What Is This Module About?

You have learned from the module entitled "*Learning About Fractions*" the basic operations concerning fractions. Now you are ready to advance to the addition and subtraction of fractions. Learning addition and subtraction of fractions is important because it is used in many applications in daily life.

Fractions are used in measuring quantities like the amount of meat you buy from the market, the length of rope needed, a part of the total inheritance being granted, the share a person gets from the total profit and many others.

Before studying this module, you should have finished studying "*Learning About Fractions,*" and know the basic operations concerning fractions like simplifying fractions to lowest terms, comparing fractions, and converting mixed numbers to improper fractions and vice versa.

This module is divided into 3 lessons:

Lesson 1 – *Addition and Subtraction of Similar Fractions*

Lesson 2 – *Addition and Subtraction of Dissimilar Fractions*

Lesson 3 – *Addition and Subtraction of Mixed Numbers*

What Will You Learn From This Module?

After studying this module, you should be able to:

- add and subtract similar fractions;
- add and subtract dissimilar fractions;
- add and subtract mixed numbers; and
- solve word problems involving the addition and subtraction of fractions.

Let's See What You Already Know

1. Luisa bought materials to make a banner for her barangay. She bought $^{4}/_{7}$ meter of red cloth, $^{3}/_{7}$ meter of yellow cloth and $^{5}/_{7}$ meter of green cloth. How many meters of cloth did she buy?

2. Lito sold $^{1}/_{3}$ of a sack of camote and ¼ sack of sayote. How many sacks of vegetables did he sell altogether?

3. Solve the following:

   a. $\frac{7}{12} + \frac{1}{6} + \frac{5}{8} = ?$ _____

   b. $\frac{3}{4} - \frac{1}{5} = ?$ _____

4. Mang Lino's rice harvest yielded 15 ¼ sacks of rice while Mang Pepe's rice harvest yielded 19 ¾ sacks of rice. How much more did Mang Pepe harvested than Mang Lino?

5. Liza bought 3 ½ kilos of fish, 2 ¾ kilos of beef, and 1 $^{2}/_{3}$ kilos of chicken. How much meat did Liza buy?

6. Mrs. Santos bought ½ a kaban of rice. She used 1/10 of kaban and kept the rest. How much rice did she keep?

7. A recipe for a cake needs 3 ½ cups of milk. If 1 ¾ cups of milk are already mixed in the ingredients, how any more cups of milk are needed?

Well, how was it? Do you think you fared well? Compare your answers with those found in the *Answer Key* on pages 51–62.

If all your answers are correct, very good! This shows that you already know much about the topics in this module. You may still study the module to review what you already know. Who knows, you might learn a few more things as well!

If you got a low score, don't feel bad. This only means that this module is for you. It will help you understand some important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more. Are you ready?

You may go now to the next page to begin Lesson 1.

LESSON 1

Addition & Subtraction of Similar Fractions

In this lesson, we are going to learn how to add and subtract *similar fractions*. Let us say in cooking, you have as ingredients ¼ cup of water, $^{2}/_{4}$ cup of egg whites, and ¾ cup of milk. To find out how much liquid is in the mixture, you need to add the volume of each ingredient. After studying this lesson, you should be able to:

- tell what similar fractions are;
- add and subtract similar fractions; and
- solve word problems involving similar fractions.

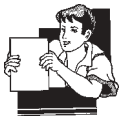
Let's Study and Analyze

The two brothers, Ronald and Nardo were tasked to paint the roof of the house. Ronald painted $^{3}/_{8}$ of the roof while Nardo painted $^{1}/_{8}$ of the roof. What part of the roof is already painted?

$^{4}/_{8}$ or ½ of the roof has already been painted. Do you know how this answer was computed?

The problem above requires knowledge in addition of fractions. How do you add $^{4}/_{8}$ and $^{1}/_{8}$ anyway? How did we come up with $^{5}/_{8}$?

Before we learn how to add fractions, we first need to review the concept of similar fractions. We will go back and learn how to solve the problem posed above later in the lesson.



Let's Learn

Let us review the concept of similar fractions. *Similar fractions* are fractions that have the same denominator. Below are some examples of similar fractions:

EXAMPLE 1

$$\frac{17}{12};\ \frac{5}{12};\ \frac{1}{12};\ \frac{7}{12};\ \frac{15}{12}$$

$\longrightarrow$ numerator

$\longrightarrow$ denominator

EXAMPLE 2

$$\frac{11}{7};\ \frac{1}{7};\ \frac{9}{7};\ \frac{5}{7};\ \frac{6}{7}$$

$\longrightarrow$ numerator

$\longrightarrow$ denominator

Take note that fractions can be added or subtracted *only when these fractions are similar fractions*. Therefore, $^1/_5$ and $^3/_5$ which are similar fractions, can easily be added together, whereas $^1/_6$ and $^3/_5$ which are dissimilar fractions still need to be changed to similar fractions before we could add them. Let us get acquainted with adding similar fractions first before we go on to learn how to add dissimilar fractions.

Let's Study and Analyze

Let us now look at some sample problems on how to add similar fractions and reduce the answer (sum) in its lowest term, if necessary.

EXAMPLE 1 Add $^2/_9$, $^1/_9$, and $^5/_9$.

Solution:

STEP 1 Write the fraction in equation form.

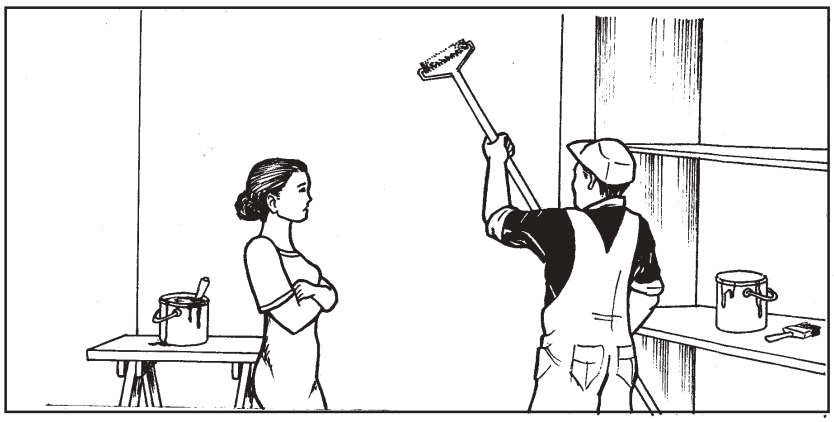
$$\frac{2}{9} + \frac{1}{9} + \frac{5}{9} = ?$$

STEP 2 Add the numerators of the fractions while retaining the denominator. The denominator represents the number of parts or divisions in a whole. In similar fractions, this number of parts is the same for all the fractions. Therefore, the value of the denominator should be left unchanged.

$$\frac{2}{9} + \frac{1}{9} + \frac{5}{9} = \frac{2 + 1 + 5}{9} = \frac{8}{9}$$

The sum of the fractions is 8/9.

EXAMPLE 2 Tatay cleaned the room and swept the yard before leaving the automotive shop. It took him ¼ hour to clean his room and $^{2}/_{4}$ hour to sweep the yard. How many hours did he work before he left for the automotive shop?



STEP 1 Write the given information.

a. ¼ hour – time it took Tatay to clean his room.
b. $^{2}/_{4}$ hour – time it took Tatay to clean the yard.

STEP 2 Determine what is asked.

Find out how long it took Tatay to clean his room and sweep the yard.

STEP 3 Write down the number sentence.

$$\frac{1}{4} + \frac{2}{4} = \text{N}$$ (the total amount of time Tatay cleaned the room and his yard)

STEP 4 Solve the equation.

Add the numerators of the similar fractions while retaining the denominator.

$$\frac{1}{4} + \frac{2}{4} = \frac{1+2}{4} = \frac{3}{4} \text{ hour}$$

Tatay worked for three fourths (¾) of an hour.

EXAMPLE 3 Let us now solve the problem posed at the beginning of the lesson. Ronald was able to paint $^3/_8$ of the roof while Nardo was able to paint $^1/_8$ of the roof. So what part of the roof was already painted?

STEP 1 Write the given information.

a. $^3/_8$ – part of the roof painted by Ronald
b. $^1/_8$ – part of the roof painted by Nardo

STEP 2 Determine what is asked.

Find the total part of the roof painted.

STEP 3 Write down the number sentence.

$$\frac{3}{8} + \frac{1}{8} = \text{N}$$ (the total amount of time Tatay cleaned the room and his yard)

STEP 4 Solve the equation.

Add the numerators of the similar fractions while retaining the denominator.

$$\frac{3}{8} + \frac{1}{8} = \frac{3+1}{8} = \frac{4}{8}$$

$^4/_8$ can still be reduced to lowest terms since both numerator (4) and denominator (8) are divisible by 4:

$$\frac{4}{8} \div \frac{4}{4} = \frac{1}{2}$$

½ is equivalent to $^4/_8$; therefore, ½ of the roof has already been painted.

Let's Review

1. Add the fractions $^{3}/_{15}$, $^{2}/_{15}$, $^{4}/_{15}$, and $^{1}/_{15}$.

   Solution:

   STEP 1 Write the fractions in equation form.

   STEP 2 Add the numerators of the given fractions while retaining the denominator.

2. Mrs. Marbella, a dressmaker, used $^{2}/_{10}$ meter of blue ribbon, $^{5}/_{6}$ meter of yellow ribbon and $^{4}/_{6}$ meter of red ribbon in making a dress for her daughter Rina. How many meters of ribbon did Mrs. Marbella use to beautify Rina's dress?

   Solution:

   STEP 1 Write down the given information.

   STEP 2 Determine what is asked.

   STEP 3 Write down the number sentence.

STEP 4 Solve the equation.

Add the numerators of the similar fractions while retaining the denominator.

Compare your answers with those in the *Answer Key* on pages 62–63.

You have now learned how to add similar fractions. Adding similar fractions is not too difficult because similar fractions have the same denominator. We therefore only have to worry about adding the numerators. What about if we want to find the difference between two fractions? Don't worry, the steps in subtracting similar fractions is similar to that of adding similar fractions.

Let's Study and Analyze

Let us now look at some sample problems involving subtraction of similar fractions.

EXAMPLE 1 Subtract $^{5}/_{11}$ from $^{9}/_{11}$.

Solution:

STEP 1 Write the fractions in equation form.

$$\frac{9}{11} - \frac{5}{11} = ?$$

STEP 2 Get the difference of the numerators while retaining the denominator.

$$\frac{9}{11} - \frac{5}{11} = \frac{9 - 5}{11} = \frac{4}{11}$$

The difference of the fractions is $^{4}/_{11}$.

EXAMPLE 2 Subtract $^{13}/_{17}$ from $^{21}/_{17}$.

Solution:

STEP 1 Write the fractions in equation form.

$$\frac{21}{17} - \frac{13}{17} = ?$$

STEP 2 Get the difference of the numerators while retaining the denominator.

$$\frac{21}{17} - \frac{13}{17} = \frac{21 - 13}{17} = \frac{8}{17}$$

The difference of the fractions is $^{8}/_{17}$.

EXAMPLE 3 A jug contained $^{7}/_{9}$ gallons of water. If Ben used $^{4}/_{9}$ gallons of the water, how much water is left in the jug?

STEP 1 Write the given information.

a. $^{7}/_{9}$ gallons – initial amount of water stored in the jug.
b. $^{4}/_{9}$ gallons – amount of water Ben used from the jug.

STEP 2 Determine what is asked.

Find the amount of water left in the jug after Ben used part of the water.

STEP 3 Write down the number sentence.

$$\frac{7}{9} - \frac{4}{9} = \text{N}$$ (the total amount of time Tatay cleaned the room and his yard)

STEP 4 Solve the equation.

Subtract the numerators of the similar fractions while retaining the denominator.

$$\frac{7}{9} - \frac{4}{9} = \frac{7 - 4}{9} = \frac{3}{9}$$

$^{3}/_{9}$ can still be reduced to lowest terms since both numerator (3) and denominator (9) are divisible by 3:

$$\frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$$

$^{1}/_{3}$ is equivalent to $^{3}/_{9}$; therefore, $^{1}/_{3}$ gallon is left on the jug.

Let's Try This

1. Subtract $^{12}/_{13}$ from $^{23}/_{13}$.

   STEP 1 Write the fractions in equation form.

   STEP 2 Get the difference of the numerators while retaining the denominator.

2. Find the difference between $^{19}/_{21}$ and $^{11}/_{21}$.

3. Subtract $^{24}/_{31}$ from $^{30}/_{31}$.

4. Jun took $^{4}/_{12}$ of the cake while Carol took $^{6}/_{12}$ of the cake. How much more cake did Carol take than what Jun took?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Write the fractions in equation form.

STEP 5 Subtract the numerators of the given fractions while retaining the denominator.

5. Mang Pepe owns $^{7}/_{9}$ hectare of land. If he planted vegetables on $^{5}/_{9}$ hectare of the land, what area of his land has not been planted?

Compare your answers with those found in the *Answer Key* on pages 63–65.

Let's Remember

- Similar fractions are fractions with the same denominators.
- Similar fractions are added by adding the numerators while retaining the denominator.
- Similar fractions are subtracted by getting the difference between the two numerators while retaining the denominator.
- Always simplify the answer in the lowest term.

Let's See What You Have Learned

1. Aling Maria bought ¾ kilo of fish, $^{5}/_{4}$ kilo of beef and ¼ kilo of chicken from the market. How much meat did Aling Maria purchase?

2. A 5 hectare land was divided among the relatives of Lolo Ben. Among those who got some piece of land were the three brothers Ricky, Paul, and Eric. Ricky got $^{1}/_{8}$ of the land. Paul got $^{3}/^{8}$ of the land while Eric got $^{2}/_{8}$ of the land. What portion of the 5 hectare land is owned by the three brothers?

3. Mang Rolly was able to buy $^{2}/_{5}$ liters of paint while Mang Tomas was able to buy $^{4}/_{5}$ liters of paint. How much more paint did Mang Tomas buy than Mang Rolly?

4. Mario bought ¾ kilogram of corn from the market. He gave ¼ of a kilogram to his neighbor. How many kg of corn were left?

5. Simplify the equation below. (Hint: find the sum of $^{5}/_{15}$ and $^{7}/_{15}$ first, then subtract $^{3}/_{15}$ from the computed sum).

$$\frac{5}{15} + \frac{7}{15} - \frac{3}{15} = ?$$

Compare your answers with those in the *Answer Key* on pages 66–69.

If your test score is from:

0–2 You should study the whole lesson again.

3–4 Review the parts of the module which you did not understand.

5 Excellent! You have understood the lesson well.

You may now turn to the next page for the next lesson.

LESSON 2

Addition & Subtraction of Dissimilar Fractions

In the first lesson, you have learned how to add and subtract similar fractions. But some of the fractions we need to add or subtract are dissimilar. For example, if Aling Marsha bought $^{2}/_{3}$ meter of black cloth, $^{3}/_{4}$ meter of blue cloth, and $^{4}/_{5}$ meter of red cloth, how are we to know the total length of cloth that Aling Marsha bought? The denominators of the fractions in our example are as different. How can we add the fractions together?

In this lesson, you will learn how to add and subtract dissimilar fractions. After studying this lesson, you should be able to:

- tell what dissimilar fractions are;
- add and subtract dissimilar fractions; and
- solve word problems involving dissimilar fractions.

Let's Try This

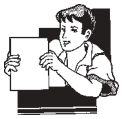
Can you identify which of the following sets of fractions are similar and which are dissimilar?

a. $\frac{6}{8}; \frac{6}{13}; \frac{6}{11}$

b. $\frac{4}{5}; \frac{3}{4}; \frac{8}{9}$

c. $\frac{12}{20}; \frac{1}{20}; \frac{17}{20}$

Compare your answers with those in the *Answer Key* on page 69.



Let's Learn

You learned in the module 'Learning About Fractions" that *dissimilar fractions* are fractions that have different denominators. Below are some examples of *dissimilar fractions*.

EXAMPLE 1

$\frac{17}{12}; \frac{3}{8}; \frac{1}{17}; \frac{7}{9}; \frac{15}{21}$ → numerators
→ denominators

(Notice that the denominators are all different)

EXAMPLE 2

$\frac{11}{7}; \frac{1}{13}; \frac{9}{5}; \frac{5}{10}; \frac{6}{11}$ → numerators
→ denominators

Dissimilar fractions can be *proper fractions* (fractions with numerators that are lesser than their denominators) or *improper fractions* (fractions with numerators that are greater than their denominators).

Let's Study and Analyze

Dissimilar fractions cannot be added directly. You first need to convert dissimilar fractions into similar fractions. This means that you have to change the fractions you want to add so they would have the same denominator. To do this, you need to find the *least common denominator* (LCD) of the fractions to be added.

The *least common denominator* is the lowest possible number that is a *multiple* of all the denominators of the compared fractions. Remember that *multiples* of a certain number are the multiplied products of that number. For example the *multiples* of 2 are 2, 4, 6, 8, 10 … and so on. The *multiples* of 5 are 5, 10, 15, 20, 25, 30 … and so on. Look at the set of fractions shown below.

$$\frac{1}{4}; \frac{3}{12}; \frac{1}{6}$$

How do we look for the *least common denominator* (LCD) of the three fractions? To get the LCD of the three fractions, we need to compare the *multiples* of their denominators (4, 12 and 6). The smallest *multiple* common to the three denominators will be the LCD. Shown below are the multiples of the three denominators.

4 – 4, 8, 12, 16, 20, **24**, 28 …

12 – 12, **24**, 36, 48 …

6 – 6, 12, 18, **24**, 30 …

Were you able to find common multiples of the three denominators? For the three denominators 4, 12 and 6, we can see that 12 is a common multiple. Observe that 24 is also a common multiple of 4, 12 and 6. Since the common multiple 12 is smaller than the common multiple 24, we can say that 12 is the *least common denominator*.

Let us now learn how to get the LCD step by step by studying the example below.

EXAMPLE 1 Find the LCD of $^{3}/_{5}$, $^{9}/_{10}$ and $^{2}/_{3}$.

Compare the denominators 5, 10 and 3.

STEP 1 Start by enumerating the multiples of the largest denominator (10 is the largest denominator among the three). For every multiple that you enumerate, check if this multiple is also a multiple of the other denominators. Stop enumerating when you find a common multiple for the denominators.

10 – 10, 20, **30**

5 – 5, 10, 15, 20, 25, **30**

3 – 3, 6, 9, 12, 15, 18, 21, 24, 27, **30**

Therefore 30 is a common multiple of 10, 5 and 3.

STEP 2 When you find a multiple of the largest denominator that is also a multiple of the other denominators, then this is the LCD of the fractions.

Therefore, the LCD of $^{3}/_{5}$, $^{9}/_{10}$ and $^{2}/_{3}$ is 30.

Let's Try This

Find the LCD of the following:

1. 3/8, 1/4, 5/12

2. 2/3, 5/6, 7/9

Compare your answers with those found in the *Answer Key* on page 70.

Let's Study and Analyze

EXAMPLE 1 Find the sum of ¼, $^{1}/_{6}$ and $^{3}/_{8}$.

STEP 1 Find the *least common denominator* (LCD) of the fractions to be added.

Compare the denominators 4, 6 and 8. 8 is the largest denominator, therefore, we enumerate the multiples of 8 and check for a common multiple for all the denominators.

8 – 8, 16, **24**

6 – 6, 12, 18, **24**

4 – 4, 8, 12, 16, 20, **24**

Therefore, 24 is the LCD of 8, 6 and 4.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (24).

a. Convert ¼ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (4), 24 ÷ 4 = 6. The quotient is 6. Multiply the numerator and denominator by the quotient (6) to get the equivalent fraction.

$$\frac{1}{4} \times \frac{6}{6} = \frac{6}{24}$$

b. Convert $^{1}/_{6}$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (6), 24 ÷ 6 = 4. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{4}{4} = \frac{4}{24}$$

c. Convert $^{3}/_{8}$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (8), 24 ÷ 8 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{3}{8} \times \frac{3}{3} = \frac{9}{24}$$

STEP 3 Add the similar fractions.

$$\frac{1}{4} + \frac{1}{6} + \frac{3}{8} = \frac{6}{24} + \frac{4}{24} + \frac{9}{24} = \frac{6 + 4 + 9}{24} =$$

Therefore, the sum is $^{19}/_{24}$.

Now we proceed to solve word problems involving the addition of dissimilar fractions.

EXAMPLE 2 Let us go back to the problem posed at the beginning of the lesson. Aling Marsha bought $^2/_3$ meter of black cloth, ¾ meter of blue cloth, and $^4/_5$ meter of red cloth. Find the total length of the cloth Aling Marsha bought.

STEP 1 Write the given information.

$^2/_3$ meter – length of black cloth she bought.
¾ meter – length of blue cloth she bought.
$^4/_5$ meter – length of red cloth she bought.

STEP 2 Determine what is asked.

Find the total length of the cloth Aling Marsha bought.

STEP 3 Express the problem in equation form.

$$\frac{2}{3} + \frac{3}{4} + \frac{4}{5} = \text{N (portion of the room already pai}$$

We cannot add the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

Compare the denominators 3, 4 and 5. 5 is the largest denominator, therefore, we enumerate the multiples of 5 and check for a common multiple for all the denominators.

5 – 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, **60**

3 – 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, **60**

4 – 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, **60**

Since 60 is the smallest common multiple for the three denominators, then the LCD is 60.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (60).

a. Convert $^{2}/_{3}$ to an equivalent fraction whose denominator is 60. Divide the LCD (60) by the denominator (3), 60¸ 3 = 20. The quotient is 20. Multiply the numerator and denominator by the quotient (20) to get the equivalent fraction.

$$\frac{2}{3} \times \frac{20}{20} = \frac{40}{60}$$

b. Convert $^{3}/_{4}$ to an equivalent fraction whose denominator is 60. Divide the LCD (60) by the denominator (3), 60¸ 4 = 15. The quotient is 15. Multiply the numerator and denominator by the quotient (15) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{15}{15} = \frac{45}{60}$$

c. Convert $^{4}/_{5}$ to an equivalent fraction whose denominator is 60. Divide the LCD (60) by the denominator (5), 60¸ 5 = 12. The quotient is 12. Multiply the numerator and denominator by the quotient (12) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{15}{15} = \frac{48}{60}$$

The three fractions $^{40}/_{60}$, $^{45}/_{60}$, and $^{48}/_{60}$ are now similar fractions.

STEP 6 Add the similar fractions.

$$\frac{2}{3} + \frac{3}{4} + \frac{4}{5} = \frac{40}{60} + \frac{45}{60} + \frac{48}{60}$$

$$= \frac{40 + 45 + 48}{60} = \frac{133}{60} \text{ or } 2\frac{13}{60}$$

Therefore, the sum is $^{133}/_{60}$ or 2 $^{13}/_{60}$. This means that Aling Marsha bought cloth 2 $^{13}/_{60}$ meters long.

Let's Review

1. A 10-hectare land is divided among family members. Each of the three sisters Luisa, Nelly, and Sharon each own a portion of land. Luisa owns $^1/_3$ of the land; Nelly owns $^1/_6$ of the land while Sharon owns $^1/_4$ of the land. What part of the land is owned by the three sisters?

   STEP 1 Write the given information.

   STEP 2 Determine what is asked.

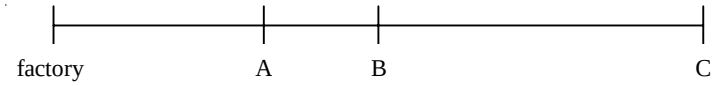
   STEP 3 Express the problem in equation form.

   STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

   STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD.

STEP 6 Add the similar fractions.

The distance from the factory to warehouse A is $^{3}/_{5}$ mile. The distance from warehouse A to warehouse B is ¼ mile. The distance from warehouse B to warehouse C is $^{9}/_{10}$ mile. Mang Anding needs to deliver goods from the factory to warehouse A, then to warehouse B, and then to warehouse C. What is the total distance Mang Anding will cover to deliver the goods to the warehouses?



Compare your answers with those in the *Answer Key* on pages 71–74.

Let's Study and Analyze

Subtraction of Dissimilar Fractions

You have learned how to add dissimilar fractions. How about subtracting them? The steps are essentially the same as when you add dissimilar fractions. You must convert the dissimilar fractions to similar fractions by finding the LCD. And then you can easily subtract the fractions.

Let us study the example given below on how to subtract dissimilar fractions.

EXAMPLE

STEP 1 Write the given information.

¾ - amount of cloth Aling Minda has.
½ – amount of cloth Aling Minda needs to make the dress.

STEP 2 Determine what is asked.

Find the amount of cloth that was left unused.

STEP 3 Express the problem in equation form.

To solve for the answer, subtract the amount of cloth she has ($^3/_4$ meter) by the amount of cloth she used ($^1/_2$ meter).

$$\frac{3}{4} - \frac{1}{2} = \text{N} \text{ (portion of each cloth unused)}$$

We cannot subtract the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be subtracted.

Compare the denominators 4 and 2. 4 is the largest denominator, therefore, we enumerate the multiples of 4 and check for a common multiple for both denominators.

4 – **4**
2 – 2, **4**

Therefore, the LCD is 4.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (4).

a. Convert ½ to an equivalent fraction whose denominator is 4. Divide the LCD (4) by the denominator (2), $4 \div 2 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$

b. ¾ already has 4 as its denominator.

$$\frac{3}{4}$$

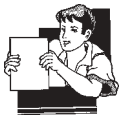
The two fractions $^{2}/_{4}$ and $^{3}/_{4}$ are now similar fractions.

STEP 6 Subtract the similar fractions.

$$\frac{3}{4} - \frac{1}{2} = \frac{3}{4} - \frac{2}{4} = \frac{3-2}{4} = \frac{1}{4}$$

Therefore, the difference is $^{1}/_{4}$. This means that ¼ meter of cloth was left.

Were you able to solve the problem? Compare your answers with those found in the *Answer Key* on page 41.



Let's Learn

You can actually solve math problems that combine addition and subtraction of dissimilar fractions. You just need to convert the dissimilar fractions to similar fractions first. Then add or subtract the similar fractions accordingly.

Let's Try This

1. Mang Andy took $^{1}/_{7}$ kaban of rice from a stock of $^{2}/_{3}$ kaban of rice. How much rice was left from the stock?

   STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Express the problem in equation form.

STEP 4 Find the least common denominator (LCD) of the fractions to be subtracted.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD.

STEP 6 Subtract the similar fractions.

Compare your answers with those found in the *Answer Key* on pages 74–78.

Let's Remember

- Dissimilar fractions are fractions that have different denominators.
- Dissimilar fractions should first be converted to similar fractions before adding or subtracting them.

Let's See What You Have Learned

1. Aling During's basket has 2/3 kilo of fish, 5/6 kilo of beef, and ¼ kilo of chicken. How much meat is in the basket? Show the step by step solution.

2. Mang Lito owns 4/5 hectares of land. If he planted vegetables in ¼ hectares of the land, how much land was left uncultivated?

3. Berto painted ½ of the room while Carlos painted $^{2}/_{9}$ of the room and Willy painted $^{1}/_{6}$ of the room. What part of the room is already painted?

4. Solve $^{3}/_{5} + {}^{5}/_{6} - {}^{2}/_{3}$.

5. Solve $^{7}/_{8} - {}^{2}/_{5} + ¾$.

6. Solve $^{1}/_{6} + {}^{7}/_{8} - {}^{5}/_{12}$.

Compare your answers with those found in the *Answer Key* on pages 79–87.

If your test score is from:

0–3 You should study the whole lesson again.

4–5 Review the parts of the module which you did not understand.

6 Excellent! You have understood the lesson well.

LESSON 3

Addition & Subtraction of Mixed Numbers, Fractions, and Whole Numbers

You have learned how to add and subtract similar and dissimilar fractions from the previous lessons. Now you are ready to learn how to add and subtract a combination of mixed numbers, fractions and whole numbers. There are many quantities that are measured in mixed number forms. That is why it is important to know how to add and subtract mixed numbers.

For example, how do you get the total amount of paint Mang Pedro used if he consumed 2 ¾ liters of white paint and 1 2/3 liters of red paint? How can you add two fractions which are mixed numbers and have different denominators? After studying this lesson, you should be able to:

- tell what mixed numbers are; and
- solve problems involving the addition and subtraction of mixed numbers.

Let's Try This

You have learned about mixed numbers in the previous module *Learning About Fractions*. Do you still remember what mixed numbers are? Can you identify which of the following numbers in the table below are mixed numbers, which are whole numbers and which are fractions? Write your answers on the blanks provided below the table.

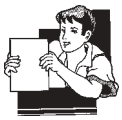
$\frac{3}{5}$	115	$2\frac{7}{12}$	$\frac{1}{2}$	$5\frac{1}{4}$	$11\frac{4}{7}$	$\frac{11}{15}$	46	$7\frac{1}{3}$	$\frac{2}{3}$

Mixed numbers:_____

Whole numbers:_____

Fractions:_____

Compare your answers with those in the *Answer Key* on page 88.



Let's Learn

Mixed numbers are quantities that have a whole number part and a fraction part. Below are some examples of mixed numbers.

EXAMPLE 1

$14\ \frac{2}{3}$ ← fraction

↓ whole number

EXAMPLE 2

$9\ \frac{11}{35}$ ← fraction

↓ whole number

Let's Study and Analyze

How do you add mixed numbers? Let us take a look at our earlier example of Mang Pedro and his paints.

EXAMPLE Mang Pedro consumed 2 ¾ liters of white paint and $1\ ^{2}/_{3}$ liters of red paint. What is the total volume of paint that Mang Pedro used?

SOLUTION

STEP 1 Write the given information.

$2\ ^{3}/_{4}$ liters – amount of white paint Mang Pedro used.
$1\ ^{2}/_{3}$ liters – amount of red paint Mang Pedro used.

STEP 2 Determine what is asked.

Find the total amount of paint Mang Pedro used.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in 2 ¾ is ¾. The fraction in 1 $^{2}/_{3}$ is $^{2}/_{3}$. To find the LCD of ¾ and $^{2}/_{3}$, find the smallest common multiple of their denominators (4 and 3)

4 – 4, 8, **12**
3 – 3, 6, 9, **12**

12 is the smallest common multiple of the two denominators; therefore, 12 is the LCD of ¾ and $^{2}/_{3}$.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (12).

a. Convert ¾ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (4), 12 ÷ 4 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

Replace ¾ with the equivalent fraction $^{9}/_{12}$. Therefore 2 ¾ becomes 2 $^{9}/_{12}$.

Convert $^{2}/_{3}$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (3), 12 ÷ 3 = 4. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$$

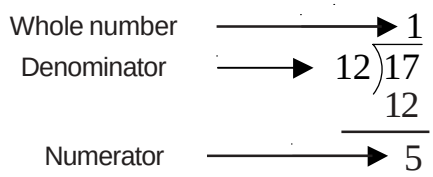
Replace $^{2}/_{3}$ with the equivalent fraction $^{8}/_{12}$. Therefore, 1 $^{2}/_{3}$ becomes 1 $^{8}/_{12}$.

STEP 5 Align the whole numbers and align the fractions together in a column. Add the whole numbers and add the similar fractions.

$2\ {}^{9}/_{12} \quad + \quad 1\ {}^{8}/_{12} \quad = \quad ?$

$$\begin{array}{r} 2\ \frac{9}{12} \\ +\quad 1\ \frac{8}{12} \\ \hline 3\ \frac{17}{12} \end{array}$$

$3\ {}^{17}/_{12}$ can still be simplified since the fraction part is an improper fraction.

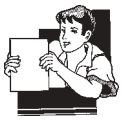


Thus, ${}^{17}/_{12}$ is equal to $1\ {}^{5}/_{12}$.

Therefore,

$$3\ \frac{17}{12} = 3 + \frac{17}{12} = 3 + 1\ \frac{5}{12} = 4\ \frac{5}{12}$$

Mang Pedro used $4\ {}^{5}/_{12}$ liters of paint.



Let's Learn

There are cases when the fraction part of the mixed number is an improper fraction, then the answer needs to be simplified. Let us review the concept.

EXAMPLE Simplify $5\ {}^{8}/_{5}$.

The mixed number has a whole number part (5) and a fraction part ($^{8}/_{5}$).

$$5\ \frac{8}{5}$$

fraction

whole number

STEP 1 Separate the whole number part and the fraction part of the mixed number.

$$5 + \frac{8}{5}$$

STEP 2 Convert the improper fraction $^{8}/_{5}$ to a mixed number.

Whole number → 1

Denominator → $5\overline{)8}$

$\underline{5}$

Numerator → 3

Thus, $^{8}/_{5}$ is equal to $1\ {}^{3}/_{5}$.

STEP 3 Since $^{8}/_{5}$ is equal to $1\ {}^{3}/_{5}$, we can replace $^{8}/_{5}$ with $1\ {}^{3}/_{5}$ in the equation.

$$5 + \frac{8}{5} = 5 + 1\ \frac{3}{5} = 6\ \frac{3}{5}$$

$5\ {}^{8}/_{5}$ when simplified, is equal to $6\ {}^{3}/_{5}$.

Let's Review

1. Mang Rico needs to fence a triangular piece of land. The first side is 12 ½ meters long. The second side is $7\ ^{1}/_{6}$ meters long and the third side is $8\ ^{1}/_{9}$ meters long. How long should the fence be to cover the triangular piece of land?

   STEP 1 Write the given information.

   STEP 2 Determine what is asked.

   STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

   STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD.

   STEP 5 Align the whole numbers and align the fractions together in a column. Add the whole numbers and add the similar fractions.

2. Mrs. Cortes needs to buy 3 colors of silk cloth for a costume. She needs 5 ¾ meters of the red one, 8 $^{7}/_{9}$ meters of the white one and 10 $^{5}/_{6}$ meters of the green color. How many meters of silk cloth does she need to buy?

Compare your answers with those in the *Answer Key* on pages 88–92.

Let's Study and Analyze

You have learned how to add different fractions involving mixed number forms. Now you will learn how to subtract mixed numbers. Look at an example below.

EXAMPLE Edna bought 5 $^{1}/_{6}$ meters of cloth from a roll of 21 ½ meters. How many meters of cloth were left in the roll?

SOLUTION

STEP 1 Write the given information.

21 ½ meters – length of cloth in the roll.
5 $^{1}/_{6}$ meters – length of cloth Edna bought.

STEP 2 Determine what is asked.

Find how much cloth was left in the roll of cloth.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in 21 ½ is ½. The fraction in 5 $^{1}/_{6}$ is $^{1}/_{6}$. To find the LCD of ½ and $^{1}/_{6}$, find the smallest common multiple of their denominators (2 and 6).

2 – 2, 4, **6**
6 – **6**

6 is the smallest common multiple for both 2 and 6; therefore 6 is the LCD of 2 and 6.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (6).

a. Convert ½ to an equivalent fraction whose denominator is 6. Divide the LCD (6) by the denominator (2), 6 ¸ 2 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{3}{3} = 3$$

Replace ½ with the equivalent fraction $^{3}/_{6}$. Therefore 21 $^{1}/_{6}$ becomes 21 $^{3}/_{6}$.

b. The fraction $^{1}/_{6}$ doesn't need to be changed since the denominator (6) is already equal to the LCD (6).

Therefore the mixed number 5 $^{1}/_{6}$ is retained.

STEP 5 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

21 $^{3}/_{6}$ – 5 $^{1}/_{6}$ = ?

$$\begin{array}{r} 21\ \frac{3}{6} \\ -\ \ 5\ \frac{1}{6} \\ \hline 16\ \frac{2}{6} \end{array}$$

The fraction $^2/_6$ can still be simplified since the numerator (2) and denominator (6) are divisible by 2:

$$\frac{2}{6} \div \frac{2}{2} = \frac{1}{3}$$

So simplifying to lowest terms, the fraction 16 $^2/_6$ becomes 16 $^1/_3$. Therefore, there were 16 $^1/_3$ meters of cloth left in the roll.

Let us now study another case in subtraction of mixed numbers where the fraction part being subtracted is smaller than the fraction part subtracting it.

EXAMPLE 2 Aling Basia has 12 ¼ kilos of beef to sell. If she was able to sell 9 ½ kilos of beef, how much meat was left to sell?

Solution:

STEP 1 Write the given information.

12 ¼ kilos – amount of beef Aling Basia needs to sell.
9 $^1/_2$ kilos – amount of meat she already sold.

STEP 2 Determine what is asked.

Find how much meat was left to sell.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in 12 ¼ is ¼. The fraction in 9 ½ is ½. To find the LCD of ¼ and ½, find the smallest common multiple of their denominators (4 and 2).

2 – 2, **4**
4 – **4**

4 is the smallest common multiple for both 2 and 4; therefore 4 is the LCD of 2 and 4.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (4).

a. Convert ½ to an equivalent fraction whose denominator is 4. Divide the LCD (4) by the denominator (2), 4 ¸ 2 = 2. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$

Replace ½ with the equivalent fraction $^{2}/_{4}$. Therefore 9 ½ becomes 9 $^{2}/_{4}$.

b. The fraction ¼ doesn't need to be changed since the denominator (4) is already equal to the LCD (4).

Therefore the mixed number 12 ¼ is retained.

STEP 5 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

$$12\ ¼ \quad - \quad 9\ ^{2}/_{4} \quad = \quad ?$$

Generally, we cannot subtract a bigger number from a smaller number like 3 – 8 or 1 – 5. Similarly, we cannot also subtract a bigger fraction from a smaller fraction. In our example, we cannot subtract $^{2}/_{4}$ from ¼ because $^{2}/_{4}$ is greater than ¼. So what should be done?

Regroup 1 from the whole number and add this to the fraction expressed in equivalent fraction form. Since the LCD is 4, then the equivalent fraction is $^{4}/_{4}$. The whole number 12 now becomes 11.

$$\frac{1}{4} = 12 + ¼ = (11+1) + ¼ = 11 + (1 + ¼)$$

The regrouped 1 in the fraction part of the mixed number is transformed to an equivalent fraction whose numerator and denominator is equal to the LCD (4). Therefore, 1 is transformed to the equivalent fraction $^{4}/_{4}$. 12 ¼ becomes 11 $^{5}/_{4}$.

$$\begin{array}{r} 12\ \frac{1}{4} \\ -\ \ 9\ \frac{2}{4} \\ \hline \end{array} \qquad \Rightarrow \qquad \begin{array}{r} 11\ \frac{5}{4} \\ -\ \ 9\ \frac{2}{4} \\ \hline \end{array}$$

The difference is 2 ¾, therefore, 2 ¾ kilos of meat still has to be sold.

Let's Review

Solve the following problems.

1. Mang Ben took $7\ ^{3}/_{10}$ meters of copper wire for electrical wiring from a coil of wire $13\ ^{7}/_{15}$ meters long. How much copper wire was left from the coil?

   STEP 1 Write the given information.

   STEP 2 Determine what is asked.

   STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

   STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD.

STEP 5 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

2. A water jug contains 5 ½ gallons of water. Aling Zeny used 1 ¾ gallons of it for making cold juice. How much water remained in the jug?

Compare your answers with those in the *Answer Key* on pages 92–96.

Let's Study and Analyze

EXAMPLE 1 Edna bought 3 kilos of mangoes and 2 $^{1}/_{3}$ kilos of grapes. How many kilos of fruits did she buy?

SOLUTION

STEP 1 Write the given information.

3 kilos – amount of mangoes Edna bought.
2 $^{1}/_{3}$ kilos – amount of grapes Edna bought.

STEP 2 Determine what is asked.

Find the total amount of fruits Edna bought.

STEP 3 Solve for the answer.

To solve for the answer, we need to add 3 kilos of mangoes with 2 $^1/_3$ kilos of grapes. To get the sum, just add the whole numbers and retain the fraction part.

$$\begin{array}{rcll} & 3 & - & \text{mangoes} \\ + & 2\ \frac{1}{3} & - & \text{grapes} \\ \hline & 5\ \frac{1}{3} & & \end{array}$$

Edna bought 5 $^1/_3$ kilos of fruits.

EXAMPLE 2 Mang Tomas bought 5 kilos of rice. He cooked ¾ kilos for his family's lunch. How many kilos were left?

SOLUTION

STEP 1 Write the given information.

5 kilos – amount of rice bought.
¾ kilos – amount of rice consumed.

STEP 2 Determine what is asked.

Find the amount of rice left.

STEP 3 Solve for the answer.

To solve for the answer, we need to subtract ¾ kilo from the 5 kilos of rice. But we cannot subtract ¾ kilos from 5 kilos directly. You need to change 5 kilos into an equivalent mixed number.

a. Regroup 1 from the whole number (5). Express 1 into an equivalent fraction. Since the LCD is 4, the equivalent fraction is $^4/_4$. The whole number 5 is now changed into its equivalent mixed number, 4 $^4/_4$.

$$5 = 4 + 1 = 4 + \frac{4}{4} = 4\ \frac{4}{4}$$

b. Now we can subtract ¾ from $4\ ^{4}/_{4}$.

$$\begin{array}{rr} & 4\ \frac{4}{4} \\ - & \frac{3}{4} \\ \hline & 4\ \frac{1}{4} \end{array}$$

The difference is 4 ¼. Therefore, 4 ¼ kilos of rice were left.

Let's Review

EXAMPLE 3 Aling Beth bought 4 kilograms of hotdogs. She cooked 1 ½ kilograms for her son's birthday party. How many kilograms of hotdogs were left?

SOLUTION

STEP 1 Write the given information.

4 kilograms – amount of hotdogs mother bought.
1 ½ kilograms – amount of hotdogs consumed in the party.

STEP 2 Determine what is asked.

Find out how much hotdogs were left from the 4 kilos after consuming 1 ½ kilo.

STEP 3 Solve for the answer.

To solve for the answer, you need to subtract the amount of hotdogs bought (4 kilos) by the amount that was consumed (1 ½ kilos). But we cannot subtract 1 ½ directly from 4. We need to transform 4 into an equivalent mixed number first.

a. Regroup 1 from the whole number (4). Express 1 into an equivalent fraction. Since the LCD is 2, the equivalent fraction is $^2/_2$. The whole number 4 is now changed into its equivalent mixed number, $3\ ^2/_2$.

$$4 = 3 + \frac{2}{2} = 3\ \frac{2}{2}$$

b. Now we can subtract 1 ½ from $3\ ^2/_2$.

$$\begin{array}{r} 3\ \frac{2}{2} \\ -\quad 1\ \frac{1}{2} \\ \hline 2\ \frac{1}{2} \end{array}$$

The difference is 2 ½. Therefore, there are 2 ½ kilos of hotdogs left.

Let's Review

1. Aling Delia needs 2 cups of milk, 3 ¾ cups of egg white, and $^1/_3$ cup of water for the cake she is going to bake. How many cups of combined liquid ingredients will the milk, egg whites and water make?

STEP 1 Write the given information.

STEP 2 Determine what is asked.

STEP 3 Solve for the answer.

2. Aling Cora has 20 meters of cloth in stock. If she was able to use $9\ ^{3}/_{7}$ meters of cloth for making dresses, how much stock of cloth was left?

3. Mang Tonio weighed $57\ ^{1}/_{3}$ kilos. After a month, he lost ¾ of a kilo. How much does he weigh after losing ¾ kilos?

Compare your answers with those in the *Answer Key* on pages 96–99.

Let's Remember

- Mixed numbers **are quantities that have a whole number part and a fraction part.**
- Whole numbers can be changed to mixed numbers so that addition and subtraction operations are possible with problems involving a combination of mixed numbers, whole numbers and fractions.
- Always simplify your answer to lowest term.

Let's See What You Have Learned

1. Mario weighed 43 ¼ kilograms last month. Three months later he weighed 47 ½ kilograms. How many kilograms did he gain in those three months?

2. Manong Oscar gathered 16 kilograms of tomatoes. He sold 10 $^{1}/_{3}$ kilograms of the tomatoes. How many kilograms of tomatoes were left with Manong Oscar?

3. Gabriel bought 3 $^{2}/_{3}$ dozen eggs. His sister bought ¾ dozen eggs while his mother bought 1 ½ dozen eggs. How many dozen eggs did they buy?

4. Mang Pedro harvested 21 kilograms of mangoes. He gave $5\ ^{2}/_{3}$ kilograms to his cousins. How many kilograms of mangoes were left with Mang Pedro?

5. Mang Juan bought 2 kilos of chicken. He used ¾ kilo for dinner. How much chicken was left?

Compare your answers with those in the *Answer Key* on pages 99–104.

If your test score is from:

1–2 You should study the whole lesson again.

3–4 Review the parts of the lesson which you did not understand.

5 Excellent! You have understood the lesson well.

Let's Sum Up

- Similar fractions are added by finding the sum of the numerators while retaining the denominator.
- Similar fractions are subtracted by getting the difference between the two numerators while retaining the denominator.
- Dissimilar fractions should first be converted to similar fractions before adding or subtracting them.
- Whole numbers can be converted to mixed numbers so that addition and subtraction are possible with problems involving a combination of mixed numbers, whole numbers and fractions.

What Have You Learned?

1. Solve the expressions below: (1 point each)

   a. $\frac{8}{21} + \frac{5}{21} + \frac{13}{21} - \frac{6}{21} = ?$ _____

   b. $\frac{3}{4} + \frac{1}{6} - \frac{5}{8} = ?$ _____

2. Mang Rey is 5 ¾ feet tall while Mang Fred is 6 ¼ feet tall. How much taller in feet is Mang Fred?

3. A 5 hectare land is divided among family members. The three brothers Freud, Wally and Jed each own a portion of land. Freud owns $^{1}/_{5}$ of the land. Wally owns $^{1}/_{3}$ of the land, while Jed owns $^{3}/_{10}$ of the land. How much of the 10-hectare land is owned by the three brothers? Express your answer in fractions.

4. Dong owns $^{5}/_{7}$ hectares of land. If he planted vegetables in $^{1}/_{3}$ hectares of land, how much land was left uncultivated? (3 points)

5. Aling Susan harvested 27 kilos of lansones. She sold 11 $^{3}/_{5}$ kilos. How many kilos of lansones were left with Aling Susan? (3 points)

6. Danny bought 4 $^{5}/_{6}$ dozen eggs. His sister bought $^{1}/_{3}$ dozen eggs while his father bought 2 ¼ dozen eggs. How many dozen eggs did they buy? (3 points)

7. Donna is 150 ¼ centimeters tall and Lina is 120 ½ centimeters tall. What is the difference in the heights between the two girls?

Compare your answers with those in the *Answer Key* on pages 104–113.

If your test score is from:

0–4 You should study the whole module again.

5–6 Review the parts of the module which you did not understand.

7 – 8 Excellent! You have understood the lessons of the module well.

Answer Key

A. Let's See What You Already Know *(pages 2–3)*

1. **STEP 1** Write the given information.

   a. $^4/_7$ meters – length of red cloth Luisa bought.
   b. $^3/_7$ meters – length of yellow cloth she bought.
   c. $^5/_7$ meters – length of green cloth she bought.

   STEP 2 Determine what is asked.

   Find the total length of cloth Luisa bought.

   STEP 3 Write down the number sentence.

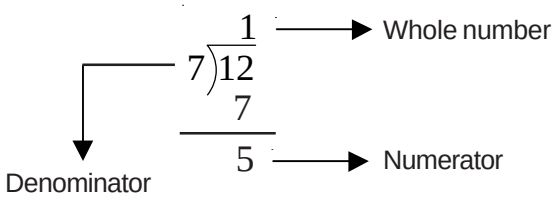
   $$\frac{4}{7} + \frac{3}{7} + \frac{5}{7} = N$$ (the total length of cloth Luisa bought)

   STEP 4 Solve the equation.

   Add the numerators of the similar fractions while retaining the denominator.

   $$\frac{4}{7} + \frac{3}{7} + \frac{5}{7} = \frac{4 + 3 + 5}{7} = \frac{12}{7}$$

   $^{12}/_7$ is an improper fraction which can be simplified:

   Therefore, $^{12}/_7$ is equal to $1\ ^5/_7$. This means that Luisa bought a total of $1\ ^5/_7$ meters of cloth.

2. **STEP 1** Write the given information.

   a. $^1/_3$ sack – amount of camote Lito sold.
   b. ¼ sack – amount of sayote Lito sold.

STEP 2 Determine what is asked.

Find how many sacks of vegetables Lito was able to sell.

STEP 3 Express the problem in equation form.

$$\frac{1}{3} + \frac{1}{4} = \text{N (number of sacks of vegetables Lito s}$$

We cannot add the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

Compare the denominators 3 and 4. 4 is the largest denominator, therefore, we enumerate the multiples of 4 and check for a common multiple for all the denominators.

4 – 4, 8, **12**
3 – 3, 6, 9, **12**

Therefore, 12 is the LCD of 3 and 4.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (12).

a. Convert $^1/_3$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (3), 12 ÷ 3 = 4. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$$

b. Convert ¼ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (4), 12 ÷ 4 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

STEP 3 Add the similar fractions.

$$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{4 + 3}{12} = \frac{7}{12}$$

The sum is $^{7}/_{12}$; therefore, Lito was able to sell $^{7}/_{12}$ sack of vegetables.

3. a. **STEP 1** Find the *least common denominator* (LCD) of the fractions to be added.

Compare the denominators 12, 6 and 8. 12 is the largest denominator, therefore, we enumerate the multiples of 12 and check for a common multiple for all the denominators.

12 – 12, **24**
6 – 6, 12, 18, **24**
8 – 8, 16, **24**

Therefore, 24 is the LCD of 12, 6, and 8.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (24).

a. Convert $^{7}/_{12}$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (12), $24 \div 12 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{7}{12} \times \frac{2}{2} = \frac{14}{24}$$

b. Convert 1/6 to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (6), $24 \div 6 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{4}{4} = \frac{4}{24}$$

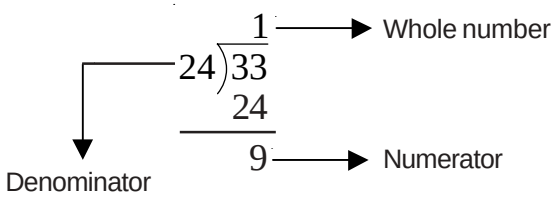
c. Convert $^{5}/_{8}$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (8), $24 \div 8 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{5}{8} \times \frac{3}{3} = \frac{15}{24}$$

STEP 3 Add the similar fractions.

$$\frac{14}{24} + \frac{4}{24} + \frac{15}{24} = \frac{14 + 4 + 15}{24} = \frac{33}{24}$$

Therefore, the sum is $^{33}/_{24}$. This is an improper fraction which can still be simplified.



$^{33}/_{24}$ is equal to $1\ ^{9}/_{24}$. Therefore, the sum is equal to $1\ ^{9}/_{24}$.

b. **STEP 1** Find the *least common denominator* (LCD) of the fractions to be subtracted.

Compare the denominators 4 and 5. 5 is the largest denominator, therefore, we enumerate the multiples of 4 and check for a common multiple for both denominators.

5 – 5, 10, 15, **20**
4 – 4, 8, 12, 16, **20**

Therefore, the LCD is 20.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (20).

a. Convert ¾ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (4), 20 ÷ 4 = 5. The quotient is 5. Multiply the numerator and denominator by the quotient (5) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{5}{5} = \frac{15}{20}$$

b. Convert $^1/_5$ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (5), 20 ÷ 5 = 4. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{5} \times \frac{4}{4} = \frac{4}{20}$$

The two fractions $^{15}/_{20}$ and $^4/_{20}$ are now similar fractions.

STEP 3 Subtract the similar fractions.

$$\frac{3}{4} - \frac{1}{5} = \frac{15}{20} - \frac{4}{20} = \frac{15 - 4}{20} = \frac{11}{20}$$

Therefore, the difference is $^{11}/_{20}$.

4. **STEP 1** Write the given information.

a. 15 ¼ sacks – amount of harvested rice by Mang Lino.
b. 19 ¾ sacks – amount of harvested rice by Mang Pepe.

STEP 2 Determine what is asked.

Find how much more rice Mang Pepe harvested than Mang Lino.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fractions in the mixed numbers, ¼ and ¾, are already simil ar fractions, and the LCD is equal to 4

STEP 4 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

$19\ {}^{3}/_{4} \ - \ 15\ {}^{1}/_{4} \ = \ ?$

$$\begin{array}{r} 19\ \frac{3}{4} \\ -\ \ 15\ \frac{1}{4} \\ \hline 4\ \frac{2}{4} \end{array}$$

The fraction ${}^{2}/_{4}$ can still be simplified since the numerator (2) and denominator (4) are divisible by 2:

$$\frac{2}{4} \div \frac{2}{2} = \frac{1}{2}$$

So simplifying to lowest terms, the fraction $4\ {}^{2}/_{4}$ becomes $4\ {}^{1}/_{2}$. Therefore, Mang Pepe harvested $4\ {}^{1}/_{2}$ more sacks of rice than Mang Lino.

5. **STEP 1** Write the given information.

a. 3 ½ kilos – amount of fish Liza bought.
b. $2\ {}^{3}/_{4}$ kilos – amount of beef Liza bought.
c. $1\ {}^{2}/_{3}$ kilos – amount of chicken Liza bought.

STEP 2 Determine what is asked.

Find the total amount of meat Liza bought.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in 3 ½ is ½. The fraction in 2 ¾ is ¾. The fraction in 1 $^{2}/_{3}$ is $^{2}/_{3}$. To find the LCD of ½, ¾ and $^{2}/_{3}$, find the smallest common multiple of their denominators (2, 4 and 3)

2 – 2, 4, 6, 8, 10, **12**
4 – 4, 8, **12**
3 – 3, 6, 9, **12**

12 is the smallest common multiple of the denominators; therefore, 12 is the LCD of ½, ¾ and $^{2}/_{3}$.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (12).

a. Convert ½ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (2), 12 ¸ 2 = 6. The quotient is 6. Multiply the numerator and denominator by the quotient (6) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$$

Replace ½ with the equivalent fraction $^{6}/_{12}$. Therefore 3 ½ becomes 3 $^{6}/_{12}$.

b. Convert ¾ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (4), 12 ¸ 4 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

Replace ¾ with the equivalent fraction $^{9}/_{12}$. Therefore 2 ¾ becomes 2 $^{9}/_{12}$.

c. Convert $^{2}/_{3}$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (3), $12 \div 3 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$$

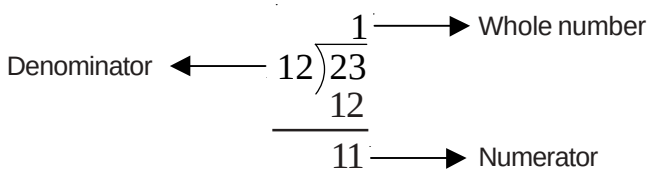
Replace $^{2}/_{3}$ with the equivalent fraction $^{8}/_{12}$. Therefore, $1\ ^{2}/_{3}$ becomes $1\ ^{8}/_{12}$.

STEP 5 Align the whole numbers and align the fractions together in a column. Add the whole numbers and add the similar fractions.

$$3\tfrac{1}{2} + 2\ ^{9}/_{12} + 1\ ^{8}/_{12} = ?$$

$$\begin{array}{r} 3\ \frac{6}{12} \\ +\ \ 2\ \frac{9}{12} \\ \hline 1\ \frac{8}{12} \end{array}$$

$6\ ^{23}/_{12}$ can still be simplified since the fraction part is an improper fraction.



Thus, $^{23}/_{12}$ is equal to $1\ ^{11}/_{12.}$

Therefore,

$$6\ \frac{23}{12} = 6 + \frac{23}{12} = 6 + 1\ \frac{11}{12} = 7\ \frac{11}{12}$$

Liza bought $7\ ^{11}/_{12}$ kilos of meat.

6. **STEP 1** Write the given information.

a. ½ kaban – amount of rice Mrs. Santos bought.
b. $^1/_{10}$ kaban – amount of rice Mrs. Santos used.

STEP 2 Determine what is asked.

Find the amount of rice Mrs. Santos kept.

STEP 3 Express the problem in equation form.

To solve for the answer, subtract the amount of rice she bought (½ kaban) by the amount of rice she used ($^1/_{10}$ kaban).

$$\frac{1}{2} - \frac{1}{10} = \text{N (portion of the rice kept)}$$

We cannot subtract the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be subtracted. Compare the denominators 2 and 10. 10 is the largest denominator, therefore, we enumerate the multiples of 10 and check for a common multiple for both denominators.

10 – **10**
2 – 2, 4, 6, 8, **10**

Therefore, the LCD is 10.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (10).

a. Convert ½ to an equivalent fraction whose denominator is 10. Divide the LCD (10) by the denominator (2), 10 ÷ 2 = 5. The quotient is 5. Multiply the numerator and denominator by the quotient (5) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$$

b. $^1/_{10}$ already has 10 as its denominator.

$$\frac{1}{10}$$

The two fractions $^5/_{10}$ and $^1/_{10}$ are now similar fractions.

STEP 6 Subtract the similar fractions.

$$\frac{1}{2} - \frac{1}{10} = \frac{5}{10} - \frac{1}{10} = \frac{5-1}{10} = \frac{4}{10}$$

The fraction $^4/_{10}$ can still be simplified to lowest terms since both numerator (4) and denominator (10) are divisible by 2.

$$\frac{4}{10} \div \frac{2}{2} = \frac{2}{5}$$

Therefore, the difference is $^2/_5$. This means that Mrs. Santos kept $^2/_5$ a kaban of rice.

7. **STEP 1** Write the given information.

a. 3 ½ cups – amount of milk needed for the recipe.
b. 1 ¾ cups – amount of milk already added to the recipe.

STEP 2 Determine what is asked.

Find out how much more milk needs to be added to the recipe.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in 3 ½ is ½. The fraction in 1 ¾ is ¾. To find the LCD of ½ and ¾, find the smallest common multiple of their denominators (2 and 4).

2 – 2, **4**
4 – **4**

4 **is the smallest common multiple for both 2 and 4; therefore 4 is the LCD of 2 and 4.**

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (4).

a. Convert ½ to an equivalent fraction whose denominator is 4. Divide the LCD (4) by the denominator (2), $4 \div 2 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$

Replace ½ with the equivalent fraction $^2/_4$. Therefore 3 ½ becomes 3 $^2/_4$.

b. The fraction ¾ doesn't need to be changed since the denominator (4) is already equal to the LCD (4).

Therefore the mixed number 1 ¾ is retained.

STEP 5 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

$$3\ ^2/_4 \quad - \quad 1\ ^3/_4 \quad = \quad ?$$

Generally, we cannot subtract a bigger number from a smaller number like 3 – 8 or 1 – 5. Similarly, we cannot also subtract a bigger fraction from a smaller fraction. In our example, we cannot subtract $^3/_4$ from $^2/_4$ because $^3/_4$ is greater than $^2/_4$. So what should be done?

Regroup 1 from the whole number (3) and add this to the fraction expressed in equivalent fraction form. Since the LCD is 4, then the equivalent fraction is $^4/_4$. The whole number 3 now becomes 2.

$$3\ \frac{2}{4} = 3 + \frac{2}{4} = (2 + 1) + \frac{2}{4} = 2 + \left(1 + \frac{2}{4}\right)$$

The regrouped 1 in the fraction part of the mixed number is transformed to an equivalent fraction whose numerator and denominator is equal to the LCD (4). Therefore, 1 is transformed to the equivalent fraction $^4/_4$. $3\ ^2/_4$ becomes $2\ ^6/_4$.

$$2 + (1 + {}^2/_4) = 2 + ({}^4/_4 + {}^2/_4) = 2 + {}^6/_4 = 2\ {}^6/_4$$

$$\begin{array}{r} 3\ \frac{2}{4} \\ -\ 1\ \frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 2\ \frac{6}{4} \\ -\ 1\ \frac{3}{4} \\ \hline 1\ \frac{3}{4} \end{array}$$

The difference is 1 ¾, therefore, 1 ¾ cups of milk still needs to be added to the recipe.

B. Lesson 1

Let's Review (pages 8–9)

1. **STEP 1** Write the fractions in equation form.

$$\frac{3}{15} + \frac{2}{15} + \frac{4}{15} + \frac{1}{15} = ?$$

STEP 2 Add the numerators of the fractions while retaining the denominator.

$$\frac{3}{15} + \frac{2}{15} + \frac{4}{15} + \frac{1}{15} = \frac{3 + 2 + 4 + 1}{15} = \frac{10}{15}$$

The fraction $^{10}/_{15}$ can still be reduced to lowest terms since both numerator (10) and denominator (15) are divisible by 5.

$$\frac{10}{15} \div \frac{5}{5} = \frac{2}{3}$$

Therefore, the sum of the fractions is $^2/_3$.

2. **STEP 1** Write the given information.

a. $^{2}/_{10}$ meter – length of blue ribbon Mrs. Marbella used.
b. $^{5}/_{10}$ meter – length of yellow ribbon she used.
c. $^{2}/_{10}$ meter – length of red ribbon she used.

STEP 2 Determine what is asked.

Find out how much ribbon Mrs. Marbella used.

STEP 3 Write down the number sentence.

$$\frac{2}{10} + \frac{5}{10} + \frac{2}{10} = N$$

(the total amount of ribbon Mrs. Marbella used)

STEP 4 Solve the equation.

Add the numerators of the similar fractions while retaining the denominator.

$$\frac{2}{10} + \frac{5}{10} + \frac{2}{10} = \frac{2 + 5 + 2}{10} = \frac{9}{10}$$

Therefore, Mrs. Marbella used $^{9}/_{10}$ meter of ribbons.

Let's Try This (pages 11–12)

1. **STEP 1** Write the fractions in equation form.

$$\frac{23}{13} - \frac{12}{13} = ?$$

STEP 2 Get the difference of the numerators while retaining the denominator.

$$\frac{23}{13} - \frac{12}{13} = \frac{23 - 12}{13} = \frac{11}{13}$$

The difference is $^{11}/_{13}$.

2. **STEP 1** Write the fractions in equation form.

$$\frac{19}{21} - \frac{11}{21} = ?$$

STEP 2 Get the difference of the numerators while retaining the denominator.

$$\frac{19}{21} - \frac{11}{21} = \frac{19 - 11}{21} = \frac{8}{21}$$

The difference is $^{8}/_{21}$.

3. **STEP 1** Write the fractions in equation form.

$$\frac{30}{31} - \frac{24}{31} = ?$$

STEP 2 Get the difference of the numerators while retaining the denominator.

$$\frac{30}{31} - \frac{24}{31} = \frac{30 - 24}{31} = \frac{6}{31}$$

The difference is $^{6}/_{31}$.

4. **STEP 1** Write the given information.

$^{4}/_{12}$ – portion of the cake that Jun took.
$^{6}/_{12}$ – portion of the cake that Carol took.

STEP 2 Determine what is asked.

Find out how much more cake Carol took than Jun.

STEP 3 Write the fractions in equation form.

$$\frac{6}{12} - \frac{4}{12} = ?$$

STEP 4 Get the difference of the numerators while retaining the denominator.

$$\frac{6}{12} - \frac{4}{12} = \frac{6 - 4}{12} = \frac{2}{12}$$

The fraction $^{2}/_{12}$ can still be reduced to lowest terms since both numerator (2) and denominator (12) are divisible by 2.

$$\frac{2}{12} \div \frac{2}{2} = \frac{1}{6}$$

Therefore, Carol took $^{1}/_{6}$ more cake than Jun.

5. **STEP 1** Write the given information.

a. $^{7}/_{9}$ hectare – portion of land that Mang Pepe owns.

b. $^{5}/_{9}$ hectare – portion of land that Mang Pepe planted with vegetables.

STEP 2 Determine what is asked.

Find out what part of the land was not planted with vegetables.

STEP 3 Write the fractions in equation form.

$$\frac{7}{9} - \frac{5}{9} = ?$$

STEP 4 Get the difference of the numerators while retaining the denominator.

$$\frac{7}{9} - \frac{5}{9} = \frac{7 - 5}{9} = \frac{2}{9}$$

The difference is $^{2}/_{9}$. Therefore, $^{2}/_{9}$ hectare of Mang Pepe's land has not been planted with vegetables.

Let's See What You Have Learned (pages 13–14)

1. **STEP 1** Write the given information.

   a. $^3/_4$ kilo – amount of fish Aling Maria bought.
   b. $^5/_4$ kilo – amount of beef she bought.
   c. $^1/_4$ kilo – amount of chicken she bought.

   STEP 2 Determine what is asked.

   Find out how meat Aling Maria bought.

   STEP 3 Write down the number sentence.

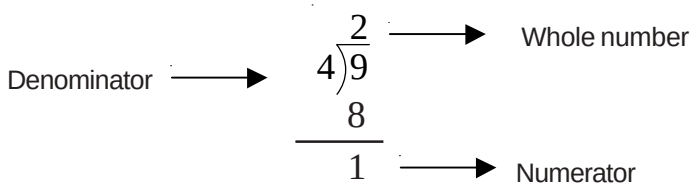
   $$\frac{3}{4} + \frac{5}{4} + \frac{1}{4} = N$$ (the total amount of meat Aling Maria bought)

   STEP 4 Solve the equation.

   Add the numerators of the similar fractions while retaining the denominator.

   $$\frac{3}{4} + \frac{5}{4} + \frac{1}{4} = \frac{3 + 5 + 1}{4} = \frac{9}{4}$$

   The improper fraction $^9/_4$ can still be simplified to a mixed number.

   Therefore $^9/_4$ is equal to 2 ¼. This means that Aling Maria bought 2 ¼ kilos of meat.

2. **STEP 1** Write the given information.

   a. $^1/_8$ – portion of the land owned by Ricky.
   b. $^3/_8$ – portion of the land owned by Paul.
   c. $^2/_8$ – portion of the land owned by Eric.

STEP 2 Determine what is asked.

Find out what portion of the land is owned by the three brothers.

STEP 3 Write down the number sentence.

$\frac{1}{8} + \frac{3}{8} + \frac{2}{8} = N$ (the portion of land that the three brothers own)

STEP 4 Solve the equation.

Add the numerators of the similar fractions while retaining the denominator.

$$\frac{1}{8} + \frac{3}{8} + \frac{2}{8} = \frac{1 + 3 + 2}{8} = \frac{6}{8}$$

The fraction $^6/_8$ can still be simplified to lowest terms since both numerator (6) and denominator (8) can be divided by 2.

$$\frac{6}{8} \div \frac{2}{2} = \frac{3}{4}$$

Therefore, $^6/_8$, when simplified to lowest terms, is equal to ¾. This means that the three brothers own ¾ of the 5-hectare land.

3. **STEP 1** Write the given information.

a. $^2/_5$ liters – amount of paint Mang Rolly bought.
b. $^4/_5$ liters – amount of paint Mang Tomas bought.

STEP 2 Determine what is asked.

Find out how much more paint Mang Tomas bought than Mang Rolly.

STEP 3 Write the fractions in equation form.

$$\frac{4}{5} - \frac{2}{5} = ?$$

STEP 4 Get the difference of the numerators while retaining the denominator.

$$\frac{4}{5} - \frac{2}{5} = \frac{4 - 2}{5} = \frac{2}{5}$$

The difference is $^2/_5$. Therefore, Mang Tomas bought $^2/_5$ liter more paint than Mang Rolly.

4. **STEP 1** Write the given information.

a. $^3/_4$ kilogram – amount of corn Mario bought.

b. $^1/_4$ kilogram – amount of corn Mario gave to his neighbor.

STEP 2 Determine what is asked.

Find out how much corn was left with Mario.

STEP 3 Write the fractions in equation form.

$$\frac{3}{4} - \frac{1}{4} = ?$$

STEP 4 Get the difference of the numerators while retaining the denominator.

$$\frac{3}{4} - \frac{1}{4} = \frac{3 - 1}{4} = \frac{2}{4}$$

The fraction $^2/_4$ can be reduced to lowest terms since both numerator (2) and denominator (4) are divisible by 2.

$$\frac{2}{4} \div \frac{2}{2} = \frac{1}{2}$$

The fraction $^2/_4$ when simplified to lowest terms is equal to ½. This means that Mario had ½ kilo of corn left.

5. **STEP 1** Write the fractions in equation form.

$$\frac{5}{7} + \frac{7}{15} - \frac{3}{15} = ?$$

STEP 2 Solve the equation.

First step is to add the numerators 5 and 7 together.

$$\frac{5}{7} + \frac{7}{15} - \frac{3}{15} = \frac{(5 + 7) - 3}{15} = \frac{12 - 3}{15}$$

The sum of the numbers is then subtracted by the numerator 3.

$$\frac{12 - 3}{15} = \frac{9}{15}$$

The fraction $^{9}/_{15}$ can still be reduced to lowest terms since both numerator (9) and denominator (15) are divisible by 3.

$$\frac{9}{15} \div \frac{3}{3} = \frac{3}{5}$$

The fraction $^{9}/_{15}$ when simplified to lowest terms is equal to $^{3}/_{5}$. Therefore the computed fraction is $^{3}/_{5}$.

C. Lesson 3

Let's Try This (page 15)

a. This is a set of dissimilar fractions.
b. This is a set of dissimilar fractions.
c. This is a set of similar fractions.

Let's Try This (page 18)

1. Compare the denominators 8, 4 and 12.

   STEP 1 Start by enumerating the multiples of the largest denominator (12 is the largest denominator among the three). For every multiple that you enumerate, check if this multiple is also a multiple of the other denominators. Stop enumerating when you find a common multiple for the denominators.

   12 – 12, **24**
   8 – 8, 16, **24**
   4 – 4, 8, 12, 16, 20, **24**

   Therefore 24 is a common multiple of 12, 8 and 4.

   STEP 2 When you find the smallest common multiple of the denominators, then this is the LCD of the fractions.

   Therefore, the LCD of $^{3}/_{8}$, $^{1}/_{4}$ and $^{5}/_{12}$ is 24**.**

2. Compare the denominators 3, 6 and 9.

   STEP 1 Start by enumerating the multiples of the largest denominator (9 is the largest denominator among the three). For every multiple that you enumerate, check if this multiple is also a multiple of the other denominators. Stop enumerating when you find a common multiple for the denominators.

   9 – 9, **18**
   6 – 6, 12, **18**
   3 – 3, 6, 9, 12, 15, **18**

   Therefore 18 is the smallest common multiple of 9, 6 and 3.

   STEP 2 When you find the smallest common multiple of the denominators, then this is the LCD of the fractions.

   Therefore, the LCD of $^{2}/_{3}$, $^{5}/_{6}$ and $^{7}/_{9}$ is 18.

Let's Review (pages 22–23)

1. **STEP 1** Write the given information.

   a. $^1/_3$ – part of the land owned by Luisa.
   b. $^1/_6$ – part of the land owned by Nelly.
   c. $^1/_4$ – part of the land owned by Sharon.

   STEP 2 Determine what is asked.

   Find what part of the land is owned by the three sisters.

   STEP 3 Express the problem in equation form.

   $$\frac{1}{3} + \frac{1}{6} + \frac{1}{4} = \text{N (portion of the land owned by the sisters)}$$

   We cannot add the fractions yet since they are dissimilar.

   STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

   Compare the denominators 3, 6 and 4. 6 is the largest denominator, therefore, we enumerate the multiples of 6 and check for the smallest common multiple for the denominators.

   6 – 6, 12
   4 – 4, 8, 12
   3 – 3, 6, 9, 12

   12 is the smallest common multiple for the three denominators. Therefore, the LCD is 12.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (12).

a. Convert $^1/_3$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (3), $12 \div 3 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$$

b. Convert $^1/_6$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (6), 12 ¸ 6 = 2. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{2}{2} = \frac{2}{12}$$

c. Convert $^1/_4$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (4), 12 ¸ 4 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

The three fractions $^4/_{12}$, $^2/_{12}$, and $^3/_{12}$ are now similar fractions.

STEP 6 Add the similar fractions.

$$\frac{4}{12} + \frac{2}{12} + \frac{3}{12} = \frac{4 + 2 + 3}{12} = \frac{9}{12}$$

The fraction $^9/_{12}$ can be reduced to lowest terms since both numerator (9) and denominator (12) are divisible by 3.

$$\frac{10}{15} \div \frac{5}{5} = \frac{2}{3}$$

The fraction $^9/_{12}$, when reduced to lowest terms is equal to ¾. This means that the three sisters own ¾ of the land.

2. **STEP 1** Write the given information.

a. $^3/_5$ mile – distance from factory to warehouse A.
b. $^1/_4$ mile– distance from warehouse A to warehouse B.
c. $^9/_{10}$ mile – distance from warehouse B to warehouse C.

STEP 2 Determine what is asked.

Find the total distance Mang Anding needs to cover to deliver the goods to the warehouses.

STEP 3 Express the problem in equation form.

$$\frac{3}{4} + \frac{1}{4} + \frac{9}{10} = \text{N}$$ (total distance Mang Anding needs to cover

We cannot add the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

Compare the denominators 5, 4 and 10. 10 is the largest denominator, therefore, we enumerate the multiples of 10 and check for the smallest common multiple for the denominators.

10 – 10, **20**
5 – 5, 10, 15, **20**
4 – 4, 8, 12, 16, **20**

20 is the smallest common multiple for the three denominators. Therefore, the LCD is 20.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (20).

a. Convert $^3/_5$ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (5), $20 \div 5 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{3}{5} \times \frac{4}{4} = \frac{12}{20}$$

b. Convert $^1/_4$ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (4), $20 \div 4 = 5$. The quotient is 5. Multiply the numerator and denominator by the quotient (5) to get the equivalent fraction.

$$\frac{1}{4} \times \frac{5}{5} = \frac{5}{20}$$

c. Convert $^{9}/_{10}$ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (10), $20 \div 10 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

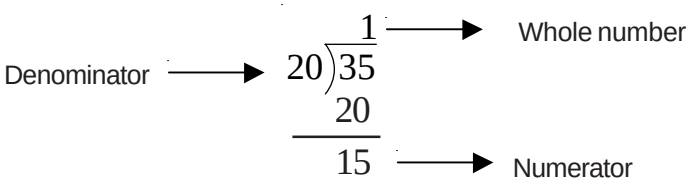
$$\frac{9}{10} \times \frac{2}{2} = \frac{18}{20}$$

The three fractions $^{12}/_{20}$, $^{5}/_{20}$, and $^{18}/_{20}$ are now similar fractions.

STEP 6 Add the similar fractions.

$$\frac{12}{20} + \frac{5}{20} + \frac{18}{20} = \frac{12 + 5 + 18}{20} = \frac{35}{20}$$

The improper fraction $^{35}/_{20}$ can still be simplified to a mixed number.



Therefore $^{35}/_{20}$ is equal to $1\ ^{15}/_{20}$ or $1\ ^{3}/_{4}$. This means that Mang Anding will have to cover a distance of 1 ¾ miles to deliver the goods to the warehouses.

Let's Try This (pages 25–26)

STEP 1 Write the given information.

a. $^{2}/_{3}$ kaban – stock of rice Mang Andy has.
b. $^{1}/_{7}$ kaban – amount of rice Mang Andy took from the stock.

STEP 2 Determine what is asked.

Find the amount of rice left in the stock.

STEP 3 Express the problem in equation form.

To solve for the answer, subtract the amount of rice he has took ($^1/_7$ meter) by the amount of rice in stock ($^2/_3$ meter).

$$\frac{2}{3} - \frac{1}{7} = \text{N (remaining amount of rice stock)}$$

We cannot subtract the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be subtracted.

Compare the denominators 3 and 7. 7 is the largest denominator, therefore, we enumerate the multiples of 7 and check for a common multiple for both denominators.

7 – 7, 14, **21**
3 – 3, 6, 9, 12, 15, 18, **21**

Therefore, the LCD is 21.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (21).

a. Convert $^1/_7$ to an equivalent fraction whose denominator is 21. Divide the LCD (21) by the denominator (7), $21 \div 7 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{1}{7} \times \frac{7}{7} = \frac{3}{21}$$

b. Convert $^2/_3$ to an equivalent fraction whose denominator is 21. Divide the LCD (21) by the denominator (3), $21 \div 3 = 7$. The quotient is 7. Multiply the numerator and denominator by the quotient (7) to get the equivalent fraction.

$$\frac{2}{3} \times \frac{7}{7} = \frac{14}{21}$$

The two fractions $^3/_{21}$ and $^{14}/_{21}$ are now similar fractions.

STEP 6 Subtract the similar fractions.

$$\frac{14}{21} - \frac{3}{21} = \frac{14 - 3}{21} = \frac{11}{21}$$

Therefore, the difference is $^{11}/_{21}$. This means that $^{11}/_{21}$ kaban of rice was left as stock.

2. **STEP 1** Write the given information.

a. $^{5}/_{6}$ of a day – time it will take Mang Roger to travel by boat.
b. $^{1}/_{24}$ of a day – time it will take Mang Roger to travel by plane.

STEP 2 Determine what is asked.

Find the amount of time Mang Roger will save if he travels by plane instead of riding a boat.

STEP 3 Express the problem in equation form.

To solve for the answer, subtract the amount of time it will take to travel by boat ($^{5}/_{6}$) by the amount of time it will take to travel by plane ($^{1}/_{24}$).

$$\frac{5}{6} - \frac{1}{24} = \text{N (time saved if Mang Roger rode a pl}$$

We cannot subtract the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be subtracted.

Compare the denominators 6 and 24. 24 is the largest denominator, therefore, we enumerate the multiples of 24 and check for a common multiple for both denominators.

24 – **24**
6 – 6, 12, 18, **24**

Therefore, the LCD is 24.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (24).

a. Convert $^5/_6$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (6), 24 ¸ 6 = 4. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$$

The fraction $^1/_{24}$ does not need to be converted since its denominator (24) is already equal to the LCD.

$$\frac{1}{24}$$

The two fractions $^{20}/_{24}$ and $^1/_{24}$ are now similar fractions.

STEP 6 Subtract the similar fractions.

$$\frac{20}{24} - \frac{1}{24} = \frac{20 - 1}{24} = \frac{19}{24}$$

Therefore, the difference is $^{19}/_{24}$. This means that $^{19}/_{24}$ of a day was saved if Mang Roger rode a plane rather than riding the boat.

3. **STEP 1** Find the *least common denominator* (LCD) of the fractions.

Compare the denominators 7, 21 and 3. 21 is the largest denominator, therefore, we enumerate the multiples of 21 and check for a common multiple for all the denominators.

21 – **21**
7 – 7, 14, **21**
3 – 3, 6, 9, 12, 15, 18, **21**

Therefore, 21 is the LCD of 21, 7 and 3.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (21).

a. Convert $^3/_7$ to an equivalent fraction whose denominator is 21. Divide the LCD (21) by the denominator (7), 21 ¸ 7 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{3}{7} \times \frac{3}{3} = \frac{9}{21}$$

b. The fraction $^5/_{21}$ need not be converted since its denominator (21) is already equal to the LCD.

$$\frac{5}{21}$$

c. Convert $^1/_3$ to an equivalent fraction whose denominator is 21. Divide the LCD (21) by the denominator (3), 21 ¸ 3 = 7. The quotient is 7. Multiply the numerator and denominator by the quotient (7) to get the equivalent fraction.

$$\frac{1}{3} \times \frac{7}{7} = \frac{7}{21}$$

STEP 3 Solve for the answer.

$$\frac{9}{21} + \frac{5}{21} - \frac{7}{21} = \frac{9 + 5 - 7}{21} = \frac{7}{21}$$

The fraction $^7/_{21}$ can be simplified to lowest terms since both numerator (7) and denominator (21) are divisible by 7.

$$\frac{7}{21} \div \frac{7}{7} = \frac{1}{3}$$

The answer is $^1/_3$.

Let's See What You Have Learned (pages 27–28)

1. **STEP 1** Write the given information.

   a. $^2/_3$ kilo – amount of fish in the basket.
   b. $^5/_6$ kilo – amount of beef in the basket.
   c. $^1/_4$ kilo – amount of chicken in the basket.

   STEP 2 Determine what is asked.

   Find the total amount of meat in Aling During's basket.

   STEP 3 Express the problem in equation form.

   $$\frac{2}{3} + \frac{5}{6} + \frac{1}{4} = \text{N}$$ (the total amount of meat in the basket)

   We cannot add the fractions yet since they are dissimilar.

   STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

   Compare the denominators 3, 6 and 4. 6 is the largest denominator, therefore, we enumerate the multiples of 6 and check for the smallest common multiple for the denominators.

   6 – 6, **12**
   3 – 3, 6, 9, **12**
   4 – 4, 8, **12**

   12 is the smallest common multiple for the three denominators. Therefore, the LCD is 12.

   STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (12).

   Convert $^2/_3$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (3), $12 \div 3 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

   $$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$$

b. Convert $^{5}/_{6}$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (6), $12 \div 6 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{5}{6} \times \frac{2}{2} = \frac{10}{12}$$

c. Convert $^{1}/_{4}$ to an equivalent fraction whose denominator is 12. Divide the LCD (12) by the denominator (4), $12 \div 4 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

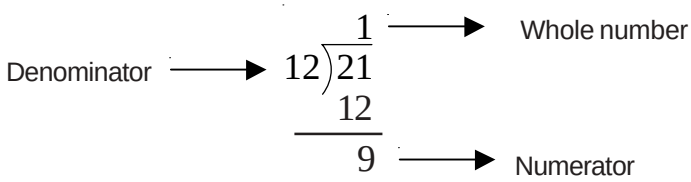
$$\frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

The three fractions $^{8}/_{12}$, $^{10}/_{12}$, and $^{3}/_{12}$ are now similar fractions.

STEP 6 Add the similar fractions.

$$\frac{8}{12} + \frac{10}{12} + \frac{3}{12} = \frac{8 + 10 + 3}{12} = \frac{21}{12}$$

The improper fraction $^{21}/_{12}$ can still be simplified to a mixed number.



The fraction $^{21}/_{12}$ is equal to $1\ ^{9}/_{12}$ or 1 ¾. This means that 1 ¾ kilo of meat is in Aling During's basket.

2. **STEP 1** Write the given information.

a. $^{4}/_{5}$ hectare – land owned by Mang Lito.
b. $^{1}/_{4}$ hectare – part of the land planted with vegetables.

STEP 2 Determine what is asked.

Find the part of Mang Lito's land left uncultivated.

STEP 3 Express the problem in equation form.

To solve for the answer, subtract the part of land Mang Lito owns by the part of his land planted with vegetables.

$$\frac{4}{5} - \frac{1}{4} = \text{N (amount of land uncultivated)}$$

We cannot subtract the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be subtracted.

Compare the denominators 5 and 4. 5 is the largest denominator, therefore, we enumerate the multiples of 5 and check for a common multiple for both denominators.

5 – 5, 10, 15, **20**
4 – 4, 8, 12, 16, **20**

Therefore, the LCD is 20.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (20).

a. Convert $^4/_5$ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (5), $20 \div 5 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{4}{5} \times \frac{4}{4} = \frac{16}{20}$$

b. Convert $^1/_4$ to an equivalent fraction whose denominator is 20. Divide the LCD (20) by the denominator (4), $20 \div 4 = 5$. The quotient is 5. Multiply the numerator and denominator by the quotient (5) to get the equivalent fraction.

$$\frac{1}{4} \times \frac{5}{5} = \frac{5}{20}$$

The two fractions $^{16}/_{20}$ and $^{5}/_{20}$ are now similar fractions.

STEP 6 Subtract the similar fractions.

$$\frac{16}{20} - \frac{5}{20} = \frac{16 - 5}{20} = \frac{11}{20}$$

Therefore, the difference is $^{11}/_{20}$. This means that $^{11}/_{20}$ hectare of land was left uncultivated.

3. **STEP 1** Write the given information.

a. ½ - part of the room that Berto painted.
b. $^{2}/_{9}$ – part of the room that Carlos painted.
c. $^{1}/_{6}$ – part of the room that Willy painted.

STEP 2 Determine what is asked.

Find the portion of the room that has already been painted.

STEP 3 Express the problem in equation form.

$$\frac{1}{2} + \frac{2}{9} + \frac{1}{6} = \text{N} \text{ (portion of the room already painted)}$$

We cannot add the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be added.

Compare the denominators 2, 9 and 6. 9 is the largest denominator, therefore, we enumerate the multiples of 9 and check for the smallest common multiple for all the denominators.

9 – 9, 18
6 – 6, 12, 18
2 – 2, 4, 6, 8, 10, 12, 14, 16, 18

Therefore, the LCD is 18.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (18).

a. Convert ½ to an equivalent fraction whose denominator is 18. Divide the LCD (18) by the denominator (2), $18 \div 2 = 9$. The quotient is 9. Multiply the numerator and denominator by the quotient (9) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{9}{9} = \frac{9}{18}$$

b. Convert $^2/_9$ to an equivalent fraction whose denominator is 18. Divide the LCD (18) by the denominator (9), $18 \div 9 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{2}{9} \times \frac{2}{2} = \frac{4}{18}$$

c. Convert $^1/_6$ to an equivalent fraction whose denominator is 18. Divide the LCD (18) by the denominator (6), $18 \div 6 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{3}{3} = \frac{3}{18}$$

The three fractions $^9/_{18}$, $^4/_{18}$, and $^3/_{18}$ are now similar fractions.

STEP 6 Add the similar fractions.

$$\frac{1}{2} + \frac{2}{9} + \frac{1}{6} = \frac{9}{18} + \frac{4}{18} + \frac{3}{18} = \frac{9 + 4 + 3}{18} = \frac{1}{1}$$

$^{16}/_{18}$ is not yet in lowest terms since both numerator (16) and denominator (18) are divisible by 2.

$$\frac{16}{18} \div \frac{2}{2} = \frac{8}{9}$$

Therefore, the sum is $^{16}/_{18}$ or $^{8}/_{9}$. This means that $^{8}/_{9}$ of the room has already been painted.

4. **STEP 1** Find the *least common denominator* (LCD) of the fractions.

Compare the denominators 5, 6 and 3. 6 is the largest denominator, therefore, we enumerate the multiples of 6 and check for a common multiple for all the denominators.

6 – 6, 12, 18, 24, **30**
5 – 5, 10, 15, 20, 25, **30**
3 – 3, 6, 9, 12, 15, 18, 21, 24, 27, **30**

Therefore, 30 is the LCD of 6, 5 and 3.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (30).

a. Convert $^{3}/_{5}$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (5), $30 \div 5 = 6$. The quotient is 6. Multiply the numerator and denominator by the quotient (6) to get the equivalent fraction.

$$\frac{3}{5} \times \frac{6}{6} = \frac{18}{30}$$

b. Convert $^{5}/_{6}$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (6), $30 \div 6 = 5$. The quotient is 5. Multiply the numerator and denominator by the quotient (5) to get the equivalent fraction.

$$\frac{5}{6} \times \frac{5}{5} = \frac{25}{30}$$

c. Convert $^{2}/_{3}$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (3), $30 \div 3 = 10$. The quotient is 10. Multiply the numerator and denominator by the quotient (10) to get the equivalent fraction.

$$\frac{2}{3} \times \frac{10}{10} = \frac{20}{30}$$

STEP 3 Solve for the answer.

$$\frac{18}{30} + \frac{25}{30} - \frac{20}{30} = \frac{18 + 25 - 20}{30} = \frac{23}{30}$$

The answer is $^{23}/_{30}$.

5. **STEP 1** Find the *least common denominator* (LCD) of the fractions.

Compare the denominators 8, 5 and 4. 8 is the largest denominator, therefore, we enumerate the multiples of 8 and check for a common multiple for all the denominators.

8 – 8, 16, 24, 32, **40**
5 – 5, 10, 15, 20, 25, 30, 35, **40**
4 – 4, 8, 12, 16, 20, 24, 28, 32, 36, **40**

Therefore, 40 is the LCD of 8, 5 and 4.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (40).

a. Convert $^{7}/_{8}$ to an equivalent fraction whose denominator is 40. Divide the LCD (40) by the denominator (8), $40 \div 8 = 5$. The quotient is 5. Multiply the numerator and denominator by the quotient (5) to get the equivalent fraction.

$$\frac{7}{8} \times \frac{5}{5} = \frac{35}{40}$$

b. Convert $^{2}/_{5}$ to an equivalent fraction whose denominator is 40. Divide the LCD (40) by the denominator (5), $40 \div 5 = 8$. The quotient is 8. Multiply the numerator and denominator by the quotient (8) to get the equivalent fraction.

$$\frac{2}{5} \times \frac{8}{8} = \frac{16}{40}$$

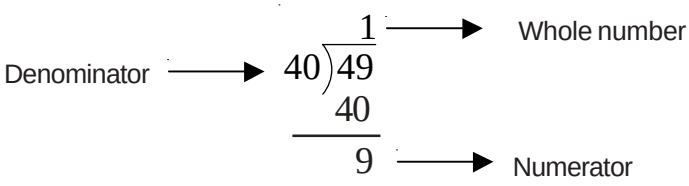
c. Convert $^{3}/_{4}$ to an equivalent fraction whose denominator is 40. Divide the LCD (40) by the denominator (4), $40 \div 4 = 10$. The quotient is 10. Multiply the numerator and denominator by the quotient (10) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{10}{10} = \frac{30}{40}$$

STEP 3 Solve for the answer.

$$\frac{35}{40} - \frac{16}{40} + \frac{30}{40} = \frac{35 - 16 + 30}{40} = \frac{49}{40}$$

The improper fraction $^{49}/_{40}$ can be simplified to a mixed number.



Therefore, the fraction $^{49}/_{40}$ is equal to $1\ ^{9}/_{40}$ which is the answer.

6. **STEP 1** Find the *least common denominator* (LCD) of the fractions.

Compare the denominators 8, 5 and 4. 8 is the largest denominator, therefore, we enumerate the multiples of 8 and check for a common multiple for all the denominators.

12 – 12, **24**
8 – 8, 16, **24**
6 – 6, 12, 18, **24**

Therefore, 24 is the LCD of 12, 8, and 6.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (24).

a. Convert $^1/_6$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (6), $24 \div 6 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{4}{4} = \frac{4}{24}$$

b. Convert $^7/_8$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (8), $24 \div 8 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{7}{8} \times \frac{3}{3} = \frac{21}{24}$$

c. Convert $^5/_{12}$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (12), $24 \div 12 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{5}{12} \times \frac{2}{2} = \frac{10}{24}$$

STEP 3 Solve for the answer.

$$\frac{4}{24} + \frac{21}{24} - \frac{10}{24} = \frac{4 + 21 - 10}{24} = \frac{15}{24}$$

The fraction $^{15}/_{24}$ can be reduced to lowest terms since both numerator (15) and denominator (24) are divisible by 3.

$$\frac{10}{15} \div \frac{5}{5} = \frac{2}{3}$$

The fraction $^{15}/_{24}$ is equal to $^5/_8$. The answer is $^5/_8$.

D. Lesson 3

Let's Try This (pages 30–31)

Mixed numbers: $2\ ^{7}/_{12}$, 5 ¼, $11\ ^{4}/_{7}$, $7\ ^{1}/_{3}$
Whole numbers: 115, 46
Fractions: $^{3}/_{5}$, ½, $^{11}/_{15}$, $^{2}/_{3}$

Let's Review (pages 35–36)

STEP 1 Write the given information.

a. 12 ½ meters – length of the first side.
b. $7\ ^{1}/_{6}$ meters – length of the second side.
c. $8\ ^{1}/_{9}$ meters – length of the third side.

STEP 2 Determine what is asked.

Find out how much fencing material is needed to cover the triangular area.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in 12 ½ is ½. The fraction in $7\ ^{1}/_{6}$ is $^{1}/_{6}$. The fraction in $8\ ^{1}/_{9}$ is $^{1}/_{9}$. To find the LCD of ½, $^{1}/_{6}$ and $^{1}/_{9}$, find the smallest common multiple of their denominators (2, 6 and 9)

9 – 9, **18**
6 – 6, 12, **18**
2 – 2, 4, 6, 8, 10, 12, 14, 16, **18**

18 is the smallest common multiple of the denominators; therefore, 18 is the LCD of ½, $^{1}/_{6}$ and $^{1}/_{9}$.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (18).

a. Convert ½ to an equivalent fraction whose denominator is 18. Divide the LCD (18) by the denominator (2), 18 ÷ 2 = 9. The quotient is 9. Multiply the numerator and denominator by the quotient (9) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{9}{9} = \frac{9}{18}$$

Replace ½ with the equivalent fraction $^{9}/_{18}$. Therefore 12 ½ becomes $12\ ^{9}/_{18}$.

b. Convert $^{1}/_{6}$ to an equivalent fraction whose denominator is 18. Divide the LCD (18) by the denominator (6), 18 ÷ 6 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{2}{2} = \frac{2}{12}$$

Replace $^{1}/_{6}$ with the equivalent fraction $^{3}/_{18}$. Therefore, $7\ ^{1}/_{6}$ becomes $7\ ^{3}/_{18}$.

c. Convert $^{1}/_{9}$ to an equivalent fraction whose denominator is 18. Divide the LCD (18) by the denominator (9), 18 ÷ 9 = 2. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{1}{9} \times \frac{2}{2} = \frac{2}{18}$$

Replace $^{1}/_{9}$ with the equivalent fraction $^{2}/_{18}$. Therefore, $8\ ^{1}/_{9}$ becomes $8\ ^{2}/_{18}$.

STEP 5 Align the whole numbers and align the fractions together in a column. Add the whole numbers and add the similar fractions.

$$12\ ^{9}/_{18} \quad + \quad 7\ ^{3}/_{18} \quad + \quad 8\ ^{2}/_{18} \quad = \quad ?$$

$$\begin{array}{rr} & 12\ \frac{9}{18} \\ + & 7\ \frac{3}{18} \\ & 8\ \frac{2}{18} \\ \hline & 27\ \frac{14}{18} \end{array}$$

The fraction $^{14}/_{18}$ in the mixed number can be reduced to lowest terms since both numerator (14) and denominator (18) are divisible by 2.

$$\frac{14}{18} \div \frac{2}{2} = \frac{7}{9}$$

The mixed number $27\ ^{14}/_{18}$ then becomes $27\ ^{7}/_{9}$. This means that $27\ ^{7}/_{9}$ meters of fencing material is needed to cover the triangular area.

2. **STEP 1** Write the given information.

   a. 5 ¾ meters – length of red cloth she needs.
   b. $8\ ^{7}/_{9}$ meters – length of white cloth she needs.
   c. $10\ ^{5}/_{6}$ meters – length of green cloth she needs.

   STEP 2 Determine what is asked.

   Find out how much cloth she needs.

   STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

   The fraction in 5 ¾ is ¾. The fraction in $8\ ^{7}/_{9}$ is $^{7}/_{9}$. The fraction in $10\ ^{5}/_{6}$ is $^{5}/_{6}$. To find the LCD of ¾, $^{7}/_{9}$ and $^{5}/_{6}$, find the smallest common multiple of their denominators (4, 6 and 9)

   9 – 9, 18, 27, **36**
   6 – 6, 12, 18, 24, 30, **36**
   4 – 4, 8, 12, 16, 20, 24, 28, 32, **36**

36 is the smallest common multiple of the denominators; therefore, 36 is the LCD of ¾, $^{7}/_{9}$ and $^{5}/_{6}$.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (36).

a. Convert ¾ to an equivalent fraction whose denominator is 36. Divide the LCD (36) by the denominator (4), 36 ÷ 4 = 9. The quotient is 9. Multiply the numerator and denominator by the quotient (9) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{9}{9} = \frac{27}{36}$$

Replace ¾ with the equivalent fraction $^{27}/_{36}$. Therefore 5 ¾ becomes 5 $^{27}/_{36}$.

b. Convert $^{7}/_{9}$ to an equivalent fraction whose denominator is 36. Divide the LCD (36) by the denominator (9), 36 ÷ 9 = 4. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{7}{9} \times \frac{4}{4} = \frac{21}{36}$$

Replace $^{7}/_{9}$ with the equivalent fraction $^{21}/_{36}$. Therefore, 8 $^{7}/_{9}$ becomes 8 $^{21}/_{36}$.

c. Convert $^{5}/_{6}$ to an equivalent fraction whose denominator is 36. Divide the LCD (36) by the denominator (6), 36 ÷ 6 = 6. The quotient is 6. Multiply the numerator and denominator by the quotient (6) to get the equivalent fraction.

$$\frac{5}{6} \times \frac{6}{6} = \frac{30}{36}$$

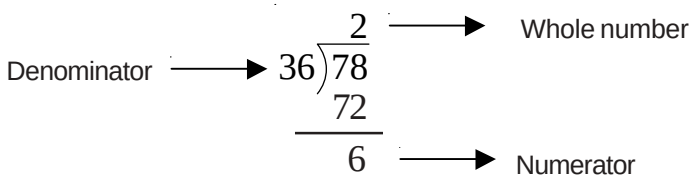
Replace $^{5}/_{6}$ with the equivalent fraction $^{30}/_{36}$. Therefore, 10 $^{5}/_{6}$ becomes 10 $^{30}/_{36}$.

STEP 5 Align the whole numbers and align the fractions together in a column. Add the whole numbers and add the similar fractions.

$5\ {}^{27}/_{36} \quad + \quad 8\ {}^{21}/_{36} \quad + \quad 10\ {}^{30}/_{36} \quad = \quad ?$

$$\begin{array}{r} 5\ \frac{27}{36} \\ +\quad 8\ \frac{21}{36} \\ 10\ \frac{30}{36} \\ \hline 23\ \frac{78}{36} \end{array}$$

The improper fraction ${}^{78}/_{36}$ in the mixed number can be simplified further.



${}^{78}/_{36}$ is equal to $2\ {}^{6}/_{36}$ or $2\ {}^{1}/_{6}$. Replacing ${}^{78}/_{36}$ with $2\ {}^{1}/_{6}$ we have:

$$2 + \frac{78}{36} = 2 + 2\ \frac{1}{6} = 4\ \frac{1}{6}$$

Mrs. Cortes needs $4\ {}^{1}/_{6}$ meters of cloth.

Let's Review (pages 40–41)

1. **STEP 1** Write the given information.

   a. $13\ {}^{7}/_{15}$ meters – length of the coil of wire.
   b. $7\ {}^{3}/_{10}$ meters – length of wire taken by Mang Ben.

   STEP 2 Determine what is asked.

   Find how much wire was left in the coil.

STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

The fraction in $13\ ^{7}/_{15}$ is $^{7}/_{15}$. The fraction in $7\ ^{3}/_{10}$ is $^{3}/_{10}$. To find the LCD of $^{7}/_{15}$ and $^{3}/_{10}$, find the smallest common multiple of their denominators (15 and 10).

15 – 15, **30**
10 – 10, 20, **30**

30 is the smallest common multiple for both 15 and 10; therefore 30 is the LCD of 15 and 10.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (4).

a. Convert $^{7}/_{15}$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (15), $30 \div 15 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{7}{15} \times \frac{2}{2} = \frac{14}{30}$$

Replace $^{7}/_{15}$ with the equivalent fraction $^{14}/_{30}$. Therefore $13\ ^{7}/_{15}$ becomes $13\ ^{14}/_{30}$.

b. Convert $^{3}/_{10}$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (10), $30 ¸ 10 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{3}{10} \times \frac{3}{3} = \frac{9}{30}$$

Replace $^{3}/_{10}$ with the equivalent fraction $^{9}/_{30}$. Therefore $7\ ^{3}/_{10}$ becomes $7\ ^{9}/_{30}$.

STEP 5 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

$13\ ^{14}/_{30} \quad - \quad 7\ ^{9}/_{30} \quad = \quad ?$

$$\begin{array}{rr} & 13\ \frac{14}{30} \\ - & 7\ \frac{9}{30} \\ \hline & 6\ \frac{5}{30} \end{array}$$

The fraction in the mixed number $6\ {}^{5}/_{30}$ can still be reduced to lowest terms since both numerator (5) and denominator (30) are divisible by 5.

$$\frac{5}{30} \div \frac{5}{5} = \frac{1}{6}$$

Therefore, $6\ {}^{5}/_{30}$ becomes $6\ {}^{1}/_{6}$. This means $6\ {}^{1}/_{6}$ meters of copper wire is left in the coil.

2. **STEP 1** Write the given information.

   a. 5 ½ gallons – amount of water in the jug.
   b. $1\ {}^{3}/_{4}$ gallons – amount of water taken from the jug.

   STEP 2 Determine what is asked.

   Find how much water is left in the jug.

   STEP 3 Find the LCD of the fractions in the mixed numbers to make them similar fractions.

   The fraction in 5 ½ is ½. The fraction in 1 ¾ is ¾. To find the LCD of ½ and ¾, find the smallest common multiple of their denominators (2 and 4).

   2 – 2, **4**
   4 – **4**

   4 is the smallest common multiple for both 2 and 4; therefore 4 is the LCD of 2 and 4.

STEP 4 Replace each of the fractions in the mixed numbers with equivalent fractions whose denominator is equal to the LCD (4).

a. Convert ½ to an equivalent fraction whose denominator is 4. Divide the LCD (4) by the denominator (2), $4 \div 2 = 2$. The quotient is 2. Multiply the numerator and denominator by the quotient (2) to get the equivalent fraction.

$$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$$

Replace ½ with the equivalent fraction $^2/_4$. Therefore 5 ½ becomes $5\ ^2/_4$.

b. The fraction ¾ doesn't need to be changed since the denominator (4) is already equal to the LCD (4).

Therefore the mixed number 1 ¾ is retained.

STEP 5 Align the whole numbers and align the fractions together in a column. Subtract the similar fractions and then subtract the whole numbers.

$$5\ ^2/_4 \quad - \quad 1\ ^3/_4 \quad = \quad ?$$

Generally, we cannot subtract a bigger number from a smaller number like 3 – 8 or 1 – 5. Similarly, we cannot also subtract a bigger fraction from a smaller fraction. In this case, we cannot subtract $^3/_4$ from $^2/_4$ because $^3/_4$ is greater than $^2/_4$. So what should be done?

Regroup 1 from the whole number and add this to the fraction expressed in equivalent fraction form. Since the LCD is 4, then the equivalent fraction is $^4/_4$. The whole number 5 now becomes 4.

$$5\ \frac{2}{4} = 5 + \frac{2}{4} = (4 + 1) + \frac{2}{4} = 4 + \left(1 + \frac{2}{4}\right)$$

The regrouped 1 in the fraction part of the mixed number is transformed to an equivalent fraction whose numerator and denominator is equal to the LCD (4). Therefore, 1 is transformed to the equivalent fraction $^4/_4$. $5\ ^2/_4$ becomes $4\ ^6/_4$.

$4 + (1 + {}^{2}/_{4}) = 4 + ({}^{4}/_{4} + {}^{2}/_{4}) = 4 + {}^{6}/_{4} = 4\,{}^{6}/_{4}$

$$\begin{array}{r} 5\ \frac{2}{4} \\ +\ 1\ \frac{3}{4} \\ \hline \end{array} \qquad \begin{array}{r} 4\ \frac{6}{4} \\ -\ 1\ \frac{3}{4} \\ \hline \end{array}$$

The difference is 3 ¾, therefore, 3 ¾ gallons of water is left on the jug.

Let's Review (pages 44–45)

1. a. 2 cups – amount of milk needed.
   b. $3\,{}^{3}/_{4}$ cups – amount of egg whites needed.
   c. ${}^{1}/_{3}$ cup – amount of water needed.

   STEP 2 Determine what is asked.

   Find the total amount of combined liquid ingredients.

   STEP 3 Solve for the answer.

   To solve for the answer, we need to add 2, 3 ¾ and ${}^{1}/_{3}$.

   a. But first we need to get the LCD of the fractions ¾ and ${}^{1}/_{3}$.

      4 – **4, 8,** 12
      3 – **3, 6, 9,** 12

      The LCD of ¾ and ${}^{1}/_{3}$ is 12.

   b. Convert the fractions to equivalent fractions with denominators equal to the LCD (12).

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

   ¾ is equal to ${}^{9}/_{12}$. Therefore, 3 ¾ becomes $3\,{}^{9}/_{12}$.

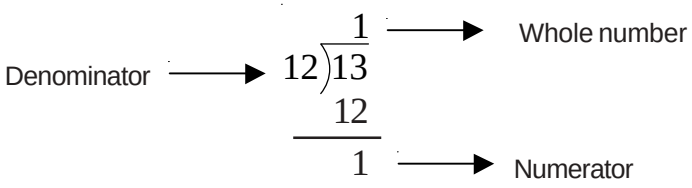
$$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$$

   Therefore ${}^{1}/_{3}$ is equal to ${}^{4}/_{12}$.

c. Now we can add the quantities.

$$\begin{array}{rr} & 2 \\ + & 3\ \frac{9}{12} \\ & \frac{4}{12} \\ \hline & 5\ \frac{13}{12} \end{array}$$

The improper fraction in the mixed number can still be simplified.



$^{13}/_{12}$ is equal to $1\ ^{1}/_{12}$.

$$5\ ^{13}/_{12} = 5 + {}^{13}/_{12} = 5 + 1\ ^{1}/_{12} = 6\ ^{1}/_{12}$$

Therefore, the liquid ingredients make $6\ ^{1}/_{12}$ cups.

2. **STEP 1** Write the given information.

   a. 20 meters – length of cloth in stock.
   b. $9\ ^{3}/_{7}$ meters – length of cloth used.

   STEP 2 Determine what is asked.

   Find out how much cloth was left in stock.

   STEP 3 Solve for the answer.

   To solve for the answer, you need to subtract the amount of cloth in stock (20 meters) by the amount of cloth used ($9\ ^{3}/_{7}$ meters). But we cannot subtract $9\ ^{3}/_{7}$ directly from 20. We need to transform 20 into an equivalent mixed number first.

a. Regroup 1 from the whole number (20). Express 1 into an equivalent fraction. Since the LCD is 7, the equivalent fraction is $^7/_7$. The whole number 20 is now changed into its equivalent mixed number, $19\ ^7/_7$.

$$20 = 19 + \frac{7}{7} = 19\ \frac{7}{7}$$

b. Now we can subtract $9\ ^3/_7$ from $19\ ^7/_7$.

$$\begin{array}{r} 19\ \frac{7}{7} \\ -\quad 9\ \frac{3}{7} \\ \hline 10\ \frac{4}{7} \end{array}$$

The difference is $10\ ^4/_7$. Therefore, $10\ ^4/_7$ meters of cloth were left.

3. **STEP 1** Write the given information.

a. $57\ ^1/_3$ kilograms – Mang Tonio's original weight.
b. ¾ kilogram – weight he lost after a month.

STEP 2 Determine what is asked.

Find out how much Mang Tonio weighs after losing ¾ kilograms.

STEP 3 Solve for the answer.

To solve for the answer, you need to subtract the original weight of Mang Tonio ($57\ ^1/_3$ kilos) by the weight he lost (¾ kilos). But we cannot subtract $57\ ^1/_3$ directly from ¾. We need to find the LCD of the fractions first and make them similar. The LCD of the denominators (3 and 4) is 12. $57\ ^1/_3$ becomes $57\ ^4/_{12}$. ¾ becomes $^9/_{12}$.

$$57\ \frac{4}{12} - \frac{9}{12}$$

This is not possible since $^{4}/_{12}$ is smaller than $^{9}/_{12}$.

a. Regroup 1 from the whole number (57). Express 1 into an equivalent fraction. Since the LCD is 12, the equivalent fraction is $^{12}/_{12}$. The whole number 57 is now changed into its equivalent mixed number, $56\ ^{12}/_{12}$.

$$57\ \frac{4}{12} = 56 + 1 + \frac{4}{12} = 56 + \frac{12}{12} + \frac{4}{12} = 56\ \frac{1}{1}$$

b. Now we can subtract $^{9}/_{12}$ from $56\ ^{16}/_{12}$.

$$\begin{array}{r} 56\ \frac{16}{12} \\ -\quad \frac{9}{12} \\ \hline 56\ \frac{7}{12} \end{array}$$

The difference is $56\ ^{7}/_{12}$. Therefore, Mang Tonio weighed $56\ ^{7}/_{12}$ after a month.

Let's See What You Have Learned (pages 46–47)

1. **STEP 1** Write the given information.

   a. 47 ½ kilos – Mario's weight after 3 months.
   b. 43 ¼ kilos – Mario's original weight.

   STEP 2 Determine what is asked.

   Find out how much weight Mario gained in three months.

   STEP 3 Solve for the answer.

   To solve for the answer, you need to subtract Mario's weight after 3 months (47 ½ kilos) by Mario's original weight (43 $^{1}/_{4}$ meters). But we cannot subtract 43 $^{1}/_{4}$ directly from 47 ½. We need to find the LCD first.

a. Find the LCD of ½ and ¼.

2 – 2, **4**
4 – **4**

The LCD is 4. ½ now becomes $^{2}/_{4}$ and ¼ is retained. 47 ½ becomes 47 $^{2}/_{4}$.

b. Now we can subtract 43 $^{1}/_{4}$ from 47 $^{2}/_{4}$.

$$\begin{array}{rr} & 47\ \frac{2}{4} \\ - & 43\ \frac{1}{4} \\ \hline & 4\ \frac{1}{4} \end{array}$$

The difference is 4 $^{1}/_{4}$. Therefore, Mario gained 4 $^{1}/_{4}$ kilos in three months.

2. **STEP 1** Write the given information.

a. 16 kilos – amount of tomatoes gathered by Manong Oscar.

b. 10 $^{1}/_{3}$ kilos – amount of tomatoes sold.

STEP 2 Determine what is asked.

Find out how much tomatoes were left with Manong Oscar.

STEP 3 Solve for the answer.

To solve for the answer, you need to subtract the amount of tomatoes gathered (16 kilos) by the amount of tomatoes sold (10 $^{1}/_{3}$ kilos). But we cannot subtract 10 $^{1}/_{3}$ directly from 16. We need to transform 16 into an equivalent mixed number first.

a. Regroup 1 from the whole number (16). Express 1 into an equivalent fraction. Since the LCD is 3, the equivalent fraction is $^3/_3$. The whole number 16 is now changed into its equivalent mixed number, $15\ ^3/_3$.

$$16 = 15 + \frac{3}{3} = 15\ \frac{3}{3}$$

b. Now we can subtract $10\ ^1/_3$ from $15\ ^3/_3$.

$$\begin{array}{r} 15\ \frac{3}{3} \\ -\ \ 10\ \frac{1}{3} \\ \hline 5\ \frac{2}{3} \end{array}$$

The difference is $5\ ^2/_3$. Therefore, $5\ ^2/_3$ kilos of tomatoes were left.

3. **STEP 1** Write the given information.

a. $3\ ^2/_3$ dozen – amount of eggs Gabriel bought.
b. $^3/_4$ dozen – amount of eggs his sister bought.
c. $1\ ^1/_2$ dozen – amount of eggs his mother bought.

STEP 2 Determine what is asked.

Find the total amount of eggs bought.

STEP 3 Solve for the answer.

To solve for the answer, we need to add $3\ ^2/_3$, ¾ and $1\ ^1/_2$.

a. But first we need to get the LCD of the fractions $^2/_3$, ¾ and $^1/_2$.

4 – 4, 8, **12**
3 – 3, 6, 9, **12**
2 – 2, 4, 6, 8, 10, **12**

The LCD is 12.

b. Convert the fractions to equivalent fractions with denominators equal to the LCD (12).

$$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12}$$

$^{2}/_{3}$ is equal to $^{8}/_{12}$. Therefore, $3\ ^{2}/_{3}$ becomes $3\ ^{8}/_{12}$.

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

¾ is equal to $^{9}/_{12}$. Therefore, ¾ becomes $^{9}/_{12}$.

$$\frac{1}{2} \times \frac{6}{6} = \frac{6}{12}$$

Therefore $^{1}/_{2}$ is equal to $^{6}/_{12}$. Therefore, 1 ½ becomes $1\ ^{6}/_{12}$.

c. Now we can add the quantities.

$$\begin{array}{rr} & 3\ \frac{8}{12} \\ + & \frac{9}{12} \\ & 1\ \frac{6}{12} \\ \hline & 4\ \frac{23}{12} \end{array}$$

The improper fraction in the mixed number can still be simplified.

$$\begin{array}{r} 1 \\ 12\overline{)23} \\ \underline{12} \\ 11 \end{array}$$

Denominator → 12) 23 ; 1 → Whole number ; 11 → Numerator

$^{23}/_{12}$ is equal to $1\ ^{11}/_{12}$.

$4\ ^{23}/_{12} = 4 + {}^{23}/_{12} = 4 + 1\ ^{11}/_{12} = 5\ ^{11}/_{12}$

Therefore, they bought $5\ ^{11}/_{12}$ dozen eggs.

4. **STEP 1** Write the given information.

a. 21 kilograms – amount of harvested mangoes.
b. $5\ ^{2}/_{3}$ kilograms – amount of mangoes given to his cousin.

STEP 2 Determine what is asked.

Find out how much mangoes are left with Mang Pedro.

STEP 3 Solve for the answer.

To solve for the answer, you need to subtract the harvested mangoes (21 kilos) by the amount of mangoes given away ($5\ ^{2}/_{3}$ kilos). But we cannot subtract $5\ ^{2}/_{3}$ directly from 21.

a. Regroup 1 from the whole number (21). Express 1 into an equivalent fraction. Since the LCD is 3, the equivalent fraction is $^{3}/_{3}$. 21 is now changed into its equivalent mixed number, $20\ ^{3}/_{3}$.

$$21 = 20 + \frac{3}{3} = 20\ \frac{3}{3}$$

b. Now we can subtract $5\ ^{2}/_{3}$ from $20\ ^{3}/_{3}$.

$$\begin{array}{r} 20\ \frac{3}{3} \\ +\quad 5\ \frac{2}{3} \\ \hline 15\ \frac{1}{3} \end{array}$$

The difference is $15\ ^{1}/_{3}$. Therefore, $15\ ^{1}/_{3}$ kilos of mangoes are left.

5. **STEP 1** Write the given information.

a. 2 kilos – amount of chicken bought.
b. $^{3}/_{4}$ kilo – amount of chicken cooked for dinner.

STEP 2 Determine what is asked.

Find out how much chicken was left.

STEP 3 Solve for the answer.

To solve for the answer, you need to subtract the amount of chicken bought (2 kilos) by the amount of chicken consumed ($^3/_4$ kilos). But we cannot subtract $^3/_4$ directly from 2. We need to transform 2 into an equivalent mixed number first.

a. Regroup 1 from the whole number (2). Express 1 into an equivalent fraction. Since the LCD is 4, the equivalent fraction is $^4/_4$. The whole number 2 is now changed into its equivalent mixed number, $1\ ^4/_4$.

$$2 = 1 + \frac{4}{4} = 1\frac{4}{4}$$

b. Now we can subtract $^3/_4$ from $1\ ^4/_4$.

$$\begin{array}{r} 1\frac{4}{4} \\ -\ \ \frac{3}{4} \\ \hline 1\frac{1}{4} \end{array}$$

The difference is $1\ ^1/_4$. Therefore, $1\ ^1/_4$ kilos of chicken were left.

E. What Have You Learned? *(pages 48–50)*

1. a. $\frac{8}{21} + \frac{5}{21} + \frac{13}{21} - \frac{6}{21} = \frac{8 + 5 + 13 - 6}{21} = \frac{20}{21}$

b. $\frac{3}{4} + \frac{1}{6} - \frac{5}{8} = ?$

STEP 1 Find the LCD of the fractions first.

8 – 8, 16, **24**
6 – 6, 12, 18, **24**
4 – 4, 8, 12, 16, 20, **24**

The LCD is 24.

STEP 2 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (24).

a. Convert $^3/_4$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (4), $24 \div 4 = 6$. The quotient is 6. Multiply the numerator and denominator by the quotient (6) to get the equivalent fraction.

$$\frac{3}{4} \times \frac{6}{6} = \frac{18}{24}$$

b. Convert 1/6 to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (6), $24 \div 6 = 4$. The quotient is 4. Multiply the numerator and denominator by the quotient (4) to get the equivalent fraction.

$$\frac{1}{6} \times \frac{4}{4} = \frac{4}{24}$$

c. Convert $^5/_8$ to an equivalent fraction whose denominator is 24. Divide the LCD (24) by the denominator (8), $24 \div 8 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{5}{8} \times \frac{3}{3} = \frac{15}{24}$$

STEP 3 Solve for the answer.

$$\frac{18}{24} + \frac{4}{24} - \frac{15}{24} = \frac{18 + 4 - 15}{24} = \frac{7}{24}$$

Therefore, the answer is $^7/_{24}$.

2. **STEP 1** Write the given information.

   a. $6\ ^{1}/_{4}$ feet – height of Mang Fred.
   b. $5\ ^{3}/_{4}$ feet – height of Mang Rey.

   STEP 2 Determine what is asked.

   Find out how much taller is Mang Fred than Mang Rey.

   STEP 3 Solve for the answer.

   To solve for the answer, you need to subtract the height of Mang Fred ($6\ ^{1}/_{4}$ feet) by the height of Mang Rey ($5\ ^{3}/_{4}$ feet). But we cannot subtract $5\ ^{3}/_{4}$ directly from 6 ¼. Since ¼ is smaller than ¾.

   a. Regroup 1 from the whole number (6). Express 1 into an equivalent fraction. Since the LCD is 4, the equivalent fraction is $^{4}/_{4}$. The 6 ¼ is now changed into its equivalent mixed number, $5\ ^{5}/_{4}$.

$$6\ \frac{1}{4} = 5 + \frac{4}{4} + \frac{1}{4} = 5\ \frac{5}{4}$$

   b. Now we can subtract $5\ ^{3}/_{4}$ from $5\ ^{5}/_{4}$.

$$\begin{array}{rr} & 5\ \frac{5}{4} \\ - & 5\ \frac{3}{4} \\ \hline & \frac{2}{3} \end{array}$$

   The difference is $^{2}/_{3}$. Therefore, Mang Fred is $^{2}/_{3}$ feet taller than Mang Rey.

3. **STEP 1** Write the given information.

   a. $^{1}/_{5}$ – part of the land owned by Freud.
   b. $^{1}/_{3}$ – part of the land owned by Wally.
   c. $^{3}/_{10}$ – part of the land owned by Jed.

STEP 2 Determine what is asked.

Find the total portion of the land owned by the three brothers.

STEP 3 Write down the number sentence.

$$\frac{1}{5} + \frac{1}{3} + \frac{3}{10} = N$$ (the total portion of the land owned by the brothers)

STEP 4 Get the LCD of the fractions to be added.

10 – 10, 20, **30**
5 – 5, 10, 15, 20, 25, **30**
3 – 3, 6, 9, 12, 15, 18, 21, 24, 27, **30**

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (30).

a. Convert $^1/_5$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (5), $30 \div 5 = 6$. The quotient is 6. Multiply the numerator and denominator by the quotient (6) to get the equivalent fraction.

$$\frac{1}{5} \times \frac{6}{6} = \frac{6}{30}$$

b. Convert $^1/_3$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (3), $30 \div 3 = 10$. The quotient is 10. Multiply the numerator and denominator by the quotient (10) to get the equivalent fraction.

$$\frac{1}{3} \times \frac{10}{10} = \frac{10}{30}$$

c. Convert $^3/_{10}$ to an equivalent fraction whose denominator is 30. Divide the LCD (30) by the denominator (10), $30 \div 10 = 3$. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{3}{10} \times \frac{3}{3} = \frac{9}{30}$$

STEP 3 Solve for the answer.

$$\frac{6}{30} + \frac{10}{30} + \frac{9}{30} = \frac{6 + 10 + 6}{30} = \frac{25}{30}$$

The fraction $^{25}/_{30}$ can be simplified to lowest terms since both numerator (25) and denominator (30) are divisible by 5.

$$\frac{25}{30} \div \frac{5}{5} = \frac{5}{6}$$

Therefore, $^{25}/_{30}$ is equal to $^{5}/_{6}$. This means that the three brothers own $^{5}/_{6}$ of the land.

4. **STEP 1** Write the given information.

a. $^{5}/_{7}$ hectare – land owned by Dong.
b. $^{1}/_{3}$ hectare – part of the land planted with vegetables.

STEP 2 Determine what is asked.

Find the part of Dong's land that was left uncultivated.

STEP 3 Express the problem in equation form.

To solve for the answer, subtract the part of land Dong owns by the part of his land planted with vegetables.

5 1

7 3

We cannot subtract the fractions yet since they are dissimilar.

STEP 4 Find the *least common denominator* (LCD) of the fractions to be subtracted.

Compare the denominators 7 and 3. 7 is the largest denominator, therefore, we enumerate the multiples of 7 and check for a common multiple for both denominators.

7 – 7, 14, **21**

3 – 3, 6, 9, 12, 15, 18, **21**

Therefore, the LCD is 21.

STEP 5 Convert each of the fractions to an equivalent fraction whose denominator is equal to the LCD (21).

a. Convert $^5/_7$ to an equivalent fraction whose denominator is 21. Divide the LCD (21) by the denominator (7), 21 ¸ 7 = 3. The quotient is 3. Multiply the numerator and denominator by the quotient (3) to get the equivalent fraction.

$$\frac{5}{7} \times \frac{3}{3} = \frac{15}{21}$$

b. Convert $^1/_3$ to an equivalent fraction whose denominator is 21. Divide the LCD (21) by the denominator (3), 21 ÷ 3 = 7. The quotient is 7. Multiply the numerator and denominator by the quotient (7) to get the equivalent fraction.

$$\frac{1}{3} \times \frac{7}{7} = \frac{7}{21}$$

The two fractions $^{15}/_{21}$ and $^7/_{21}$ are now similar fractions.

STEP 6 Subtract the similar fractions.

$$\frac{15}{21} - \frac{7}{21} = \frac{15 - 7}{21} = \frac{8}{21}$$

Therefore, the difference is $^8/_{21}$. This means that $^8/_{21}$ hectare of land was left uncultivated.

5. **STEP 1** Write the given information.

a. 27 kilos – amount of harvested lansones.
b. $11\ ^3/_5$ kilos – amount of lansones sold.

STEP 2 Determine what is asked.

Find out how much lansones were left with Aling Susan.

STEP 3 Solve for the answer.

To solve for the answer, you need to subtract the harvested lansones (27 kilos) by the amount of lansones sold ($11\ ^{3}/_{5}$ kilos). But we cannot subtract $11\ ^{3}/_{5}$ directly from 27.

a. Regroup 1 from the whole number (27). Express 1 into an equivalent fraction. Since the LCD is 5, the equivalent fraction is $^{5}/_{5}$. 27 is now changed into its equivalent mixed number, $26\ ^{5}/_{5}$.

$$27 = 26 + \frac{5}{5} = 26\ \frac{5}{5}$$

b. Now we can subtract $11\ ^{3}/_{5}$ from $26\ ^{5}/_{5}$.

$$\frac{5}{6} \times \frac{2}{2} = \frac{10}{12}$$

The difference is $15\ ^{2}/_{5}$. Therefore, $15\ ^{2}/_{5}$ kilos of lansones were left.

6. **STEP 1** Write the given information.

a. $4\ ^{5}/_{6}$ dozen – amount of eggs Gabriel bought.
b. $^{1}/_{3}$ dozen – amount of eggs his sister bought.
c. $2\ ^{1}/_{4}$ dozen – amount of eggs his mother bought.

STEP 2 Determine what is asked.

Find the total amount of eggs bought.

STEP 3 Solve for the answer.

To solve for the answer, we need to add $4\ ^{5}/_{6}$, $^{1}/_{3}$ and $2\ ^{1}/_{4}$.

a. But first we need to get the LCD of the fractions $^{5}/_{6}$, $^{1}/_{3}$ and $^{1}/_{4}$.

6 – 6, **12**
4 – 3, 6, 9, **12**
3 – 2, 4, 6, 8, 10, **12**

The LCD is 12.

b. Convert the fractions to equivalent fractions with denominators equal to the LCD (12).

$$\frac{5}{6} \times \frac{2}{2} = \frac{10}{12}$$

$^{5}/_{6}$ is equal to $^{10}/_{12}$. Therefore, $4\ ^{5}/_{6}$ becomes $4\ ^{10}/_{12}$.

$$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$$

$^{1}/_{3}$ is equal to $^{4}/_{12}$. Therefore, $^{1}/_{3}$ becomes $^{4}/_{12}$.

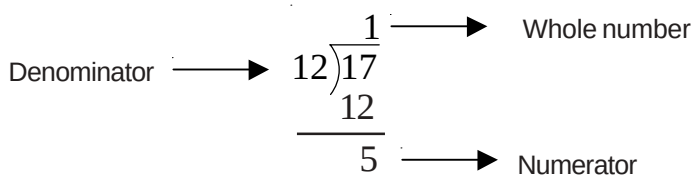
$$\frac{1}{4} \times \frac{3}{3} = \frac{3}{12}$$

Therefore $^{1}/_{4}$ is equal to $^{3}/_{12}$. Therefore, 2 ¼ becomes $2\ ^{3}/_{12}$.

c. Now we can add the quantities.

$$\begin{array}{rr} & 4\ \frac{10}{12} \\ + & \frac{4}{12} \\ \hline & 2\ \frac{3}{12} \\ \hline & 6\ \frac{17}{12} \end{array}$$

The improper fraction in the mixed number can still be simplified.



$^{17}/_{12}$ is equal to $1\ ^{5}/_{12}$.

$6\ ^{17}/_{12} = 6 + {}^{17}/_{12} = 6 + 1\ ^{5}/_{12} = 7\ ^{5}/_{12}$

Therefore, they bought $7\ ^{5}/_{12}$ dozen eggs.

7. **STEP 1** Write the given information.

   a. 150 ¼ centimeters – Donna's height.
   b. 120 ½ centimeters – Lina's height.

   STEP 2 Determine what is asked.

   Find out the height difference between Donna and Lina.

   STEP 3 Solve for the answer.

   To solve for the answer, you need to subtract Donna's height (150 ¼ centimeters) by Lina's height (120 $^{1}/_{2}$ centimeters). But we cannot subtract 43 $^{1}/_{4}$ directly from 47 ½. We need to find the LCD first.

   a. Find the LCD of ½ and ¼.

   2 – **2,** 4
   4 – 4

   The LCD is 4. ½ now becomes $^{2}/_{4}$ and ¼ is retained. 120 ½ becomes 120 $^{2}/_{4}$.

   b. Subtract 120 $^{2}/_{4}$ from 150 $^{1}/_{4}$.

$$\begin{array}{rr} & 150\ \frac{1}{4} \\ - & 120\ \frac{2}{4} \\ \hline \end{array}$$

   We cannot subtract the two quantities directly since ¼ is smaller than $^{2}/_{4}$.

   a. Regroup 1 from the whole number (150). Express 1 into an equivalent fraction. Since the LCD is 4, the equivalent fraction is $^{4}/_{4}$. 150 is now changed into its equivalent mixed number, 149 $^{5}/_{4}$.

$$150\ \frac{1}{4} = 149 + \frac{4}{4} + \frac{1}{4} = 149\ \frac{4}{4} + \frac{1}{4} = 149\ \frac{5}{4}$$