Important Concepts . . .

Preview Review

Mathematics Grade 8 TEACHER KEY

W1 - Lesson 5: Working with Percents

Important Concepts of Grade 8 Mathematics

W1 - Lesson 1 .....Perfect Squares and Square Roots
W1 - Lesson 2 ..... Working with Ratios and Rates
W1 - Lesson 3 ..... Multiplying and Dividing Fractions
W1 - Lesson 4 ..... Multiplying and Dividing Integers
W1 - Lesson 5 ..... Working with Percents
W1 - Review
W1 - Quiz

W2 - Lesson 1 ..... Modelling and Solving Linear Equations Using Algebra Tiles
W2 - Lesson 2 .....Solving Linear Equations
W2 - Lesson 3 .....Graphing and Analyzing Linear Relations
W2 - Lesson 4 ..... Critiquing the Representation of Data
W2 - Lesson 5 ..... Probability of Independent Events
W2 - Review
W2 - Quiz

W3 - Lesson 1 ..... Pythagorean Theorem
W3 - Lesson 2 .....Calculating Surface Area
W3 - Lesson 3 .....Calculating Volume
W3 - Lesson 4 .....Drawing 3-D Objects
W3 - Lesson 5 .....Congruence of Polygons
W3 - Review
W3 - Quiz

Materials Required

Protractor
Ruler
Calculator

No Textbook Required

This is a stand-alone course.

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Preview/Review Concepts for Grade Eight Mathematics

Teacher Key

W1 – Lesson 5:

Working with Percents

OBJECTIVES

By the end of this lesson, you will be able to:

- Determine the percent represented by a grid
- Represent a percent greater than 100 using grid paper
- Convert percents into decimals and fractions
- Convert decimals into percents and fractions
- Convert fractions into percents and decimals
- Solve problems involving percents

GLOSSARY

Percent – a given part for every hundred; for example, 25% means 25 for every 100.

W1 – Lesson 5: Working with Percents

Materials required:

- Paper, Pencil, Calculator, and Grid Paper

Part 1: Representing Percents Greater than 100%

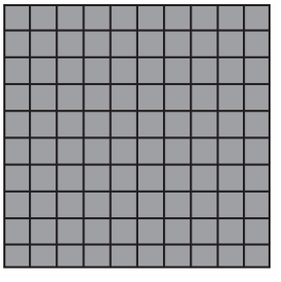
The word percent can be broken down into per-cent which literally means "per hundred." A percent is used to represent a given part for every hundred and uses a % symbol to indicate that the number is a percent. On your last math test, you may have received a mark of 75%. This means that if 100 questions were written, you would have gotten 75 of them correct. You are used to seeing percents between 0-100, but it is possible to have a percent that is greater than 100.

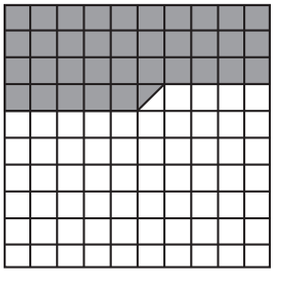
If you own a business, you will likely increase the price of a product that you purchased in order to make a profit. If you double the price of the product you are marking up the price by 100%.

For example, if you buy a chair for $75 and sell it for $150, then you are adding 100% of the cost of the original product to itself and you make $75 in profits. 75 is 100% of 75, so you have made a 100% profit. Similarly, if you sold the chair for $225, the mark up in price is $150. $150 is 200% of 75, so you have made a 200% profit.

Another example is the work of a photographer. If you go to a portrait studio and ask for a picture to be enlarged, they have the ability to increase it by 150%. This means the picture you receive will be 1 and a half or 1.5 times as large as the original picture you gave them to enlarge.

Percents can be represented using a grid paper with one hundred squares. Each square that is shaded in represents 1%.

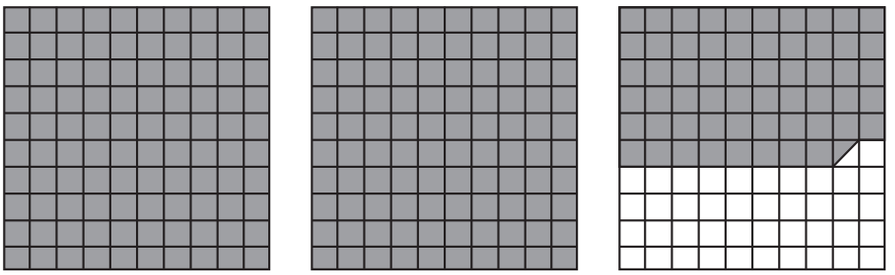




In this example, the completely shaded in grid represents 100%. The partially shaded in grid represents $35\frac{1}{2}\%$.
In total $135\frac{1}{2}\%$ is represented by using the grid paper.

Practice Questions

1. Represent the given diagram as a percent, as a decimal number, and in fraction form.

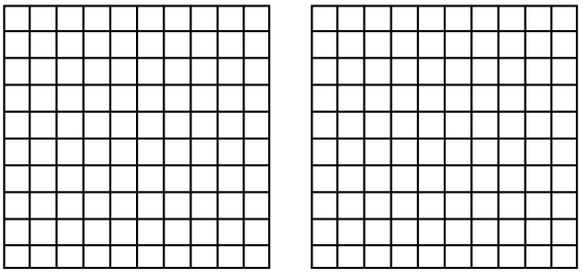


Percentage = 268.5%

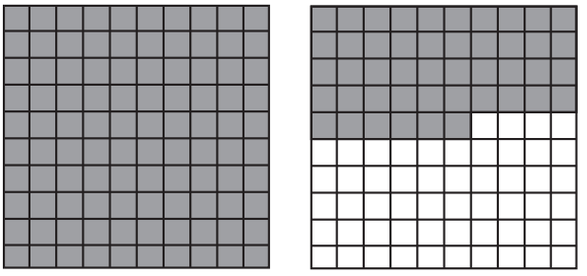
Decimal = 2.685

Fraction = $\frac{2685}{1000} = 2\frac{137}{200}$

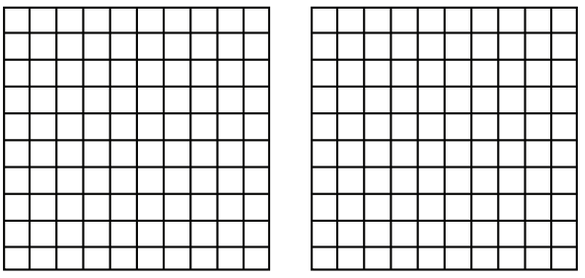
2. Represent 146% using the following grids.



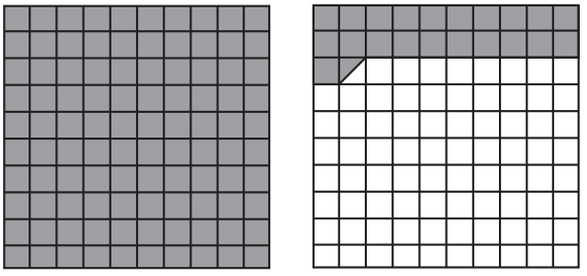
Answer:



3. Represent 121.5% using the following grids.



Answer:



Part 2: Relating Percents, Decimals, and Fractions

A percent can also be expressed as a decimal number and in fraction form.

- To express a percent as a decimal, remove the percent symbol, and move the decimal point in the percentage two places to the left.

$$\mathbf{48\% = .48 = 0.48}$$

- To express a percent as a fraction, place the percent over 100 and drop the percent symbol. Then simplify the resulting fraction.

$$148\% = \frac{148}{100} = \frac{148 \div 4}{100 \div 4} = \frac{37}{25} = 1\frac{12}{25}$$

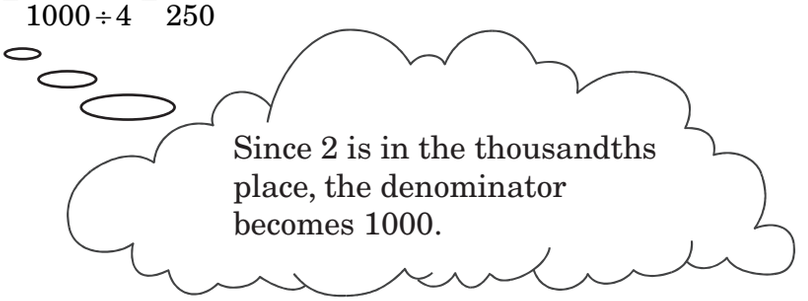
A decimal can also be expressed as a percent and in fraction form.

- To express a decimal as a percent, move the decimal point two places to the right and add a percent symbol at the end of the number.

$$\mathbf{0.572 = 0.57.2 = 57.2\%}$$

- To express a decimal as a fraction, place the decimal number over a denominator that is equal to the last place value in the decimal number and remove the decimal point. Then simplify the resulting fraction.

$$0.572 = \frac{572}{1000} = \frac{572 \div 4}{1000 \div 4} = \frac{143}{250}$$



A fraction can also be expressed as a percent and as a decimal number.

- To express a fraction as a decimal, divide the numerator by the denominator.

  $$\frac{5}{8} = 5 \div 8 = 0.625$$

  Mixed numbers can also be expressed as decimals by applying the same rules.

  $$2\frac{4}{5} = 2 + (4 \div 5) = 2 + 0.80 = 2.80$$

- To express a fraction as a percent, divide the numerator by the denominator, and move the decimal point two places to the right. Then add a percent symbol behind the resulting number.

  $$\frac{5}{8} = 5 \div 8 = 0.625 = 62.5\%$$

  Mixed numbers can also be expressed as percentages by applying the same rules.

  $$2\frac{4}{5} = 2 + (4 \div 5) = 2 + 0.80 = 2.80 = 280\%$$

Practice Questions

1. Express the following percents as a decimal number and in fraction form.

   a. 382%

   $$\boldsymbol{382\% = 3.82 = \frac{382}{100} = 3\frac{41}{50}}$$

   b. 166%

   $$\boldsymbol{166\% = 1.66 = \frac{166}{100} = 1\frac{33}{50}}$$

2. Express the following decimals as a percent and in fraction form.

   a. 1.18

   $$1.18 = 118\% = \frac{118}{100} = 1\frac{9}{50}$$

   b. 2.05

   $$2.05 = 205\% = \frac{205}{100} = 2\frac{1}{20}$$

3. Express the following fractions as a decimal number and a percent.

   a. $3\frac{7}{10}$

   $$\boldsymbol{3\frac{7}{10} = 3 + (7 \div 10) = 3 + 0.70 = 3.70 = 370\%}$$

   b. $\frac{12}{5}$

   $$\boldsymbol{\frac{12}{5} = 12 \div 5 = 2.4 = 240\%}$$

Part 3: Problem Solving with Percents

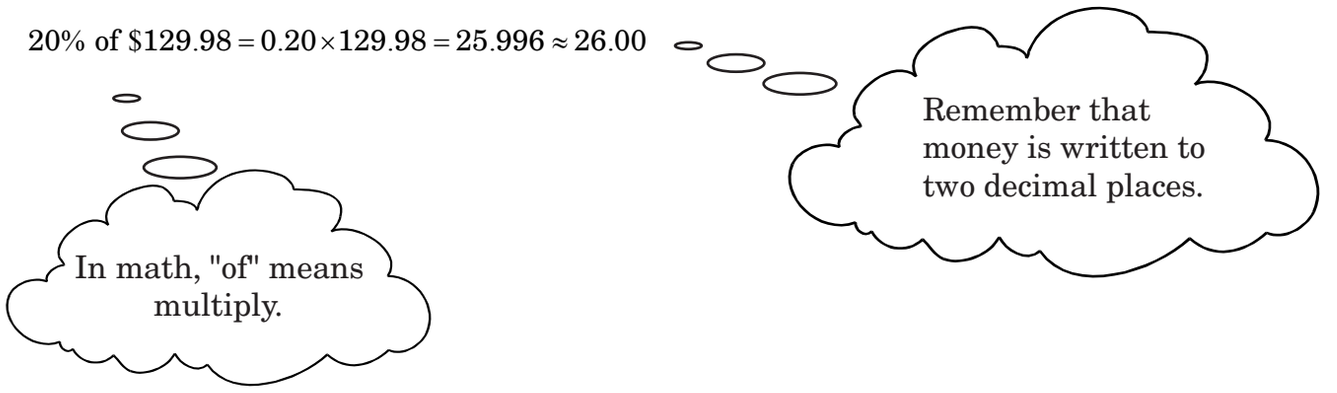
To solve problems involving percents, you must convert the percent into a decimal first. Then it is possible to complete the calculations.

Example 1

A clothing store is discounting all its out-of-season stock for 15% off the sale price. Isaiah wants to buy a jacket that is on sale for 20% off its original price. If the original price of the jacket is $129.98, how much will it cost Isaiah to purchase the jacket before taxes?

Answer:
Step 1: Calculate the sale price after applying the 20% discount.
Convert 20% into a decimal and then complete the calculation.

$$20\% \text{ of } \$129.98 = 0.20 \times 129.98 = 25.996 \approx 26.00$$



Subtract the amount of the first discount from the original price of the jacket.

$$129.98 - 26 = \$103.98$$

Step 2: Calculate the final price after applying the 15% discount.
Convert 15% into a decimal and then complete the calculation.

$$15\% \text{ of } \$103.98 = 0.15 \times 103.98 = 15.597 \approx 15.60$$

Subtract the amount of the second discount from the sale price of the jacket.

$$\$103.98 - 15.60 = \$88.38$$

Isaiah will pay $88.38 for the jacket.

Example 2

Megan lives in Victoria and wants to buy a new pair of shoes that cost $59.99. How much will the shoes cost in total, including GST & PST? (The PST in British Columbia is 7%).

Answer:
Step 1: Calculate the amount of the GST.
Convert the GST into a decimal and complete the calculation.

$$5\% \text{ of } \$59.99 = 0.05 \times 59.99 = 2.9995 \approx 3.00$$

Step 2: Calculate the amount of the PST.
Convert the PST into a decimal and complete the calculation.

$$7\% \text{ of } \$59.99 = 0.07 \times 59.99 = 4.1993 \approx 4.20$$

Step 3: Calculate the total cost of the shoes.
Add the GST and the PST to the original price of the shoes.

$$\$59.99 + 3.00 + \$4.20 = \$67.19$$

Alternate solution:

Because the taxes are being taken off the same amount, they can be added together and the final price can be calculated in a fewer number of steps.
Step 1: Add the GST & PST together.

$$5\% + 7\% = 12\%$$

Step 2: Calculate the total cost of the shoes.
Convert the total taxes into a decimal and complete the calculation.

$$12\% \text{ of } \$59.99 = 0.12 \times 59.99 = 7.1988 \approx 7.20$$

Add the amount of the taxes to the original price of the shoes.

$$59.99 + 7.20 = \$67.19$$

Megan will pay $67.19 for the new pair of shoes.

Practice Questions

1. An MP3 player in Regina costs $19.99 and is discounted by 25%. What is the total cost of the MP3 player including all appropriate taxes? (The PST in Saskatchewan in 6%).

   Step 1: Calculate the sale price of the MP3 player.
   Convert 25% into a decimal and then complete the calculation.

   $25\% \text{ of } \$19.99 = 0.25 \times 19.99 = 4.9975 \approx 5.00$

   Subtract the amount of the discount from the original price.

   $19.99 - 5.00 = \$14.99$

   Step 2: Calculate the amount of the GST.
   Convert the GST into a decimal and complete the calculation.

   $5\% \text{ of } \$14.99 = 0.05 \times 14.99 = 0.7495 \approx 0.75$

   Step 3: Calculate the amount of the PST.
   Convert the PST into a decimal and complete the calculation.

   $6\% \text{ of } \$14.99 = 0.06 \times 14.99 = 0.8994 \approx 0.90$

   Step 4: Calculate the total cost of the MP3 player.
   Add the GST and the PST to the sale price of the MP3 player.

   $14.99 + \$0.75 + \$0.90 = \$16.64$

   In Regina, the MP3 player will cost $16.64.

2. One summer, Chloe counted 320 ducks in a lake. The following summer Chloe noticed that only 80% of the ducks returned. How many ducks returned that following summer?

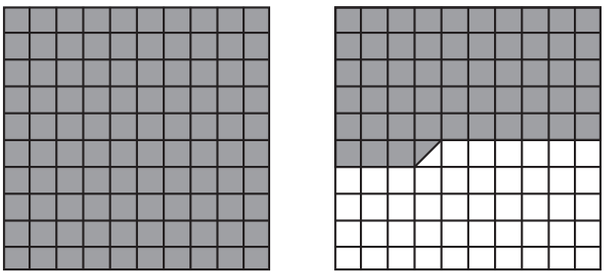
   Convert 80% into a decimal and then complete the calculation.

   $80\% \text{ of } 320 = 0.80 \times 320 = 256$

   That following summer, only 256 ducks returned to the lake.

Lesson 5: Assignment

1. Determine the number represented by the following grid. Express the answer as a percent, a decimal number and in fraction form.



There are 163.5 squares shaded.
As a percent, this is expressed as 163.5%.
As a decimal, it is expressed as 1.635.
As a fraction form, it is expressed as $1\frac{127}{200}$.

2. Express the following percents as decimal numbers and in fraction form.

   a. 121%

$$121\% = 1.21 = \frac{121}{100} = 1\frac{21}{100}$$

   b. 34%

$$34\% = 0.34 = \frac{34}{100} = \frac{17}{50}$$

   c. 279%

$$279\% = 2.79 = \frac{279}{100} = 2\frac{79}{100}$$

3. Express the following decimals as percents and in fraction form.

   a. 1.56

   $$\boldsymbol{1.56 = 156\% = \frac{156}{100} = 1\frac{14}{25}}$$

   b. 2.85

   $$\boldsymbol{2.85 = 285\% = \frac{285}{100} = 2\frac{17}{20}}$$

   c. 5.42

   $$\boldsymbol{5.42 = 542\% = \frac{542}{100} = 5\frac{21}{50}}$$

4. Express the following fractions as decimal numbers and as percents.

   a. $2\frac{5}{8}$

   $$\boldsymbol{2\frac{5}{8} = \frac{21}{8} = 2.625 = 262.5\%}$$

   b. $\frac{18}{4}$

   $$\boldsymbol{\frac{18}{4} = 4.5 = 450\%}$$

   c. $5\frac{3}{4}$

   $$\boldsymbol{5\frac{3}{4} = \frac{23}{4} = 5.75 = 575\%}$$

5. Emma had 44 shots on goal during hockey practice and scored 11 times. What percent of her shots were saved?

Calculate the number of shots saved.

44-11=33

Determine the percentage of shots saved.

$\frac{33}{44} = 0.75$

Express the answer as a percent.

0.75=75%

75% of Emma's shots were saved.

6. There were 224 people in the movie theatre on Thursday night. Approximately 63% of them had popcorn. How many people in the theatre had popcorn that night?

Express the percent as a decimal and complete the calculation.

63% of 224 = 0.63 × 224 = 141.12

Approximately 141 people had popcorn to snack on that night.

7. The original price of a DVD player is $148.99 and it is on sale for 15% off. There is a further 10% discount taken off at the cash register. What is the cost of the DVD player before taxes?

   Step 1: Calculate the sale price after applying the 15% discount. Convert 15% into a decimal and then complete the calculation.

   15% of $148.99 = 0.15 × 148.99 = 22.3485 ≈ 22.35

   Subtract the amount of the first discount from the original price of the DVD player.

   148.99 - 22.35 = $126.64

   Step 2: Calculate the final price after applying the 10% discount. Convert 10% into a decimal and then complete the calculation.

   10% of 126.64 = 0.10 ×126.64 = 12.664 ≈ 12.66

   Subtract the amount of the second discount from the sale price of the DVD player.

   126.64 - 12.66 = $113.98

   The final price of the DVD player is $113.98.

8. The price tag on a mountain bike in Ontario is $114.00. What is the total cost of the bike including all applicable taxes? (The PST in Ontario is 8%).

Step 1: Calculate the amount of the GST.
Convert the GST into a decimal and complete the calculation.

5% of $114.00 = 0.05 × 114.00 = 5.70

Step 2: Calculate the amount of the PST.
Convert the PST into a decimal and complete the calculation.

8% of $114.00 = 0.08 × 114.00 = 9.12

Step 3: Calculate the total cost of the mountain bike.
Add the GST and the PST to the original price of the mountain bike.

$114.00 + $5.70 + $9.12 = $128.82

Alternate solution:

Because the taxes are being taken off the same amount, they can be added together and the final price can be calculated in a fewer number of steps.

Step 1: Add the GST & PST together.

5% + 8% = 13%

Step 2: Calculate the total cost of the mountain bike.
Convert the total taxes into a decimal and complete the calculation.

13% of $114.00 = 0.13 × 114.00 = 14.82

Add the amount of the taxes to the original price of the mountain bike.

114.00 + 14.82 = $128.82

The mountain bike will cost $128.82 in Ontario.

9. What is the total cost of a leather jacket that costs $399.00 and is on sale for 75% off, if it is purchased in Alberta? (There is no PST in Alberta).

Step 1: Calculate the sale price of the leather jacket.
Convert 75% into a decimal and then complete the calculation.

75% of $399.00 = 0.75 × 399.00 = 299.25

Subtract the amount of the discount from the original price.

399.00 - 299.25 = $99.75

Step 2: Calculate the amount of the GST.
Convert the GST into a decimal and complete the calculation.

5% of $99.75 = 0.05 ×99.75 = 4.9875 ≈ 4.99

Step 3: Calculate the total cost of the leather jacket.
Add the GST to the sale price of the leather jacket.

$99.75 + $4.99 = $104.74

In Alberta, the leather jacket will cost $104.74.

10. The population of MetroTown was 570 000. The next year, the population increased by 10%. In the following year after that, the population increased by another 12%. What is the population of MetroTown now?

Step 1: Calculate the population after the first population increase. Convert 10% into a decimal and then complete the calculation.

10% of 570 000 = 0.10 × 570 000 = 57 000

Add the population increase to the original population.

570 000 + 5 7000 = 627 000

Step 2: Calculate the population after the second population increase. Convert 12% into a decimal and then complete the calculation.

12% of 627 000 = 0.12 × 627 000 = 702 240

Add the second population increase to the previous year's population.

627 000 + 75 240 = 702 240

The current population of MetroTown is 702 240.

LEARNING
ANYTIME ANYWHERE