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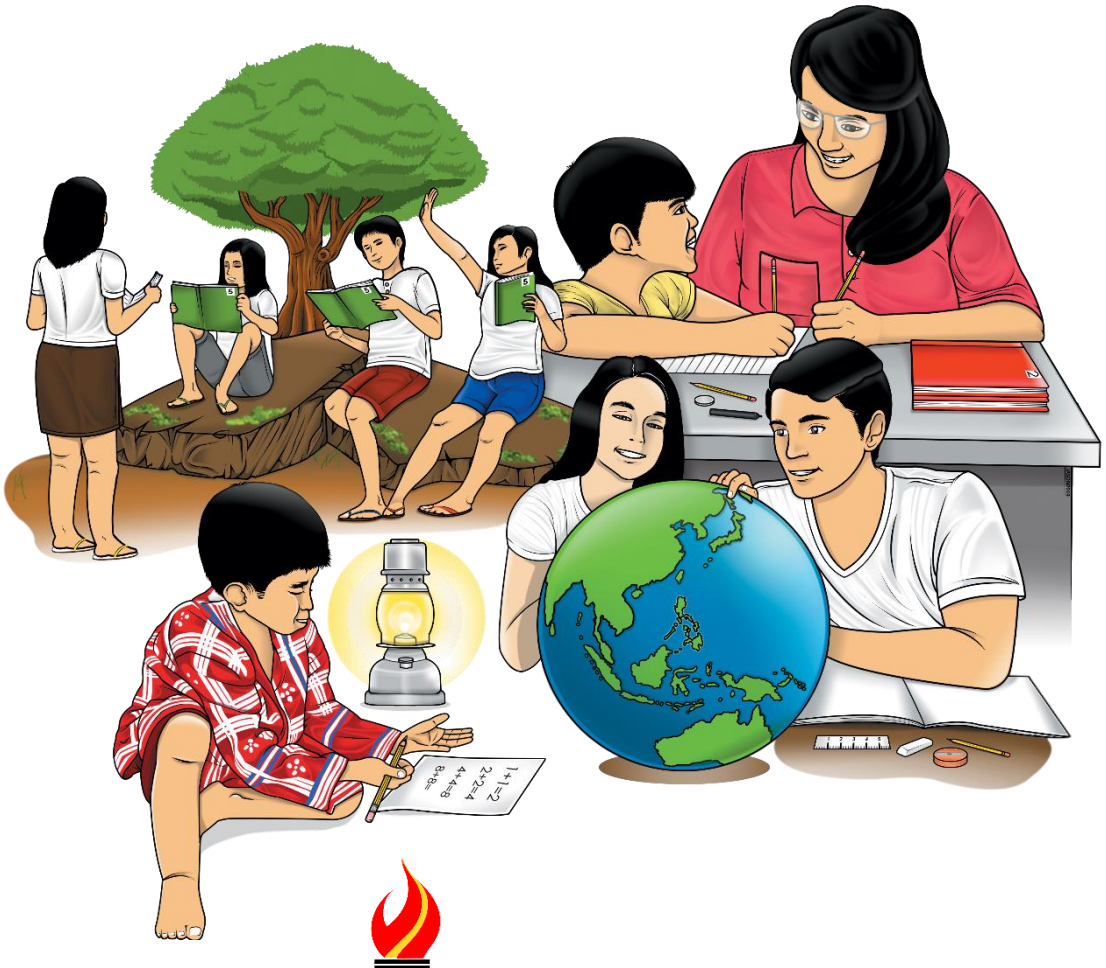
Mathematics

Quarter 3 – Module 2:
Defining Percentage, Rate and Base



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Development Team of the Module

Writers: Nikolai S. Aralar, Maria Niann L. Atis

Editors: Virginia A. Millares, Elizabeth Mandreza

Reviewers: Renato S. Cagomoc, Rolando Lacbo, Joshua Sherwin T. Lim

Illustrator: Rose Ann M. Nzareno, Salvacion Sarmiento

Layout Artist: Razle L. Jabelo, Jaycee B. Barcelona

Management Team: Ma. Gemma M. Ledesma, Arnulfo R. Balane, Rosemarie M. Guino
Joy B. Bihag, Ryan R. Tiu, Sarah S. Cabaluna,
Thelma Cabadsan-Quitalig, Elena S. De Luna,
Renato S. Cagomoc, Noel E. Sagayap, Geraldine P. Sumbise
Joshua Sherwin T. Lim

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Department of Education – Region VIII

Office Address: DepEd Regional Office No. 8
Candahug, Palo, Leyte
Telefax: (053)-832-2997
E-mail Address: region8@deped.gpv.ph

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Mathematics

Quarter 3 – Module 2:
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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

Hi, Mathletes! In this module, you will gain understanding about percentage, rate or percent and base. These terms are commonly used everywhere, such as in food shops, grocery stores, internet, and advertisements. Understanding these terms will help you identify them in a given problem. To understand percentage, rate and base, you need to use your knowledge of fractions, ratios and decimals. Also, understanding proportional relationships is needed in this lesson.

After going through this module, you are expected to:

1. define percentage, rate, and base.

Are you ready to begin? Let us check what you know about percentage, rate and base.

What I Know

Directions: Write the letter that corresponds to the correct answer.

1) Which represents rate in the statement *25 is 25% of 100*?
   A. 25 C. 100
   B. 25% D. 250

2) What do you call 60 in the statement *15 is 25% of 60*?
   A. base C. percent
   B. rate D. percentage

3) In the phrase *20% of 90*, what is 20%?
   A. base C. percent
   B. rate D. percentage

4) Is the statement *30% of 150 is 20* **TRUE**?
   A. Possible C. Maybe
   B. Yes D. No

5) What is 250 in the statement *24% of 250 is 60*?
   A. base C. percent
   B. rate D. percentage

6) What term refers to the comparison of the percentage to the base expressed in percent?
   A. base C. percent
   B. rate D. percentage

7) What do you call the quantity that represents the whole?
   A. base C. percent
   B. rate D. percentage

8) Which term is described as the quantity that is part of the base?
   A. base C. percent
   B. rate D. percentage

9) Which represents base in *30% of 300 is 90*?
   A. 30 C. 300
   B. 90 D. 30%

10) Which statement is **TRUE**?
   A. Percentage is part of a whole. C. Base is part of a portion.
   B. Percentage is part of portion. D. Base is part of a whole.

Please check your answers against the answer key on page 13.

Lesson 1 Defining Percentage, Rate and Base

In this module, you will learn how to define percentage, rate and base. Are you excited to learn? Let's go ahead and discover.

What's In

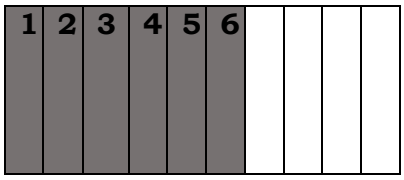
Can you still recall the steps in visualizing percent and its relationship to fractions, ratios and decimals using models?

We have known in the previous lessons that percent is a part of a hundred. It came from the Latin phrase per centum, which means per hundred. In Mathematics, we can easily spot percent because it uses the symbol %.
Consider the sample situation below:

Example 1:

A furniture maker cut a big chunk of wood and divided it equally into 10 pieces. Six of them were painted gray and 4 were left in its original color. What part of the whole wood are painted pieces? Represent this part in fraction, decimal, ratio, and percent.

This illustration shows that the shaded rectangles represent the painted pieces of wood and the non-shaded rectangles represent the unpainted parts. Let us represent the ratio of the shaded part to the whole or total number of parts.



Represent this figure in fraction: $\frac{6}{10} \div \frac{2}{2} = \frac{3}{5}$

Represent this figure in decimal:

$$\frac{6}{10} = \mathbf{0.6}$$

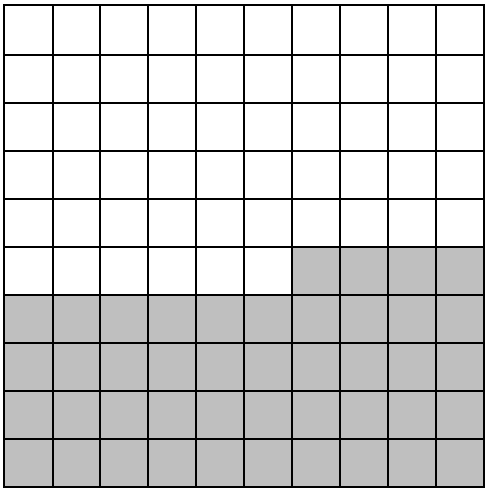
Represent this figure in ratio: **6:10**
Represent this figure in percent:

$$\frac{6}{10} = \frac{60}{100} = \mathbf{60\%}$$

Therefore, 60% of the 10 pieces of wood are painted.

Example 2:

A square swimming pool has a 10 x 10 grid of tiles artistically arranged on its floor area. The grid is composed of blue and white tiles. The shaded squares represent the blue tiles and the non-shaded squares represent the white tiles. Express the shaded area as a fraction, a decimal, and a percent of the whole. Express the fraction in lowest terms.



Fraction: $\frac{44}{100} \div \frac{4}{4} = \frac{11}{25}$

Decimal: $\frac{44}{100} = 0.44$

Ratio: 44:100

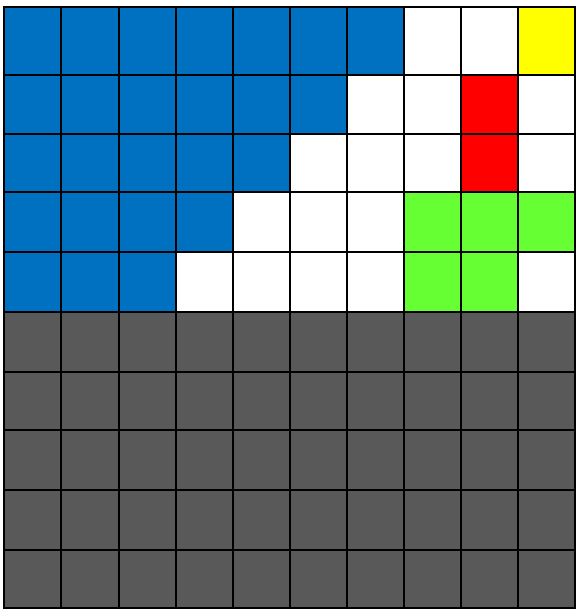
Percent: $\frac{44}{100} = 44\%$

Therefore, 44% of the 10 x 10 grid of tiles are colored blue.

Try the activity below.

The grid below has 100 cells.

- Each cell or square is equal to 1% of the whole (the yellow cell is 1%).
- Two cells are equal to 2% (the red cells).
- Five cells are equal to 5% (the green cells).
- Twenty-five cells (blue cells) are equal to 25% of the whole or one quarter $\left(\frac{1}{4}\right)$.
- Fifty cells (gray cells) are equal to 50% of the whole or half $\left(\frac{1}{2}\right)$.



Observe closely. How many unshaded cells are there? What is the percentage of unshaded cells?

There are two ways:

1. Simply count the unshaded cells.
2. Count all the shaded cells, and subtract the sum number from 100.

1 yellow, 2 red, 5 green, 25 blue and 50 gray. That is a total of 83.

So, **100 – 83 = 17**. Therefore, out of 100 cells, **17** are unshaded. Each cell represents 1%, and so, **17%** of the whole is unshaded.

What's New

In this module, you will learn how to define percentage, rate and base.

Consider the problem below

A fruit stand is selling the best variety of fruits in Calbayog City. It sells carabao mangoes for only 12 pesos each. It offers a 30% discount on the total price of the first 30 pieces if you will buy 50 piece or more. How much will you pay for 50 mangoes?

What is It

We often encounter percentage, rate and base in daily life. We see percentages as discounts in prices of clothes, shoes, meat products, grocery items and even in fruits.

Percentages are like fractions and decimals. They are ways to describe what proportion of a whole is represented by a number. **Percentage** is a term from Latin, meaning "out of one hundred". We can consider a "whole" broken up into 100 equal parts, each part is a single percent. Percentage represents a part of the base.

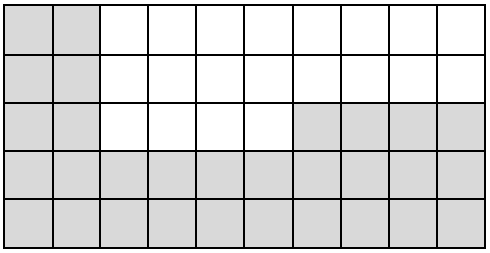
The base is the number that represents the whole or the 100 percent. The rate defines what part the percentage is of the base.

Example 1:

Let's discuss the problem from the previous part.

A fruit stand is selling the best variety of fruits in Calbayog City. It sells carabao mangoes for only 12 pesos each. It offers a 30% discount on the total price of the first 30 pieces if you will buy 50 piece or more. How much will you pay for 50 mangoes?

Let the shaded parts represent the number of Carabao mangoes with 30% discount. The unshaded parts represent the number of Carabao mangoes with fixed price of 12 pesos.



Note that the price of the Carabao mangoes is now 30% less than the original price for the first 30 pieces bought. This means that 30% of the original price is the savings that you will get.

First, get the "30%" of the total price for the first 30 pieces of mangoes you bought, which is

$$12 \times 30 = 360$$
$$30\% \text{ of } 360 = N$$

30% is 30 out of 100 and it is N out of ₱360.

Write the corresponding mathematical sentence to this, then find the value of the missing terms.

$$N \text{ out of } 360 = 30 \text{ out of } 100$$
$$N:360 = 30:100$$

By the cross-product rule (or Fundamental Law of Proportion):

$$100 \times N = 360 \times 30$$
$$100N = 10800$$
$$\frac{100N}{100} = \frac{10800}{100}$$

$$N = 108$$

The original price of the first 30 pieces of Carabao mangoes is 360. Therefore, ₱108.00 will be deducted from 360, and it is the amount that you will save.

$$360 - 108 = 252$$

The discounted price of the first 30 pieces of Carabao mangoes is 252.

Since you bought 50 Carabao mangoes and the remaining 20 pieces will cost ₱12.00 each., then the price of the remaining 20 pieces of mangoes is 240.

$$12 \times 20 = 240$$

Then add 252 + 240 = 492. Therefore, the total amount to pay for 50 Carabao mangoes is ₱492.00.

The given problem is an example of a problem on Percentage.

Percentage is a part of a whole. That whole or total is base, while the number with percent (%) symbol is the rate.

From the problem, we have learned that 30% of ₱360.00 is ₱108.00.
30% is the Rate (the expression with the % symbol)
₱108.00 is the Percentage (part of the whole; part of ₱360.00)
₱360.00 is the Base (whole or total)

Example 2:

Alegre Guitars gave out coupons to their valued customers as part of their anniversary celebration. The coupons offer 15% off of any purchase of ₱3,500.00 or more.

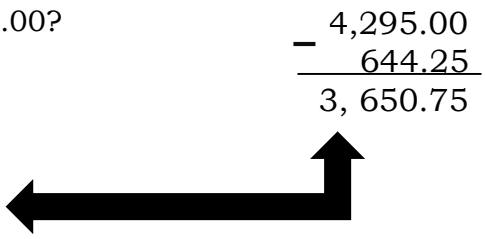
Jason wants to buy a guitar that has a price tag of ₱4,295.00. How much will Jason and his mother save from the regular price of the guitar if they use the coupon? How much will they pay for the guitar?

Remember that problems involving percentage have three quantities **percentage**, **rate** and **base**. In the problem above, 15% is the discount rate or *percent off* the purchase price. The base is the original price of the guitar which is ₱4,295.00.

The percentage is the amount that relates to the rate. It is always part of the whole. Since the rate is the *percent off*, the percentage is the *amount off* of the price. In the problem above, the percentage is unknown.

How much is 15% of ₱4,295.00?
Rate: 15%
Base: 4,295.00
Percentage: N

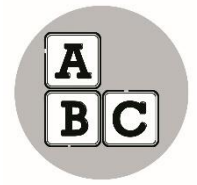
15% x 4,295.00 = *N*
0.15 x 4,295.00 = 644.25



Therefore,15% of ₱4,295.00 is ₱644.25 and this is the amount Jason and his mother will save from the guitar's original price using the discount coupon.

15% is the Rate (the expression with the % symbol)
₱644.25 is the Percentage (part of the whole; part of ₱4,295.00)
₱4,295.00 is the Base (whole or total)

So, if we deduct 644.25 from the original price ₱4,295.00, they are only going to pay ₱3,650.75 for the guitar.



What's More

Let's try the activities below.

Activity 1: Fill Me Out!

Directions: Copy the table below on your answer sheet. Identify the rate, base, and percentage in each statement. Place them in the correct columns to complete the table.

	Rate	**Base**	**Percentage**
1) 25 is 25% of 100			
2) 15 is 25% of 60			
3) 18 is 20% of 90			
4) 18 is 30% of 60			
5) 20% of 150 is 30			

Activity 2: Pick Me Right!

Directions: Identify whether what is asked in each problem is **base**, **percentage** or **rate**. Write **A** if you are asked to find the ***base***, **B** for ***percentage*** and **C** for ***rate*** .

Example:

In an examination of 75 items, Richard got 60% correct answers. How many correct answers did Richard get?
Answer: B

1) A farmer harvested 250 cavans of yellow corn. He sold 85% of his harvest. How many cavans of yellow corn did he sell?
2) Singapore's population of about 3 million is 15% of the population in Malaysia. What is the population of Malaysia?
3) Mika, a grade five pupil, has 30 sheets of art paper for her project in Math. If 6 sheets of art paper were used by Mika, what percent of the sheets of art paper did she use?
4) A vendor had 200 balloons for sale. If he sold 125 of them, what percent remains unsold?
5) In a certain voting precinct, there were 300 voters who voted during the last election. This was 75% of the registered voters. How many registered voters are there?

Activity 3: You Complete Me!

Directions: Complete the table by supplying the missing number. Express fraction in lowest terms.

	Percent	Fraction	Decimal
1)	23%		
2)		1/2	
3)			0.36
4)		3/2	
5)	300%		

What I Have Learned

Fill in the blanks with the correct answers from the box below.

The 1) _____is the quantity which is a part of the whole. The number with % symbol beside it is called the 2)_____. Rate is the percentage divided by the base and 3) _____ by 100. The 4)_____ or the whole is percentage divided by rate. Change the rate to 5)_____ form, before computing.

whole	**Decimal**		**Base**	**Rate**
	Percentage	**multiplied**		

What I Can Do

Congratulations for having reached this far! Let's try some real-life situations involving percentage, rate and base.

Again, the base is the whole or the total. The percentage is the part of the whole. The rate is represented by a percent.

Directions: Solve the word problem.

Mario bought a box of avocados. He found that 12% of the avocados were rotten and 66 were in good condition. Find the total number of avocados in the box.

Assessment

Directions: Write the letter of the correct answer.

1) In the statement *24% of 250 is 60*, which represents base?
   A. 0.24 C. 60
   B. 24% D. 250

2) If 30% of 300 is 90, what do you call 90?
   A. base C. portion
   B. rate D. percentage

3) In the statement "18 is 20% of 90" statement what is 20%?
   A. base C. portion
   B. rate D. percentage

4) What do you call the comparison of the percentage to the base expressed in percent?
   A. N C. rate
   B. base D. percentage

5) Which of the following statement is **TRUE**?
   A. 20% of 150 is 30 C. 150 is 20% of 30
   B. 30% of 150 is 20 D. 150 is 30% of 20

6) What quantity is part of the base?
   A. N C. rate
   B. base D. percentage

7) Which represents rate in *25 is 25% of 100*?
   A. 25 C. 100
   B. 25% D. 250

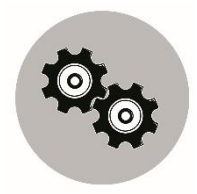
8) What do you call the quantity that represents the whole?
   A. N C. rate
   B. base D. percentage

9) What do you call 60 in *15 is 25% of 60*?
   A. N C. rate
   B. base D. percentage

10) Which statement is **TRUE**?
   A. Percentage is part of a whole. C. Base is part of a portion
   B. Percentage is part of portion. D. Base is part of a whole.

Please check your answers with the ANSWER KEY on page 13.

Got a score of 8-10? CONGRATULATIONS! Job well done. See you in the next module. If below 8, you may have to go over the lessons and the exercises again.



Additional Activities

Directions: Using the problems in ***Activity 2: Pick Me Right***", solve each problem.

1) A farmer harvested 250 cavans of yellow corn. He sold 85% of his harvest. How many cavans of yellow corn did he sell?

2) Singapore's population of about 3 million is 15% of the population in Malaysia. What is the population of Malaysia?

3) Mika, a grade five pupil, has 30 sheets of art paper for her project in Math. If 6 sheets of art paper were used by Mika, what percent of the sheets of art paper did she use?

4) A vendor had 200 balloons for sale. If he sold 125 of them, what percent remains unsold?

5) In a certain voting precinct, there were 300 voters, who voted during the last election. This was 75% of the registered voters. How many registered voters are there?

Answer Key

What I Know

1. B
2. A
3. B
4. D
5. A
6. B
7. A
8. D
9. C
10. A

What's In

No. of unshaded cells = 17

Percentage of unshaded cells = 17

What's More

Activity 1: Fill Me Out

	Rate	Base	Percentage
1.	25%	100	25
2.	25%	60	15
3.	20%	90	18
4.	30%	60	18
5.	20%	150	30

What's More

Activity 2: Pick Me Right

1. B
2. A
3. C
4. C
5. A

What's More

Activity 3: You Complete Me

	Percent	Fraction	Decimal
1.	23%	23/100	0.23
2.	50%	1/2	0.5
3.	36%	9/25	0.36
4.	150%	3/2	1.5
5.	300%	3	3.0

What's I Have Learned

1. Percentage
2. Rate
3. Multiplied
4. Base
5. Decimal

What I Can Do

Solution:

Let the total number of avocados in the basket be ***n***.

12% of the avocados are rotten, and avocados in good condition are 66 which is 100% - 12% = 88% of the total. Therefore, according to the question,

88% of n = 66

88/100 x n = 66

n = (66 x 100)/88

n = 3 x 25

n = 75

Therefore, the total number of avocados in the basket is 75.

Assessment

1. D
2. D
3. B
4. C
5. A
6. D
7. B
8. B
9. B
10. A

Additional Activities

1. 212.5
2. 20 million
3. 20%
4. 37.5%
5. 400

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For inquiries or feedback, please write or call:

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph