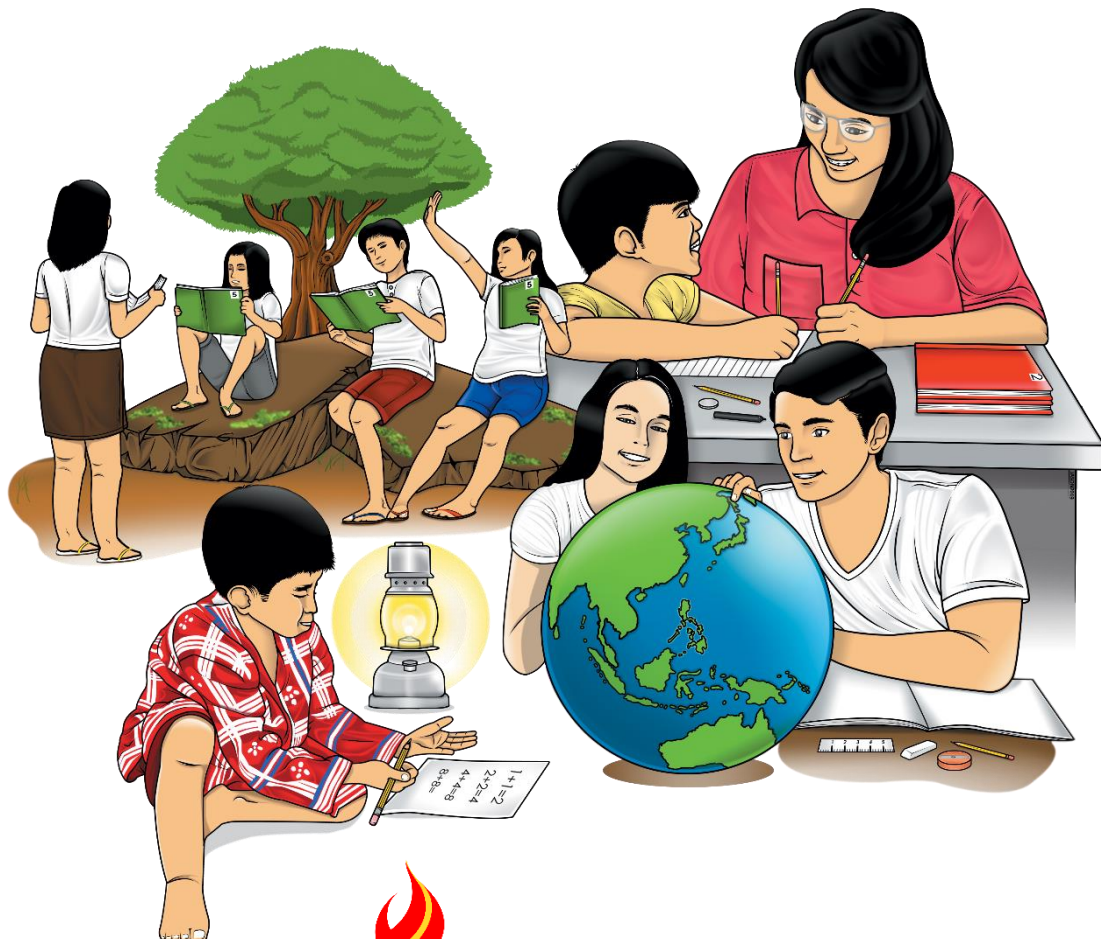


Mathematics

Quarter 2 – Module 19:

Recognizing Two Quantities in Direct Proportion



Mathematics– Grade 5
Alternative Delivery Mode
Quarter 2 – Module 19: Recognizing Two Quantities in Direct Proportion
First Edition, 2020

Republic Act 8293, Section 176 states that: No copyright shall subsist in any work of the Government of the Philippines. However, prior approval of the government agency or office wherein the work is created shall be necessary for the exploitation of such work for a profit. Such agency or office may, among other things, impose as a condition the payment of royalties.

Borrowed materials (i.e., songs, stories, poems, pictures, photos, brand names, trademarks, etc.) included in this book are owned by their respective copyright holders. Every effort has been exerted to locate and seek permission to use these materials from their respective copyright owners. The publisher and authors do not represent nor claim ownership over them.

Published by the Department of Education
Secretary: Leonor Magtolis Briones
Undersecretary: Diosdado M. San Antonio

Development Team of the Module

Writer: Nikolai S. Aralar
Editor: Ma. Rina S. Flor, Miguel Jr. V. Dumas, Ramil R. Magdua
Reviewers: Renato S. Cagomoc, Rolando Lacbo, Joshua Sherwin T. Lim,
Pedro L. Montecillo, Jr
Illustrator: Jeffrey Llaneta
Layout Artist: Joey Sustitudo
Management Team:
Ramir B. Uytico
Arnulfo R. Balane
Rosemarie M. Guino
Joy B. Bihag
Ryan R. Tiu
Sarah S. Cabaluna
Thelma Cabadsan-Quitlig
Elena S. De Luna
Renato S. Cagomoc
Noel E. Sagayap
Geraldine P. Sumbise
Joshua Sherwin T. Lim

Printed in the Philippines by

Department of Education – Region VIII

Office Address: DepEd Regional Office No. 8
Candahug, Palo, Leyte

Telefax: 053 – 832-2997

E-mail Address: region8@deped.gov.ph

5

Mathematics

Quarter 2 – Module 19:

**Recognizing Two Quantities in
Direct Proportion**

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.

Good luck and happy learning!



What I Need to Know

Hi, Mathletes!

This module was designed to help you gain understanding and test your ability in recognizing two quantities in direct proportion. Mastery of this mathematical skill is essential for you to understand more about the concepts of ratios and fractions.

In this module, you will be able to learn techniques in recognizing two quantities that are in direct proportion. Further, you will be provided with challenging and fun activities to gauge your understanding of the concepts at hand.

When you finish up this module, you will be able to:

1. identify quantities in a proportion;
2. recognize when two quantities are in direct proportion; and
3. value the importance of recognizing two quantities in direct proportion in real-life situations.

So, what are you waiting for? Let's start!

However, before you go further, let us check your prior knowledge in recognizing two quantities in direct proportion.



What I Know

Directions: Solve each problem to find the missing quantity. Write your answers on a separate sheet of paper.

1. Which pair of ratios shows a direct proportion?
A. 6: 15 and 2: 45
B. 6: 2 and 15: 45
C. 2:15 and 6 : 45
D. 45: 2 and 15:6
2. All of the following situations show direct proportion **except** for one. Which is it?
A. Rolly buys more pencils and these cost him more.
B. Increasing the speed of the bus decreases the time of travel.
C. The more Christmas lanterns to be made means more time to finish the job.
D. In a baking recipe, increasing the amount of flour increases the yield.
3. It is said that a good ratio of pizzas to people is 1:3. You are expecting visitors at home and there will be 12 of them. How many pizzas do you need for your visitors to make the ratio of pizza to people in direct proportion?
A. 8 B. 6 C. 4 D. 2
4. Using the concept of Direct Proportion, all are proportions to 12 : 36, EXCEPT
A. 1 : 3 B. 24 : 72 C. 6 : 18 D. 8 : 25
5. Find the missing term of $\frac{4}{n} = \frac{12}{3}$
A. 2 B. 3 C. 1 D. 4
6. Yesterday, Ada answered correctly 6 out of a 10-item math quiz. How many items should she answer correctly in a 20-item quiz to equate her performance yesterday?
A. 10 B. 12 C. 14 D. 16

7. The store signage says, "Notebooks are priced at 3 pieces for 42 pesos". In this situation, which two quantities are in direct proportion?
- I. the number of notebooks bought
 - II. the amount of money paid
 - III. the store signage
 - IV. the number of pieces of notebook in the store
- A. II and IV B. II and III c. I and III D. I and II
8. *There are 4 boys to 7 girls in teacher Angela's dance class per day. On the day of the recital, there are 42 girls in total.*
In the given situation, which of the following pairs of quantities are in direct proportion with each other?
- A. The total number of boys to the total number of girls in the recital.
 - B. The total number of dancers to the number of girls present.
 - C. The total number of dancers to the number of boys present.
 - D. The number of boys in a class to the number of girls in the recital.
9. When two quantities increase or decrease in the same ratio, it is called _____.
- A. extremes
 - B. direct proportion
 - C. inverse proportion
 - D. equivalent ratios
10. Your father bought 7 cans of paint in a ratio of blue to red of 4:3. What would your father need if he doubled the amount of paint in direct proportion?
- A. 8:6
 - B. 6:8
 - C. 4:4
 - D. 3:2

Lesson

1

Recognizing Two Quantities in Direct Proportion

To recognize two quantities in direct proportion, you need to master the skills on defining and describing a proportion. In addition, mastery on finding the missing term for a pair of equivalent ratios using the different ways is also helpful in this lesson. Direct proportions play a big role in our everyday lives. Direct proportions arise in various situations involving speed, money, fuel efficiency of your car, or even the food consumption as the family members grow bigger and bigger.

In this module, you will learn how to recognize ratios of two quantities in direct proportion. Are you ready? Let's get started to learn.

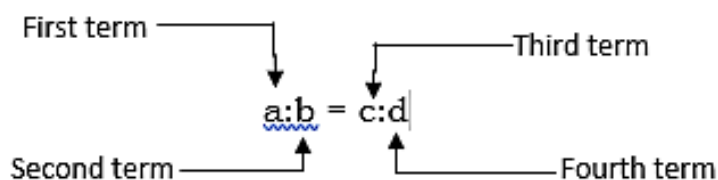


What's In

Can you still recall how to define and describe a proportion?

A proportion is a statement of equality between two ratios. It can be written in two ways: two equal fractions, or, using a colon, $\mathbf{a:b = c:d}$. In defining and describing a proportion, the order in which we compare quantities is very important.

As previously discussed in identifying proportions, two equal ratios form a proportion. Each part of a proportion is a term. Wherein, \mathbf{a} is the first term, \mathbf{b} the second term, \mathbf{c} the third term, and \mathbf{d} the fourth term.



Further, the first term (**a**) and the fourth term (**d**) are called the **extremes** while the second term (**b**) and the third term (**c**) are the **means**.

$$\begin{array}{c}
 \text{extremes} \\
 \overbrace{a : b = c : d} \\
 \underbrace{\hspace{1.5cm}} \\
 \text{means}
 \end{array}$$

In a proportion, the product of the extremes is equal to the product of the means. In other words, $a \times d = b \times c$. If the proportion is written with fractions, like $\frac{a}{b} = \frac{c}{d}$, then their cross-products are equal.

Consider the following examples.

Example 1: $\frac{6}{8}$ and $\frac{12}{16}$

- Find the cross products.

$$\begin{array}{ccc}
 \frac{6}{8} & \begin{array}{c} \nearrow \\ \nwarrow \end{array} & \frac{12}{16}
 \end{array}$$

$$6 \times 16 = 96 \text{ and } 8 \times 12 = 96$$

Since the cross products are equal, hence, $\frac{6}{8}$ and $\frac{12}{16}$ form a proportion.

Example 2: $5 : 18$ and $15 : 50$

- Product of the means:

$$18 \times 15 = 270$$

- Product of the extremes:

$$5 \times 50 = 250$$

- Since the product of the means is not equal to the product of the extremes, hence, **18 : 15** and **5 : 50 do not** form a proportion.

Try answering the activity below. Do your best!

Directions: Tell whether the following pair of ratios form a proportion by writing the equality symbol (=) on the blank provided. If they are NOT, write the inequality symbol \neq . Use your Math activity notebook for this activity.

- 1) $1 : 2$ _____ $5 : 10$
- 2) $3 : 4$ _____ $12 : 13$
- 3) $4 : 6$ _____ $12 : 18$
- 4) $15 : 3$ _____ $1 : 5$
- 5) $10 : 10$ _____ $1 : 1$



What's New

From the previous lesson, you learned how to define and describe a proportion. This time, we are going to deal with recognizing two quantities in direct proportion. A proportion is a name we give to a statement that two ratios are equal.

Let's take a look at the given situation below.

You are trying to copy the pork empanada recipe of your grandmother that calls for 10 ounces of ground pork. The recipe is for 5 serving but you want to make enough for 8. Your mother bought 15 ounces of ground pork and insisted that you add it all up with the rest of the ingredients.

Do you think you have the correct proportion of ground pork to the number of servings you want to make? How will you find out if they are, indeed, directly proportional?





What Is It

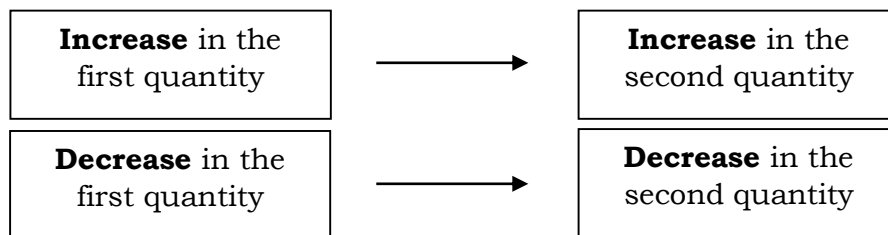
In recognizing two quantities in direct proportion, you have to take note that for two ratios or two quantities to be proportionate, they have to be equivalent ratios as well.

Direct Proportion

If an **increase** in one quantity produces a proportionate **increase** in another quantity, then the two quantities are directly proportional to each other.

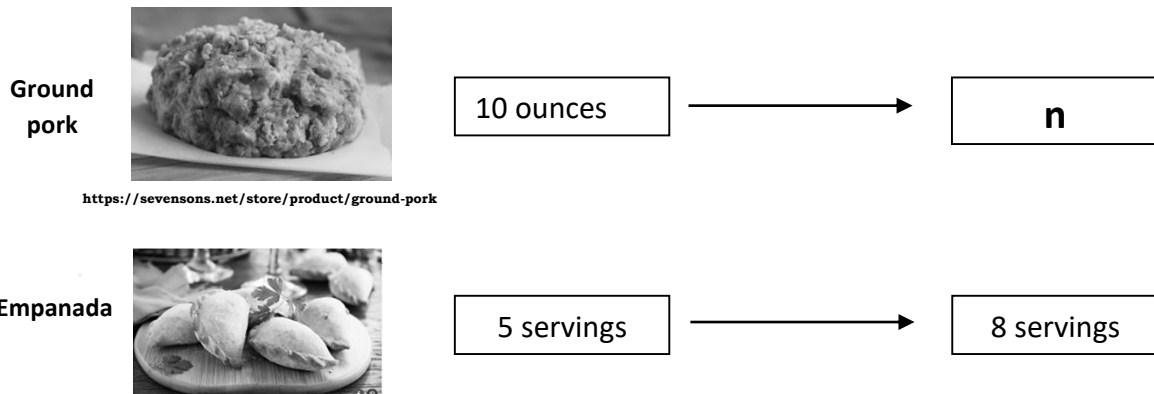
On the other hand, if a **decrease** in one quantity produces a proportionate **decrease** in another quantity, then the two quantities are directly proportional to each other.

Change in both the quantities must be same. That is,



Let's consider the given situation above. The situation tells that the ratio of ground pork to number of servings in its original recipe is **10 : 5**. As the number of servings increases, the same goes with the amount of ground pork. This situation definitely shows **direct proportion!**

To illustrate this further, please take a look at the figure below.

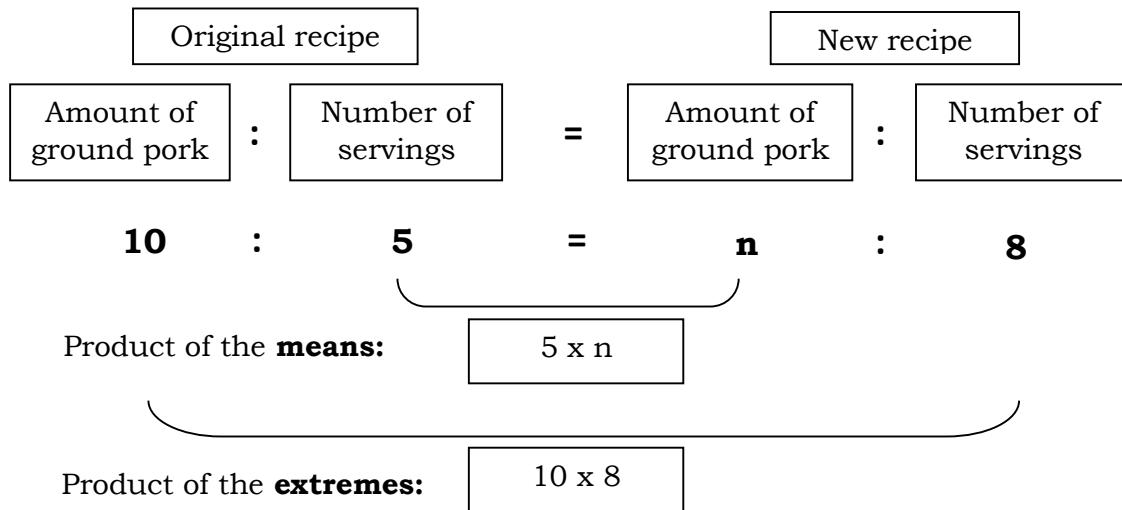


<https://sevensons.net/store/product/ground-pork>

<https://www.epicurious.com/recipes/food/views/empanada-dough-230786>

Based on this figure, you will see that the number of empanada increases from 5 servings to 8 servings. So to make this a direct proportion, the amount of ground pork will also increase. Will it be 15 ounces? Let us find out the value of **n** or the amount of pork needed to make 8 servings of empanada.

So, we form our proportion as



Applying the principle of proportion, we have **5 x n = 10 x 8**

This results to **5n = 80**.

Solving for **n**, we divide both sides of the equation by 5, thus we have

$$\frac{5n}{5} = \frac{80}{5}$$

So we get, **n = 16**

Therefore, the right amount of ground pork for the new recipe is 16 ounces and not 15 ounces.

Let's consider the examples below for you to have a deeper understanding about direct proportion.

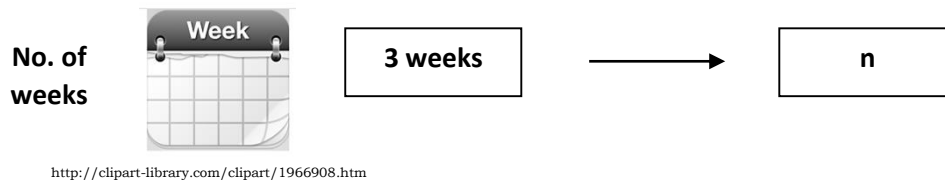
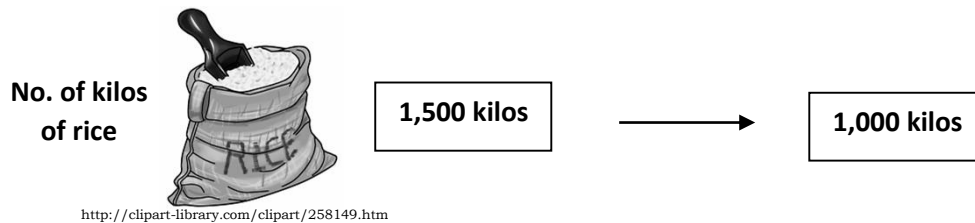
Example 1:

In a relief operation for typhoon victims, 120 families in the evacuation center had consumed 1500 kilos of NFA rice for 3 weeks. If there were only 1000 kilos of NFA rice for the same number of families, how long will it take for the families to consume this volume of rice?

This problem clearly shows the relationship among the number of families, the number of kilos of rice and the number of days to consume rice.

From the given situation above, we can see that the more the kilos of rice there is, the longer it will last for 120 families. This situation is an example of a **direct proportion**. Take note that the number of kilos of rice decreased, hence we expect that the number of weeks to consume rice will also decrease.

To visually represent the given problem, please consider the illustrations below.



Thus, we form a proportion as

$$\frac{\text{no. of kilos of rice}}{\text{no. of weeks}} = \frac{\text{no. of kilos of rice}}{\text{no. of weeks}}$$

Substituting the values for the identified quantities, we have:

$$\frac{1500}{3} = \frac{1000}{n}$$

Getting the cross-product, we have $1500 \times n = 1000 \times 3$.

This result to $1500n = 3000$

To solve for **n**, we divided both sides of the equation by 1500, thus we have:

$$\frac{1500n}{1500} = \frac{3000}{1500}$$

So, $n = 2$

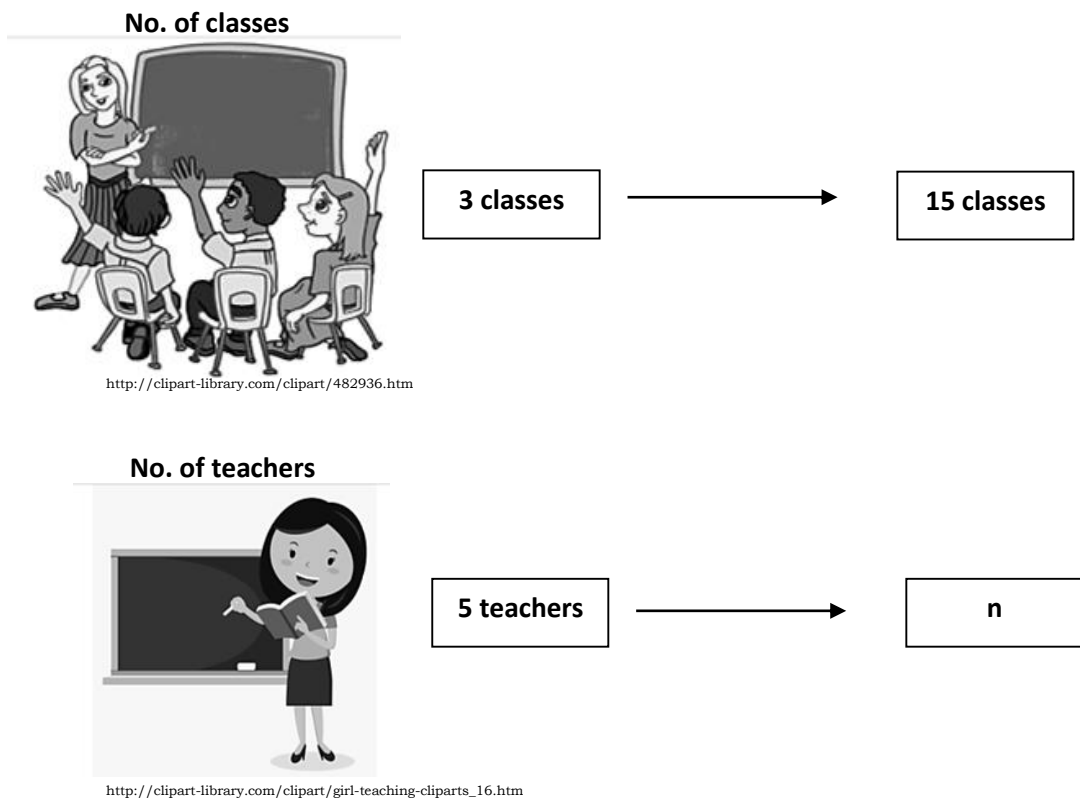
Therefore, **1000** kilos of NFA rice will be consumed in **2** weeks. So, we rewrite our proportion as **1500 : 3 = 1000 : 2**, and they are in direct proportion.

Example 2:

For every 3 classes in the intermediate grades, there are 5 teachers. How many teachers are there for 15 classes?

This problem clearly shows the relationship between the number of teachers to handle the classes and the total number of classes in the intermediate grades.

From the given situation above, we can see that the more the number of classes there is, the greater the number of teachers to handle these classes. This situation is an example of a **direct proportion**. To illustrate this further, we have:



Thus, we form our proportion as:

$$\frac{\text{no. of classes}}{\text{no. of teachers}} = \frac{\text{no. of classes}}{\text{no. of teachers}}$$

Substituting each quantity in the proportion, we have $\frac{3}{5} = \frac{15}{n}$

Getting the cross-product, we have: $3 \times n = 5 \times 15$.

This result to $3n = 75$.

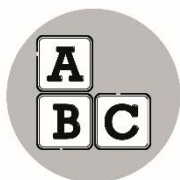
To find for n , we divide both sides of the equation by 3. Thus we have

$$\frac{3n}{3} = \frac{75}{3}$$

Thus, $n = 25$

Therefore, there should be 25 teachers needed to teach 15 classes. Further, **3: 5** is in direct proportion to **15 : 25**.

It's easy, right? Now that you have understood how to recognize two quantities in direct proportion, let's try the activities below. Good luck!



What's More

Activity 1: Coding Time!

Directions: Write **DP** on the blank provided before the item if the given situation tells about direct proportion and **NDP** if they do not. The first item is done for you.

- DP 1. You buy more pencils ---- it costs you more
_____ 2. Number of students are more --- more number of teachers
_____ 3. The more workers in a certain job, the less number of days to finish the job.
_____ 4. The shorter the distance Mario travels, the less time he takes.
_____ 5. The faster you walk, the shorter the time you get to your destination.

Activity 2: Tell me my Pair!

Directions: In each situation, identify the **two quantities** that are in a direct proportion. Write your answer on the space provided after each given situation. The first item is done for you as your guide.

- Three bags of cement are needed to make 1 cubic meter of concrete.
How many bags are needed to make 5 cubic meters of concrete?
Quantity 1: The number of bags of cement
Quantity 2: The volume in cubic meter of concrete
- A sick child whose mass is 14 kg should receive medication dose that is in proportion to the dose of a 70 kg adult. If the adult dose is 5ml, how much should the child receive?
Quantity 1: _____
Quantity 2: _____
- A baker uses 3 cups of raisins in every batch of puto. How many cups of raisins does he use when he bakes 6 batches?
Quantity 1: _____
Quantity 2: _____

4. It takes Mike 18 minutes to finish reading 4 pages of a book. How long does it take for him to finish reading 30 pages?

Quantity 1: _____

Quantity 2: _____

5. A machine can produce 6 yards of fabric in 2 minutes. How much fabric can the machine produce in 1 hour?

Quantity 1: _____

Quantity 2: _____

Activity 3: Complete Me!

Directions: Encircle the letter of the ratio that is directly proportional to the given ratio.

1) 2:6

A. 3:8

B. 4:12

C. 1:4

2) 20:5

A. 4:1

B. 18:3

C. 4:3

3) 12:20

A. 2:5

B. 6:5

C. 3:5

4) 3:15

A. 1:5

B. 6:25

C. 2:14

5) 10:15

A. 1:2

B. 3:4

C. 2:3



What I Have Learned

From what you have learned in the discussion from this module, answer the following questions. Write the correct answer in the blank before each number.

_____ 1. It is a Math statement that shows two ratios are equal.

_____ 2. What do you call a Mathematical statement saying, *when one quantity increases, the other quantity also increases at the same rate*?

_____ 3. This can be also used if there is an unknown quantity in a given pair of equivalent fractions.

_____ 4. Is it true that in direct proportion, when one quantity decreases the other quantity also decreases?

_____ 5. In $\frac{a}{b} = \frac{c}{d}$, it says that $ad = bc$. While a and d are called extremes, what do you call b and c ?

You're on the right track now! You are almost on the finish line. Just keep going.



What I Can Do

Congratulations that you have reached this far! You are really working hard today. Now, let's apply what you have learned in possible day to day situations.

Again, when one quantity increases constantly or decreases constantly with respect to another quantity, then, the two quantities are **directly proportional** to each other. Consider the situation below.

Directions: Based on your daily activities, give three (3) situations that tell about direct proportion. Determine the two (2) quantities which are in direct proportion with each other.

Example:

Situation: **Washing the dishes**

Quantity 1: **The number of dishes to be washed**

Quantity 2: **The time it takes to finish washing the dishes.**

1. Situation: _____

Quantity 1: _____

Quantity 2: _____

2. Situation: _____

Quantity 1: _____

Quantity 2: _____

3. Situation: _____

Quantity 1: _____

Quantity 2: _____



Assessment

Directions: Answer each of the following questions below. Encircle the letter that corresponds to your answer.

- Which pair of ratios shows a direct proportion?
A. 6:5 and 2:4 B. 4:3 and 8:6 C. 2:1 and 6:4 D. 5:2 and 5:6
- Which of the following situations shows direct proportion?
A. Finding the circumference of a circle given its radius.
B. Increasing the speed of travel and the time it takes to reach the destination.
C. Decreasing the number of workers against the number of days to finish the job.
D. All of these
- It is said that a ratio of egg yolks to condensed milk to make a perfect egg pie is 6 pieces to 1 cup. How many cups of milk will you need if you have 48 egg yolks?
A. 3 B. 4 C. 6 D. 8
- Using the concept of direct proportion, all are proportions to 2 : 6, EXCEPT
A. 6:15 B. 10:25 C. 14:30 D. 18:45
- Find the missing term of $\frac{4}{n} = \frac{12}{3}$
A. 2 B. 3 C. 1 D. 4
- There are 4 boys to 7 girls in a musical band. At the same ratio, how many boys are there if there are 42 girls?
A. 24 B. 28 C. 32 D. 36
- In solving for the height of the triangle given its area and the base, which pair of quantities could be paired to form a direct proportion?
I. The height of the triangle and its area.
II. The height of the triangle and its base.
A. I only C. Both I and II
B. II only D. Neither I nor II

8. In a garden, 2 out of every 8 roses are white. To find the number of white roses given that there are 32 red roses, which of the following quantities can be paired to form a direct proportion?
- I. The total number of roses in the garden.
 - II. The number of white roses in the garden
 - III. The number of red roses in the garden
- A. I and II B. I and III C. II and III D. All of these
9. In a direct proportion, when one quantity increases the other quantity _____.
- A. remains the same
 - B. increases
 - C. fluctuates
 - D. decreases
10. Your mother placed 5 flowers in a vase. How many vases does your mother need for 15 flowers?
- A. 9
 - B. 7
 - C. 5
 - D. 3

Nice one, you haven't missed a thing! Just one more activity and you are done.



Additional Activities

Directions: Based on the given picture, write a situation that shows direct proportion. After the situation is written, identify the two quantities which are indirect proportion to each other.

1.



clipart-library.com/clipart/1693579.htm

Situation: _____

Quantity 1: _____

Quantity 2: _____

2.



<http://clipart-library.com/clipart/319115.htm>

Situation: _____

Quantity 1: _____

Quantity 2: _____



Answer Key

Additional Activities

Note: Answers will vary.

So, the teacher will be the one to check if the learner's answer is correct.

What's More:

Activity 1: Coding Time!

- DP
- DP
- NDP
- DP
- NDP

Activity 2: Tell me my Pair!

- Quantity 1: The weight of the person
- Quantity 2: The volume of the medicine.
- Quantity 1: The number of cups of raisin.
- Quantity 2: The number of batches of puto
- Quantity 1: The time it takes Mike to finish reading a number of pages
- Quantity 2: The number of pages in a book
- Quantity 1: The length of the fabric
- Quantity 2: The time it takes the machine to produce the fabric

Activity 3: Complete Me!

- B
- A
- C
- A
- C

What I Have Learned

- Proportion
- Direct Proportion
- Cross product
- Yes
- Means

What I Know

- C
- B
- D
- A
- C
- D
- B
- A
- B
- A

What's In

- =
- ≠
- =
- ≠
- =

What I Can Do

Note: Answers will vary.

So, the teacher will be the one to check if the learner's answer is correct.

Assessment

- B
- A
- D
- C
- C
- A
- A
- C
- B
- D

References

Burgos, J. R., Perez M H. and. Placer. D. P (2016) 21st Century Mathletes. Quezon City, Viral Group Inc.,.

Caingat, M. L. (2005), Enjoying Mathematics. Mandaluyong City, JEDIGAR Enterprises,.

Coronel, C. C. and Bamba. N. D. (2010) MATHEMATICS for a Better Life Textbook. Quezon City, SD Publication, Inc.,

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