

Unit 3/4 Percent, Ratios and Rate

Name: _____

By the end of this unit I should:

1. Be aware of situations that apply to percents greater than 100% or between 0% and 1%.
2. Be able to change a fraction to decimal and percent forms.
3. Be able to change decimals to fraction and percent forms.
4. Be able to change percents to decimal and fraction forms.
5. Find the percent if given a situation where you know a certain amount out of a total. (Write the fraction and change to a percent)
6. Find the percent of a #. (Change to a decimal and multiply).
7. Find the number (the whole) if given the percent and the part.
8. Find the discount, new selling price, sales tax (13%) and total cost of an item.
9. Solve other word problems associated with percent.
10. Express 2 term and 3 term ratios in different forms.
11. Write equivalent ratios and be able to reduce them to lowest terms.
12. Be able to express ratios as decimals, fractions and percents.
13. Express a part to part ratio as a part to whole ratio.
14. Solve for a missing term in a proportion ($3:4 = x:16$)
15. Be aware of real life applications of ratio and solve problems associated with them. (ex. Map scales)
16. Know what a rate is and be able to give examples.
17. Write rates as a unit rate (unit price).
18. Compare rates.
19. Be able to determine the best buy by comparing unit price.

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What Is a Ratio?

Here is a collection of sports balls:



A ratio is a statement of how numbers compare. It is a comparison of the size of one number to the size of others. Ratios can be simplified in the exact same way fractions can. A two-term ratio compares 2 quantities: For example, the ratio of basketballs to tennis balls is 7 to 8. There are three ways to write two-term ratios:

Basketballs to tennis ball: 1) using "to" 7 to 8

2) using ":" 7 : 8

3) as a fraction $\frac{7}{8}$

Note: The numbers must be written in the correct order

There are two different types of ratios. A part-to-whole ratio compares one quantity to the total number of items. For example, what is the ratio of golf balls to all of the balls?

Answer: 5 to 20, 5 : 20 or $\frac{5}{20}$.

A part to part ratio provides the relationship between two distinct groups. For example, what is the ratio of tennis balls to basket balls?

Answer: 8 to 7 or 8 : 7 or $\frac{8}{7}$.

a) What is the ratio of golf balls to basket balls? _____

b) What is the ratio of basket balls to all balls? _____

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Here are some shapes:



a) What is the ratio of stars to flowers? (Write three ways) _____,

_____ , _____

b) What is the ratio of happy faces to all shapes? What is this ratio called?

_____ ,

c) What ratio does $5 : 3 : 4$ represent?

d) What is the ratio of flowers to stars? _____

e) What is the ratio of stars to happy faces to all shapes? _____

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Equivalent Ratios

As stated before, ratios can be simplified just like fractions can.

To simplify a ratio find a common term and divide both parts of the ratio by it. This will create a **proportion**.

For example ;

$$6:4 = 3:2$$

Simplify and write as a proportion

a. 7:21

b. 12:52

c. 5:25

d. 11:33

e. The ratio of hot dogs to hamburgers sold at a BBQ was 7:3.

- If 77 hotdogs were sold, how many hamburgers were sold?

- If a total of 100 items were sold, how many hot dogs were sold? How many hamburgers were sold?

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Ratio Tables

A ratio table is a structured list of equivalent ratios that helps to understand the relationship between the ratios and the numbers.

Number of Items	1	5	10	50
Cost (\$)	5	25	50	250

Ratio tables can be made by increasing or decreasing each number by a scale factor

	2		6
3	6	9	18

4			5
24	18	60	

Fill in the missing values

	9		8
5		50	

6	20		10
	60	42	

Zach's Paint Mixture		
Red Paint (Cups)	Yellow Paint (cups)	Orange Paint (cups)
3	5	
	10	16
9		
	20	32
15		40

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Evan saves \$2 of every \$5 he earns mowing lawns

\$ saved	2					
\$spent	3					
Total \$ earned	5					

How much will Evan have saved when he has earned \$150?

Rates & Unit Rates

A **rate** is a comparison of two amounts measured in different units. Example of rates include measurements made in ; kilometers per hour, dollars per hour, meters per second, and calories per serving. A **unit rate** is a rate where the second quantity is one unit such as \$34 per pound, 25 miles per hour, and 0.73 cents per dollar. To find a unit rate we must make the denominator 1 by dividing both terms by the original denominator.

Example : Rate

John travels at 120 km every 2 hours. In this example, we are comparing distance (km) and time (hours)

It the second quantity in the rate is 1, then we have a unit rate.

Example : Unit Rate

Since John travels 120 km every 2 hours, The unit rate is 60 km every hour. This is

written as $\frac{120km}{2h} = \frac{60km}{1h} = 60 km/h$

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Are the following rates or ratios?

- a) Kayla earns \$33 for 3 hours of snow clearing. _____
- b) Mr. Hirsche mixes 3 scoops of dark blue paint with 2 scoops of white paint in order to make light blue paint. _____
- c) A&W is selling 2 teen burgers for \$5. _____
- d) Mr Hawkins can type 30 words each second. _____
- e) The best way to make fruit punch is to have six apples for every pineapple.

Write the unit rate for each of the following:

- a) Jill made \$45 babysitting for 5 h. _____
- b) 12 apples cost \$1.25. _____
- c) A car travels 140km in 3h. _____
- d) A human heart beats 140 times in 2 minutes. _____
- e) A dozen Pepsi costs \$8.25. _____

Miranda's Maid Service charges \$280 to clean 8 offices. What is the company's price for cleaning a single office?

A roller coaster can take 162 passengers around the track in 9 minutes. The roller coaster operates at a constant rate. How many passengers can the roller coaster take around the track per minute?

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A grocery store sells a 15.5oz box of Oreos for \$2.98. The same store also sells a 14oz box of Chips Ahoy for \$2.50. Which is the better deal per ounce?

A grocery store sells Coca-Cola for \$1.29 for a 1.25L bottle. The same store sells Pepsi for \$2.49 for a 2L bottle. Which is the better deal?

Cross Multiplying

Another way to solve some rate problems is by cross multiplying

To cross multiply:

1. Set up a proportion with the missing value denoted with a variable
2. Multiply the opposite numerators and denominators by each other
3. Divide to solve for the missing value

Example : Frozen Fruit bars cost \$3.95 for 5 bars. How much money would it cost to buy 12 bars?

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Five lemons cost \$1.80. What is the cost for 9 lemons at this rate?

Pat wants to enter a typing contest. In order to enter, one must be able to type 50 words per minute. Pat took 15 seconds to type 10 words. Can he enter the contest?

A recipe for oatmeal cookies calls for 2 cups of flour for every 3 cups of oatmeal. How much flour is needed for a big batch of cookies that uses 9 cups of oatmeal?

It takes 27kg of milk to make 4g of butter. How much milk is needed to make 3kg of butter?

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Pam drove her car 99km with 9 liters of fuel. Assuming that the relationship is proportionate ; how far can Pam drive with 13 litres of fuel?

Mandy works construction. She knows that a 6 meter long metal bar has a mass of 40kg. Assuming the relationship is proportionate ; how long would a 15kg bar be?

Katherine spends 7hr each day in school including 30 minutes for lunch. Write a ratio to compare the time for lunch with the total time in school each day.

If the ratio of people wearing hats to people not wearing hats is 6:20, then how many people would be wearing hats if 52 people were in the class?

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John takes lego blocks in a handful that has red, blue, and black blocks in a ratio of 6:4:2. One handful has 48 blocks altogether. How many of each block does he have?

Practice!!! 😊

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Relating Percents, Fractions, and Decimals

You should remember how to relate fractions, decimals and Percents from grade 6 & 7:

Here are some of the main ideas:

- To change from percent to decimal - move the decimal 2 places left:

$$27\% \rightarrow 27.\% = 0.27$$



$$9\% \rightarrow 9.\% = 0.09$$



- To change from decimal to percent - move the decimal places 2 places right:

$$0.125 = 12.5\%$$



$$0.6 = 60\%$$



- Percents mean "out of 100" - to change from percent to fraction, write with a denominator of 100 and reduce:

$$25\% = \frac{25}{100} = \frac{1}{4}$$

- To change from fraction to percent, change your denominator to 100 (use equivalent fractions) or change your fraction to a decimal

$$\frac{7}{20} = \frac{7 \times 5}{20 \times 5} = \frac{35}{100} = 35\%$$

$$\frac{3}{8} = \frac{3 \times 125}{8 \times 125} = \frac{375}{1000} = 0.375 = 0.375 = 37.5\%$$



In grade 8 you need to be able to do this for percents less than 1, greater than 100 as well as between 1 & 100.

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Complete the following table. Use lowest terms where possible.

Percent	Decimal	Fraction
13%		
	0.15	
32%		
		$\frac{21}{100}$
105%		
	0.125	
		$\frac{13}{20}$
0.25%		
	1.30	

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Calculating Exact Percentages

To calculate percentage of numbers

1. Change the percentage into a decimal
2. If you see the word "of" change it to a multiplication symbol
3. Multiply the decimal by the number you are calculating the percentage of

Example : Calculate 15% of 40

What is 12% of 19?

What is 18% of 29?

Ten co-workers are buying Ted a going away present and will each pay 10%. They decide to buy him a backpack for \$92.30 including tax. How much should each person pay?

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Percents greater than 100

It is possible for percents to be represented as a greater than 100. For example we can see percents greater than 100 in grades, business earnings, and sports.

Percents greater than 100 are still represented as a fraction with 100 as the denominator.

Complete the following table

Percents	Fractions	Decimals
157%		
343%		
210%		
101%		

Calculate the following:

150% of 0.5

120% of 150

315% of 40

276% of 310

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Ivan is 160cm tall. Tiara is 152cm tall. Both Ivan and Tiara are 13 years old. An adult's height is normal 107% of his or her height at age 13. What are Ivan and Tiara's expected adult heights?

Remember!

In math we are often trying to solve for an unknown variable. A variable is generally represented by the letter 'x' or another letter. Whenever there is an unknown in a question writing a variable can make said question easier to solve.

Solve for the unknown variable:

120% of a number is 36

140% of a number is 70

320% of a number is 96

205% of a number is 82

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Fractional Percents

A fractional percent is a number out of one hundred that included a fraction. Fractional percents can be written as mixed number percents or percentages with decimals.

For example, twelve and a half percent can be represented as 12.5% or as $12\frac{1}{2}\%$

Writing fractional percents as fractions

1. If included, write the mixed number as a fraction
2. Divide the fraction by 100
3. Write the fraction in lowest terms

Example :

$$12\frac{1}{2}\%$$

1. If included, write the mixed number as a fraction
2. Divide the fraction by 100
3. Write the fraction in lowest terms

Write the following as fractions in lowest terms

$$21\frac{1}{3}\%$$

$$2\frac{1}{7}\%$$

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Write the following as fractions in lowest terms

25.5%

60.25%

0.5% of 250

1.25% of 320

1.5% of 520

3.25% of 410

Your friend wants you to help deliver newspapers that will sell for a total of \$350. He gives you two choices. Either 3.5% of total sales or a lump sum of \$25. What is the better deal?

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Increasing Percentages

In certain situations a value may be increased by a percentage. When this is the case we add 100% to our original percentage and continue forward.

For example : An increase of 5% is the same as multiplying by 105%

Calculate the total price

\$39.99 with 5% sales tax

\$40.25 with 7% sales tax

\$19.99 with 12% sales tax

\$32.50 with 14% sales tax

In 2005. The number of movie tickets sold in Canada increased 0.5% to 120.3 million.

Suppose it increased another 0.5% in 2006. What is the new number of movie tickets sold?

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Decreasing Percentages

Percents can also be used to calculate the decrease in number. To calculate a decrease using a percent we subtract from 100% and multiply the number.

For example, A 15% discount is same as paying 85% of the full price

Calculate the percent decrease

15% discount on \$14.99

32% discount on \$18.00

Miriam wants to buy a pair of inline skates. One store is selling the skates at 15% off the regular price of \$149.95. Another store is selling the skates for \$139.95 , with 10% off. Which store has the better price?

Mikael's father bought a new car for \$35,500. The car decreased in value by 20% after one year. What was the value of the car after one year?

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A herd of 200 caribou was moved to a new location. The population increased by 10% the first year and increased by 20% the second year. What was the percent increase after two years?

John wants to buy a Iphone. At a store he sees it regularly sell for \$119.95. It is advertised at 20% off, but because he lives in BC he has to pay 5% GST and 7% PST. He has saved 115\$ from babysitting. Can he buy this Iphone?

A student is awarded a \$1000 scholarship and places it in an account that pays 3% simple interest per year. What is the total value of the scholarship amount at the end of the second year?

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Practice!!!

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