Statistics and Probability
Quarter 4 – Module 20: Identifying Dependent and Independent Variables

ALTERNATIVE DELIVERY MODE

ADM

Statistics and Probability – Grade 11
Alternative Delivery Mode
Quarter 4 – Module 20: Identifying Dependent and Independent Variables
First Edition, 2021

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Identifying Dependent and Independent Variables

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

This module was designed and written with you in mind. In this module, you will be introduced to the two types of variables: dependent and independent. Furthermore, you will learn how to distinguish the two.

After going through this module, you are expected to:

1. define dependent and independent variables; and
2. identify the dependent and independent variables in a sentence or problem.

Are you ready now to study using your ADM module? Good luck and may you find it helpful.

Before you proceed to the lesson, make sure to answer first the questions in the next page (*What I Know*).
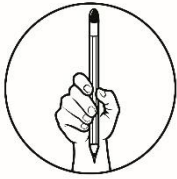
What I Know

Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Which of the following statements is FALSE about bivariate?
   a. It involves one variable.
   b. It involves two variables.
   c. It deals with causes or relationships.
   d. Its two variables are dependent and independent.

2. Which of the following variables depends on other factors, measured and presumed as the "effect"?
   a. bivariate   c. dependent
   b. constant   d. independent

3. Which of the following variables describes something that is stable and unaffected by other variables you are trying to measure and is presumed the "cause"?
   a. bivariate   c. dependent
   b. constant   d. independent

4. What variable is something that is influenced and affected?
   a. bivariate   c. dependent
   b. constant   d. independent

5. Marco believes that health is wealth. That is why as part of his routine, he jogs every morning. The number of calories he burns during a jog depends on the distance he jogs. In the given situation, which are the variables?
   a. Marco
   b. number of calories
   c. distance Marco jogs
   d. number of calories Marco burns and distance Marco jogs

6. Which of the following concepts is TRUE about dependent and independent variables?
   a. Dependent variable is the one being studied and measured.
   b. Dependent variable is the one you do not expect to change.
   c. Dependent variable causes a change in independent variable.
   d. Dependent variable is the variable the experimenter changes or controls.

7. In graphing the scatter plot, where do you plot the independent variable?
   a. origin   b. x-axis   c. y-axis   d. z-axis

8. Andrew knows that through education, he can achieve his dreams. That is why to support his schooling, Andrew is doing a part-time job. For each hour of working, he earns Php40. What is the independent variable?
   a. Php 40
   b. part-time job
   c. amount earned
   d. hours spent in doing part-time job

9. Jeny and Camille are preparing relief goods to serve at an evacuation center. The more relief goods they prepare, the more people they will be able to serve. Which of the following is the dependent variable?
   a. Jeny and Camille
   b. evacuation center
   c. number of relief goods prepared
   d. number of people they will be able to serve

10. Suppose a study found that spending time with friends or family decreases the amount of stress someone is feeling and allows them to perform better on tests. In the given statement, which represents the dependent variable?
    a. total number of tests
    b. spending time with friends or family
    c. spending stress with friends or family
    d. amount of stress someone is feeling

11. Which of the following sentence structures is CORRECT in featuring dependent and independent variables?
    a. Body weight depends on the amount of food intake.
    b. The amount of food intake depends on body weight.
    c. The number of hours you work out depends on body weight.
    d. The number of hours you work out depends on food intake.

12. Which of the following sentence structures is CORRECT in featuring dependent and independent variables?
    a. How far you can drive depends on the weight of the car.
    b. The amount of gas you have depends on your driver's license.
    c. The amount of gas you have depends on how far you can drive.
    d. How far you can drive depends on the amount of gas you have.

13. If the dependent variable is the plant's height, which of the following CANNOT possibly be the independent variable?
    a. amount of water provided to the plant
    b. type of fertilizer provided to the plant
    c. exposure of the plant to classical music
    d. amount of sunlight received by the plant

14. If the independent variable is the number of minutes spent on watching Math YouTube videos, which of the following is the best possible dependent variable?
    a. number of likes
    b. number of views
    c. number of subscribers
    d. academic performance in Math

15. If the dependent variable is the speed of goldfish growth, which of the following can be the independent variable?
    a. type of food
    b. type of water
    c. size of aquarium
    d. all of the above

Lesson 1 Dependent and Independent Variables

It is important to understand variables because they are being studied and interpreted based on the given data. A study may take into consideration several variables. These variables may be of many types and levels but in this lesson, you will be identifying independent and dependent variables in given situations. Check your readiness for this lesson by answering the following exercises.

What's In

Recall the Variable!

Encircle the variables in each situation below and determine whether the situation involves univariate or bivariate data.

Statements	Univariate or Bivariate
1. A researcher looked into the salary/income and civil status of government employees.	
2. The veterinarian listed the weight of the newborn puppies.	
3. The school nurse recorded the age and the blood pressure of the teachers.	
4. A vendor keeps track of how much ice candy they sell everyday versus the daily temperature.	
5. A STEM student surveyed Grade 10 students on the number of hours spent using cell phone and their previous grade.	

Guide Questions:

1. How were you able to differentiate univariate from bivariate data?
   _____

2. Which among the statements above may deal with relationship between variables?
   _____

When we are examining bivariate data, the two variables could depend on each other and one variable could influence another. In this case, try to answer the next activity.

Notes to the Teacher

Check the student's level of readiness for the next topic. If she/he did not answer most of the items and the guide questions, you may provide another activity involving situations with related variables.

What's New

Are You in a Relationship?
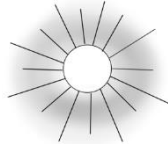
Match the pictures in Column A to Column B. Then, answer the   questions   that follow.

Column A   Column B

____ 1.

A.

____ 2.

B.

____ 3.

C.

____ 4.

D.

____ 5.

E.

Guide Questions:

1. How did you match each picture in Column A to Column B? What are the things you considered?

   _____

2. In general, what do the pictures in Column A and Column B represent?

   _____

3. Suppose you didn't eat breakfast, what could happen to you?

   _____

4. If you didn't pass an examination, what could be the reason?

   _____

5. Which situation do you think should happen first before another situation happens? Explain your answer.

   _____

> In the activity, you were able to identify situations that involve relationship between two variables, a skill that will be of help in understanding our next lesson. You can also use your language skills dealing with cause-and-effect relationship for better understanding. Let's find out as you go through the lesson.

What Is It

In the previous activity, you became familiar with bivariate data. Bivariate data always involve two variables. One of these variables is the *dependent variable* and the other one is the *independent variable*.

> *What is the difference between the two variables?*

Dependent variable *depends on other variables or factors*. It is something that is influenced and affected. It is also associated with the word *effect* or *outcome*.

Independent variable *affects the dependent variable*. It is something you have control over, one which you can choose and manipulate. However, in some cases, you may not be able to manipulate the independent variable. It is commonly known as the *cause* or the *reason* behind changes.

For example, the researcher wants to determine the effects of the use of social media on the academic performance of students in Mathematics.

The bivariate data in the study are the *use of social media* and *academic performance*. Academic performance depends on the use of social media, or we can say that academic performance is affected by the use of social media. Therefore, **independent variable** here is the use of social media and the **dependent variable** is the academic performance.
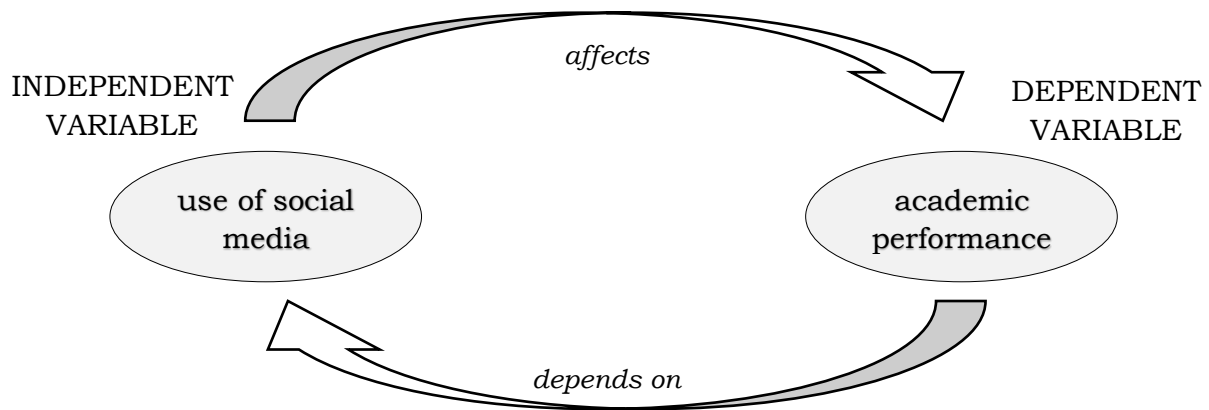
Independent variables happen first and
y (dependent variable) is the result of x (independent variable).

Let's have more examples.

Identify the dependent and independent variables in the next statements.

- **Taking a nap in the afternoon makes people more relaxed and less irritable for the rest of the day**. If you want to be more relaxed and less irritable, it *depends on* the number of hours you take a nap in the afternoon.
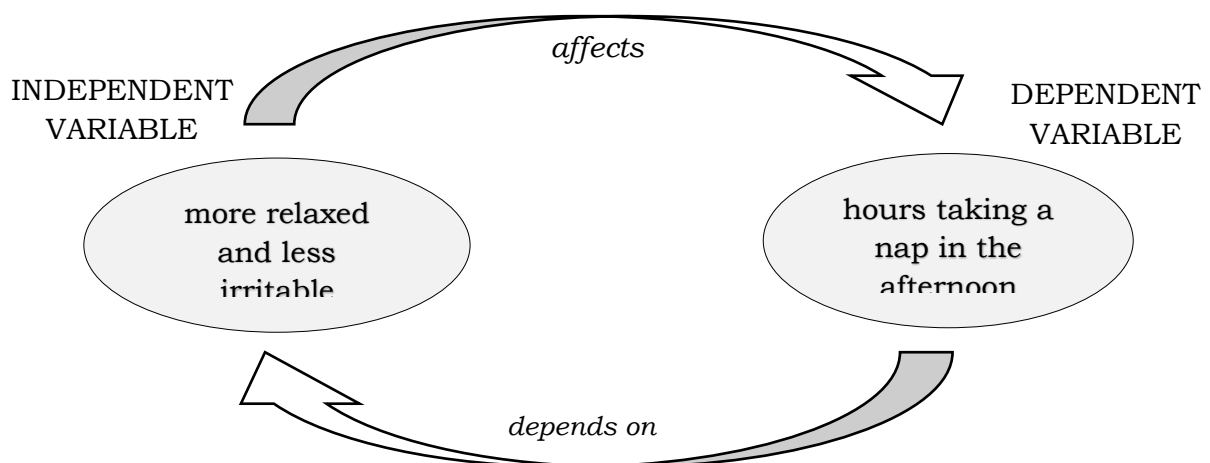
- **Research Title: Math App (Math Tricks) for Improving Fundamental Basic Skills and Retention of Grade 11 Students of Mapalad Integrated High School**

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Increasing or improving your fundamental basic skills and retention *depends on* how you frequently practice or use the Math app called Math Tricks.

INDEPENDENT VARIABLE

affects

DEPENDENT VARIABLE

improving fundamental basic skills and retention

frequency of using Math app (Math Tricks)

depends on
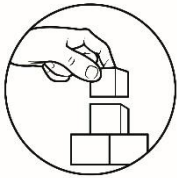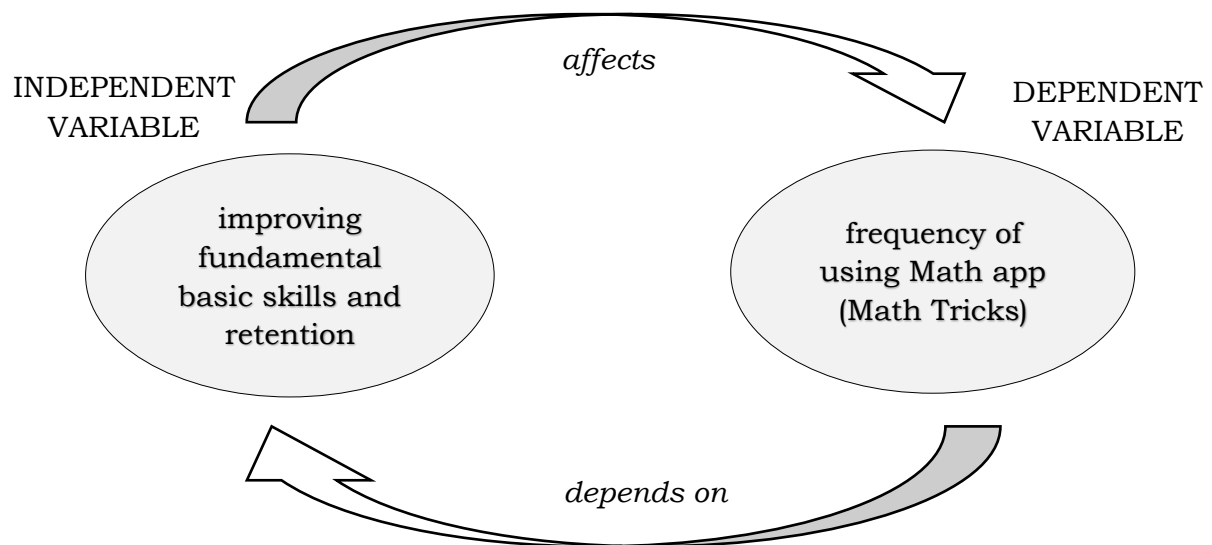
What's More

Activity 1.1 Let's Connect to Correct!

Connect the dependent and independent variables to form a correct sentence structure. The first one is given as an example.

Independent Variable	Dependent Variable	Correct Sentence
number of hours studying for a test	test score	Test score **depends on** the number of hours studying for a test.
kilowatts used in a household	electricity bill	1.
person's running speed	time it takes to run a mile	2.
genes they inherit from their parents	height of a person	3.

Activity 1.2 It Depends on...

On the table below, you have sets of variables not categorized into dependent and independent variables. Connect the two variables by using **depends on** to form a correct sentence structure.

Variables		Dependent variable <u>depends on</u> independent variable.
chance of developing cancer	number of cigarettes a person smoke	1.
taking care of our natural resources	global warming	2.
chance of dropping out	tardiness, cutting classes, and absenteeism of a student	3.
educational attainment	opportunities for high-paying jobs	4.
total calories and fat	number of junk foods you eat	5.

Activity 1.3 Identify Me!

<u>Underline</u> the independent variable and encircle the dependent variable.

1. effect of temperature on plant pigmentation

2. effects of fertilizer brand on plant growth

3. effect of brightness of light on a moth being attracted to the light

4. test scores of students and time spent on studying

5. relationship between income and educational attainment of young adult

Activity 1.4 Put Me in the Box!

Identify the independent and dependent variables in each question stated below.

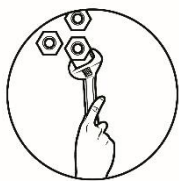| Questions	Independent Variable	Dependent Variable
1. How does logical thinking develop critical thinking?		
2. What are the effects of *Koreanovelas* on the Filipino value system?		
3. In what way does collaborative learning increase communicative competence?		
4. To what extent does texting decrease students' grammatical competence?		
5. What corrupt practices trigger one's resignation?		

> In graphing the scatter plot, **independent variable** always goes on the **x-axis** (horizontal axis) while the **dependent variable** goes on the **y-axis** (vertical axis).

What I Have Learned

Complete the following statements. In nos. 3-4, choose the expression on the parentheses that best completes the sentences.

1. _____ data always involve two variables.

2. Bivariate data has _____ variable and _____ variable.

3. Dependent variable _____ (depends on, affects) the other variable.

4. Independent variable _____ (depends on, affects) the other variable.

5. _____ variable is related with the words "outcome" or "effect".

6. _____ variable is linked as the "cause" or the "reason" behind the changes.

What I Can Do

Let's Search in the Research!

Identify the independent and dependent variables in the given research titles.

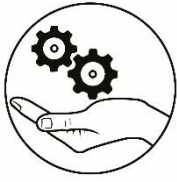| Research Title	Independent Variable	Dependent Variable
Example: Math Minute and Peer Tutoring in Raising the Level of Student's Mastery in Solving Basic Operations of Integers	*Math Minute and peer tutoring*	*student's mastery in solving basic operation of integers*
1. Organizational Commitment and Teaching Performance of Elementary Teachers in Rizal		
2. Conceptual, Interpersonal, and Technical Skills of Bank Managers: Their Relationship to Operational Efficiency		
3. Increasing Mathematics Achievement Through Contextualized and Localized Materials		
4. Impact of Blended Learning on Student Achievement in Social Studies		
5. Effectiveness of Exposing Students to Classical Music on Reading Comprehension		

Assessment

Multiple Choice. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. What do you call a data that involves two variables?
   a. bivariate
   b. constant
   c. dependent
   d. independent

2. Which of the following variables describes something that is already there and is fixed, one that you would like to evaluate with respect to how it affects something else?
   a. bivariate
   b. constant
   c. dependent
   d. independent

3. Which of the following variables may change or vary and can be considered as the outcome?
   a. bivariate
   b. constant
   c. dependent
   d. independent

4. Changes in the _____ variable cause changes in the _____ variable.
   a. constant; independent
   b. dependent; independent
   c. independent; dependent
   d. independent; independent

5. As a person's exposure to sunlight increases, his or her chance of developing cancer increases. In the given findings, which are the variables?
   a. person
   b. increases
   c. exposure to sunlight
   d. exposure to sunlight and chance of developing cancer

6. Which of the following concepts below is NOT TRUE about dependent and independent variables?
   a. The dependent variable causes a change in the independent variable.
   b. The independent variable causes a change in the dependent variable.
   c. The dependent variable is affected by the independent variable.
   d. The dependent variable depends on the independent variable.

7. In graphing the scatter plot, where do you plot the dependent variable?
   a. origin   b. x-axis   c. y-axis   d. z-axis

8. You want to determine which type of fertilizer helps plants grow the fastest, so you add a different brand of fertilizer to each plant and see how tall they grow. What is the independent variable?
   a. Plants
   b. type of fertilizer
   c. how plants grow
   d. fruit of the plant

9. Students took a test after they studied either in silence or with the television turned on. What is the dependent variable?
   a. silence
   b. subject
   c. score on test
   d. television turned on

10. A team from the Department of Public Works and Highways (DPWH) is painting lines on the freeway. The number of hours needed to finish the project depends on the length of road that needs to be lined. In the given statement, which represents the independent variable?
    a. road
    b. length of the road that needs to be lined
    c. number of hours need to finish the project
    d. Department of Public Works and Highways

11. What would be the independent variable in an experiment testing which paper airplane design goes the farthest?
    a. the paper used
    b. the paper airplane design
    c. how hard the plane is thrown
    d. the distance of each plane's flight

12. According to a study, the more time people spend using social media, the less able they are to express themselves in conversation. In the given statement, which represents the dependent variable?
    a. more time for themselves
    b. using social media in conversation
    c. more time people spend in using social media
    d. less able to express themselves in conversation

13. Which of the following sentence structures is CORRECT in featuring dependent and independent variables?
    a. How grass grows depends on the type of soil used.
    b. The type of soil used depends on how grass grows.
    c. The type of soil used depends on the type of grass.
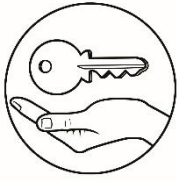   d. Grass doesn't grow in any type of soil used.

14. Which of the following sentence structures is INCORRECT in featuring dependent and independent variables?
    a. The noise level in a classroom is affected by memory retention.
    b. The more grams of salt a person consumes, the higher his/her blood pressure is.
    c. If a person eats carrots daily, there will be an improvement in his/her vision.
    d. Eating breakfast in the morning increases academic performance in Mathematics.

15. If the dependent variable is "*increasing the ability to learn in school*", what is the best possible independent variable?
    a. travelling every week
    b. taking selfies three times a day
    c. eating breakfast in the morning
    d. watching television for 12 hours

Additional Activities

Give five (5) research proposal titles that involve bivariate data. Identify the dependent and independent variables in the title.

RESEARCH PROPOSAL TITLES

1. _____
   _____

2. _____
   _____

3. _____
   _____

4. _____
   _____

5. _____
   _____

Answer Key

What I Know

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

What's In

Variables		
1. salary/income ✓ civil status ✓	bivariate
2. weight ✓	univariate
3. age ✓ blood pressure ✓	bivariate
4. daily sales of ice candy ✓ temperature ✓	bivariate
5. number of hour spend in using cellphone ✓ previous grade ✓	bivariate

What's New

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

What's More

Activity 1.1

1. Electricity bill depends on the kilowatts used in a household.

2. The time it takes to run a mile depends on person's running speed.

3. Height of a person depends on the genes s/he inherited from his/her parents.

Activity 1.2

1. Chance of developing cancer depends on the number of cigarettes a person smoke.
2. Global warming depends on how we take care of our natural resources.
3. Chance of dropping out depends on the tardiness, cutting classes, and absenteeism of a student.
4. Opportunities for high-paying job depends on one's educational attainment.
5. Total calories and fat depend on the number of junk foods you eat.

Activity 1.3

Independent Variable (underline)	Dependent Variable (encircle)
1. temperature	plant pigmentation
2. fertilizer brand	plant growth
3. brightness of light	moth being attracted to the light
4. time spent on studying	test scores
5. educational attainment	income

What's More

Activity 1.4

	Independent Variable	Dependent Variable
1	logical thinking	critical thinking
2	*Koreanovelas*	Filipino value system
3	collaborative learning	communicative competence
4	texting	grammatical competence
5	corrupt practices	one's resignation

What I Have Learned

1. bivariate
2. independent; dependent
3. depends
4. affects
5. dependent
6. independent

What I Can do

Let's Search in the Research!

	Independent Variable	Dependent Variable
1	organizational commitment	teaching performance
2	conceptual, interpersonal, technical skills	operational efficiency
3	contextualized and localized materials	achievement
4	blended learning	student achievement
5	exposing students to classical music	reading comprehension

Additional Activity

Research titles may vary. Make sure there is bivariate data involved.

Assessment

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

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