for the missing number.

1. Last year the 6<sup>th</sup> grade had 350 students. This year the number decreased 36%. How many students are in this year's 6<sup>th</sup> grade class?

2. Enrollment in the Ski/Snowboard Club increased by 30% this year. There are now 182 students in the club. How many students were there last year?

3. The Game Stop is having a sale and all games are reduced by 55%. If a game is now \$29.99, what was the original price? Round your answer to the nearest cent.

4. AYSO has 18 8<sup>th</sup> grade boys' teams this year, but this is a 28% (rounded to the nearest whole number) decrease from the prior year. How many 8<sup>th</sup> grade teams were there last year?

Name: \_\_\_\_\_

**DOLLARS AND (PER)CENTS: PERCENT OF CHANGE**

Whether it's a new CD, a slick pair of sneakers, or that really cool sweater at the Gap, there's always something to buy - especially if it's on sale! Just how much can you save? A lot! Just take this percent of change test and get the lowdown on markdowns!

1. At Target, a shirt that costs \$25 goes on sale for \$15. What is the percent of decrease in the price?
  
2. A \$40 autographed and framed poster of the Spice Girls goes up in price to \$50. What is the percent of increase in the price?
  
3. Thirty people are shopping in a CD store. Forty-five minutes later, there are 13 people in the store. What is the percent of decrease in the number of people in the store?
  
4. A liter of Pepsi costs \$1.19 at the corner grocery store. But with a handy coupon, the same liter of soda costs \$1.09. What is the percent of decrease in price?
  
5. A \$400 Sony stereo system goes on sale for \$240. What is the percent of decrease in the stereo system's price?
  
6. A pair of sneakers, regularly priced at \$84, is on sale for 20% off.
  - a. Discount: \_\_\_\_\_
  
  - b. Sale Price: \_\_\_\_\_
  
7. Your dream CD player is on sale for 20% OFF the original price. If the original price is \$270, what is the sale price? Hint: Find the discount first.
  - a. Discount: \_\_\_\_\_
  
  - b. Sale Price: \_\_\_\_\_

## PERCENT ERROR NOTES

### HOW TO FIND PERCENT ERROR:

#### METHOD #1:

A certain percent of error is acceptable in industry depending on the product. For example, if a bag of chips is labeled to have 8 ounces, that is your **estimated or predicted amount**. Due to the large volume of bags of chips produced, it is likely that not EVERY bag will weigh exactly 8 ounces. If you were to weigh the actual chips, you may get 8.1 ounces and this would be your **actual value**.

To find the numerator of percent of error, you find the absolute value of the difference between the predicted value or amount and the actual value.

Next you divide by the denominator which is actual value. You will get a decimal outcome.

The last step is to multiply your answer by 100 to change it to a percent. This will be your **percent error**.

#### METHOD #2:

To find the percent of error using proportions you would find the difference between the predicted value or amount and the actual value (subtracting the absolute value of the numbers so that you do not get negatives). This number becomes the numerator of one ratio with the denominator of that ratio being the actual measured value. The second ratio will be % over 100. From here, you cross multiply and solve just like you do for other percent problems.

$$\text{Percent Error} = \frac{|\text{Estimated or Predicted Value} - \text{Actual Value}|}{\text{Actual Value}} \times 100$$

$$\text{OR you could use Percent Error} = \frac{|\text{Experimental (measured) Value} - \text{Accepted (theoretical) Value}|}{\text{Accepted Value}} \times 100$$

**Example:** Joshua uses his thermometer and finds the boiling point of ethyl alcohol to be 75° C. He looks in a reference book and finds that the actual boiling point of ethyl alcohol is 80°C. What is his percent error?

#### METHOD 1

*First identify the predicted value and the actual value. In this case the reference book would be the predicted value and the experiment would give you the actual value. Find the difference:*

$$|75 - 80| = 5$$

*Now set up the difference over the Predicted value and divide to get a decimal:*

$$\frac{5}{80} = 0.0625$$

*Last you multiply by 100 to get your percent error:  $0.0625 \times 100\% = 6.3\%$  rounded to the nearest tenth*

*In the formula it would look like this:*

$$\text{Percent Error} = \frac{|75 - 80|}{80} \times 100\% = \text{about } 6.3\%$$

#### METHOD 2

*First identify the predicted value and the actual value. In this case the reference book would be the predicted value and the experiment would give you the actual value. Find the difference:*

*$80 - 75 = 5$ ; so you use this as the numerator with the original as the denominator*

$$\frac{x}{100} = \frac{5}{80} ; 80x = 100(5) ; 80x = 500 ; x = 6.25 ; \text{so } x \approx 6.3\%$$

**Do the DOA....Difference Over ACTUAL (or accepted).**

## Percent Error Notes

|                                 |   |
|---------------------------------|---|
| What is Percent Error?          | Percent error is the difference between a predicted (estimated) value and the actual value as a percentage.   |
| Why is percent error important? | Percent error is important because it tells us how right or wrong our prediction or estimate is.  |
| How to calculate percent error? | There are 2 ways to calculator percent error.<br>1. Proportion<br>2. Decimal to Percent   |
| Proportion                      | <p>To calculate the percent error by using a proportion, consider this example:</p> <p>A student made a mistake when measuring the volume of a big container. He found the volume to be 65 liters. However, the real value for the volume is 50 liters. What is the percent error?</p> <p>Set up a proportion to find a percent by starting with x over 100</p> $\frac{x}{100} = \frac{\text{amount of error (subtraction)}}{\text{actual value}}$ <p>To find the amount of error, we need to subtract the measured amount with the actual so <math>65 - 50 = 15</math>. 15 is the numerator and 50 (the real value) is the denominator for the proportion.</p> <p>Solve the proportion to find the percent error is 30%.</p> |
| Decimal                         | <p>To calculate the percent error by decimal, first set up a fraction. Consider this example:</p> <p>A man measured his height and found 6 feet. However, after he carefully measured his height a second time, he found his real height to be 5 feet. What is the percent error the man made the first time he measured his height?</p> $\frac{\text{amount of error}}{\text{accepted (or real/actual) value}} = \frac{1}{5}$ <p><math>1/5</math> as a decimal is .20 and then convert to a percent is 20%.</p>  |

|          |  |
|----------|--|
| You try: | I thought 70 people would turn up to the concert, but in fact 80 did! What was my percent error?                             |
|          | The report said the parking lot held 240 cars, but we counted only 200 parking spaces. Find the percent error in the report. |
|          | What is the percent error of a length measurement of 0.229 cm if the correct value is 0.225 cm?                              |
|          | I expected to walk 80 km in a day. In fact I walked only 75 km. What was the percentage error?                               |

**PRACTICE**

1. Ariel weighed an object on her balance and recorded a mass of 24.3 grams. The label on the object said that it should weigh 24.5 grams. What is the percent error to the nearest hundredth of a percent?

2. Chase worked in a lab helping pack material that was labeled to weigh 15 ounces. When one of his boxes was pulled and weighed it was 14.5 ounces. What was the percent error to the nearest tenth?

3. The density of water at 4°C is known to be 1.00 g/mL. Kayla experimentally found the density of water to be 1.075 g/mL. What is her percent error?

4. The Handbook of Chemistry and Physics lists the density of a certain liquid to be 0.7988 g/mL. Taylor experimentally finds this liquid to have a density of 0.7925 g/mL. The teacher allows up to +/- 0.500% error to make an "A" on the lab. Did Fred make an "A"? Prove your answer.

5. An object has a mass of 35.0 grams. On Anthony's balance, it weighs 34.85 grams. What is the percent error of his balance?

## Percent Error Practice

*Directions: For each of the following situations find the percent error involved. Be careful in determining the true vs. observed value.*

1. Samantha S. Sloppiness measured the volume of her soda before she drank it for her midmorning snack. She measured the volume of the 12 oz. bottle to be 14 oz.
2. Clyde Clumsy was directed to weigh a 500 g mass on the balance. After diligently goofing off for ten minutes, he quickly weighed the object and reported 458 g.
3. Pretty Patty Pestilence had casually recorded her grades for the nine weeks in her notebook. She concluded she had 250 points out of 300 for the grading period. However, Miraculous (chem teacher) determined she had 225 points out of 300 and awarded her a "C" for the grading period.
4. Drew D. Dingaling came to Miraculous with a problem. Drew was told to measure 50 cm of copper wire to use in an experiment. Since his ruler only measured to 45 cm he used this amount of wire and his experiment was a failure.
5. Henry Heavyfoot was just arrested for speeding by Officer O'Rourke for traveling 65 mph in a 55 mph zone. Henry claimed his speedometer said 55 mph not 65 mph.
6. Willomina Witty was assigned to determine the density of a sample of nickel metal. When she finished, she reported the density of nickel as 5.59 g/ml. However, Miraculous knew the density of nickel was 6.44 g/ml.
7. An experiment to determine the volume of a "mole" of a gas was assigned to Barry Bungleditup. He didn't read the experiment carefully and concluded the volume was 18.7 liters. Miraculous knew he should have obtained 22.4 liters.

**Answers: 1. 16.6%; 2. 8.40%; 3. 11.1%; 4. 10.0%; 5. 15.4%; 6. 13.2%; 7. 16.5%**

## Problem Solving

|   |   |
|---|---|
| <p>1. Hal's Sporting Goods had a 1-day sale. The original price of a mountain bike was \$325. On sale, it was \$276.25. What is the percent reduction for this sale?</p>  | <p>2. The toy store buys stuffed animals from the manufacturer for \$2.40 each. The store then sells them at 96% increase in price. What is the retail price of each animal?</p>  |
| <p>3. A watch that normally sells for \$120, is on sale for \$90. What is the percent discount for this sale?</p>   | <p>4. Generally parties of 8 or more at a restaurant must pay an 18% gratuity for their meal service. After a celebration dinner at Chili's, the bill is \$115.95 for 10 people. How much will they be charge gratuity?</p>             |
| <p>5. Last year, Jason, a car salesman, made 23% commission on each car he sold. During the month of December, he sold a car for \$32,000, one for \$45,000, and a third one for \$19,500. How much was Jason's commission for the month of December?</p> | <p>6. Jessica decides she is going to make bracelets and then sell them. It cost her \$5 to buy the material to make the bracelets. She wants to mark the bracelet up 75% to sell it. How much will Jessica sell the bracelets for?</p> |
| <p>7. After deciding to buy the blue sweater, you realize it is 30% off. If the original price was \$45, how much is the sale price?</p>  | <p>8. A hat and pair of socks cost \$12 and the total at the cashier was \$12.84. What percent sales tax was charged?</p>   |
| <p>9. A store pays \$10 whole sale for a cap. The store sells the cap for \$25. What is the percent mark-up for the cap?</p>  | <p>10. The sale price of a pair of shoes is \$72. If the shoes were on sale for 20% off, what was the original price?</p>   |

## Be the Best Buyer!

Look at the stores. Decide which store has the best deal for what you want to buy.

| Store A                            |
|------------------------------------|
| Sales tax rate of 7%               |
| Everything in the store is 15% off |
| Skateboard...\$97                  |
| Helmet...\$26                      |
| Extra Wheels...\$28                |
| Knee pads...\$9                    |
| Football...\$30                    |
| Cleats...\$59                      |
| Helmet...\$120                     |
| Mouth piece...\$12                 |
| Hockey stick...\$185               |
| Ice skates...\$55                  |
| Hockey puck...\$3                  |
| Hockey gloves...\$35               |

| Store B                            |
|------------------------------------|
| Sales tax rate of 8%               |
| Everything in the store is 20% off |
| Skateboard...\$99                  |
| Helmet...\$25                      |
| Extra Wheels...\$29                |
| Knee pads...\$10                   |
| Football...\$35                    |
| Cleats...\$64                      |
| Helmet...\$119                     |
| Mouth piece...\$10                 |
| Hockey stick...\$187               |
| Ice skates...\$52                  |
| Hockey puck...\$5                  |
| Hockey gloves...\$31               |

Task: Pick a group of items to purchase. You must purchase all the items in that group, although it does not matter what group you pick. The discount and tax apply to each group of items. Determine which store has the better deal for the group of items you decide to purchase.

Remember to take the discount first and then calculate the sales tax. Record your findings below.

## Roll the Savings

For this activity, you will need a pair of dice. By taking turns, you will roll the dice and use the numbers to create a price for an item. After you have all the prices for the items, you will roll the dice again, to create the discount percentage for each item. The final task is to determine the discount for each item and the sale price of each item. Record the results in the chart. Happy Savings!

| <b>Item</b>    | <b>Price \$</b> | <b>Discount %</b> | <b>Discount \$</b> | <b>Sale Price \$</b> |
|----------------|-----------------|-------------------|--------------------|----------------------|
| Shoes          |                 |                   |                    |                      |
| Vacuum Cleaner |                 |                   |                    |                      |
| MP3 Player     |                 |                   |                    |                      |
| DVD            |                 |                   |                    |                      |
| Candy          |                 |                   |                    |                      |

Steps:

- 1) Roll dice to find the price of the first time (repeat for all 5 items)
- 2) Roll dice to find the percent discount for the first item (repeat for all 5 items)
- 3) Using the discount, calculate how much will be saved for each item
- 4) Calculate the sale price for each item

**PERCENT APPLICATIONS WORKSHEET –work it out and check it!**

1. Sue answers 42 out of 60 questions correctly. What **percent** of her answers are correct?
2. On a 20-item practice test, how many questions must you answer correctly for a score of 80% correct?
3. A teacher earns \$18,500 per year. If 18% of her income is withheld for taxes, how much money is withheld for taxes? How much of her income is left after taxes?
4. A 25¢ stamp is increased to 30¢. What **percent** of the original price does this increase represent?
5. At \$450 per month, a student pays \$5400 a year in rent. If his annual income is \$15,000, what **percent** of his income is spent on rent?
6. In one state, sales tax is 6%. If sales tax on a car is \$564.00, find the price of the car before tax.
7. Of the 540 seniors at Lake City High School, 35% are going on a school trip. If the buses ordered for the trip seat 42 students, how many buses will be needed so that each student will have a seat?
8. What **percent** was a television set reduced if it was marked \$225 and sold for \$195?



18. To keep pace with a 4% rate of inflation, how much should last year's \$0.37 stamp cost this year?
19. In an election, one candidate claimed 52% of the votes, while the other candidate claimed 2681 votes. If 5000 people voted, how do you know the election results are invalid?
20. If you answered 37 items correctly on a test, and received a score of 74%, how many items were on the test?
21. 85% of the students who take College Algebra pass the course. How many fail out of 140 students?

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**ANSWERS**

1. 70%   2. 16   3. \$15,200   4. 20%   5. 36%   6. \$9400   7. 5 buses   8. 13 1/3%   9. 20%
10. \$25.80   11. \$3271.80   12. \$3104.40   13. 15%   14. 18%   15. \$18.50   16. \$23.70
17. 20%   18. \$0.26   19. The number of votes would total 5281.   20. 50   21. 21

**CCM6+7+ Unit 8 Percents STUDY GUIDE*****I. Ratios/Rates/Unit Rates REVIEW***

1. Joe and Larry each bought Hershey bars. Joe bought 5 bars for \$2.83 and at a different store Larry bought 3 bars for \$1.62. Who got the better buy?
2. Usain Bolt ran 100m in 9.83 seconds. How many meters per second did he run?

***II. Proportions REVIEW***

3. Are these ratios proportional?
  - a)  $\frac{7}{8}$  and  $\frac{40}{42}$
  - b)  $\frac{3}{5}$  and  $\frac{45}{75}$
4. Three cans of dog food sell for \$0.99. Find the cost of 15 cans.
5. A student reads 45 pages in 2 hours and  $x$  pages in 3 hours. Solve for  $x$ .
6. Solve:
  - a)  $\frac{x}{8} = \frac{90}{120}$
  - b)  $\frac{0.8}{90} = \frac{5.6}{y}$
7. A truck driver estimates that it will take him 12 h to drive 1,160 km. After 5 h, he has driven 484 km. Is he on schedule? Explain.

***III. Percents***

8. What percent of 400 is 20?
9. Find 45% of 12.
10. 20% of what number is 24?
11. Find the percent of change and tell whether it is an increase or a decrease:
  - a) from 1.2 to 0.2
  - b) from 8.8 to 30
12. 30% of the glee club members showed up for the party. If 12 students showed up, how

many members did not show up?

13. Suzie paid \$89.12 for a shirt, and this included 4.5% sales tax. What was the price of the shirt before tax?

14. A hot dog at the beach is marked up 80% from the wholesale cost of \$0.75. What will be the price of the hot dog?

15. A t-shirt normally costs \$19.95, but is on sale for 20% off. Tax is 6.5%. What will be the final cost of the t-shirt?

16. A Lays Ruffles Sour Cream N Bacon Chips bag says its mass is 235g. However, you place it on a super sensitive scale and it actually weighs 241g. What is the percent of error?

**V. Interest...  $I=prt$**

17. Find the simple interest if \$150 is deposited at an interest rate of 9% for 2 years. What is the balance?

18. Find the simple interest if \$6000 is deposited at an interest rate of 3% for 6 months. What is the balance?

19. (Not  $I=prt$ ...just a weird random problem.) The county animal shelter has 32 dogs, 10 rabbits, and the rest are cats. The sum of dogs and rabbits is 52.5% of all the animals. How many cats are at the shelter?