

Grade 8 MATH

UNIT 5 NOTES

Name: _____

Percents, Decimals, Fractions, Ratios and Rates

Class: _____

<p>Percent means <u>part out of 100</u></p> <p>Example: Test scores 78% on a Math test Sales tax 13% in NL Discounts 25% off all purchases Probability 10% chance of rain Athletic statistics scored 25% of all shots on goal</p>	<p>FRACTIONS means <u>part out of a total</u></p> <p>Ex. 27% means $\frac{27}{100}$</p> <p>$\frac{33}{50} = \frac{66}{100} = 66\%$ get fraction to something over 100</p> <p>$25\% = \frac{25}{100} = \frac{1}{4}$ simplest form</p>
<p>DECIMAL</p> <p>8.435</p> <p>8 . 4 3 5</p> <p>____. _____</p> <p>Ones tenths hundredths thousandths etc</p> <p>$25\% = 25\% \div 100 = 0.25$ Decimal place moves TWO places to the LEFT</p> <p>$0.25 = 0.25 \times 100 = 25\%$ Decimal places moves TWO places to the RIGHT</p>	<p>RATIO means <u>a comparison of two numbers by division</u></p> <p>Written 4 : 9 OR 4 to 9 OR 4 out of 9 READS 4 is compared to 9</p> <p>Ex. $13\% = \frac{13}{100}$ so as a ratio is 13 : 100</p> <p>$39 : 100 = \frac{39}{100} = 39\%$</p>

Table 1. Complete the following conversions

Percent	Decimal	Fraction	Ratio
300%			
30%			
3%			
0.3%			

Table 2. Complete the following conversions

Percent	Decimal	Fraction	Ratio
70%			
0.7%			
7%			
700%			

Table 3: Complete the following conversions.

Percent	Decimal	Fraction	Ratio
53%			
53.7%			
			3: 20
		$\frac{1}{4}$	
	0.65		
		$\frac{3}{200}$	

			1:200
	0.0013		
	2		

<p>FRACTIONS to REMEMBER:</p> $\frac{1}{8} = 0.125$ $4.125 = 4 \frac{1}{8}$ <p> $\frac{1}{8} = 0.125$ $\frac{5}{8} = 0.625$ $\frac{2}{8} = 0.250$ OR 0.25 $\frac{6}{8} = 0.750$ or 0.75 $\frac{3}{8} = 0.375$ $\frac{7}{8} = 0.875$ $\frac{4}{8} = 0.500$ OR 0.5 $\frac{8}{8} = 1.000$ or 1 </p>	<p>FRACTIONS to REMEMBER:</p> $\frac{3}{8} = 3(0.125)$ $= 0.375$ $7.625 = 7 + 5(0.125)$ $= 7 + 5(0.125)$ $= 7 \frac{5}{8}$
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Table 4: Complete the following conversions.

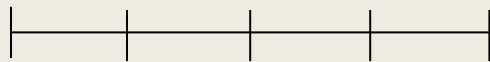
Percent	Decimal	Fraction	Ratio
87%			
63.8%			
			3:25

Percent	Decimal	Fraction	Ratio
		$\frac{1}{8}$	
	0.35		
		$\frac{7}{250}$	
			1:1000
	0.0037		
	3		
$7\frac{1}{4}\%$			
$2\frac{1}{8}\%$			
		$2\frac{3}{8}$	
			3:5000

	0.0075		
900%			
0.18%			
	2.1		

5.2. Using **percent number lines**...

numbers

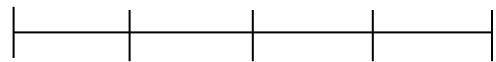


percent 0% 25% 50% 75% 100%

With numbers...

Ex. 5.2.1 If 25% is \$80, what is 100%?

numbers



percent 0% 25% 50% 75% 100%

Ex. 5.2.2 If 75% of the price of a coat is \$60, what is the full price of the coat?

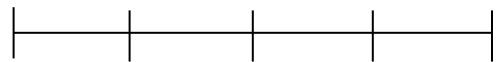
numbers



percent 0% 25% 50% 75% 100%

Ex. 5.2.3 If a pair of boots cost \$120. What is the 25% discount?

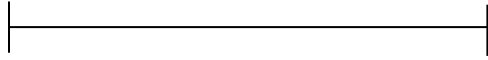
numbers



percent

Ex. 5.2.4. What is the 75% of 320?

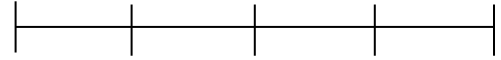
numbers



percent

Ex. What is 12.5% of 160? (what scale?
think $25\% \div 2 = 12.5\%$)

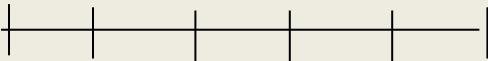
numbers



percent

5.2.Using **percent number lines...**

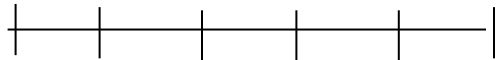
numbers



percent 0% 20% 40% 60% 80% 100%

Ex. 5.2.5. If 20% is 80, what is 100%?

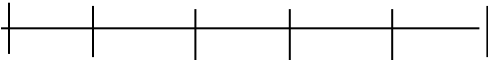
numbers



percent 0% 20% 40% 60% 80% 100%

Ex. 5.2.6. If 100% is 250, what is 80%.

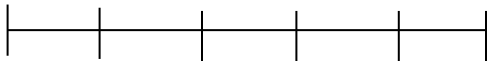
numbers



percent

Ex. 5.2.7. If 60% of the price of a snowmobile helmet is \$120, what is the full price of the helmet?

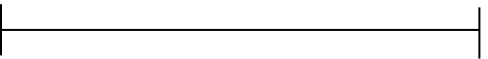
numbers



percent

Ex. 5.2.8. If 40% of the price of a skateboard is \$80, what is the full price of the skateboard?

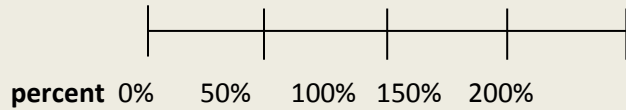
numbers



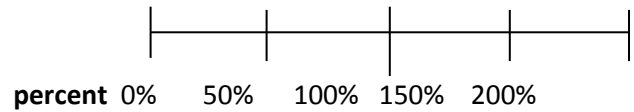
percent

5.2. Using **percent number line... greater than 100%**

Ex how much a shirt is marked up in a store

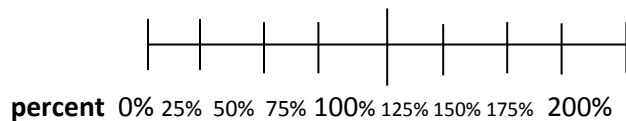
numbers

5.2.9. What is 150% of 90?

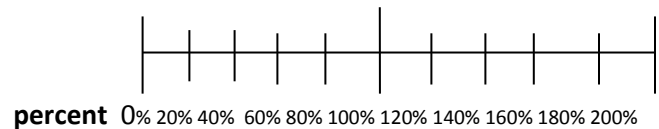
numbers

5.2.10. What is 175% of 90?

157.5

numbers

5.2.11. If 140% is 280, what is the original price? 200

numbers

5.3 Solving percent problems

NOTE : KEEP = signs lined up under each other

total part

Ex. 5.3. 20% of 200 is what number?

SOLUTION identify total and part above

$$20\% \times 200 = x \quad \text{write equation using percent}$$

$$0.20 \times 200 = x \quad \text{change percent to decimal}$$

$$40 = x \quad \text{solve for } x$$

box final answer

Ex. 5.3.1 40% of 120 is what number? 48

Ex. 5.3.2. 15% of 60g is what number? 9g

Ex. 5.3.3. 18% of 90 cm is what number? 16.2cm

<p style="text-align: center;">total part</p> <p>Ex. 5.3. 20% of what number is 200?</p> <p>SOLUTION identify <u>total</u> and <u>part</u> above $20\% x = 200$ write equation using percent</p> <p>$0.20x = 200$ change percent to decimal</p> <p>$\frac{0.20 x}{0.20} = \frac{200}{0.20}$ get variable by itself</p> <p>$x = 1000$ solve for x box final answer</p>	<p>Ex. 5.3.4 60% of what number is 150? 250</p>
<p>Ex 5.3.5 25% of what number is 125. 500</p>	<p>5.3.6 11% of what number is 99? 900</p>

5.3B.1.1 Percent change

Positive means **percent increase** OR **increase in size**

FORMULA

$$\text{PERCENT CHANGE} = \frac{\text{NEW} - \text{OLD}}{\text{OLD}} \times 100$$

Ex. 1 A tree is 5 m tall. Three years later it is 8 m tall. What is the percentage change

SOLUTION identify new and old

OLD = 5m

NEW = 8 m line up = signs

$$\text{Percentage CHANGE} = \frac{\text{NEW} - \text{OLD}}{\text{OLD}} \times 100 \text{ formula}$$

$$= \frac{8-5}{5} \times 100 \text{ substitution}$$

$$= \frac{+3}{5} \times 100 \text{ solve BEDMAS}$$

$$= +0.6 \times 100$$

Answer is a **percent** = +60%

60% INCREASE

Ex. 5.3B.1.1. In 2014, there were 150 girls at Xavier. Today there are 185 girls here. What is the percentage change? (round to nearest tenth) **+23.3%**

5.3B.1.3 There was a 9% jump in sales of snowmobiles in 2015. If there are 100 000 snowmobiles sold in 2014, how many are sold in 2015?

SOLUTION

$$\begin{aligned} &9\% \text{ of } 100\,000 \\ &= 0.09 \times 100\,000 \\ &= 9\,000 \text{ snowmobiles} \end{aligned}$$

$$\begin{aligned} &\text{Snow mobiles sold in 2015} \\ &= 100\,000 + 9\,000 \\ &= 109\,000 \text{ snowmobiles sold} \end{aligned}$$

5.3B.1.2 Population in Deer lake in 2006 was 4826. Today, there are 5000 people here. What is the percentage change? (round to nearest tenth) **+3.5%**

53B.2 Percent change

Negative means **percent decrease OR shrinkage OR reduction**

Ex. 1 A tree is 5 m tall. Three years later it is 8 m tall. What is the percentage change

SOLUTION identify new and old

OLD = 5m

NEW = 8 m line up = signs

Percentage CHANGE = $\frac{NEW-OLD}{OLD} \times 100$ formula

$$= \frac{8-5}{5} \times 100 \text{ substitution}$$

$$= \frac{+3}{5} \times 100 \text{ solve BEDMAS}$$

$$= +0.6 \times 100$$

Answer is a **percent** = + 60%

60% INCREASE

Ex. 5.3B.1.1.

The price of gasoline went from \$1.10 per litre to \$0.98 per litre this year. What was the percentage change? (round to nearest tenth) **-10.9%**

Ex. 53B.12

If last month sales were \$15, 000. If there were 20 decrease in sales this month, how much sales were there?

Ex. 53B.13

If the yearly sales in 2014 was \$305, 000. You predict the sales for 2020 will be \$412, 000. What is the percentage increase?

5.4 SALES TAX	
<p>Taxes vary from province to province NL Sales TAX = 13% REMEMER to round to nearest dollar and cent.</p>	<p>SEE table of Provincial TAXES on <u>page 256</u> of TEXT- Math Makes Sense 8</p>
<p style="text-align: center;">NO SALE</p> <p>Original price (OP): original price of item (no sale)</p> <p>Tax: TAX = TAX % of OP</p> <p>Final sales price (FP): The amount you pay at the cashier</p> <p>FP = OP + TAX_{on OP}</p>	<p style="text-align: center;">SALE</p> <p>OP</p> <p>Discount (D): <i>amount</i> taken off an item due to a sale</p> <p>D = SALE% of the OP</p> <p>Discount Price (DP): the reduce price on a sale's tag after discount has been removed</p> <p>DP = OP – D</p> <p>TAX: TAX = TAX % of PD</p> <p>Final sales price (FP):</p> <p>FP = DP + TAX_{on DP}</p>
<p>Ex. 5.4.1 You are buying a \$30.00 shirt in NL. What is the final sales price, including taxes? (to the nearest cent)</p> <p>OP= 30.00 NO SALE</p> <p>TAX = TAX of OP = 13% of 30.00 = 0.13 x 30.00 = 3.9 on calculator Approx 3.90 in cents</p> <p>FP = OP + Tax = 30.00 + 3.90 = \$33.90</p> <p>The shirt would cost \$33.90. statement</p>	<p>Ex. 5.4.1.1 You are buying a \$59.99 video game in NL. What is the final sales price, including taxes? 67.79</p>

Ex. 5.4.2

There is a 20% sale on a movie normally costing \$22.99. If bought in NL, what would the final sales price be?

$$OP = \$22.99 \quad \text{SALE}$$

$$\begin{aligned} D &= 20\% \text{ of } 22.99 \\ &= 0.20 \times 22.99 \\ &= 4.598 \quad \text{round to nearest hundredth} \\ \text{Approx } &4.60 \end{aligned}$$

$$\begin{aligned} DP &= OP - D \\ &= 22.99 - 4.60 \\ &= 18.39 \end{aligned}$$

$$\begin{aligned} \text{TAX} &= \text{Tax of DP} \\ &= 13\% \text{ of } 18.39 \\ &= 0.13 \times 18.39 \\ &= 2.3907 \quad \text{on calculator} \\ \text{Approx } &2.39 \quad \text{in cents} \end{aligned}$$

$$\begin{aligned} FP &= DP + \text{Tax} \\ &= 18.39 + 2.39 \\ &= \boxed{\$20.78} \end{aligned}$$

The movie would cost \$33.90. statement

5.4.2.1

If boots costing \$312.00 were bought when there was a 35% sale on in the store. How much would be paid at the register, tax included if bought in NL?

5.4.2.2

If the discount price was \$18.25, what is the original price if it was bought during a 20% sale?

Ex.5.4.2.3 If an ipad cost \$150.99 in NL.

A) What is the tax on this item?

$$\begin{aligned} \text{Tax} &= 13\% \times 150.99 \\ &= 0.13 \times 150.99 \\ &= 19.6287 \text{ on calculator} \\ &\doteq \$19.63 \text{ money} \end{aligned}$$

B) What is the final sales price?

$$\begin{aligned} \text{FP} &= \text{OP} + \text{TAX} \\ &= 150.99 + 19.63 \\ &\doteq \$170.62 \end{aligned}$$

C) If you were NOT asked to find tax:

REMEMBER: When you buy an item you pay: 100% of price +13% tax = **113%**

$$\begin{aligned} \text{SO FP} &= 113\% \times \text{OP} \\ &= 113\% \times 150.99 \\ &= 1.13 \times 150.99 \\ &= 170.6187 \\ &\doteq \$170.62 \end{aligned}$$

EX.5.4.2.4 If a 40% sale is on snowmobile mitts. If a pair cost \$259.00:

A) What is the discount?

$$\begin{aligned} \text{D} &= 40\% \text{ of } 259.00 \\ &= 0.40 \times 259.00 \\ &= 103.6 \text{ calculator} \\ &\doteq \$103.60 \text{ money} \end{aligned}$$

B) What is the discount price?

$$\begin{aligned} \text{DP} &= \text{OP} - \text{D} \\ &= 259.00 - 103.60 \\ &= 155.4 \text{ calculator} \\ &\doteq \$155.40 \text{ money} \end{aligned}$$

C) What is the tax?

$$\begin{aligned} \text{TAX} &= 13\% \text{ of } 155.40 \\ &= 0.13 \times 155.40 \\ &= 20.202 \\ &\doteq \$20.20 \end{aligned}$$

D) What is the final sales price?

If you found sales tax

$$\begin{aligned} \text{FP} &= \text{DP} + \text{TAX} \\ &= 155.40 + 20.20 \\ &= 175.6 \\ &\doteq \$175.60 \end{aligned}$$

OR

If you are NOT asked for sales tax:

REMEMBER: When you buy an item you pay 100% of price +13% tax = **113%**

$$\begin{aligned} \text{FP} &= 113\% \times \text{DP} \\ &= 1.13 \times 155.40 \\ &= 175.602 \\ &\doteq \$175.60 \end{aligned}$$

same

\$175.60

5.4 Solving rates**Ratio** part : total (same units)**Rate** Part : part (different units)**Unit rate:** the cost of 1 item

Ex. 5.4.1 use equivalent fractions

PAINT A 3 parts white 5 parts green

PAINT B 7 parts white 10 parts green

A) Which is the darker paint?

B) Which is the lighter paint?

Ex. 5.4.1 using equivalent fractions

PAINT A 8 parts white 5 parts blue

PAINT B 10 parts white 6 parts blue

A) Which is the darker paint?

PAINT A **PAINT B**

$$\begin{array}{l} \text{white} \\ \text{blue} \end{array} \quad \frac{8}{5} \quad \bigcirc \quad \frac{10}{6} \quad \text{CD} = \underline{30}$$

$$\begin{array}{l} \text{white} \\ \text{blue} \end{array} \quad \frac{48}{30} \quad \bigcirc \quad \frac{50}{30}$$

Darker paint has LESS WHITE

SO $48 < 50$ so paint A is DARKER

B) Which is the lighter paint?

PAINT A **PAINT B**

$$\begin{array}{l} \text{blue} \\ \text{white} \end{array} \quad \frac{5}{8} \quad \bigcirc \quad \frac{6}{10} \quad \text{CD} = \underline{40}$$

$$\begin{array}{l} \text{blue} \\ \text{white} \end{array} \quad \frac{25}{40} \quad \bigcirc \quad \frac{24}{40}$$

LIGHTER paint has LESS BLUE

SO $24 < 25$ so paint A is DARKER

Setting up RATES

If you can get 3 kg of grapes cost \$6.57, how much does 5 kg cost?

Words first $\frac{kg}{\$} \quad \frac{3}{6.57} \quad \frac{5}{x}$

Cross multiply $3x = 5 \times 6.57$

Solve for x $\frac{3x}{3} = \frac{32.85}{3}$

Divide BOTH sides by 3
 $x = \$10.95$

5.4.2 Ex. using cross multiplication

A blueprint on a house has a room of length 6 cm by width 10 cm. If the room is actually 5 m wide, how long is the room?

5.5 WORD PROBLEMS: different units RATE

5.5.1 Ex. If in a picture, a man is 9 cm and his daughter was 6 cm tall, how tall is the daughter if the man if the man is 1.8 m tall in real life?

MAN DAUGHTER
 $\frac{\text{picture cm}}{\text{real m}} \quad \frac{9}{1.8} = \frac{6}{x}$

$$\frac{9x}{9} = \frac{10.8}{9}$$

$$x = 1.2 \text{ m}$$

OR

PICTURE_(cm) REAL_(m)
 $\frac{\text{daughter}}{\text{man}} \quad \frac{6}{9} = \frac{x}{1.8}$

$$\frac{9x}{9} = \frac{10.8}{9}$$

$$x = 1.2 \text{ m}$$

5.5.2 Ex. Different units

For toothpaste it costs:

50 ml \$1.03

100 ml \$2.10 Which is the **better buy**?

150 ml \$3.03

5.5.2 Ex. Different units

For toothpaste it costs:

50 ml \$1.03

100 ml \$ 2.10 Which is the **better buy?**150 ml \$3.03 **the CHEAPEST**

$$\frac{\$}{mL} \frac{1.03}{50} = \$0.0206 /mL$$

$$\frac{\$}{mL} \frac{2.10}{100} = \$0.21 /mL$$

$$\frac{\$}{mL} \frac{3.03}{150} = \boxed{\$0.0202 /mL} \text{ **BETTER BUY!**}$$

5.6. Ex. TREE height last year is 7 m. This year it is 10 m tall. What is the percentage change?

New = 10 **identify NEW and OLD**

OLD = 7

$$\% \text{ CHANGE} = \frac{NEW-OLD}{OLD} \times 100 \quad \text{formula}$$

$$= \frac{10-7}{7} \times 100 \quad \text{substitution}$$

$$= \frac{3}{7} \times 100 \quad \text{simplify numerator}$$

$$= 0.428\cdots \times 100 \quad \text{find decimal}$$

$$\doteq + 43\% \text{ change} \quad \text{find percent}$$

POSITIVE means 43% INCREASE

Ex. 5.6.1 Last week the canteen sold 60 sandwiches. This week it sold 42 sandwiches. What is the percent change?

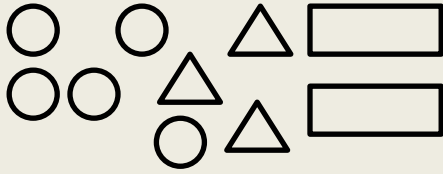
NEW = _____

OLD = _____

Ex. 5.6.2 There were 4950 people in Deer Lake in 2010. Today there are 12% more. How many people in Deer Lake now?

5.7 Comparing ratios

Ex.



Ratios

Circles: rectangles
= 5:2

Circles: triangles : rectangles
= 5 : 3 : 2

Circles and triangles compared to rectangles
= 5 + 3 : 2
= 8:2 *reduce*
= 4:1

Circles : total shapes
=5: 10 *reduce*
= 1:2

Ex. 5.7.1

Items marbles

4 red, 6, blue, 10 white

Ratios

- A) RED: BLUE
- B) BLUE: WHITE
- C) BLUE: RED: WHITE
- D) RED and BLUE: WHITE
- E) WHITE: TOTAL

REMEMBER:

ONLY **RATIOS** which compare **part to TOTAL**
can be **converted into a percent**.

part: part ratios **cannot** be converted into
a percentage.