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DepED
DEPARTMENT OF EDUCATION

Mathematics

Quarter 2-Module 3

A. Translating into variation statement a relationship between two quantities given by graph and vice versa

B. Solving problems involving variation

Week 2

ALTERNATIVE DELIVERY MODE
ADM

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MODULE 3

A. TRANSLATING INTO VARIATION STATEMENT A RELATIONSHIP BETWEEN TWO QUANTITIES GIVEN BY GRAPH AND VICE VERSA

B. SOLVING PROBLEMS INVOLVING VARIATIONS

In the previous module, you have learned about translating into variation statements a relationship between two quantities given a table of values and equation. On this module, you will be learning how to translate into variation statement the relationship between two quantities given the graph and vice versa. In addition, you are going to apply the concept of variation in solving real-life problems.

WHAT I NEED TO KNOW

LEARNING COMPETENCY

The learners will be able to:

➢ translate into variation statement a relationship between two quantities given by a graph, and vice versa (**M9AL-IIb-**1)

➢ solve accurately problems involving variations (**M9AL- IIb-c-1**)

Note that translating variations using equations and table of values were already covered in Module 2.

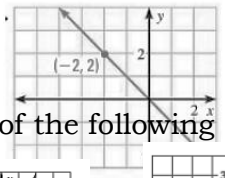
WHAT I KNOW

Let's find out how much you already know about this topic. On a separate sheet of paper, write only the letter of the best answer to the question.

Please answer all items. During the checking, take note of the items that you were not able to answer correctly and look for the right answers as you go through this module.

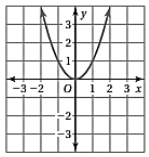
1. If y varies directly as x and y = 18 when x = 3, find the constant of variation.
   a. 6 b. 36 c. 54 d. 9
2. An amount invested earns an interest I in t months. The statement that relates I and t is $I = kt$. What type of variation is illustrated?
   a. direct b. inverse c. joint d. combined
3. In the equation B=8C, what will happen to B when C is doubled?
   a. T is halved c. T is doubled
   b. T is tripled d. T becomes zero
4. Which is an example of a direct variation?
   a. xy = 10 b. $y = \frac{2}{x}$ c. y = 5x d. $\frac{2}{y} = x$
5. The cost c varies directly as the number n of pencils is written as _____.
   a. $c = \frac{k}{n}$ b. $k = cn$ c. $n = kc$ d. $c = kn$
6. If y varies directly as x and y = 12 when x = 4, find y when x = 12.
   a. 3 b. 4 c. 36 d. 48
7. Mackee's income varies directly as the number of days that she works. If she earns Php 8,000.00 in 20 days, how much will she earn if she worked 3 times as long?
   a. Php 26,000 b. Php 24,000 c. Php 20,000 d. Php 16,000

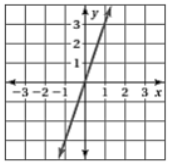
8. Which equation is NOT an example of direct variation?
   a. $y = \frac{-7}{3}x + 1$ b. $y = \frac{5}{16}x$ c. y = 4x d. y = –9x
9. If 3 men can do a portion of a job in 8 days, how many men can do the same job in 6 days?
   a. 7 b. 6 c. 5 d. 4
10. The graph of a direct variation is shown below. Which of the following is the correct direct variation equation for the graph?

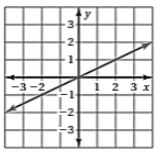


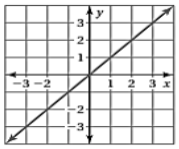
a. y = - x
b. y = x
c. y = -2x
d. y = 2x

11. Which of the following is a variation?

a) 

b) 

c) 



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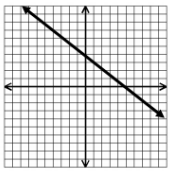
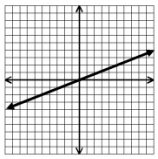
12. Do x and y in the table below show direct variation?

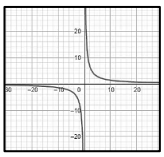
x	1	2	3	4
y	2	4	6	8

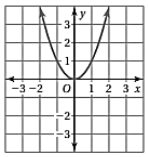
a) Yes
b) No
c) Sometimes
d) Never

13. Which of the graphs below represents direct variation?

a. 

b. 

c. 

d. 

14. The volume of gas varies directly as the temperature and inversely as the pressure. If the volume is 180 cubic centimeters when the temperature is 150°K and the pressure is 10 pounds per square centimeter, what is the volume when the temperature is 210°K and the pressure is 30 pounds per square centimeter?
   a. $56cm^3$ b. $74cm^3$ c. $80cm^3$ d. $84cm^3$
15. Hooke's Law for an elastic spring states that the distance a spring stretch varies directly as the force applied. If a force of 160 newtons stretches a spring 5 cm, how long will a force of 368 newton's stretch the same spring?
   a. 11.5 cm b. 0.03 cm c. 23cm d. 32cm

WHAT'S IN

Variation is one of the most important and useful concepts in Mathematics. This concept will help us determine the value of one variable given the value of another variable and their relationship.

The following are some of the types of variation, the symbolic representation of each, and some cue words.

Type of Variation	In symbols (*k* is the constant of variation)	Example Wording
Direct Variation	$y = kx \text{ or } \frac{y}{x} = k$ $y = kx^2 \text{ or } \frac{y}{x^2} = k$	"y varies directly with x" "y is directly proportional to x" SPECIAL CASE: Direct Square Variation "y varies directly as the square of x"
Inverse Variation	$xy = k \text{ or } y = \frac{k}{x}$	"y is inversely proportional to x" or "x is inversely proportional to y"
Joint Variation	$y = kxz \text{ or } k = \frac{y}{xz}$	"y varies directly as the product of x and z" "y varies jointly as x and z"
Combined Variation: Involves a combination of direct variation and inverse variation	$z = \frac{kx}{y} \text{ or } k = \frac{zy}{x}$	"z varies directly as x and inversely as y"

Try this!

Using *k* as the constant of variation, write the equation of the variation of the following.

1. The weight (w) of an athlete is directly proportional to his height (h)
2. P varies directly as the square of Q
3. The altitude (h) of a triangle with constant area varies inversely as its base (b).
4. The pressure (P) of a gas varies jointly as its density (d), and its absolute temperature (t).
5. F varies jointly as m_1 and m_2 and inversely as the square of d.

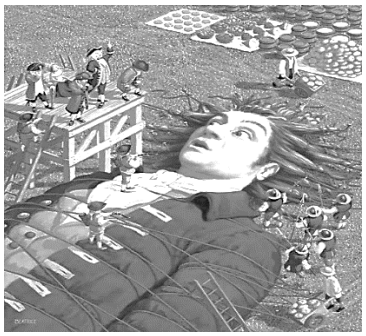
WHAT'S NEW

Let's start with this SIMPLE STORY.

Gulliver's Travels
by Jonathan Swift

Lempel Gulliver is a surgeon who takes to the seas. He completes many voyages without incident, but his final four journeys take him to some of the strangest lands on the planet, where he discovers the virtues and flaws in his own culture by comparing it with others.

One day a storm destroys the ship, leaving Gulliver as the sole survivor of the wreck. He washes up on the shores of Lilliput, an island populated by people only six inches tall. When the Lilliputians decided to make a shirt for Gulliver, a Lilliputian tailor stated that he could determine Gulliver's measurements by simply measuring the distance around Gulliver's thumb. He said "Twice around the thumb equals once around the wrist. Twice around the wrist is once around the neck. Twice around the neck is once around the waist.



https://www.amazon.com/Gullivers-Travels-Level-Penguin-Readers/dp/1405842849

WHAT IS IT

1. *Where did Gulliver ended up after his ship was wrecked?*
   _____.
2. *Who are trying to make Gulliver's clothes?*
   _____
3. *How did they decide to measures Gullivers' body?*
   _____

Using the tailor's statement, Table 1shows the measurements of thumb, wrist neck and waist.

Table 1 Measurements of Thumb, Wrist, Neck and Waist

Thumb (t) in inches	Wrist (w) in inches	Neck (n) in inches	Waist (x) in inches
0	0	0	0
1	2	4	8
2	4	8	16
3	6	12	24
4	8	16	32
5	10	20	40

Example 1: Draw the graph of the following relationship and write an equation that describes the relationship between the two variables.

a. Wrist (w) and thumb (t).
b. Waist (x) and neck (n)
c. Thumb (t) and neck (n)

Solution:

a. Wrist (w) and thumb (t):

Table1 shows the relationship between the distance around the thumb *t* varies directly *as* the distance around the wrist *w*. Then the mathematical equation describing the relation is $w = 2t$, where k = 2 is the constant of variation.

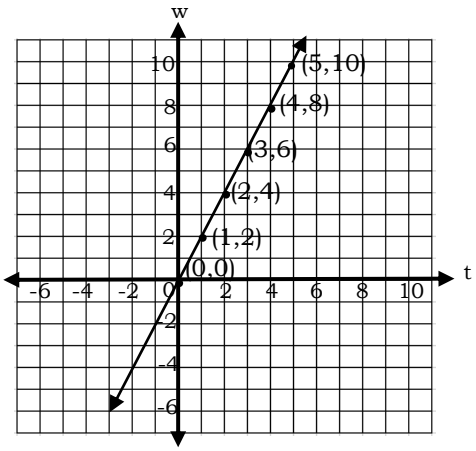
Table 2: Wrist (w) and thumb (t)

Thumb (t) in inches	0	1	2	3	4	5
Wrist (w) in inches	0	**2**	**4**	**6**	**8**	**10**

Use the information from Table2 to make an ordered pair and draw a graph of the relationship between the distance around the thumb (*t)* and the distance around the wrist (*w).*

Plot the following ordered pair (or at least two ordered pair) that represent the equation $w = 2t$ in the Cartesian coordinate plane and connect it with a line segment.

(0, 0), (1, 2), (2, 4), (3, 6), (4, 8), and (5, 10)



Notice the following about the graph:

1. The graph passes through the origin.
2. All the points lie on a line.
3. The graph of the relation $w = 2t$ is a line.

Therefore, the graph shows direct variation since it goes through the origin (0,0).

The graph of direct variation y =kx or $\frac{y}{x} = k$ where k is the constant of variation is a **straight line that goes through the origin**.

b. Waist (x) and neck (n):

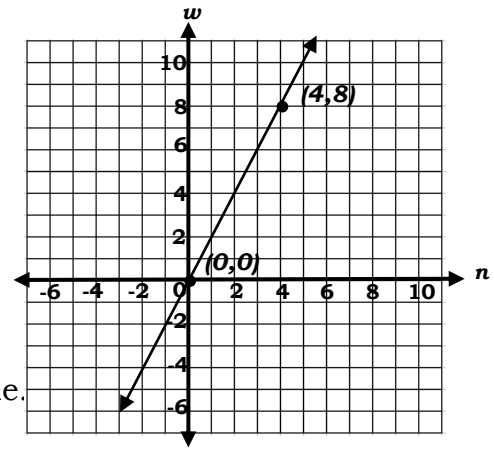
Table 2 shows the relationship between the distance around the neck n varies directly *as* the distance around the waist x. Then the mathematical equation describing the relation is $w = 2n$, where k = 2 is the constant of variation.

Table 3: Waist (x) and neck (n)

Neck (n) in inches	0	4	8	12	16	20
Waist (x) in inches	0	**8**	**16**	**24**	**32**	**40**

Use the information from Table 3 to make an ordered pair and draw a graph of the relationship between the distance around the thumb (*t)* and the distance around the wrist (*w)*.

Plot the following ordered pair (or at least two ordered pair) that represent the equation $w = 2n$ in the Cartesian coordinate plane and connect it with a line segment.
(0, 0), (4, 8) (8, 16), (12, 24), (16, 32), and (20, 40)



Notice the following about the graph:

1. The graph passes through the origin.
2. All the points lie on a line.
3. The graph of the relation $w = 2n$ is a line.

Therefore, the graph shows direct variation since it goes through the origin (0,0).

c. Thumb (t) and neck (n):

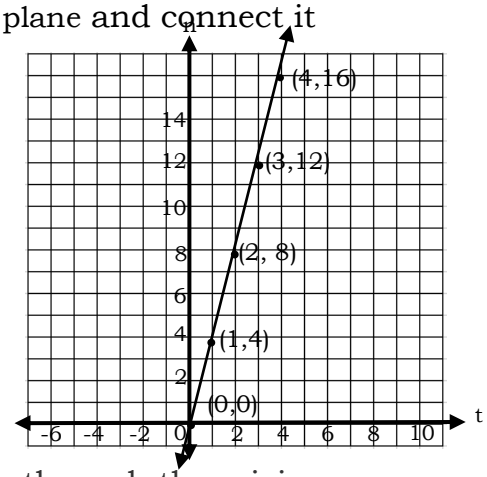
Table 4 shows the relationship between the distance around the thumb t varies directly *as* the distance around the neck n. Then the mathematical equation describing the relation is $n = 4t$, where k = 4 is the constant of variation.

Table 4: Thumb (t) and neck (n)

Thumb (t) in inches	0	1	2	3	4	5
Neck (n) in inches	0	**4**	**8**	**12**	**16**	**20**

Use the information from Table 4 to make an ordered pair and draw the graph of the relationship between the distance around the thumb (*t)* and the distance around the neck (*n).*

Plot the following ordered pair (or at least two ordered pair) that represent the equation $n = 4t$ in the Cartesian coordinate plane and connect it with a line segment.



(0, 0), (1, 4), (2, 8), (3, 12), (4, 16), and (5, 20)

Notice the following about the graph:

1. The graph passes through the origin.
2. All the points lie on a line.
3. The graph of the relation $w = 2n$ is a line.

Therefore, the graph shows direct variation since it goes through the origin (0,0)

Observe that the graph of a direct variation is a straight line.

Example 2:

When x is 6 and y is 2, find an equation that inversely relates y and x.

Solution:

$\boldsymbol{x \cdot y = k}$ Inverse Variation Model

$(6) \cdot (2) = 12$ Substitute 6 for x and 2 for y

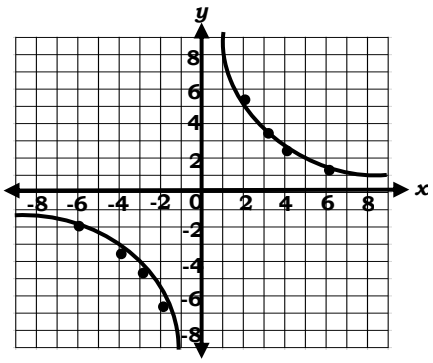
$12 = \boldsymbol{k}$ Simplify

The inverse variation that relates x and y is $x \cdot y = 12 \rightarrow y = \frac{12}{x}; k \neq 0$

Table 4: shows that the variable y varies inversely to x and the equation describes the relation is $y = \frac{12}{x}$, where $k = 12$ is the constant of variation.

x	-6	-4	-3	-2	2	3	4	6
y	**-2**	**-3**	**-4**	**-6**	**6**	**4**	**3**	**2**

Graphically it looks like this:



Notice the following about the graph:

1. The graph did not pass through the origin.
2. The graph gets very close to x- and y axes but it never touches them.
3. The graph of the relation $w = 2t$ is a smooth curve.

Therefore, the graph shows inverse variation.

The graph of inverse variation $\boldsymbol{xy = k}$ or $\mathbf{y = \frac{k}{x}}$ where $\boldsymbol{k}$ is the constant of variation is a hyperbola it never passes through the origin, and never crosses the x or y axis; the x and y axes are called the asymptotes of the hyperbola.

Example 3:
The value of z varies jointly with x and y. When $x = 3$ and $y = 2$, the value of z is 42.

a. Find z, when $x = 5$ and $y = 3$.
b. Find x, when $y = 5$ and $z = 70$.

Solution:

a. We can find the constant of variation, by first substituting the given values.

$$z = kxy$$
$$42 = k(3)(2)$$
$$42 = 6k$$
$$k = 7$$

Then substitute $k = 7$, $x = 5$, and $y = 3$ in the equation.

$$z = (7)(5)(3)$$
$$z = 105$$

Therefore, the value of z is 105, when $x = 5$ and $y = 3$.

b. Since $k = 7$, substitute $y = 5$ and $z = 70$, to find the value of x.

$$z = kxy$$
$$70 = (7)(x)(5)$$
$$70 = 35x$$
$$x = 2$$

Therefore, the value of x is 2, when $y = 5$ and $z = 70$.

Example 4:

The value of z is directly proportional to x and inversely proportional to y. When $x = 9$ and $y = 4$, the value of z is 18. Find z if $x = 12$ and $y = 6$.
Solution:
Find the value of k.

$$z = \frac{kx}{y}$$
$$18 = \frac{k(9)}{4}$$
$$k = \frac{4(18)}{9}$$
$$k = \frac{72}{9}$$
$$k = 8$$

Substitute $k = 8$, $x = 12$, and $y = 6$ to find z.

$$z = \frac{kx}{y}$$
$$z = \frac{8(12)}{6}$$
$$z = \frac{96}{6}$$
$$z = 16$$

Therefore, $z = 16$ when $x = 12$ and $y = 6$.

WHAT'S MORE

Activity 1- Observe and Compare!

Considered the table of values A and B

Table A

x	-2	-1	1	2	3
y	-4	-2	2	4	6

Tabble B

x	80	60	40	30	20
y	6	8	12	16	24

Compare the two given table of values.

1. What have you observed about the values in both tables?

   _____.

2. What do you observe about the values of y when x increases/ decreases? _____.

3. What happens to the values of y when x is doubled? Tripled?

   _____.

4. How do you compare the two relation?

   _____.

5. Write relationships which describes x and y.

   _____.

6. Draw the graph of Table A and Table B.

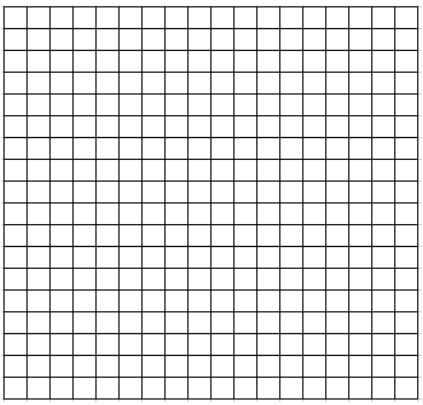


Table A

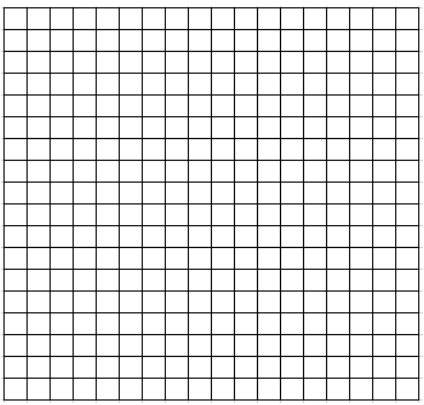


Table B

SOLVING PROBLEMS INVOLVING VARIATION

One of the useful concepts in mathematics is about the relationship between the two variables stating that, if one of the quantities increases or decreases, the other quantity also increases or decreases. This is called *variation.*

There are different applications of *variations* in various learning fields like mechanics, agriculture, and even manufacturing. Analyze the problem so you can form an equation that will represent your word problem. You can also find the constant of variation first to solve for the desired quantities.

Steps in solving word problems:

Step 1: Identify the problem.
Step 2: Formulate an equation.
Step 3: Solve.
Step 4: Assess your answer.

Example 1:

During the first month of pandemic, one of the essentials that Filipino family needs is food. With this, Barangay Captain Eugene Rodriguez decided to distribute packs of rice from the emergency fund of the barangay to his constituent in order to help them in their daily needs. If 51 kilograms of rice can feed a family for 45 days, how many kilograms of rice are needed to feed the same family for 60 days?

Solution:

Step 1: Let r = the number of kilos of rice
d =number of days

Step 2: The number of kilograms of rice (r) that can feed a family varies directly as the number of days (d) and $r = 51$ when $d = 45$.
Find r when $d = 60$.

Equation: $y = kx \longrightarrow r = kd$

Step 3: $51 = k(45) \longrightarrow$ solving for k

$$51 = 45k$$

$$\frac{51}{45} = k$$

$$r = \frac{51}{45}(60) \longrightarrow \text{Solving for r}$$

$$r = \frac{51(60)}{45}$$

$$r = 68$$

Step 4: Thus, 68 kilograms of rice are needed to feed the family for 60 days.

Example 2:

The cost (c) of a pizza varies directly as the square of its radius (r). If a pizza with a 6 inches' radius costs P180, how much should a pizza with an 11 inches' radius cost?

Solution:

Step 1: Let c = the cost of pizza
r = radius of the pizza

Step 2: c varies directly as the square of r, and c = 180 when r = 6, find c when r = 11?
Equation: $y = kx^2 \longrightarrow c = kr^2$

Step 3: $180 = k(6^2) \longrightarrow$ Solving for k
$180 = 36k$
$5 = k$
$c = 5r^2 \longrightarrow$ Solving for c
$c = 5(11^2)$
$c = 605$

Step 4: ₱ 605 is the cost of pizza with an 11 inches' radius.

Example 3:

The number of days (d) needed in repairing a house varies inversely as the number of men (m) working on the house repair. It takes 15 days for 2 men to repair the house. How many men are needed to complete the job in 6 days?

Solution:

Step 1: Let d = number of days needed in repairing a house
m = number of men working on the house repair

Step 2: d varies inversely as m, and d = 15 when m = 2. Find m when d = 6.

Equation: $xy = k \longrightarrow md = k$

Step 3: Find k when m = 2 and d = 15
$(2)(15) = k \longrightarrow$ Solving for k
$30 = k$
$m(6) = 30 \longrightarrow$ Solving for m
$6m = 30$
$m = \frac{30}{6}$
$\boldsymbol{m} = 5$

Step 4: Thus, 5 men are needed to complete the job in 6 days.

Example 4:

Kinetic energy varies jointly as the mass and the square of the velocity. A mass of 8 grams and a velocity of 5 centimeters per second has a kinetic energy of 100 ergs. Find the kinetic energy for a mass of 6 grams and a velocity of 9 centimeters per second.

Solution:

Step 1: Let e = kinetic energy
m = mass
v = velocity

Step 2: e varies jointly as m and the square of v, find e if m = 6 and v = 9.

Equation: $e = kmv^2$

Step 3: Find k when e = 100, m = 8, and v = 5.

$100 = k(8)(5^2)$ ⟶ Solving for k

$100 = k(8)(25)$

$100 = 200k$

$\frac{1}{2} = k$

$e = \frac{1}{2}mv^2$ ⟶ Solving for e

$e = \frac{1}{2}(6)(9^2)$

$e = \frac{1}{2}(6)(81)$

$e = 243$

Step 4: 243 ergs

Note: The unit of mechanical work and energy in the centimetre–gram–second system of units is "erg". I comes from the Greek ergon which means "work"

Activity 2: It's your turn!

Write an equation for the following statement and answer the problem.

1. The weight of an object on Earth varies directly as the weight of the same object on the moon. A 300-pound object would weigh 48 pounds on the moon. How much would a 65-pound object weigh on the moon?
2. The time required to do a job varies inversely as the number of people working. It takes 5hr for 7 bricklayers to build a park well. How long will it take 10 bricklayers to complete the job?
3. If y varies directly as x and inversely as z, and y = 22 when x = 4 and z = 6, find y when x = 10 and z = 25.

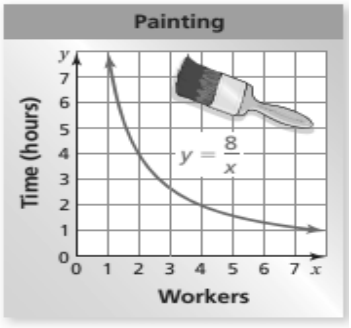
WHAT I HAVE LEARNED

- The graph of direct variation $y = kx$ or $\frac{y}{x} = k$ where k is the constant of variation is a straight line that goes through the origin.
- The graph of inverse variation $xy = k$ or $y = \frac{k}{x}$ where k is the constant of variation is a hyperbola. It never passes through the origin, and never crosses the x or y axis. The x and y axes are called the asymptotes of the hyperbola.
- **Joint variation** is like a direct variation, but it involves two or more variables: $y = k(xz)$, and the **Combined variation** is a combination of direct and inverse variation: $y = \frac{kx}{z}$.

WHAT I CAN DO

Answer the following:

1) The graph shows the number of y hours it takes x workers to paint a room.



(a) How does y change as x increases?

_____

(b) Do x and y show direct or inverse variation?

_____

(c) How many hours does it take five workers to paint the room?

_____

2) If m varies directly as n, and m = 35 when n = 42, find m when n is 78.

_____

3) At ₱60 for every $\frac{1}{2}$ kg of galunggong, how much will 2 kg of this fish cost?

_____

4) Candies are sold at P1.50 each. How much will a bag of 420 candies cost?

_____

5) If $y = kx^2$, and y = 36 when x = 3, find k.

_____

6) If x varies inversely as y and x = 8 when y =2, find x when y = 4.

_____

7) If c varies inversely as d, and c = 30 when d = 9, find d when c = 540.

_____

8) For a given distance, the required time t varies inversely as the rate r. If t=6 when r = 45, find r when t = $4\frac{1}{2}$.

_____

ASSESSMENT

Write the letter of the correct answer on your answer sheet. If your answer is not found among the choices, write the correct answer.

1. If 14 kg of dry green peas cost Php441, what is the cost of 22 kg of pulses?
(a) Php 627 (b) Php 649 (c) Php 671 (d) Php 693

2. If 36 men can do a piece of work in 25 days, in how many days will 15 men do it?
(a) 50 (b) 56 (c) 60 (d) 72

3. If 20 men can build a wall 56 meters long in 6 days, what length of a similar wall can be built by 35 men in 3 days?
(a) 49 meters (b) 36 meters (c) 52 meters (d) 42 meters

4. If 3 men can do a portion of a job in 8 days, how many men can do the same job in 6 days?
(a) 3 days (b) 4 days (c) 5 days (d) 6 days

5. If 18 dolls cost Php 630, how many dolls can be bought for Php 455?
(a) 9 (b) 11 (c) 13 (d) 15

6. If a man earns a total of Php 805 for seven days of work, in how many days can he earn Php 1840?
(a) 7 days (b) 16 days (c) 19 days (d) 23 days

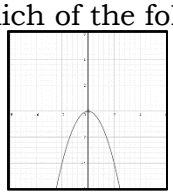
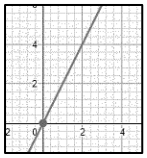
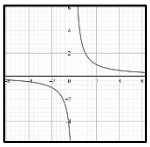
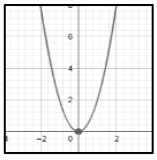
7. If a car covers 102 km in 6.8 litres of petroleum, how much distance will it cover in 24.2 litres of petroleum?
(a) 363 km (b) 330 km (c) 375 km (d) 396 km

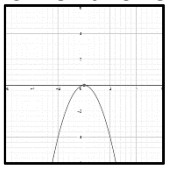
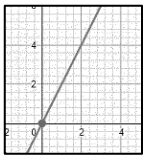
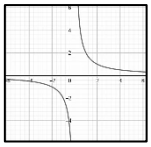
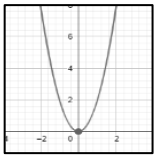
8. On a particular day, 200 US dollars is worth Php 9666. On that day, how many dollars could be bought for Php 5074.65?
(a) $105 (b) $117 (c) $127 (d) $131

9. Which of the following equation represent "The volume (V) of a cone varies jointly as its height (h) and square of its radius r?
(a) V=khr (b) V = hr (c) V = khr^2 (d) V = $kh\sqrt{r}$

10. The cost of 16 bags of washing powder, each weighing 1.5 kg, is Php 672. Find the cost of 18 bags of the same powder, each weighing 2 kg.
(a) Php 1008 (b) Php 1128 (c) Php 1338 (d) Php 1000

11. If 3 persons can weave 168 shawls in 14 days, how many shawls will be woven by 8 persons in 5 days?
(a) 153 (b) 189 (c) 127 (d) 160

12. Which of the following graph represent direct variation?
(a)  (b)  (c)  (d) 

13. Which of the following graph represent inverse variation?
(a)  (b)  (c)  (d) 

14. A bottle of 150 vitamins cost P375, if the cost varies directly with the number of vitamins in the bottle, what should a bottle with 250 vitamins cost?
(a)P625 (b) P620 (c) P600 (d) P500

15. The value of *m* varies inversely as n such that n = 12 when m = 9. Find m when n = 27?
(a)$\frac{1}{9}$ (b)129 (c)135 (d) 4

ADDITIONAL ACTIVITIES

Based from what you have learned on this module, answer the following question:
(a) Give a real-life example of two variables that vary directly.

(b) Use string to find the distance around your thumb, wrist, and neck. Do your measurements agree with those of the tailor in Gulliver's Travels? Explain your reasoning.

E-Search

You may also check the following link for your reference and further learnings on variations

- https://www.mesacc.edu/~scotz47781/mat120/notes/variation/direct/direct.html
- https://www.bigideasmath.com/protected/content/ipe_cc/grade%207/03/g7_03_08.pdf
- http://teachers.dadeschools.net/lberkson/Documents/Ch2_Section8.pdf
- http://www0.dlshs.org/webpages/hirschs/documents/Chapter11Solutions.PDF
- https://www.brainfuse.com/jsp/alc/resource.jsp?s=gre&c=35151&cc=108823
- https://www.anderson5.net/cms/lib02/SC01001931/Centricity/Domain/2147/Direct%20Variation%20Worksheets.pdf
- https://www.bigideasmath.com/protected/content/ipe/grade%207/03/g7_03_07.pdf
- https://www.mesacc.edu/~scotz47781/mat120/notes/variation/direct/direct_practice.html#

REFERENCES

Dilao, S. J., & Bernabe, J. G. (2009).*Intermediate Algebra.pp* 100-119. Quezon CIty: SD Publicaton.
Mathematics 9 Learner's Material, Department of Education

Illustrations:

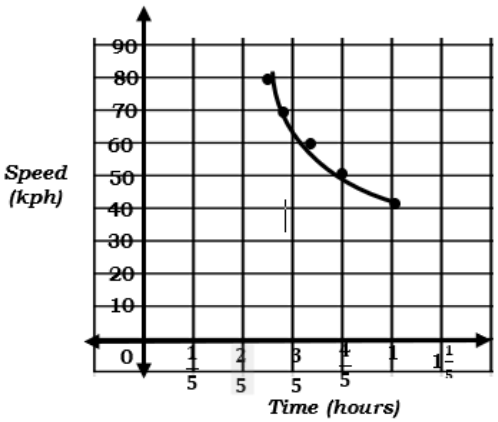
- https://www.freepik.com/free-vector/illustration-with-kids-taking-lessons-online-design_7574030.htm
- https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.pngguru.com%2Ffree-transparent-background-png-clipart-blxku&psig=AOvVaw2FnN9gLeIk9JsyFdKCTxBK&ust=1592378133556000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCKCd1IPlheoCFQAAAAAdAAAAAB

PROBLEM – BASED LEARNING WORKSHEET

WAY BACK HOME

In the city, one of the problems is transportation especially during rush hours. Some use their own vehicles, some take public vehicles to go to work and vice versa.

Ms. Dang works at E. Rodriguez Vocational High School which is 40 kilometers away from her home. Driving a car, the time it takes her to reach home depends on the traffic situation along the way. Sometimes it takes a longer time to reach home when heavy traffic is ahead of her. Her time way back home depends on the average speed. The graph below shows some of the recorded speed driving her own car and the number of hours she has taken to reach home.



LET'S ANALYZE

1. What will happen to the time of travel if the speed of driving the car decreases?

   _____

2. How long will it take her to reach home if her driving speed is 50 kph?

   _____

3. Write a mathematical statement to represent the relationship between time and speed.

   _____

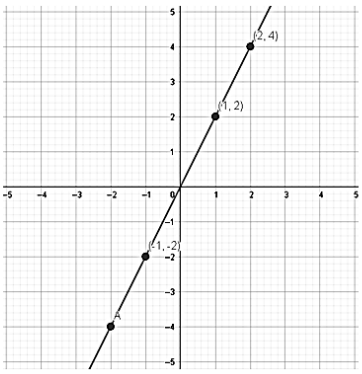
4. How do speed and time affect each other?

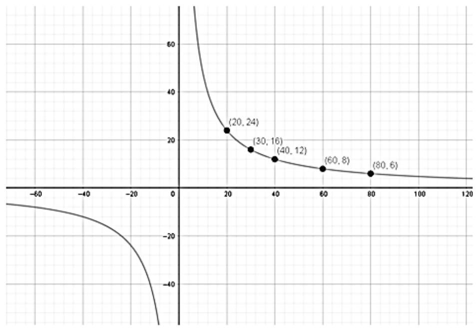
   _____

WHAT'S MORE

Activity 1

6.





Activity 2

1) The equation is $O = 6.5M$, where O is the weight in pound of the object and M is the weight in pound of the object when on moon. When the object is 65 pounds, it weighs 6.25 pounds on the moon
2) The equation is $t = \frac{35}{p}$, where t is the time required to do a job and p is the number of people working. If there are 10 people working, they will be able to finish the job in 3.5hrs.
3) The equation is $y = \frac{33x}{z}$, and the value of y is 13.2

ASSESSMENT

1. D	9. A
2. C	10. A
3. A	11. D
4. B	12. B
5. C	13. C
6. B	14. A
7. A	15. D
8. A	

PROBLEM-BASED LEARNING

1. If the speed decreases the time increases.
   s varies inversely as t. $s = \frac{k}{t}$
2. If her speed is 50kph, it takes her $\frac{4}{5}$ hours.
3. She can take a shortcut or other way to avoid traffic and arrive home faster. (Any same thought)
4. d = st
5. As the speed decreases, the time increases.
   As the time decreases, the speed increases.

ANSWER KEY

WHAT I KNOW

1. A	6. C	11. B
2. A	7. B	12. A
3. C	8. A	13. B
4. C	9. D	14. D
5. D	10. A	15. A

WHAT'S IN

Try this!

1. $w = kh$ or $k = \frac{w}{h}$
2. $P = kQ^2$ or $\frac{P}{Q^2} = k$
3. $hb = k$ or $h = \frac{k}{b}$
4. $P = kdt$ or $k = \frac{P}{dt}$
5. $F = \frac{km_1m_2}{d^2}$

Activity 1:
Use the tailor's statement to complete the table

Thumb, t	Wrist, w	Neck, n	Waist, x
0 in.	0 in.	0 in.	0 in.
1 in.	2 in.	4 in.	8 in.
2 in.	4 in.	8 in.	16 in.
3 in.	6 in.	12 in.	24 in.
4 in.	8 in.	16 in.	32 in.
5 in.	10 in.	20 in.	40 in.

Activity 2:

a. Thumb t and neck n (n =4 t)
b. Wrist w and waist x (x = 4w)
c. Wrist w and thumb t $\left(1 = \frac{1}{2}w\right)$
d. Waist x and wrist w $\left(w = \frac{1}{4}x\right)$

WHAT I CAN DO

1) The graph shows the number of y hours it takes x workers to paint a room.
   a) From the graph you can see that y decreases as x increases. So as the number of worker increases, the time it takes to paint the room decreases.
   b) The equation is written as $y = \frac{8}{x}$, so x and y show inverse variation.
   c) The equation to find y when x = 5 is $y = \frac{8}{5}$.
   It takes 1.6 hours for the five workers to paint the room.

2. 65
3. P240.00
4. P630.00
5. k = 4
6. x = 4
7. d = 0.5 or $d = \frac{1}{2}$
8. 60

WHAT'S MORE

Activity 1

1. Answer may vary
2. In table A, when the value of x increases the value of y increases also. But in table B when the value of x increases, the value of y decreases.
3. In Table A, when the value of x is doubled/tripled, the value of y also doubled/tripled while in Table B, when the value of x is doubled,/tripled the value of y is divided into 2 or 3.
4. Table A is a direct variation while Table B is an inverse variation.
5. Table A: $y = kx$ or $y = 2x$
   Table B: $y = \frac{x}{k}$ or $y = \frac{480}{x}$