

New Bedford Public Schools
Division of Adult & Continuing Education

New Bedford High School Evening Extension

2019 – 2020 School Year
Trimester III

Learning Packet
for
Quantitative Reasoning

Teacher: *Mr. Charles Eastman*
Mathematics Department
New Bedford High School
230 Hathaway Boulevard
New Bedford, MA 02740
ceastman@newbedfordschools.org

Email Mr. Eastman with questions/concerns regarding
this packet at the email address listed above.

Due date: April 7, 2020

Hot Wheels: Activity 1



You have finished car shopping and have found the perfect car. After negotiating, the total cost of the car is \$24,000. You do not have the cash, but have been approved for financing.

Financing Options

Local Bank

Option 1: 4.9% compound interest for 5 years

Option 2: 3.9% compound interest for 4 years

Car Dealer

Option 3: 0% compound interest for 3 years

Option 4: 5.9% compound interest for 6 years.

List the three basic components of a loan.

Which option do you think is the best deal and why?

You have a budget for car payments of \$350 a month. Do you think you can afford this car? How?

Interest Rates in the Real World-Buying a Used Car

New Material:

When you buy a car or a house, your monthly payment is calculated by a method called *amortization*. Amortization is the process of paying off a debt by making a given number of equal payments at specified intervals (usually monthly). These payments include the compound interest. With each payment, the amount of interest declines (as the unpaid balance on the loan declines), while the amount paid toward principal increases. If equal payments are made monthly, then the payment amount is calculated according to the following formula:

$$payment = LoanAmount \times \frac{InterestRate}{12} \times \frac{1}{1 - \left(1 + \frac{InterestRate}{12}\right)^{-12t}}$$

where t is the number of years to repay the loan.

The preceding monthly payment formula looks pretty formidable, but if we use some variables and do a little algebra, it begins to look a bit better. Let P represent the amount borrowed (the *principal*), and m represent the *monthly* interest rate (that is, $m = \text{interest rate}/12$). Then your monthly payment is given by

$$payment = \frac{P \cdot m}{1 - (1 + m)^{-12t}}$$

Consider an example. Your rich (and generous) uncle agrees to lend you \$3000 at the incredibly low interest rate of 3%, amortized over 2 years. Your monthly interest rate is $0.03/12 = 0.0025$, and your monthly payment is

$$payment = \frac{(3000)(0.0025)}{1 - 1.0025^{-24}} = 128.94(\text{dollars}).$$

How do you figure out how much of each payment goes to interest and how much to principal? Each month you must calculate the interest on the current loan balance. If the monthly interest rate is 0.0025 and the initial balance is \$3000, then the first month's interest is \$7.50. So of the first payment, only \$121.44 is applied toward the principal, leaving a new balance of \$2878.56. Using the monthly interest rate of 0.0025 on this new balance gives a second month's interest of \$7.20. So, \$121.74 is applied toward principal, leaving a new balance of \$2756.82.

Hot Wheels: Activity 2a

You need to compare the different financing options to get the best deal. Assume you have no cash and will be financing all of the new car worth \$24,000.

Local Bank

Option 1: 4.9% compound interest for 5 years

Option 2: 3.9% compound interest for 4 years

Option 1

Find the monthly payment

Find the total amount to be repaid.

How much is the total interest?

Option 2

Find the monthly payment

Find the total amount to be repaid.

How much is the total interest?

Which option has the lower monthly payment? Which option has a lower total cost? Why?

Hot Wheels: Activity 2b

Car Dealer

Option 3: 0% compound interest for 36 years
Option 4: 5.9% compound interest for 72 years.

Option 3

Find the monthly payment

Find the total amount to be repaid.

How much is the total interest?

Option 4

Find the monthly payment

Find the total amount to be repaid.

How much is the total interest?

Which option has the lower monthly payment? Which option has a lower total cost? Why?

Hot Wheels: Compare

Fill in the chart below displaying your results for the four different options..

Chart 1

Option	Annual Interest Rate (%)	Term (Months)	Monthly Payments	Total Cost of Car (\$)
1				
2				
3				
4				

Referring to Chart 1, which option,

Has the lowest monthly payments?

Has the lowest total cost of the car?

Do you think that the lowest total payment always results in a lower total cost?

Hot Wheels: Reality

After all your hard work negotiating your dream car to \$24,000, you now realize you cannot afford it. The car dealer really wants your business and asks you how much you can afford each month. You tell him about \$350 a month. He walks off to his manager's office and comes back with the paper work.

If your monthly car payment is \$350 and it is for 9 years, how much is the compound interest?

What is the total cost of the car?

Is this a good deal?

You decide you want to finance the \$24,000 car for 6 years at 5.9%. To keep your monthly payments at \$350, how much of a down payment will you need?

Name: _____

Markups & Markdowns Word Problems

1. A computer software retailer used a mark up of 150%. Find the cost of the computer game that cost the retailer \$25.
2. An item originally priced \$55 is marked 25% off. What is the sale price?
3. A man wants to buy a new winter coat and finds one he really likes, but it is too expensive at \$139. So he decides to wait. After thanksgiving, the price of the coat is marked down 35%. How much would the coat cost after thanksgiving?
4. Abby Matthews, store manager for Macy's, does not know how to price a refrigerator that cost \$900. She knows her boss wants a 140% mark up on the cost. Help Abby markup the cost of the refrigerator.
5. Kathy buys a bicycle after a 30% markdown. The original price was \$490.00. What did she pay?
6. A Hummer costs the dealer \$57,915. The dealer has a 15% markup. How much would you have to pay to own the Hummer?
7. A jeweler adds a 120% markup to a ring. If it originally cost \$100, how much would a customer pay for the ring?
8. Dunkin Donuts makes its doughnuts for \$2.00 each. DD wants a 50% markup on the cost. How much should each doughnut cost?

Name _____

Date _____

Markups and Markdowns Word Problems - Independent Practice Worksheet

Solve problems below:

1) A painting is on sale at 50% off. The sale price is \$320. What was the original price?

2) Fred buys a video game disk for \$4. There was a discount of 20%. What is the sales price?

3) A boat is marked up 20% on the original price. The original price was \$50. What is the sale price of the boat before sales tax?

4) A football is selling for 35% off the original price. The original price was \$60. What is the sale price of the football?

5) Timmy wants to buy a scooter and the price was \$50. When he goes to the store a second time, he found that price was marked down by 20%. What is the new price?

6) Andrew paid \$10 for a burger. The burgers went on sale and there was a discount of 20%. What was the sale price of the burgers?



7) Emily buys a toaster during the sale for 10% off. If Ellen pays \$36, what was the original price?

8) Zack has an old car. He wants to sell it for 60% off the current price. The market price is \$500. How much money would he receive in exchange for the car if he were able to sell it at that rate?

9) Drew bought a chemistry book for \$30. Later that book was marked down by 20%. By how much has the value been decreased?

10) What is the original price if there is a 10% discount and the sale price is \$76.50?



Quantitative Reasoning
Markup Costs

Name: _____ Date: _____

1. Fill in the answer to the question below.

Cost of Goods	Markup	Retail Sales Price	Profit
\$14	6%		
	8%	\$50	
\$60	18%		
\$150	10%		
	7%	\$298	
\$359	9%		
\$400	8%		
	5%	\$623	
\$1,000	2%		
\$25,323	5%		

2. Cost and markup on cost for each item is given. Find the retail price.

Computer cost = \$ 800 markup = 35% retail price = _____

Refrigerator cost = \$1100 markup = 28% retail price = _____

Coat cost = \$55 markup = 100% retail price = _____

3. Retail price and markup on retail for each item is given. What is the cost for each item?

Table retail = \$650 markup = 45% cost = _____

Boots retail = \$220 markup = 40% cost = _____

Desk retail = \$1000 markup = 50% cost = _____

4. Cost and markup on retail is given for the following items. Find the retail price.

Shoes cost = \$45 markup = 38% retail price = _____

TV cost = \$180 markup = 60% retail price = _____

Lamp cost = \$95 markup = 30% retail price = _____

5. Abby Matthew, store manager for Sears, does not know how to price a refrigerator that costs \$900. Abby knows her boss wants a 40% markup on cost. What should the price of the refrigerator be?

6. Boeing plans to increase its prices for Jetliners. With a selling price of \$201.5 million and a cost of \$190.1 million, what was the approximate percent markup based on cost?

7. A Honda Element with a dealer invoice price of \$19,700 was retail priced at \$23,000. How much is the approximate percent markup based on selling price?

8. A Hummer four-door costs the dealer \$57,915. The dealer has a 12.3% markup. What is the selling price of the vehicle?

9. An employee is to mark up a piece of jewelry 120%. If a necklace costs \$100, what should its selling price be?

10. A computer software retailer used a markup rate of 40%. Find the selling price of a computer game that cost the retailer \$25.

QR- Solving Problems with Percent

Tuesday, October 23, 2018 6:30 PM

Content Objective:

- ★ Students will be able to identify, explain, give examples of, summarize, ask and answer questions about, make connections to, visualize, determine the importance of, and apply what they have learned about *Solving problems with Percent.*

Homework:



Warm Up:

Solve these Proportions:

13) Castel bought four bunches of fennel for \$9.
How many bunches of fennel can Mofor buy
if he has \$18?

14) If you can buy one fruit basket for \$30 then
how many can you buy with \$60?

Direct Instruction / Guided Practice:

PERCENTS

You can use proportions to solve percent problems. To do so, you will need to remember this proportion:

(is)	Part	=	%
(of)	Whole		100

You can solve any percent problem using this proportion; you can use it to find the percent, the part, or the whole.

EXAMPLE 1 Finding the percent: 84 is what percent of 96?

$\frac{84}{96} = \frac{x}{100}$ The "is" (part) is 84, the "of" (whole) is 96, the percent is the unknown, and the percent is always over 100. To solve, we take the cross product of the two numbers across from each other: 84 times 100, which is 8400, and then we divide by the third number (96).

1) 35 is what percent of 700? _____

EXAMPLE 2 Finding the part: What is 15% of 84?

$\frac{x}{84} = \frac{15}{100}$ The "is" (part) is the unknown, the "of" (whole) is 84, the percent is 15, and the percent is always over 100. To solve, we take the cross product of the two numbers across from each other: 84 times 15, which is equal to 1260, and then we divide by the third number (100).

2) What is 25% of 36? _____

EXAMPLE 3 Finding the whole: 15 is 75% of what number?

$\frac{15}{x} = \frac{75}{100}$ The "is" (part) is 15, the "of" (whole) is unknown, the percent is 75, and the percent is always over 100. To solve, we take the cross product of the two numbers across from each other: 15 times 100, which is equal to 1500, and then we divide by the third number (75).

3) 48 is 80% of what number? _____

Independent / Collaborative Work:

1. What number is 70% of 45?

2. 23% of 75 is what number?

3. 45 is what percent of 90?

4) Ted's car is now worth \$9000, which is 60% of what he paid for it. What did he pay for his car?

(Hint: You can rephrase the question as: **\$9000 is 60% of what number?**)

5) The regular price of a TV is \$475. It's currently on sale for 20% off. What is the discount if you bought the TV during the sale? _____

(Hint: You can rephrase the question as: **What is 20% of \$475?**)

6) John needs \$8000 to buy a car. So far, he has saved \$5600. What percent of the price of the car has he saved? _____

(Hint: You can rephrase the question as: **\$5600 is what percent of \$8000?**)

Summarizer:

Summary: Every statement of percent can be expressed verbally as: "*One number is some percent of another number.*" Percent statements will always involve three numbers. Given two of these numbers, we can find the third by substituting into one of the proportions below.

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100} \quad \text{OR} \quad \frac{\text{IS (part)}}{\text{OF (whole)}} = \frac{\text{PERCENT}}{100}$$

In this lesson, we solved percent problems using proportions by following this procedure:

1. Read the percent problem.
2. Identify what information is given.
3. Identify what information is unknown.
4. Use a variable to represent the unknown quantity.
5. Set up a proportion for the problem by substituting the given information and the variable into one of the proportions listed above.
6. Evaluate and solve the proportion in Step 5 to find the unknown quantity.

Homework:



QR – Percentage Increases and Decreases with Proportions

Tuesday, October 23, 2018 6:30 PM

Content Objective:

- ★ Students will be able to identify, explain, give examples of, summarize, ask and answer questions about, make connections to, visualize, determine the importance of, and apply what they have learned about *to solve Percentage problems with Proportions*

Homework:



Warm Up:

18. During a flu epidemic, 146 students out of the 680 who attend Lincoln Middle School were absent. What percent were absent?

Direct Instruction / Guided Practice:

You can use proportions to solve percent problems. To do so, you will need to remember this proportion:

(is)	<u>Part</u>	=	<u>%</u>
(of)	Whole		100

Finding the Original Price after a Percentage Decrease:

1. Subtract the Discount from 100 to get the percentage of the Original price.
2. The Discount Price is "*part*" of the whole price.
3. Substitute the Percentage and Discount price in the Proportion and solve for the Whole Price.

Example:

Do Together:

1. If Peter pays \$84 to buy a watch after a discount of 20%, find the original price of the watch.

You do:

2. The price of a math book after a discount of 25% is \$36. What is the original price of the math book?

Independent / Collaborative Work:

5. Find the original price of a motorbike if you got a 10% discount and paid a final price of \$2160 for it.
6. What is the original price of an apple if you got a 20% discount and paid \$1 for it?
7. Mike bought an item for \$14,000 after a discount of 30%. What was the original price of the item Mike bought?
8. If a Play Station was bought for \$450 after a 10% discount, what was the original price of the Play Station?
9. What is the original price of a TV set if you paid \$1035 for it after a discount of 10%?
10. If you get 15% discount and pay \$340 for a telephone, what is its original price?

Summarizer:

Homework:



Ratios and Proportions – Proportions and Rates

Tuesday, October 23, 2018 6:30 PM

Content Objective:

- ★ Students will be able to identify, explain, give examples of, summarize, ask and answer questions about, make connections to, visualize, determine the importance of, and apply what they have learned about *Proportions and how to solve them*.

Homework:



Warm Up:

Find x

$$\frac{x}{x + 20} = \frac{24}{54}$$

Direct Instruction / Guided Practice:

Definition:

A **proportion** is an **equation** stating that two ratios are equivalent (equal), written in the form $\frac{a}{b} = \frac{c}{d}$.

Proportions always have an equal sign!

A proportion can be written in two forms: $\frac{a}{b} = \frac{c}{d}$ or $a : b = c : d$

For example, $\frac{6}{9} = \frac{2}{3}$ can also be written as $6 : 9 = 2 : 3$

where both are read "6 is to 9 as 2 is to 3".

A proportion on the other hand is an equation that says that two ratios are equivalent. For instance if one package of cookie mix results in 20 cookies than that would be the same as to say that two packages will result in 40 cookies.

$$\frac{20}{1} = \frac{40}{2}$$

A proportion is read as "x is to y as z is to w"

$$\frac{x}{y} = \frac{z}{w} \text{ where } y, w \neq 0$$

State if each pair of ratios forms a proportion.

1) $\frac{4}{2}$ and $\frac{20}{6}$

2) $\frac{3}{2}$ and $\frac{18}{8}$

3) $\frac{4}{3}$ and $\frac{16}{12}$

4) $\frac{4}{3}$ and $\frac{8}{6}$

If one number in a proportion is unknown you can find that number by solving the proportion.

Example

You know that to make 20 pancakes you have to use 2 eggs. How many eggs are needed to make 100 pancakes?

	Eggs	pancakes
Small amount	2	20
Large amount	x	100

$$\frac{\text{eggs}}{\text{pancakes}} = \frac{\text{eggs}}{\text{pancakes}} \text{ or } \frac{\text{pancakes}}{\text{eggs}} = \frac{\text{pancakes}}{\text{eggs}}$$

If we write the unknown number in the nominator then we can solve this as any other equation

$$\frac{x}{100} = \frac{2}{20}$$

Multiply both sides with 100

$$100 \cdot \frac{x}{100} = 100 \cdot \frac{2}{20}$$

$$x = \frac{200}{20}$$

$$x = 10$$

If the unknown number is in the denominator we can use another method that involves the cross product. The cross product is the product of the numerator of one of the ratios and the denominator of the second ratio. The cross products of a proportion is always equal

If we again use the example with the cookie mix used above

$$\frac{20}{1} = \frac{40}{2}$$

$$1 \cdot 40 = 2 \cdot 20 = 40$$

Solve each proportion.

$$1) \frac{10}{8} = \frac{n}{10}$$

$$2) \frac{7}{5} = \frac{x}{3}$$

$$3) \frac{9}{6} = \frac{x}{10}$$

$$4) \frac{7}{n} = \frac{8}{7}$$

Answer each question and round your answer to the nearest whole number.

1) If you can buy one can of pineapple chunks for \$2 then how many can you buy with \$10?

2) One jar of crushed ginger costs \$2. How many jars can you buy for \$4?

Independent / Collaborative Work:

- 3) One cantaloupe costs \$2. How many cantaloupes can you buy for \$6?
- 4) One package of blueberries costs \$3. How many packages of blueberries can you buy for \$9?
- 5) Shawna reduced the size of a rectangle to a height of 2 in. What is the new width if it was originally 24 in wide and 12 in tall?
- 6) Ming was planning a trip to Western Samoa. Before going, she did some research and learned that the exchange rate is 6 Tala for \$2. How many Tala would she get if she exchanged \$6?
- 7) Jasmine bought 32 kiwi fruit for \$16. How many kiwi can Lisa buy if she has \$4?
- 8) If you can buy four bulbs of elephant garlic for \$8 then how many can you buy with \$32?
- 9) One bunch of seedless black grapes costs \$2. How many bunches can you buy for \$20?
- 10) The money used in Jordan is called the Dinar. The exchange rate is \$3 to 2 Dinars. Find how many dollars you would receive if you exchanged 22 Dinars.

Summarizer:

Answer each question. Round your answer to the nearest tenth. Round dollar amounts to the nearest cent.

- 15) Asanji took a trip to Mexico. Upon leaving he decided to convert all of his Pesos back into dollars. How many dollars did he receive if he exchanged 42.7 Pesos at a rate of \$5.30 = 11.1 Pesos?
- 16) The currency in Argentina is the Peso. The exchange rate is approximately \$3 = 1 Peso. At this rate, how many Pesos would you get if you exchanged \$121.10?
- 17) Mary reduced the size of a painting to a width of 3.3 in. What is the new height if it was originally 32.5 in tall and 42.9 in wide?
- 18) Molly bought two heads of cabbage for \$1.80. How many heads of cabbage can Willie buy if he has \$28.80?

Homework: