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DepED DEPARTMENT OF EDUCATION

ALS Alternative Learning System LIFELONG LEARNING

LEARNING STRAND 2
SCIENTIFIC AND CRITICAL THINKING SKILLS

MODULE 4: HOW CAN WE HELP LIFE ON LAND?

ALS Accreditation and Equivalency Program: Junior High School

UNESCO United Nations Educational, Scientific and Cultural Organization

KOICA Korea International Cooperation Agency

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Learning Strand 2: Scientific and Critical Thinking Skills
Module 4: How Can We Help Life on Land?

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User's Guide

For the ALS Learner:

Welcome to this Module entitled How Can We Help Life on Land? under Learning Strand 2 Scientific and Critical Thinking Skills of the ALS K to 12 Basic Education (BEC).

This module was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be able to process the contents of the learning resource while being an active learner.

This module has the following parts and corresponding icons:

 *Let's Get to Know*	This will give you an idea of the skills or competencies you are expected to learn in the module.
 *Pre-assessment*	This part includes an activity that aims to check what you already know about the lesson. If you get all the answers correct (100%), you may decide to skip this module.
 *Setting the Path*	This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.
 *Trying This Out*	This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.
 *Understanding What You Did*	This includes questions that process what you learned from the lesson.
 *Sharpening Your Skills*	This section provides an activity that will help you transfer your new knowledge or skill in real-life situations or concerns.
 *Treading the Road to Mastery*	This is a task which aims to evaluate your level of mastery in achieving the given learning competency.
 *Don't Forget*	This part serves as a summary of the lessons in the module.
 *Explore More*	In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.
 *Reach the Top*	This part will assess your level of mastery in achieving the learning competencies in each lesson in the module.
Answer Key	This contains answers to all activities in the module.
Glossary	This portion gives information about the meanings of the specialized words used in the module.

At the end of this module you will also find:

References	This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer the Pre-assessment before moving on to the other activities included in the module.
3. Read the instruction carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. Return this module to your ALS Teacher/Instructional Manager/Learning Facilitator once you are through with it.

If you encounter any difficulty in answering the tasks in this module, do not hesitate to consult your ALS Teacher/Instructional Manager/Learning Facilitator. Always bear in mind that you are not alone.

We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies. You can do it!

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MODULE 4

LET'S GET TO KNOW

Josh needs a summer job. Fortunately, his grandparents are asking for his help to do agricultural labor at their farm in Benguet. But being born and raised in Metro Manila has become a conflict and consequently has given him limited knowledge about farming practices like planting crops and measuring land area. He wants to grab the opportunity of learning new skills at the same time earning money for his expenses. Let us help him prepare for his summer job.

MODULE 4
PRE-ASSESSMENT

Directions: Choose the letter of the best answer. Write your answers on a separate sheet of paper.

1. Corn and soybeans often follow one another in a crop rotation schedule because:

   A. corn and soybeans have similar insect pests that respond to the same methods of control.
   B. soybeans grow very densely and will shade out many of the weeds that grow in a cornfield.
   C. corn is a heavy user of nitrogen and soybeans can help replenish nitrogen in the soil.
   D. soybeans require humus-rich soil and corn residues add organic matter to the soil when plowed under.

2. Which of the following elements is considered important for plantgrowth?

   A. arsenic **B.** nitrogen **C.** chromium **D.** lead

3. Which of the following best describes a "fertile" soil?

   A. it has seeds
   B. it has enough water
   C. it has high levels of nitrogen
   D. it has many worms going inside

4. Why do farmers plant different crops in order to use less nutrients from the soil?

   A. crop rotation
   B. contour plowing
   C. terracing
   D. cover crops

5. What is it called when you plow across the slope of hills?

   A. terracing
   B. crop rotation
   C. no till farming
   D. contour plowing

6. Which of the following best describes soil erosion?

A. topsoil will flatten
B. topsoil will go down a slope
C. topsoil will be filled with water
D. topsoil will be planted with crops

7. Which of the following farming practices help to prevent the erosion of topsoil?

A. Plowing a field perpendicular to the contour lines.
B. Plowing a field in the direction where water drains.
C. Plowing a field parallel to the contour lines.
D. None of these will help prevent soil erosion.

8. Which of the following is NOT considered a short- or medium-term crop?

A. pineapple **B.** peanut **C.** corn **D.** apple

9. Which of the following crops should be planted near grains and tubers?

A. mung bean **B.** pineapple **C.** cassava **D.** corn

10. Which of the following describes the function of leaves, branches, and rocks in farming?

A. they absorb excess water
B. they serve as anchors of soil
C. they stop the growth of weeds
D. they serve as fertilizers of soil

11. A farmer wants to put a fence around a piece of land to mark his property. Two sides of the fence are 12 meters each, the third side is 13 meters, and the fourth side is 20 meters. What is the perimeter of the farmer's land?

A. 39 meters **B.** 45 meters **C.** 57 meters **D.** 63 meters

12. A square cage for chickens measures 25 meters on each side. What is the perimeter of the cage?

A. 25 meters
B. 50 meters
C. 75 meters
D. 100 meters

13. A four-sided farm lot has a total perimeter of 250 meters. The measurements for the first three sides are 80, 90, and 40 meters. What is the length of the fourth side?

A. 40 meters
B. 80 meters
C. 90 meters
D. 130 meters

14. A rectangular cropland measures 10 hectares and 45 hectares on each side. What is the area?

A. 110 hectares
B. 450 hectares
C. 560 hectares
D. 90 hectares

15. A cropland is on sale for 1,000 pesos for every square meter. If the area has 1,000 square meters, how much will the land be sold?

A. 10,000
B. 100,000
C. 1,000,000
D. 10,000,000

LESSON 1

SETTING THE PATH

HOW CAN I PLANT SAFELY AND WISELY?

At the end of this lesson, you will be able to:

- enumerate the strategies and guidelines in crop rotation (LS2SC-BC-PSD- LE/AE/JHS-67, LS1CS/EN-R-PSD-LE/JHS-19);
- describe the procedures in crop rotation (LS2SC-BC-PSD- LE/AE/JHS-67, LS1CS/EN-R-PSD-LE/JHS-19); and
- explain the importance of crop rotation (LS2SC-BC-PSD-LE/AE/JHS-62).

LESSON 1

TRYING THIS OUT

1. Using the table below, write your regular day-to-day schedule.
2. Make sure to include the time you wake up, eat meals (breakfast, lunch, dinner), go to work/school, go home, and sleep.
3. You can write other things too (e.g. playing games, talking to friends, bonding with family).
4. You can also write the same activity for long hours (e.g. you go to school from 7:00 AM to 12:00 NN).

TIME	ACTIVITY
12:00 – 4:00 AM	
4:00 – 5:00 AM	
5:00 – 6:00 AM	
6:00 – 7:00 AM	
7:00 – 8:00 AM	
8:00 – 9:00 AM	
9:00 – 10:00 AM	
10:00 – 11:00 AM	
11:00 – 12:00 NN	
12:00 – 1:00 PM	
1:00 – 2:00 PM	
2:00 – 3:00 PM	
3:00 – 4:00 PM	
4:00 – 5:00 PM	
5:00 – 6:00 PM	
6:00 – 7:00 PM	
7:00 – 8:00 PM	
8:00 – 9:00 PM	
9:00 – 11:59 PM	

5. *Questions*:

   a. Why is it important to have time for breakfast, lunch, and dinner?

   b. What do you think will happen if you didn't have time to sleep?

   c. Why is it important to spend time with friends and play games?

LESSON 1

UNDERSTANDING WHAT YOU DID

Your body requires you to eat healthy foods so you will have the energy to do tough tasks. You need to have enough sleep at night so you will not feel tired and sleepy during the day. You also need to talk and play games with your friends to enrich your physical, psychological, emotional and spiritual health. All of these activities are important because they help you do better in life. Just like our body, the soil needs to follow a "schedule" of activities to make sure that it will grow healthier.

Crops are plants or plant products that are grown and harvested for consumption and profit (to make money). Examples are cereals (corn, rice, and wheat), root crops (cassava and potato), vegetables (cabbages and lettuces), and fruits (bananas, oranges, and watermelons). You might think that the more crops you plant on soil, the more money you will get after selling them. But, going back to the schedule you made, doing too many things without rest will make yourself unhealthy. The same idea can be applied to your soil. Planting too many crops will make it too exhausted.

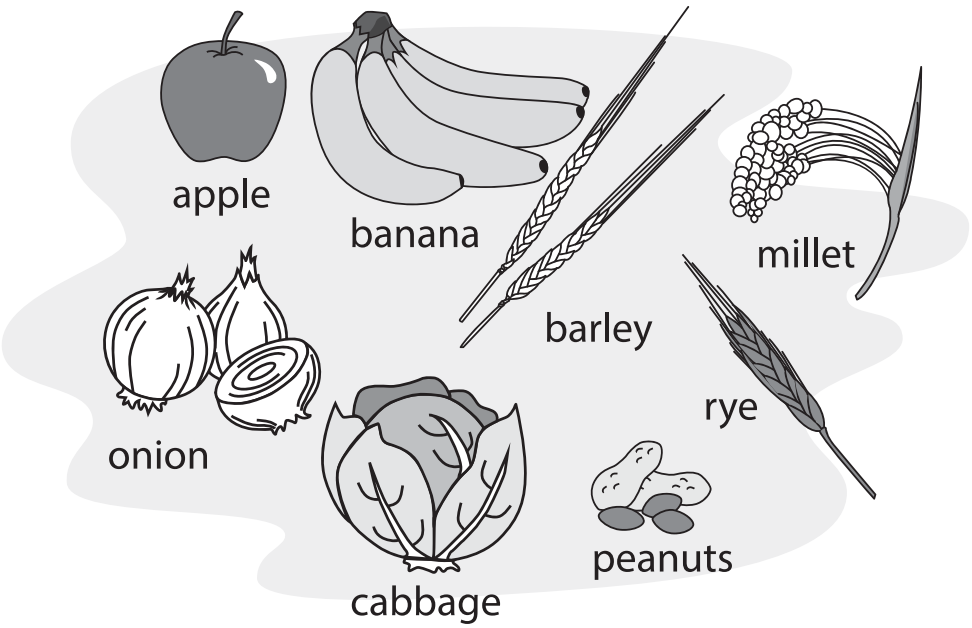


Figure 1.1. Types of crops.

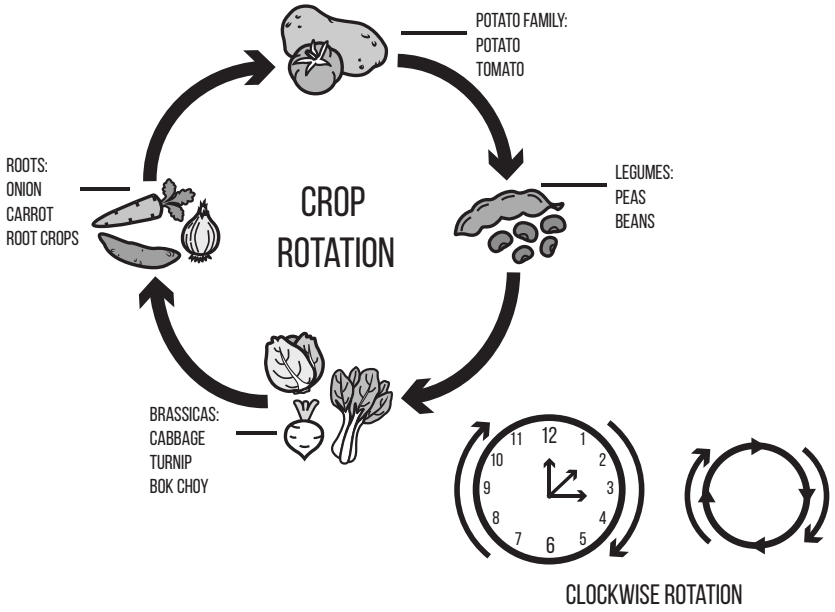


Figure 1.2. Cyclical crop rotation.

Crop rotation means changing the type of crop grown on a piece of land from year to year. You can rotate crops on land like a clock, called **cyclic rotation** (in which the same sequence of crops is repeated indefinitely on a field), or choose what is best for your business, called **non-cyclical rotation** (in which the sequence of crops varies irregularly).

Crop rotation is important in many ways.

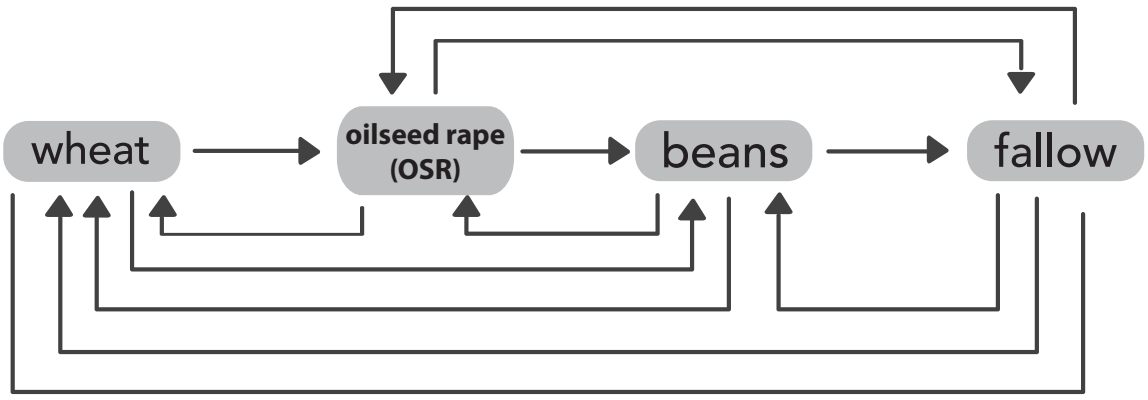


Figure 1.3. Non-cyclical crop rotation.

1. **Microorganisms** such as bacteria and fungi help in making soil healthier. Just like you, microorganisms need food to continue working. Crop rotation provides food for microorganisms in the form of organic matter.

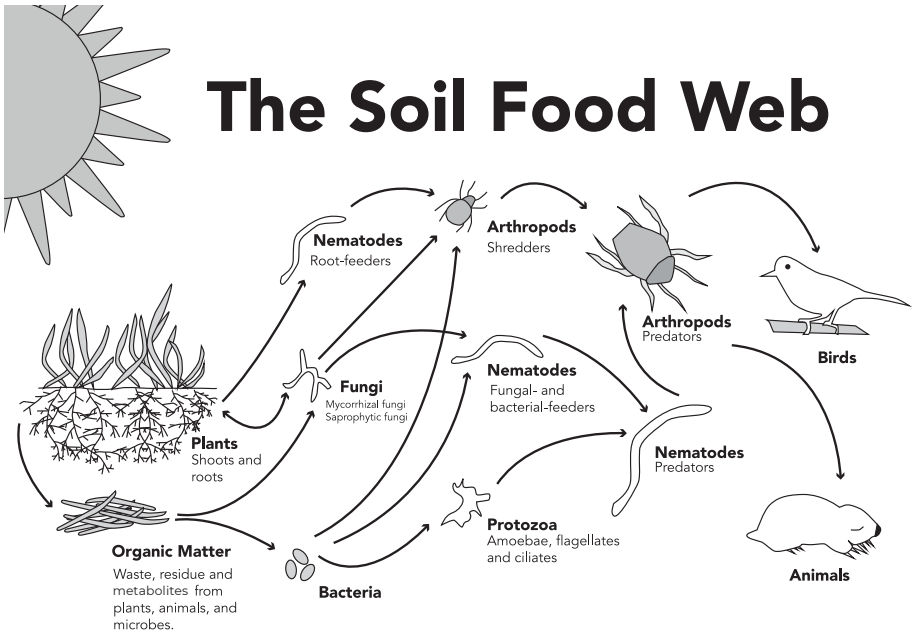


Figure 1.4. Microorganisms in soil.

2. **Nitrogen** is an important nutrient in soil. Soil can be called "**fertile**" if it has high levels of nitrogen. Fields have a value rating of **high** (75 nitrogen units), **medium** (35 nitrogen units), and **low** (15 nitrogen units).

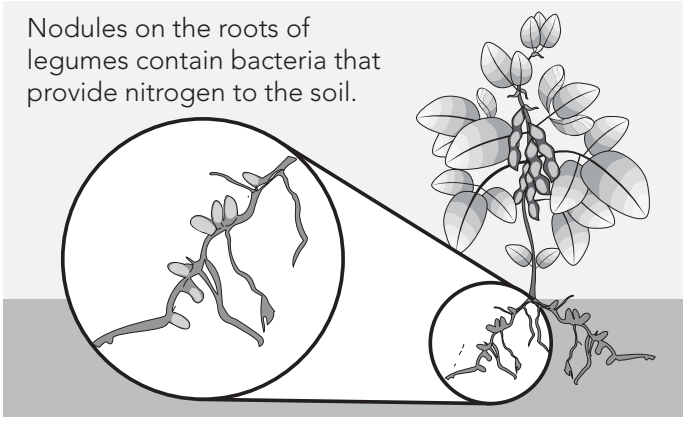


Figure 1.5. Nodules on roots of legumes contain bacteria that provide nitrogen in soil.

Legumes such as soybeans and mung beans are rich in nitrogen. Changing the place of legumes on land during crop rotation means that nitrogen can be spread out

and make the soil fertile. In some farmlands, nitrogen fixers (plants that provide additional amounts of nitrogen in soil) are used to increase fertility especially if the same land has nitrogen users (plants that consume large amounts of nitrogen in soil).

3. **Pests** can destroy crop health and soil quality. Some crops get pests faster than others. Pumpkins (*kalabasa*) get pests after 2 years. If you put cabbages (*repolyo*) after harvesting pumpkins during crop rotation, pests will not stay in the same place because cabbages take 7 years before pests get in.

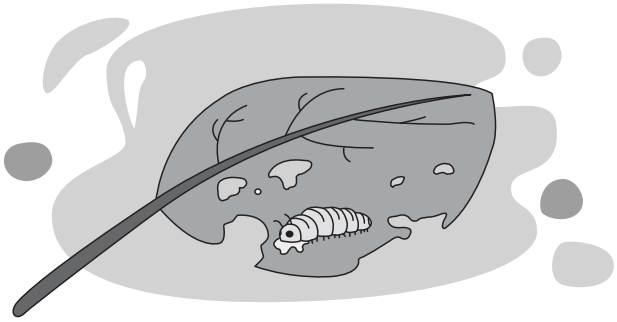


Figure 1.5. Example of pest in crops

Table 1. Rotation length to reduce soil-borne pests

VEGETABLE	DISEASE	YEARS BEFORE CROPS ARE INFESTED BY PESTS
asparagus	fusarium rot	8
cabbage	clubroot	7
cabbage	blackleg	3-4
cabbage	black rot	2-3
muskmelon	fusarium wilt	5
parsnip	root rot	2
pease	root canker	3-4
pease	fusarium wilt	5
pumpkin	black rot	2
radish	clubroot	7

LESSON 1

SHARPENING YOUR SKILLS

I. **Directions:** Lolo Gino planted two sets of crops in different fields (both medium level). Which of the two fields is more fertile, and why? Write your answers on a separate sheet of paper.

Table 2. Nitrogen Content and Consumption of Common Crops

NITROGEN FIXERS (+ NITROGEN)		HEAVY NITROGEN USERS (- NITROGEN)		MEDIUM NITROGEN USERS (- NITROGEN)		LIGHT NITROGEN USERS (- NITROGEN)	
pinto bean	+25	corn	-50	barley	-20	turnips	-10
soybean	+40	wheat	-40	oats	-20	sweet potatoes	-5
field pea	+20	sunflowers	-35			peppers	-10
		tomatoes	-60			pumpkins	-15
		watermelon	-70				

FIELD A	
corn	oats
soybean	peppers

FIELD B	
pinto bean	sunflowers
wheat	pumpkins

To make sure that you are doing crop rotation correctly, several guidelines should be remembered:

1. Separate similar crops or families of crops as much as possible.

Apiaceae (Carrot Family)	carrot, parsnip, parsley, celery (*kinchay*)
Asteraceae (Sunflower Family)	lettuce (*litsugas*), sunflower, dandelions
Brassicaceae (Mustard Family)	cabbage (*repolyo*), broccoli, cauliflower, turnip (*singkamas*), radish (*labanos*), Chinese cabbage (*bok choi*)
Chenopodiaceae (Goosefoot Family)	beet (*remolatsa*), spinach
Convolvulaceae (Bindweed Family)	sweet potato (*kamote*)
Cucurbitaceae (Gourd Family)	cucumber, watermelon (*pakwan*), squash (*kalabasa*)
Fabaceae (Pea Family/ Legumes)	garden pea, mung bean, soybean
Liliaceae (Onion Family)	onion (*sibuyas*), garlic (*bawang*), leek, shallot, chive
Malvaceae (Mallow Family)	okra
Poaceae (Grass Family)	sweet corn, popcorn, ornamental corn
Solanaceae (Nightshade Family)	tomato (*kamatis*), pepper, eggplant (*talong*), potato (*patatas*)

2. Alternate cover crops (legumes with grasses and cool season with warm season).
3. Alternate heavy feeders with light feeders (nitrogen).
4. Alternate flowering crops with vegetative crops.
5. Place crops with different canopy heights next to each other.
6. Alternate cool season crops with warm season crops.
7. Alternate deep-rooted crops (in the top 1-6 feet of soil) with moderately deep-rooted (in the top 1-4 feet of soil) and shallow-rooted (in the top 1-2 feet of soil) crops.

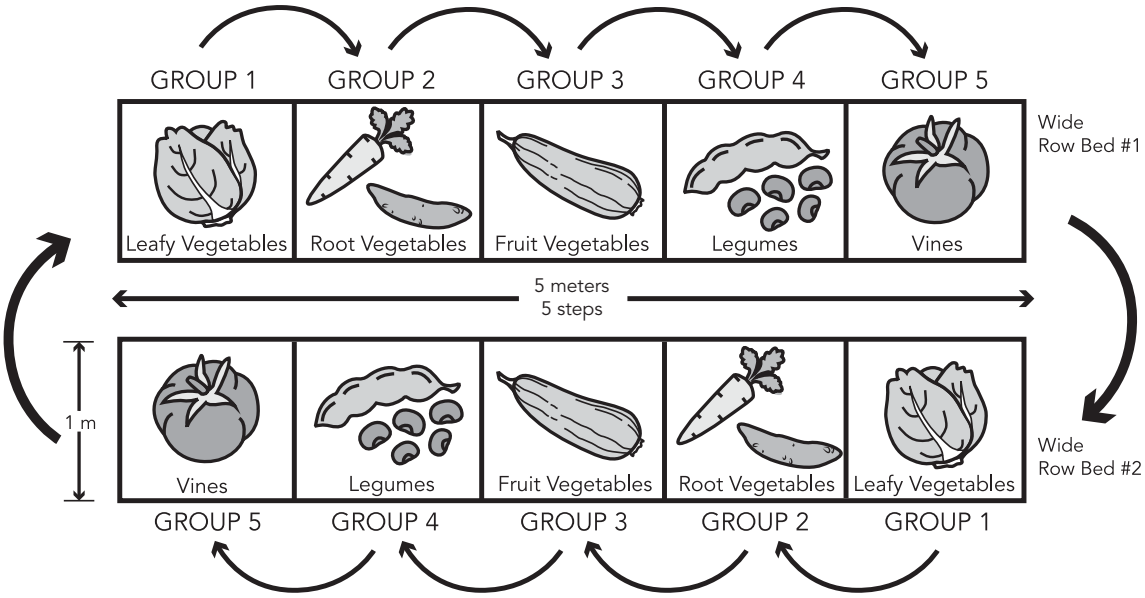


Figure 1.6. Example of crop rotation

An example of crop rotation can be seen in the figure above. Why is crop rotation a good practice?

II. **Directions:** Lolo Gino planted the following crops for Year 1. How can he improve his crops for Year 2? Why? Write your new plan and explanation on a separate sheet of paper.

YEAR 1		YEAR 2	
sweet corn	ornamental corn		
mung bean	soybean		

LESSON 1

TREADING THE ROAD TO MASTERY

Directions: Between the two fields (A & B) in Year 1,

1. Which field will produce better crops and healthier soil? Why?
2. How can you improve a better field for Year 2? Why?

Write your answers on a separate sheet of paper.

YEAR 1 FIELD A	carrot	cabbage	sweet potato	watermelon	sunflower
	parsnip	wheat	okra	pepper	potato

YEAR 1 FIELD B	soybean	corn	field pea	barley	pinto bean
	parsley	garden pea	cucumber	mung bean	cauliflower

YEAR 2					

LESSON 2

SETTING THE PATH

HOW DOES WATER AFFECT SOIL?

At the end of this lesson, you will be able to:

- enumerate the strategies and guidelines in contour farming (LS2SC-BC-PSD- LE/AE/JHS-67, LS1CS/EN-R-PSD-LE/JHS-19);
- describe the procedures in contour farming (LS2SC-BC-PSD- LE/AE/JHS-67, LS1CS/EN-R-PSD-LE/JHS-19); and
- explain the importance of contour farming (LS2SC-BC-PSD-LE/AE/JHS-62).

LESSON 2

TRYING THIS OUT

1. Imagine the two situations below.

2. You are driving along two types of roads: Road A is a smooth and flat road while Road B is a road with multiple humps. See figure 2.1.

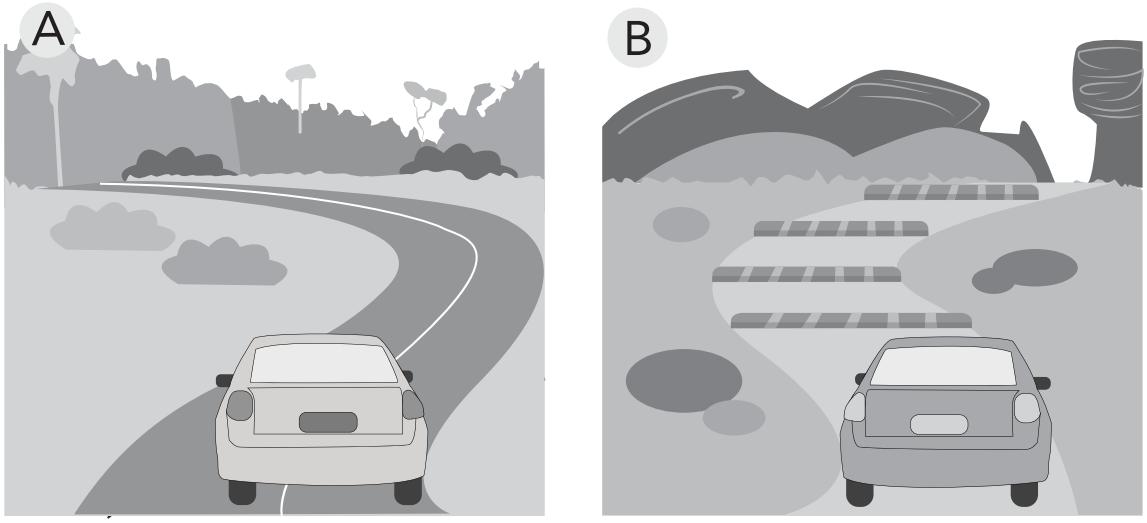


Figure 2.1. Road A (left) is a smooth and flat road while road B (right) is a road with multiple humps.

3. *Questions*:

   a. If you are driving at a speed of 30 kilometers per hour, will you be able to drive faster once you reach Road A?

   b. If you are also driving at a speed of 30 kilometers per hour, will you be able to drive faster once you reach Road B?

   c. How do road bumps affect the speed of your car when driving?

LESSON 2

UNDERSTANDING WHAT YOU DID

Bumps are placed along roads to force vehicles to slow down. This is useful so that passengers and pedestrians are secured on the street.

Farmers use the same idea when they take care of their soil and crops. Only, in this case, instead of cars, they slow down the movement of water. This technique is called contour farming.

Contour cultivation (contour farming, **contour plowing**, or **contour bunding)** is a sustainable way of **farming** where **farmers** plant crops across or perpendicular to slopes to follow the **contours** of a slope of a field. This arrangement of plants breaks up the flow of water and makes it harder for soil erosion to occur.

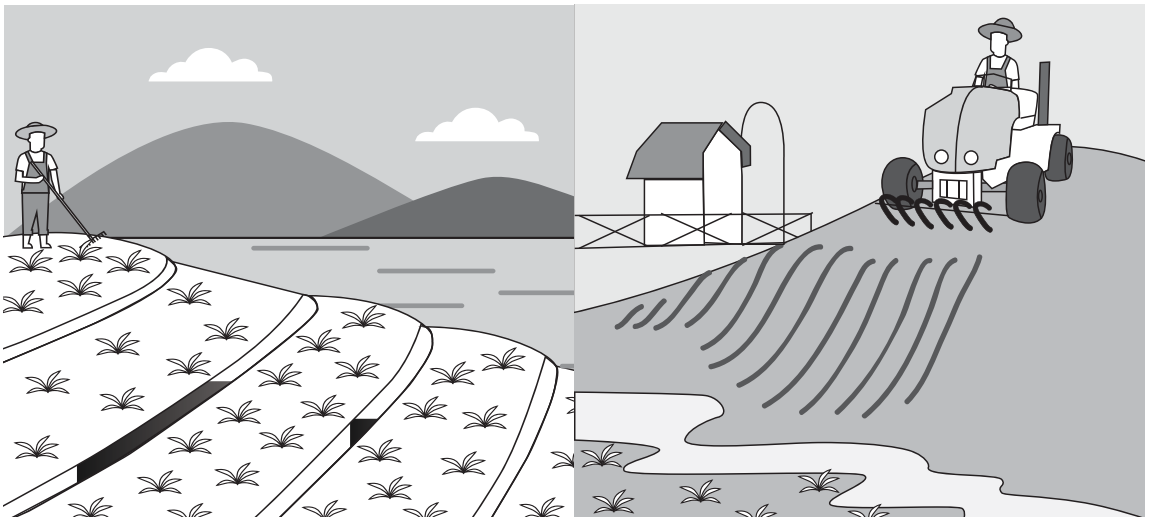


Figure 2.2. Proper contour farming (left) and improper contour farming (right).

If it starts raining along the two places, which field do you think can catch and retain rainwater easily? In which field can rainwater penetrate more? Which field can distribute equal amount of rainwater to all area?

Contour farming helps farmers use water effectively. This can be proven in the following ways:

1. If water is freely moving along a farmland, topsoil will easily go down (called soil erosion). Contour farming avoids this from happening to keep the crops in place.

2. If water is moving down at a high speed, soil will not have enough time to absorb it. Contour farming slows it down to make sure that the soil will not dry easily. It has the same principle with the bumps on the road forcing vehicles to slow down.

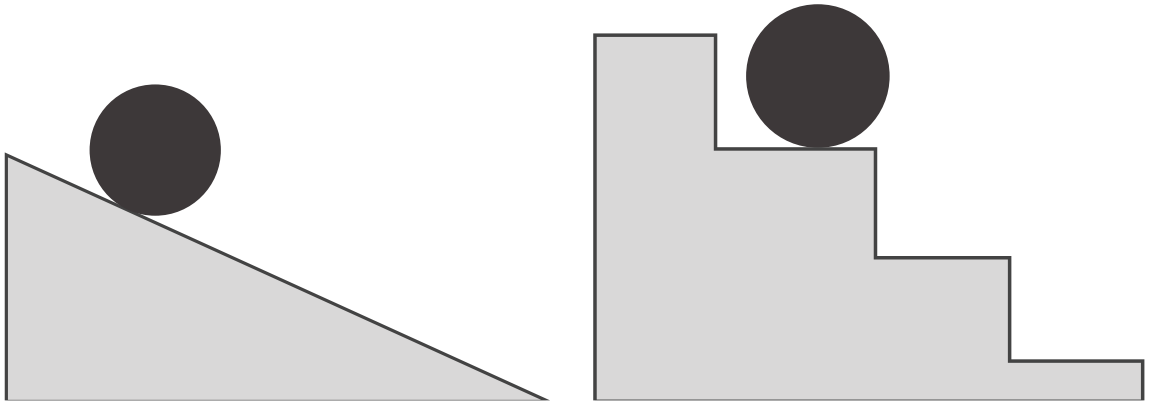


Figure 2.3. The ball will slide down quickly and fall to the ground immediately if it moves right ahead on the downward straight-line slope. In the other situation, the ball that rolls from the top of the platform along the staircase is suspended for few seconds compared to the other ball.

3. Since contour farming slows down water from touching the ground, that means the farmers do not need to collect water too often for irrigation.

By doing contour farming, farmers have an easier time doing their job while also harvesting better crops and making more money.

LESSON 2

SHARPENING YOUR SKILLS

I. **Directions**: On a separate sheet of paper, write **TRUE** if the statement is correct. If not, write **FALSE**.

_____ **1.** Contour farming is a destructive way of farming where farmers plant crops across or perpendicular to slopes to follow the contours of a slope of a field.

_____ **2.** Water is wasted when farmers use contour farming in planting crops.

_____ **3.** Soil erosion is expected when water falls from mountain tops down to the plain land and contour farming is not practiced.

_____ **4.** When water is running too fast, it is easily absorbed by the soil

_____ **5.** In using contour farming, farmers do not need large amount of water to keep their plants hydrated.

The Sloping Agricultural Land Technology (SALT) is a combination of techniques for soil conservation and food production. SALT involves both contour farming and crop rotation. Check out the steps below.

1. **Make an A-frame**

   You will need an A-frame to easily and quickly mark contour lines along your field.

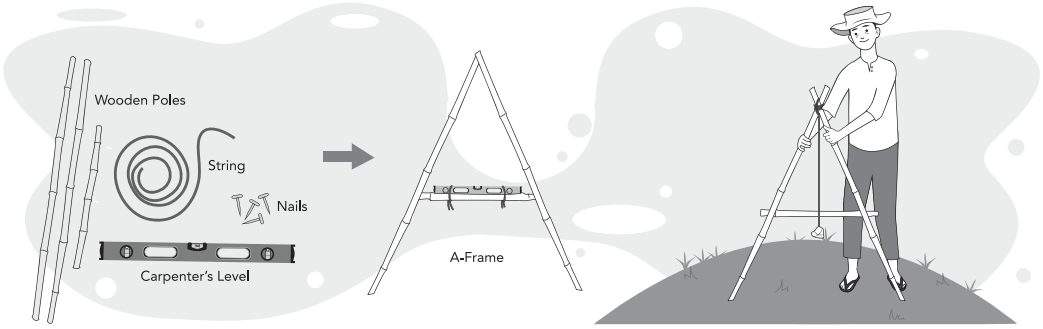


Figure 2.4. Assembly and use of an A-frame (left). The rock-and-string variation (right).

2. **Locate and mark the contour lines**

   Using an A-frame, contour lines will be located and marked using a stick (see Figure 2.4). The marks will tell you the distance of crops from each other. Remember, the farther the contour lines are from each other, the more potential erosion occurs. Closer contour lines, on the other hand, mean more nutrient-rich biomass produced and made available to the crops in the alley.

Figure 2.5. Laying out of a contour line.

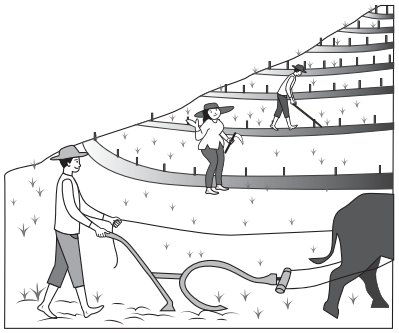


Figure 2.6. Plowing contour lines on a hillside.

3. **Prepare the contour lines**

The marked contour lines will be plowed and harrowed to make them ready for planting.

From top to bottom, contour lines should be 1 meter away from each other to avoid erosion.

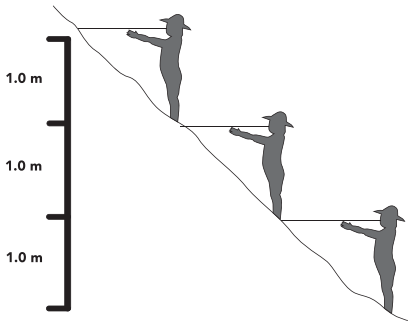


Figure 2.7. Determining distance between contours.

4. **Plant seeds of nitrogen-fixing trees and shrubs (NFTS)**

Each contour line should have two furrows at a distance of 0.5 meter apart with seed firmly covered with soil.

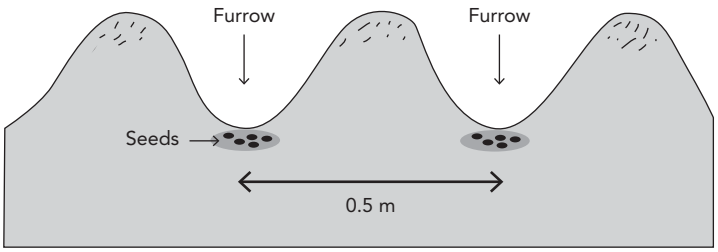


Figure 2.8. Plating seeds at 0.5 m distance in contour farming.

5. **Cultivate alternate strips**

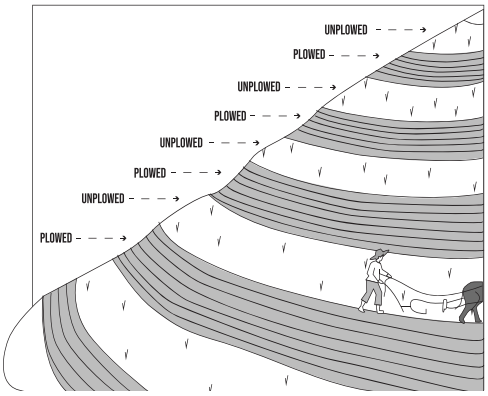


Figure 2.9. Alternating plowed and unplowed strips.

The spaces between the thick rows of NFTS where the crops are planted is called a strip (Figure 2.9).

6. Plant permanent crops

Permanent crops should be planted in every third strip (Figure 2.10) and can be planted at the same time as the seeds of NFTS. Only the planting holes are cleared and dug. Ring weeding is employed until the NFTS are large enough to hold the soil.

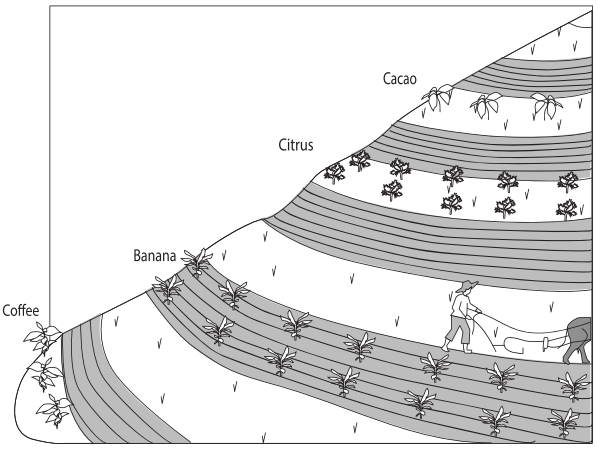


Figure 2.10. Permanent crops planted in every third strip.

7. Plant short- and medium-term crops

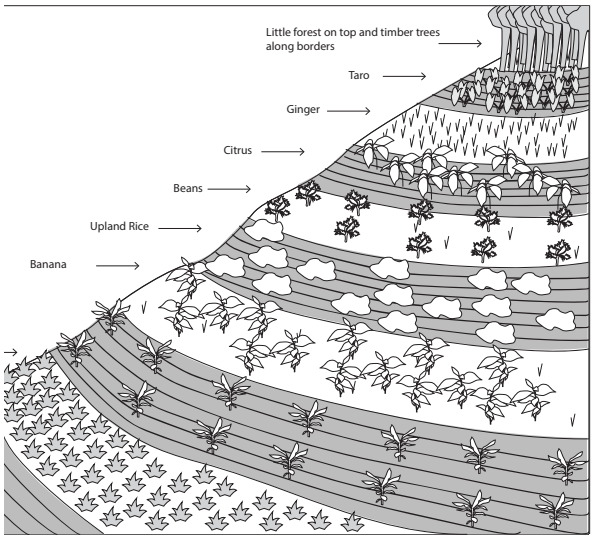


Figure 2.11. Strips of short- and medium-term plants, in between strips of long-term crops.

Short- and medium-term crops can be planted between and among strips of permanent crops.

They are sources of food and regular income while permanent crops have yet to bear fruit.

Examples of short and medium-term crops are pineapple, ginger, gabi, castor bean, camote, peanut, mung bean, melon, sorghum, corn, upland rice, etc. To avoid shading, shorter plants are planted away from tall ones.

8. Trim the NFTS regularly

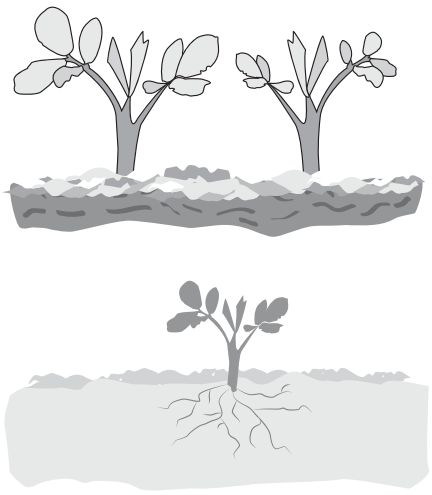


Figure 2.12. Regular trimming of NFTS plants and covering of bare soil with excess/removed plant parts.

Growing NFTS should be maintained at a height of 0.5 to 1 meter from the ground. Excess parts of NFTS, pruned leaves, and twigs are placed at the base of the crops to minimize the impact of raindrops on the bare soil. They also act as excellent organic fertilizers for both permanent, short- and medium-term crops.

9. Practice crop rotation

A good way of rotating non-permanent crops is to plant grains (corn, upland rice, sorghum, etc.), tubers (camote, cassava, gabi, etc) and other crops (pineapple, castor bean, etc) on strips where legumes (mung bean, bush sitao, peanut, etc) were planted previously, and vice versa. This practice will help maintain the fertility and good condition of your soil.

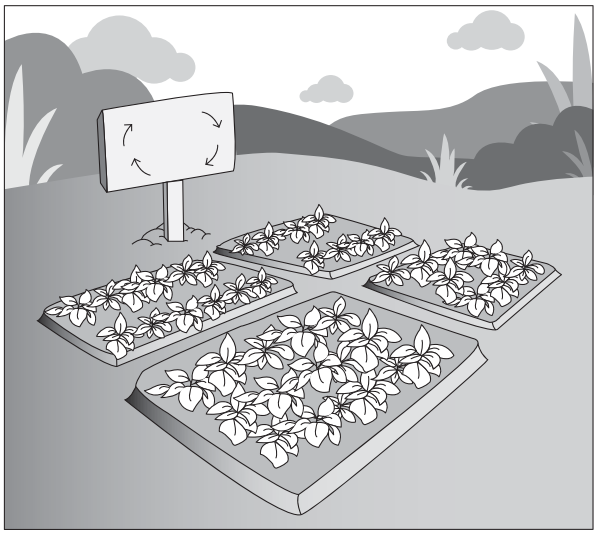


Figure 2.13. Crop rotation.

10. Build and maintain green terraces

Aside from providing food and income, SALT also provides control of soil erosion. Nitrogen-fixing trees and natural terraces are placed in double-thick rows along contour lines of the hill.

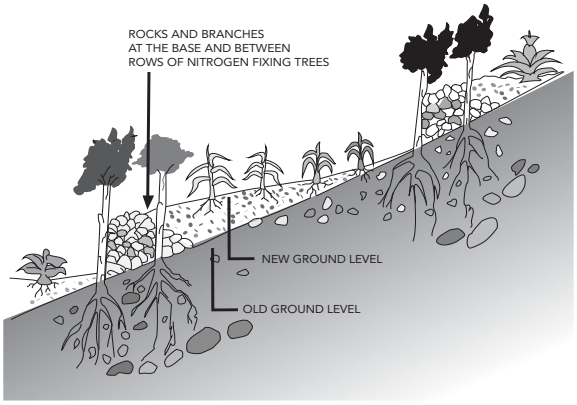


Figure 2.14. Build-up of terrace overtime with the SALT system.

By regularly placing and piling up straws, stalks, twigs, branches, leaves, rocks, and stones at the base of the trees, you can build strong, sustainable, and beautiful green terraces. These terraces act as anchors to keep the soil in place.

Questions: Is the SALT method effective? Why?

II. Directions: Arrange the following steps in contour farming by writing the correct number (1 to 10) on the space before each item. Write your answers on a separate sheet of paper.

_____ Practice crop rotation.
_____ Locate and mark the contour lines.
_____ Plant short- and medium-term crops.
_____ Plant seeds of nitrogen-fixing trees and shrubs.
_____ Cultivate alternate strips.
_____ Make an A-frame.
_____ Build and maintain green terraces.
_____ Regularly trim the nitrogen-fixing trees and shrubs.
_____ Prepare the contour lines.
_____ Plant permanent crops.

LESSON 2

TREADING THE ROAD TO MASTERY

Directions: Match **Column A** (general steps in contour farming) with **Column B** (description). Write the letter of your answer on a separate sheet of paper.

COLUMN A	COLUMN B
____ **1.** Practice crop rotation.	**A.** You will need an A-frame to easily and quickly mark contour lines along your field.
____ **2.** Locate and mark the contour lines.	**B.** Using an A-frame, contour lines will be located and marked using a stick.
____ **3.** Plant short- and medium-term crops.	**C.** The marked contour lines will be plowed and harrowed to make them ready for planting.
____ **4.** Plant seeds of nitrogen-fixing trees and shrubs.	**D.** Each contour line should have two furrows at a distance of 0.5 m apart with seed firmly covered with soil.
____ **5.** Cultivate alternate strips.	**E.** The spaces between the thick rows of NFTS where the crops are planted is called a strip.
____ **6.** Make an A-frame.	**F.** Ring weeding is employed until the NFTS are large enough to hold the soil
____ **7.** Build and maintain green terraces.	**G.** To avoid shading, plant shorter plants away from tall ones.
____ **8.** Trim the NFTS regularly.	**H.** Excess parts of NFTS, pruned leaves, and twigs are placed at the base of the crops to minimize the impact of raindrops on the bare soil.
____ **9.** Prepare the contour lines.	**I.** This practice will help maintain the fertility and good condition of your soil.
____ **10.** Plant permanent crops.	**J.** Keep gathering and piling up straw, stalks, twigs, branches, leaves, rocks, and stones at the base of the rows of nitrogen-fixing trees.

LESSON 3

SETTING THE PATH

HOW DO I MEASURE MY SOIL/LAND?

At the end of this lesson, you will be able to:

- relate geometric ideas to number and measurement ideas, including the concepts of a perimeter and area, by computing the parameter of a given piece of land (LS3MP-G-PSC-AE-5)

LESSON 3

TRYING THIS OUT

1. Your neighbor is planning to repaint their house. They are asking you if you can help them finish the job.
2. The wall is 8 feet tall. Your neighbor wants to put a different color for every 2 feet.

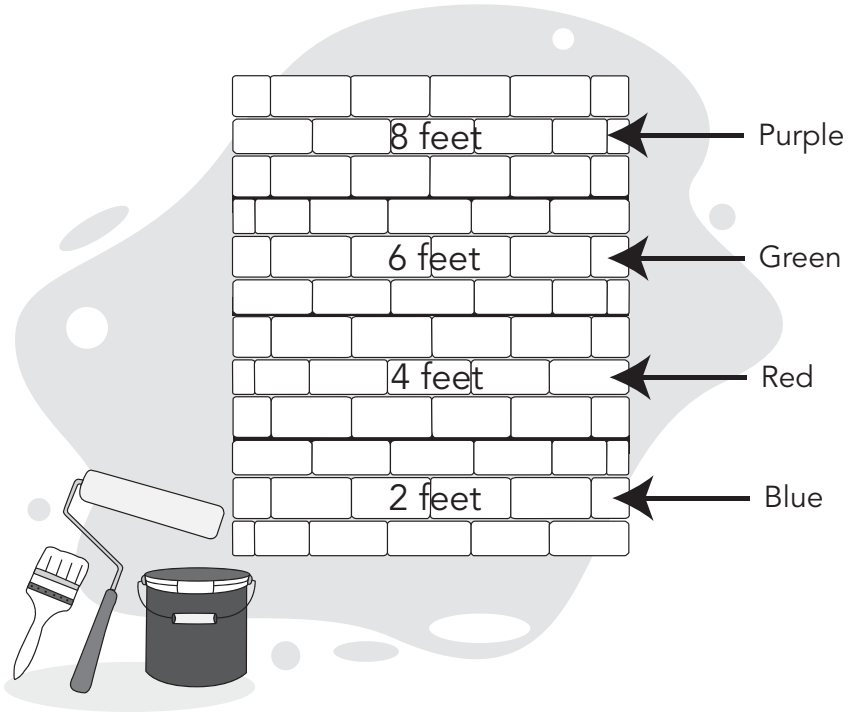


Figure 3.1. Your neighbor's wall for repainting.

3. He offers to pay you 250 pesos for every colored layer that you will finish.
4. *Questions:*
   a. How much money would you earn if you used only blue paint?
   b. How high (in feet) were you able to paint if you got 750 pesos?
   c. How will you be able to earn the highest income from painting the wall of your neighbor?

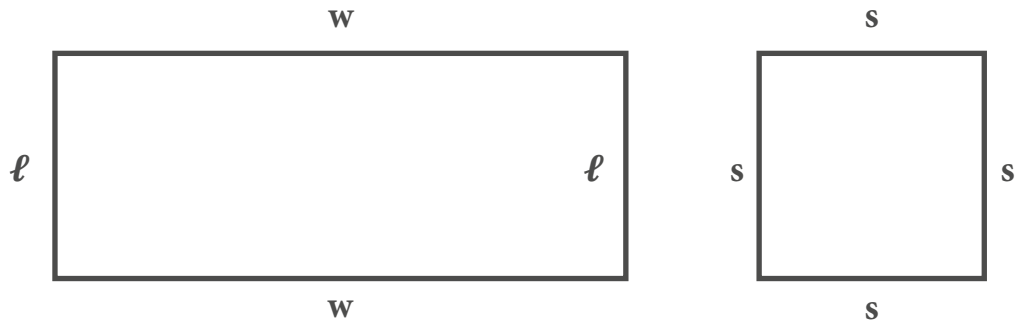
LESSON 3

UNDERSTANDING WHAT YOU DID

The amount of work you put into the repainting of the wall will tell you how much you will receive from your neighbor. The more layers you paint, the more colored layers you finish, the higher the payment. On the other hand, the less layers you paint, the less colored layers you finish, the lower the payment you will receive.

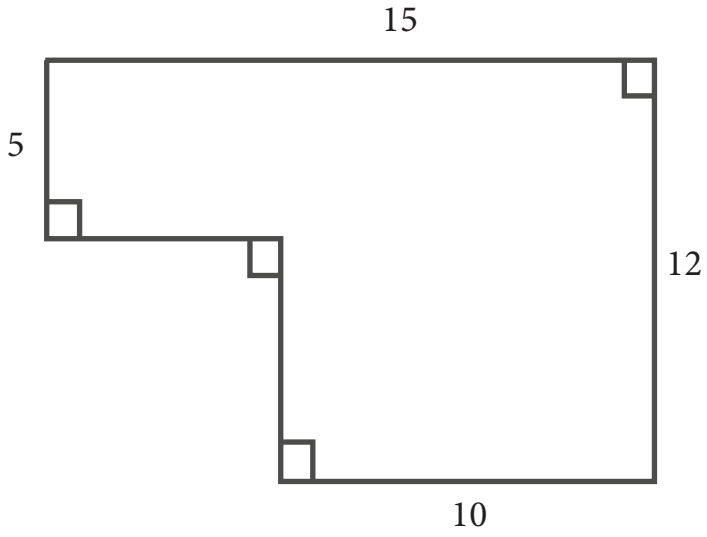
In the same way, when the farmers try to measure how big (or small) their land fields are, they are also considering how much they can earn from growing crops. Even if they are not aware of it, farmers are already applying Mathematics on their job. This lesson on measuring perimeter and area will be a useful skill we can use to understand the farmer's way of thinking.

The **perimeter** of a shape is the total distance around (outside) a shape. We can calculate the perimeter of a shape by adding up the lengths of each of the sides.

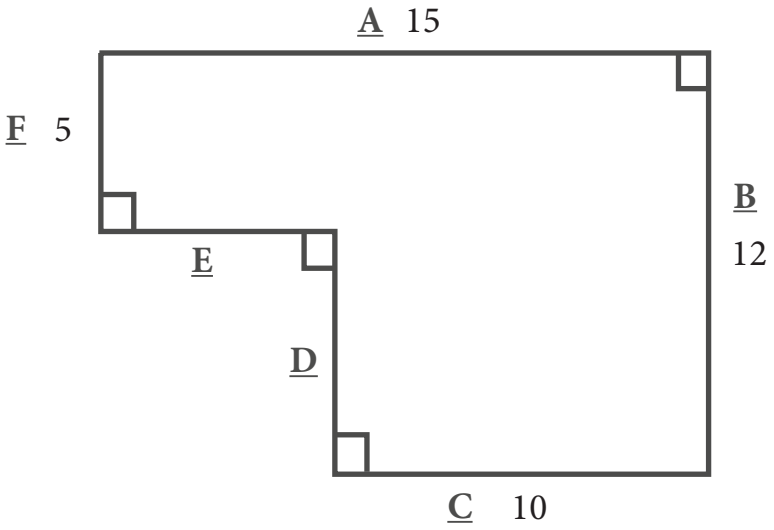


Perimeter of a rectangle = $\ell + \ell + w + w$
Perimeter of a square = 4s

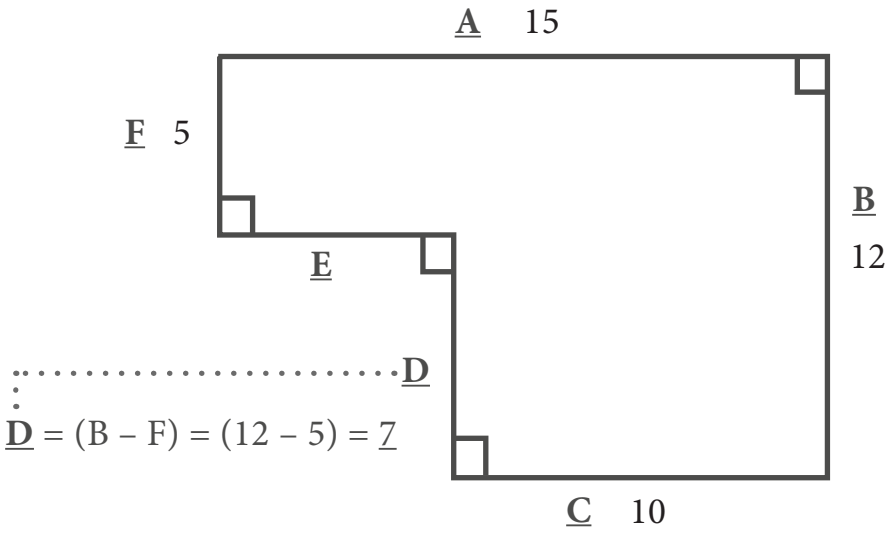
In the example below, you are asked to find the perimeter of the figure. It is a common mistake to quickly add all the numbers found on the figure. This is because the figure has 4 measurements but 6 sides.



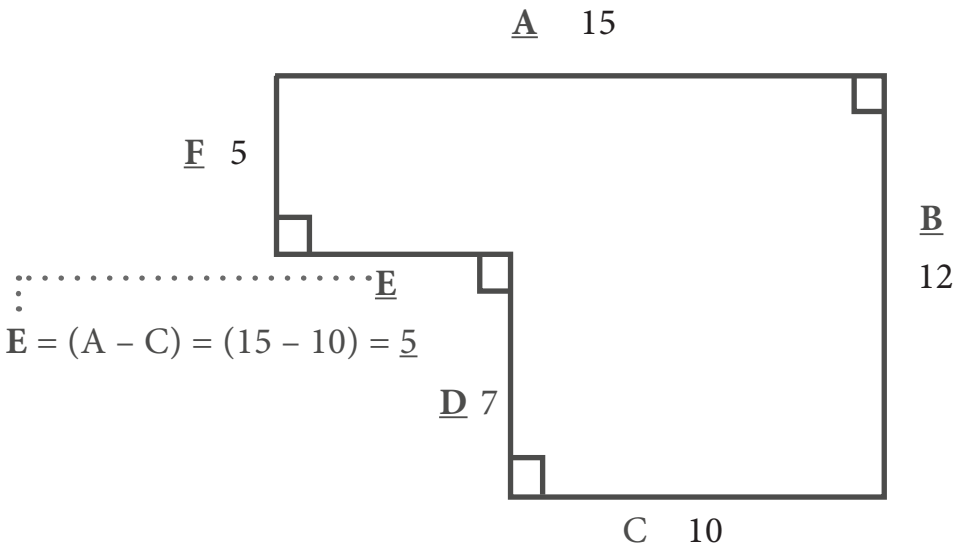
Let us now label all the sides of the figure.



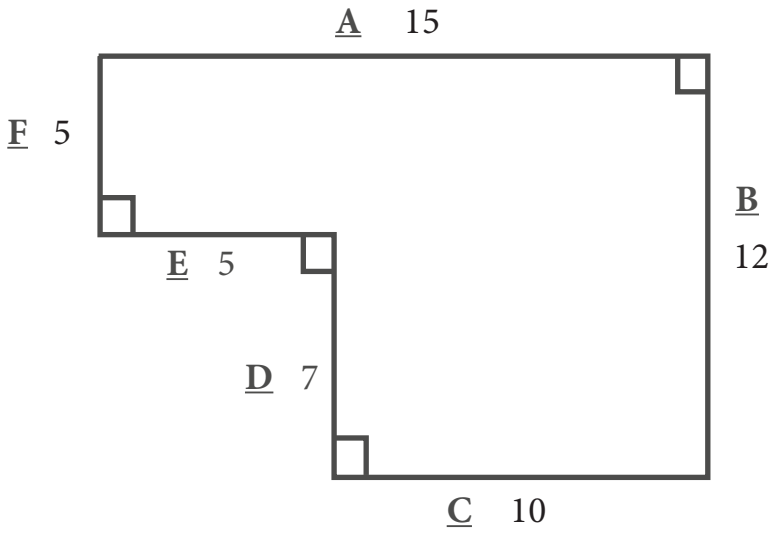
Based on the figure, the sum of the lengths of **F and D (F + D)** is equal to the length of **B**. We can now get the length of **D** by subtracting **F from B.**



At the same time, the sum of the lengths of **C and E (C + E)** is equal to the length of **A**. We can now get the length of **E** by subtracting **C from A**.



We now have the lengths of each side of the figure.



To get the perimeter, we just need to add all the lengths of each side of the figure.

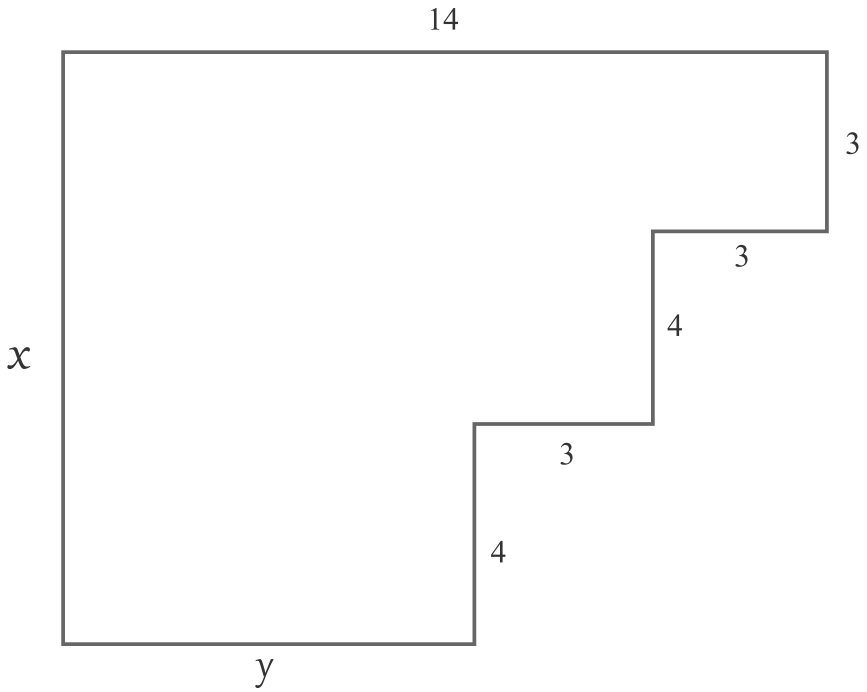
Perimeter = (A + B + C + D + E + F)
= (15 + 12 + 10 + 7 + 5 + 5)
= **54**

The perimeter of the figure is **54 units**.

LESSON 3

SHARPENING YOUR SKILLS

I. **Directions**: Jesse's boss asked him to guard his house at night when he is away. As part of their agreement, his boss will give him 20 pesos for every meter of the house Jesse can monitor. On his first night, he decided to walk around the house to check how much he can possibly earn, but he was only able to measure few areas. Below is the only area he was able to measure (all numbers in meters) and monitor.



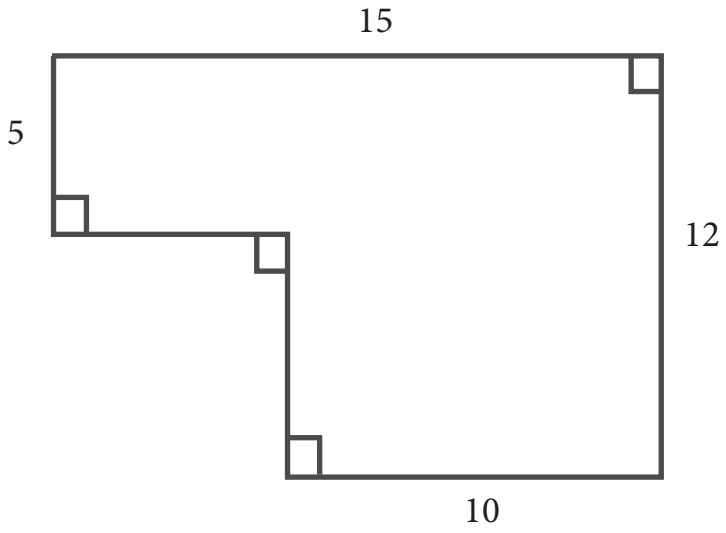
Find:

a. the length of side x
b. the length of side y
c. perimeter of the house (in meters)
d. total payment for Jesse's job (perimeter x 20 pesos)

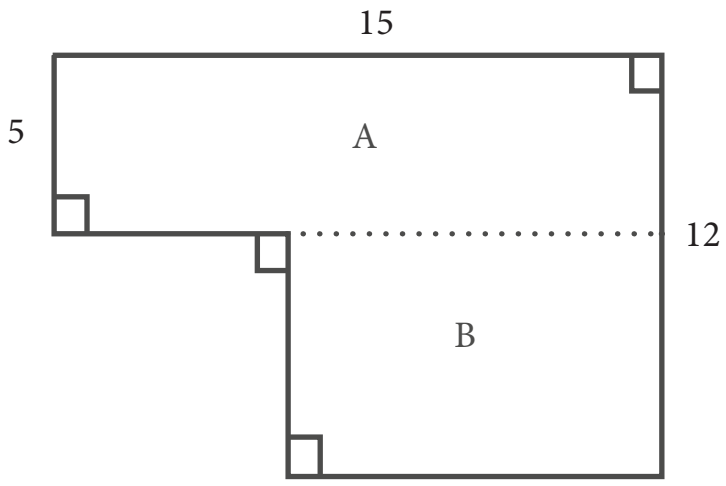
Write your answers on a separate sheet of paper.

The **area** of a shape is the amount of space inside the shape. It measures the amount of surface that shape occupies. In this lesson, we are going to focus on the area of a rectangle (area = length x width) and the area of a square (area = side x side).

Using the same figure, we are going to look for its area.

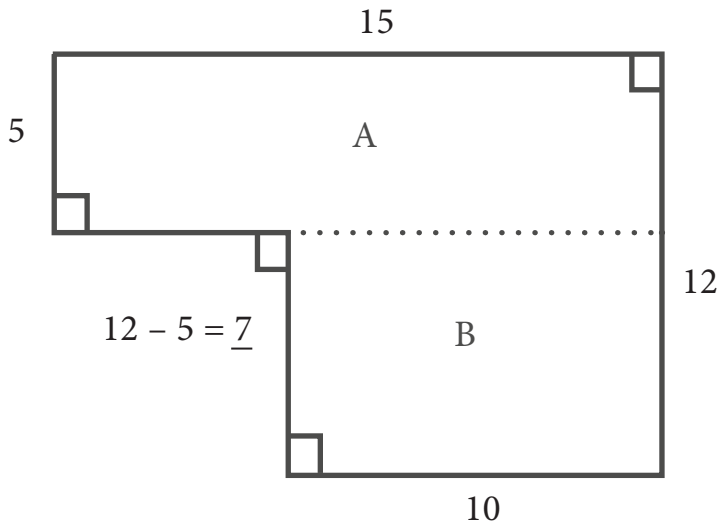


Since the figure does not have a definite shape, we can break it down into two rectangles.



Notice that there are two rectangles formed from the figure. To get the area, we need to find the length of the shorter and longer side. For rectangle A, the length of the two sides are already given. The area of rectangle A is A = length x width = 5 x 15 = **75**.

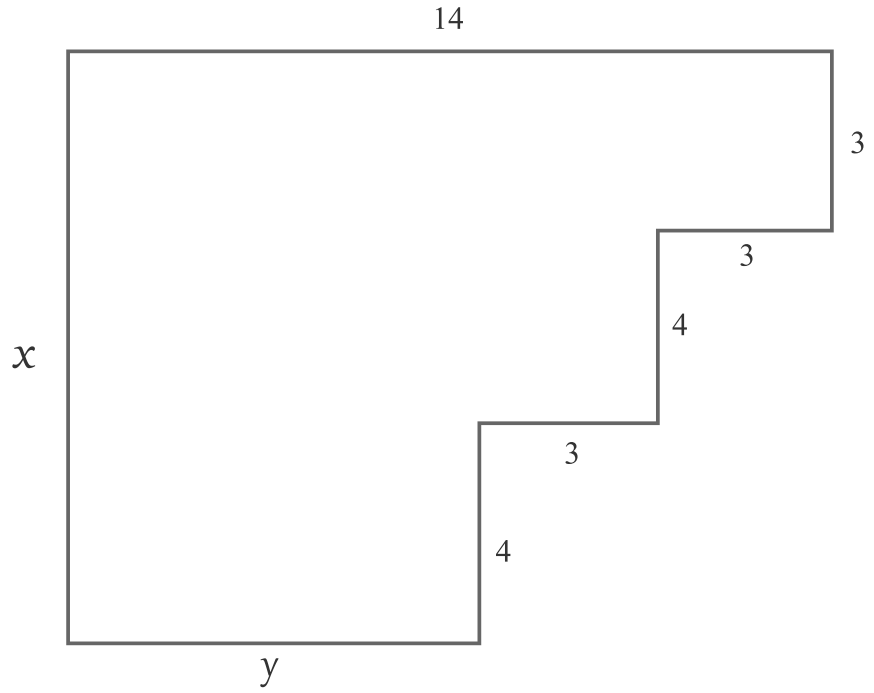
For rectangle B, one side already has a measurement (10), while the other does not. We will need to get its length using the same procedure that we did in perimeter.



The area of rectangle B is A = length x width = 7 x 10 = **70**.

To get the area of the whole figure, we can add the areas of each shape. The area of the whole figure is A = area of rectangle A + area of rectangle B = 75 + 70 = **145**. The area of the figure is 145 square units.

II. **Directions**: Jericko was asked to clean the first floor of his boss' house. He's given 25 pesos for every square meter that he finishes. The same figure is shown below.



Find:

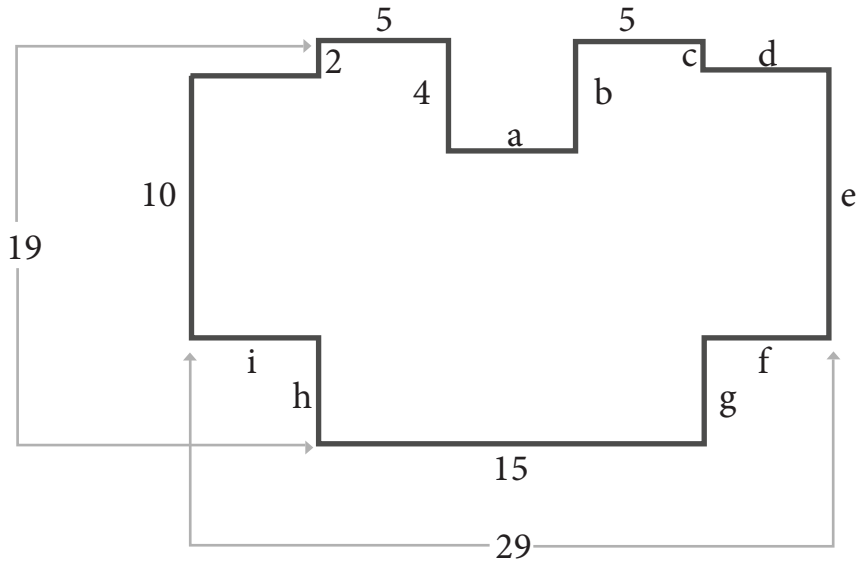
a. the length of side x
b. the length of side y
c. areas of the first floor (in square meters) clue: divide into three parts
d. total area of the house (in square meters)
e. total payment for Jericko's job if he finishes the whole first floor (total area x 25 pesos)

Write your answers on a separate sheet of paper.

LESSON 3

TREADING THE ROAD TO MASTERY

Directions: Josh is planning to buy land for his farm. He prepared 250,000 pesos for irrigation and 1,250,000 pesos for planting of crops. The shape of the land he bought is shown in the figure below.



For irrigation, he has a contract that requires a payment of 2,000 pesos per meter and for the planting of crops, he has a contract that requires a payment of 2,500 per square meter.

Find:

a. the length of each side of the land
b. land perimeter (in meters)
c. cost of irrigation (perimeter x 2,000 pesos)
d. change after payment for irrigation
e. area of each portion of land (in square meters)
f. total land area (in square meters)
g. cost of planting of crops (total area x 2,500)
h. change after payment for planting of crops

Write your answers on a separate sheet of paper.

MODULE 4

DON'T FORGET

- **Crops** are plants or plant products that are grown and harvested for consumption and profit (to make money).
- **Crop rotation** means changing the type of crop grown on a piece of land from year to year.
- You can rotate crops on land like a clock, called **cyclic rotation**, or choose what's best for your business, called **non-cyclical rotation**.
- **Contour farming** is when farmers do their activities (plowing, planting, cultivating, harvesting) across the slope instead of up and down the slope.
- The **perimeter** of a shape is the total distance around (outside) a shape.
- We can calculate the perimeter of a shape by adding up the lengths of each of the sides.
- The **area** of a shape is the amount of space inside the shape. It measures the amount of surface that shape occupies.
- The area of a rectangle is area = length x width.
- The area of a square is area = side x side.

MODULE 4

EXPLORE MORE

These resources are helpful for additional activities related to the topics of this module:

Challenges: Perimeter and Area
https://www.khanacademy.org/math/geometry/hs-geo-foundations/hs-geo-area/v/interesting-perimeter-and-area-problems

Contour Farming in the Philippines
https://www.youtube.com/watch?v=fpdcEf-npr4

GrowVeg: Create a Garden as Unique as You Are
https://www.growveg.com/garden-planner-intro.aspx

SALT: Sloping Agriculture and Land Technology
https://www.youtube.com/watch?v=y9D-gWk4S5U

What is Soil Health?
https://www.sare.org/Learning-Center/What-is-Soil-Health

MODULE 4
REACH THE TOP

You are almost done! Answer the following questions below on a separate sheet of paper.

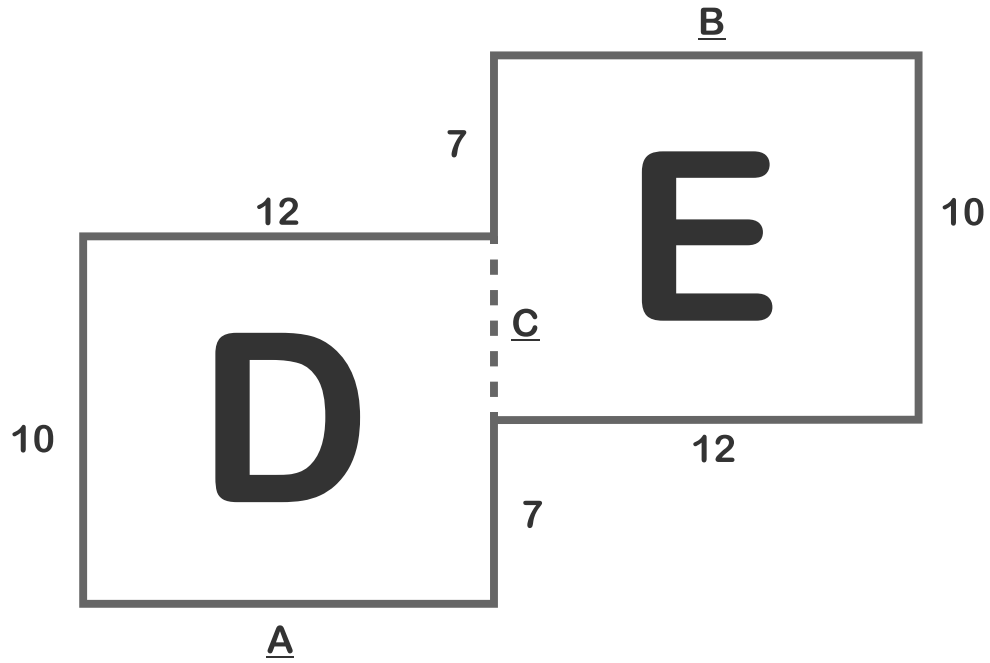
I. **Directions:** Write **I** if the statement refers to the importance of crop rotation, **G** if it refers to guidelines in crop rotation, and **P** if it refers to procedures in crop rotation.

_____ 1. Separate similar crops or families of crops as much as possible.
_____ 2. Crop rotation provides food for microorganism in the form of organic matter.
_____ 3. Changing the place of legumes during crop rotation means that nitrogen can be spread out and make the soil fertile.
_____ 4. You can rotate crops on land like a clock (cyclic rotation) or choose what's best for your business (non-cyclical rotation).
_____ 5. Alternate cool season crops with warm season crops.

II. **Directions:** Write **I** if the statement refers to the importance of contour farming, **G** if it refers to guidelines in contour farming, and **P** if it refers to procedures in contour farming.

_____ 1. The marked contour lines will be plowed and harrowed to make them ready for planting.
_____ 2. Contour farming avoids this from happening to keep the crops in place.
_____ 3. Farmers plant crops across or perpendicular to slopes to follow the contours of a slope of a field.
_____ 4. Short- and medium-term crops can be plated between and among strips of permanent crops.
_____ 5. Contour farming helps farmers use water effectively.

III. **Directions:** Using the figure below, compute what is being asked for each number



_____ **1.** sum of sides A, B, C (A + B + C)
_____ **2.** perimeter of figure D
_____ **3.** perimeter of figure E
_____ **4.** area of figure D
_____ **5.** area of figure E

ANSWER KEY

PRE-ASSESSMENT

PAGE 2

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

LESSON I: HOW CAN I PLANT SAFELY AND WISELY?

SHARPENING YOUR SKILLS

PAGE 11

ACTIVITY I

- Field A = 35 (medium level soil) – 50 (corn) – 20 (oats) + 40 (soybean) – 10 (peppers) = (-) 5 nitrogen units

- Field B = 35 (medium level soil) + 25 (pinto bean) – 35 (sunflowers) – 40 (wheat) – 15 (pumpkins) = (-) 30 nitrogen units

- Field A is more fertile than Field B by (-) 25 nitrogen units. Although both fields have negative values, Field A can easily regain nitrogen in its soil than Field B.

ACTIVITY II

YEAR 2	
Mung Bean	Ornamental corn
Sweet corn	Soybean

ANSWER KEY

TREADING THE ROAD TO MASTERY

PAGE 15

Field B will produce better crops and healthier soil in year 1. Because of the alternating nitrogen fixers and users, Field B will have a balanced soil – not having too much or too little nutrients. Also, Field B will have a lower tendency of having pests since the crops within the same family are not placed beside each other. Simple cyclic rotation in Field B is enough to maintain better crops and healthy soil.

YEAR 1 FIELD B	soybean	corn	field pea	barley	pinto bean
	parsley	garden pea	cucumber	mung bean	cauliflower

YEAR2	parsley	soybean	corn	field pea	barley
	green pea	cucumber	mung bean	cauliflower	pinto bean

ANSWER KEY

LESSON II: HOW DOES WATER AFFECT SOIL?

SHARPENING YOUR SKILLS

PAGE 20

ACTIVITY I

1. FALSE – contour farming is performing farming activities across the slope
2. FALSE – water is conserved in contour farming
3. TRUE – without contour farming, water can easily follow the slope of land
4. TRUE – soil will not have enough time to absorb water that is flowing too quickly along a slope
5. TRUE – contour farming minimizes water consumption for farmers' convenience

ACTIVITY II

1. 9
2. 2
3. 7
4. 4
5. 5
6. 1
7. 10
8. 8
9. 3
10. 6

TREADING THE ROAD TO MASTERY

PAGE 26

1. I
2. B
3. G
4. D
5. E
6. A
7. J
8. H
9. C
10. F

ANSWER KEY

LESSON III: HOW DO I MEASURE MY SOIL/LAND?

SHARPENING YOUR SKILLS

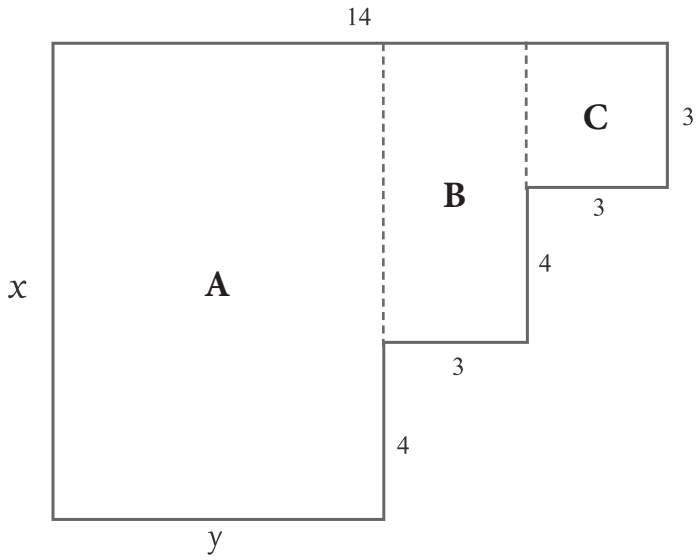
PAGE 33

ACTIVITY I

A. length of side x = 4 + 4 +3 = 11 meters
B. length of side y = 14 – 3 – 3 = 8 meters
C. perimeter of the house = 14 + 14 + 11 + 11 = 50 meters
D. total payment for Josh's job = 50 x 20 = 1000 pesos

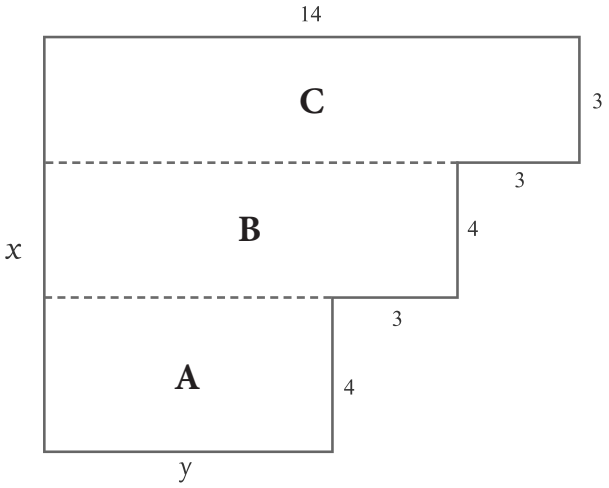
ACTIVITY II

A. Length of side x = 4 + 4 +3 = 11 meters
B. Length of side y = 14 – 3 – 3 = 8 meters
C. Area of the first floor



- Area of A = 8 x 11 = 88 square meters
- Area of B = 3 x 7 = 21 square meters
- Area of C = 3 x 3 = 9 square meters

ANSWER KEY



- Area of A = 4 × 8 = 32 square meters
- Area of B = 4 × 11 = 44 square meters
- Area of C = 3 × 14 = 42 square meters

D. Total Area = 88 + 21 + 9 = 118 square meters OR
Total Area = 32 + 44 + 42 = 118 square meters

E. Total payment for Jericko's job = 118 × 25 = 2,950 pesos

TREADING THE ROAD TO MASTERY

PAGE 37

A. length of side a = 15 − 5 − 5 = 5 meters
length of side b = 4 meters
length of side c = 2 meters
length of side d = 29 − 15 = 14 ÷ 2 = 7 meters
length of side e = 10 meters
length of side f = 7 meters
length of side g = 19 − 10 − 2 = 7 meters
length of side h = 7 meters
length of side i = 7 meters
length of side j = 7 meters

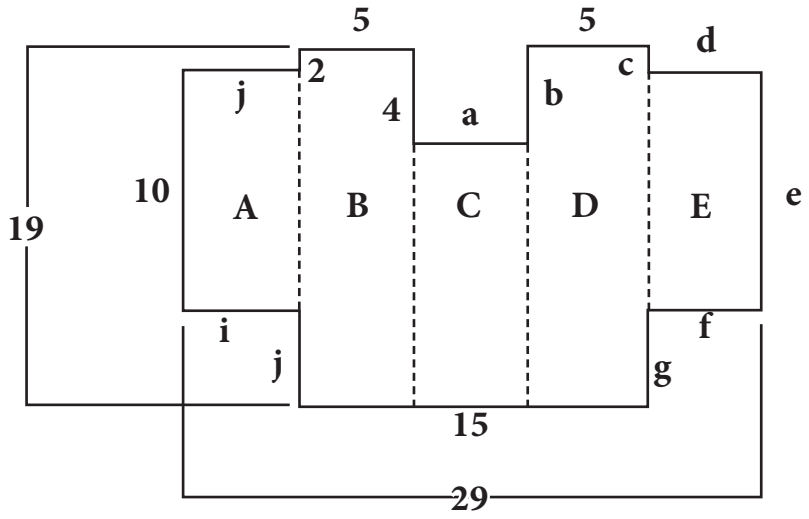
B. land perimeter = 5 + 4 + 2 + 7 +10 + 7 + 7 + 7 + 7 + 7 + 5 + 5 + 15 + 10 + 2 + 4 = 104 meters

C. cost of irrigation = 104 × 2,000 = 208,000 pesos

ANSWER KEY

D. change after payment for irrigation = 250,000 – 208,000 = 42,000 pesos

E. area of each portion of land (in square meters)



- Area of A = 7 × 10 = 70 square meters
- Area of B = 5 × 19 = 95 square meters
- Area of C = 5 × 15 = 75 square meters
- Area of D = 5 × 19 = 95 square meters
- Area of E = 7 × 10 = 70 square meters

F. Total land area = 70 + 95 + 75 + 95 + 70 = 405 square meters

G. Cost of planting crops = 405 x 2,500 = 1,012,500 pesos

H. Change after payment for planting crops = 1,500,000 – 1,012,500 = 237,500 pesos

ANSWER KEY

REACH THE TOP

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ACTIVITY I

1. G
2. I
3. I
4. P
5. G

ACTIVITY II

1. P
2. I
3. G
4. P
5. I

ACTIVITY III

1. 12 + 12 + 3 = 27
2. Perimeter = 10 + 10 + 12 + 12 = 44 units
3. Perimeter = 10 + 10 + 12 + 12 = 44 units
4. Area = 10 × 12 = 120 square units
5. Area = 10 × 12 = 120 square units

GLOSSARY

Bacteria	a member of a large group of unicellular microorganisms
Cyclic	occurring in cycles, regularly repeated
Distance	an amount of space between two things or people
Crops	a cultivated plant that is grown as food, especially a grain, fruit or vegetable
Height	the measurement from base to top or from head to foot
Length	the measurement of something from end to end
Nitrogen	the chemical element of atomic number 7
Rotation	an act of turning about an axis or center
Slope	a rising or falling surface
Soil	the upper layer of earth in which plants grow
Surface	the outside part or uppermost layer of something (often used when describing its texture, form, or extent

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