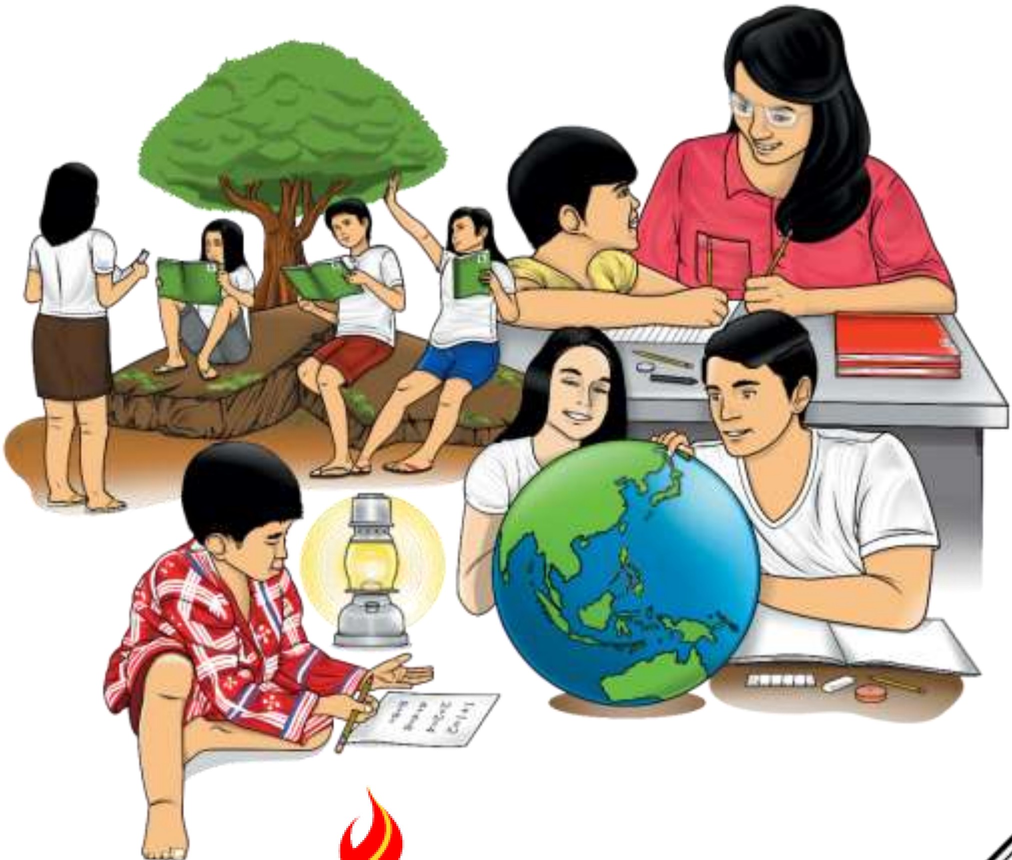
8

Mathematics

Quarter 1 – Module 5B: "Adding and Subtracting Similar and Dissimilar Rational Algebraic Expressions"



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Mathematics

Quarter 1 – Module 5B:

“Adding and Subtracting Similar and Dissimilar Rational Algebraic Expressions”

Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

This module covers key concepts of operations on rational algebraic expressions divided into lessons. This material gives you the opportunity to use your prior knowledge and skills in dealing with operations on rational algebraic expressions. You are also given varied activities to process your knowledge and skills learned to deepen and transfer your understanding of the different lessons.

This module is divided into the following lessons:

Lesson 1: Adding and Subtracting Similar Rational Algebraic Expressions; and

Lesson 2: Adding and Subtracting Dissimilar Rational Algebraic Expressions.

In going through this module, you are expected to:

1. Define similar rational algebraic expressions;
2. Add and subtract similar rational algebraic expressions;
3. Define dissimilar rational algebraic expressions;
4. Add and subtract dissimilar rational algebraic expressions; and
7. Relate operations of rational algebraic expressions in real-life situations.

What I Know

Directions: Choose the correct answer. Write your answer on a separate sheet of paper.

1. Give the Least Common Denominator (LCD) of $\frac{3}{15y^2}$ and $\frac{5}{36y^4}$.

   A. $36y^2$ C. $90y^2$
   B. $36y^4$ D. $180y^4$

2. Find the LCD of $\frac{7}{8-2a}$ and $\frac{2}{4-a}$.

   A. $(4-a)$ C. (a^2+64)
   B. $2(4-a)$ D. $(64-a^2)$

3. Give the sum of $\frac{a}{b} + \frac{a}{b}$.

A. $\frac{a^2}{b^2}$

B. $\frac{a^2}{b}$

C. $\frac{2a}{2b}$

D. $\frac{2a}{b}$

4. Find simplified form of $\frac{2x}{2} + \frac{x}{3}$.

A. $\frac{4x}{3}$

B. $\frac{5x}{3}$

C. $\frac{6x}{3}$

D. $\frac{7x}{3}$

5. Perform the indicated operation $\frac{x-2}{3} - \frac{x+2}{2}$.

A. $\frac{x+1}{6}$

B. $\frac{x+5}{6}$

C. $\frac{x-6}{6}$

D. $\frac{-x-10}{6}$

6. Look for the sum of $\frac{3x-5}{2} + \frac{x+3}{2}$.

A. $2x - 1$

B. $3x - 2$

C. $4x - 3$

D. $5x - 4$

7. Given $\frac{x+1}{3}$ as one addend of the sum $\frac{8x-7}{3}$, find the other addend.

A. $\frac{7x-4}{3}$

B. $\frac{7x-6}{3}$

C. $\frac{7x-8}{3}$

D. $\frac{7x-10}{3}$

8. Find the sum of $\frac{3}{2x} + \frac{5}{x-2}$.

A. $\frac{8}{2x(x-2)}$

B. $\frac{8x-10}{2x(x-2)}$

C. $\frac{13x-2}{2x(x-2)}$

D. $\frac{13x-6}{2x(x-2)}$

9. Subtract $\frac{r+9}{r-4}$ from $\frac{3r+1}{r-4}$.

A. 2

B. 4

C. 6

D. 8

10. Using the LCD 6, look for the equivalent rational algebraic expression of $\frac{x+1}{3}$.

A. $\frac{2x+1}{6}$

B. $\frac{2x+2}{6}$

C. $\frac{6x+1}{3}$

D. $\frac{6x+6}{3}$

11. Look for the equivalent rational algebraic expression of each of $\frac{a+1}{a}$ and $\frac{b+1}{b}$ if the LCD is ab.

A. $\frac{ab+1}{ab}, \frac{ab+b}{ab}$

B. $\frac{ab-a}{ab}, \frac{ab-1}{ab}$

C. $\frac{ab+b}{ab}, \frac{ab+a}{ab}$

D. $\frac{ab-b}{ab}, \frac{ab-a}{ab}$

12. Write as one fraction and simplify $\frac{x}{x-1} - \frac{2}{x+1}$.

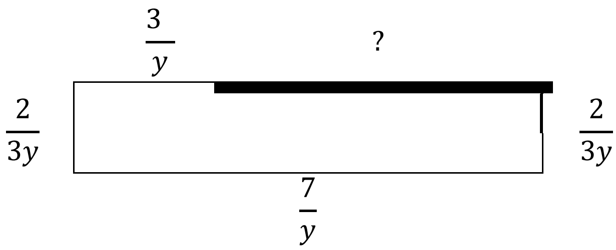
A. $\frac{x^2+x+2}{(x-1)(x+1)}$

B. $\frac{x^2-x+2}{(x-1)(x+1)}$

C. $\frac{x^2-x-2}{(x-1)(x+1)}$

D. $\frac{x^2+x-2}{(x-1)(x+1)}$

13. Find the truth about similar rational algebraic expressions among the following statements.
    A. The expressions have prime numerators.
    B. The expressions have prime denominators.
    C. The expressions have the same numerators.
    D. The expressions have the same denominators.
14. Determine the truth about dissimilar rational algebraic expressions among the following statements.
    A. The expressions have different numerators.
    B. The expressions have non-zero numerators.
    C. The expressions have different denominators.
    D. The expressions have non-zero denominators.
15. The rectangular plot for the carrots has the dimensions shown below. Find the length of the side labeled with a question mark.



    A. $\frac{3}{y}$
    B. $\frac{4}{y}$
    C. $\frac{5}{y}$
    D. $\frac{6}{y}$

Lesson 1 Adding and Subtracting Similar Rational Algebraic Expressions

Farming is never out of fashion. It offers work, food, and security to many especially during trying times. Like other jobs, farming requires so much before enjoying the fruitful harvest. The land has to be plowed, seeds need to be germinated in a fertile soil, plants have to get enough sunlight and water, and plants have to be free from unwanted invaders. Like other jobs, it is tedious but rewarding.

But don’t you know that farming uses mathematics in as much as other jobs do?

What's In

If there are similar fractions, certainly there are also similar rational algebraic expressions, the ones that have the same denominators. Recall adding and subtracting similar fractions.

A. Directions: Match items in Column A with the reduced forms in Column B.

Column A	Column B
1. $\frac{2}{16}$	A. 8
2. $\frac{18}{24}$	B. $\frac{1}{8}$
3. $\frac{16}{2}$	C. $\frac{3}{4}$
4. $\frac{10py}{60}$	D. p^2y
5. $\frac{py^2}{p^3y^3}$	E. $\frac{py}{6}$
	F. $\frac{1}{p^2y}$

B. Directions: Perform the indicated operations and reduce your answers to the lowest form. Write your answers on a separate sheet of paper.

1. $\frac{3}{15}+\frac{8}{15}$ 2. $\frac{7}{24}-\frac{1}{24}$ 3. $\frac{1}{6}-\frac{5}{6}+\frac{10}{6}$

Questions:

1. What did you do to reduce the expressions in Activity A?
2. What do you call all the groups of fractions in Activity B? Why?
3. Arrange the following steps of adding and subtracting similar fractions. Write a, b, c, and d to arrange them.

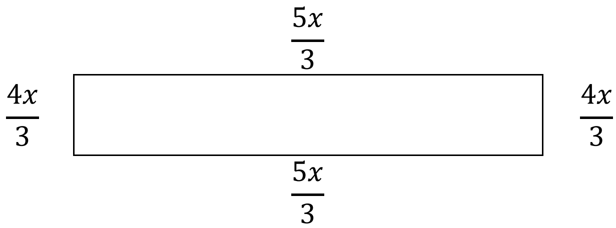
___________ Numerators are added or subtracted and the common denominator is copied.
___________ The fractions are combined into one fraction.
___________ Common factor or factors of the numerator and denominator is/are divided out.
___________ The numerators and denominators are expressed into prime factors.

What's New

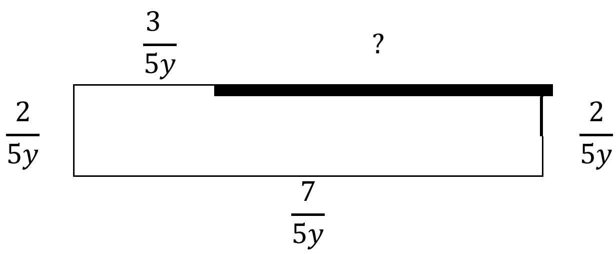
Situation: One fine Saturday morning, you are requested by your father to go with him to the farm that is just few meters away from home. In there, you saw a measuring stick. You asked your father, "Father what is this stick for?" Your father answered, "Oh! Good that you see that. I would like you to measure the distance around the plot that I prepared so that I would know the length of cyclone wire that I need to fence it".

Consider the situation above and supply what is asked in the illustration. Remember that $Side\ 1 + Side\ 2 + Side\ 3 + \cdots = Distance\ around\ the\ plot.$

1. Find the distance around the rectangular plot as illustrated.



2. Find how long the other side of the plot that is illustrated below.



Questions:

1. What should you call rational algebraic expressions that have the same denominators?
2. How did you answer Item 1?
3. How did you answer item 2?
4. Have you recognized the following as used in finding the answers of Items 2 and 3? Write Yes or No.

___________ Numerators are added or subtracted and the common denominator is copied.

___________ The fractions are combined into one fraction.

___________ Common factor or factors of the numerator and denominator is/are divided out.

___________ The numerators and denominators are expressed into prime factors.

5. Do you find similarities between the rules of adding & subtracting similar fractions and adding & subtracting similar rational algebraic expressions?

What is It

The previous activity allowed you to solve for perimeter and the missing side of the rectangle by adding and subtracting similar rational algebraic expressions just the way you add and subtract similar fractions. Observe as more examples of operating similar rational algebraic expressions will be shown to you.

Example 1: $\frac{8p}{3} + \frac{5p}{3}$

Solution

Step 1. Write the given as one expression.

$$\frac{8p}{3} + \frac{5p}{3} = \frac{8p + 5p}{?}$$

Collect the numerators.

$$= \frac{8p + 5p}{3}$$

Copy the common denominator.

Step 2. Combine like terms in the numerator by addition.

$$\frac{8p}{3} + \frac{5p}{3} = \frac{\mathbf{8p} + 5\mathbf{p}}{3}$$

Look for terms that have the same variables of the same exponent.

$$= \frac{13p}{3}$$

Add numerical coefficients and copy common variable.

Step 3. Express the sum in reduced form.

$$\frac{8p}{3} + \frac{5p}{3} = \frac{13p}{3}$$

There is no Greatest Common Factor (GCF) in the numerator and denominator.

$$= \frac{13p}{3}$$

Sum in reduced form.

Example 2: $\frac{8x+3}{2} + \frac{2x-7}{2}$

Solution

Step 1. Write the given as one expression.

$$\frac{8x + 3}{2} + \frac{2x - 7}{2} = \frac{(8x + 3) + (2x - 7)}{?}$$

Collect the numerators.

$$= \frac{(8x + 3) + (2x - 7)}{2}$$

Copy the common denominator.

Step 2. Combine like terms in the numerator by addition.

$(8x + 3) + (2x - 7)$	➡	$8x$ & $2x$	Look for terms that have the same variables of the same exponent.
	➡	3 & -7	Constants are always alike
$8x + 2x$	$=$	$\mathbf{10x}$	Add numerical coefficients and copy common variable.
$3 + -7$	?	$7 - 3$	Subtract 3 from 7 because of unlike signs.
	$=$	$\mathbf{-4}$	Copy the sign of the greater number in the sum.
$\dfrac{(8x + 3) + (2x - 7)}{2}$	$=$	$\dfrac{10x - 4}{2}$	Sum not yet reduced.

Step 3. Express the sum in reduced form.

$\dfrac{8x + 3}{2} + \dfrac{2x - 7}{2}$	$=$	$\dfrac{10x - 4}{2}$	Look for GCF of the numerator and denominator.
	$=$	$\dfrac{2(5x - 2)}{2}$	Factoring the GCMF (numerator)
	$=$	$\dfrac{\cancel{2}(5x - 2)}{\cancel{2}}$	Divide out GCF.
	$=$	$5x - 2$	Sum in reduced form.

Example 3: $\frac{x^2+4}{2x+4} + \frac{5x+2}{2x+4}$

Solution

Step 1. Write the given as one expression.

$\dfrac{x^2 + 4}{2x + 4} + \dfrac{5x + 2}{2x + 4}$	$=$	$\dfrac{(x^2 + 4) + (5x + 2)}{?}$	Collect the numerators.
	$=$	$\dfrac{(x^2 + 4) + (5x + 2)}{2x + 4}$	Copy the common denominator.

Step 2. Combine like terms in the numerator by addition.

$(x^2 + 4) + (5x + 2)$	➡	4 & 2	Constants are always alike.
$4 + 2$	$=$	$\mathbf{6}$	Addition
$\dfrac{(x^2 + 4) + (5x + 2)}{2x + 4}$	$=$	$\dfrac{x^2 + 5x + 6}{2x + 4}$	Sum not yet reduced.

Step 3. Express the sum in reduced form.

$\dfrac{x^2 + 4}{2x + 4} + \dfrac{5x + 2}{2x + 4}$	$=$	$\dfrac{x^2 + 5x + 6}{2x + 4}$	Look for GCF of the numerator and denominator.
	$=$	$\dfrac{(x + 2)(x + 3)}{2(x + 2)}$	Factoring Trinomial (numerator) and Factoring GCMF (denominator)
	$=$	$\dfrac{\cancel{(x + 2)}(x + 3)}{2\cancel{(x + 2)}}$	Divide out GCF.
	$=$	$\dfrac{x + 3}{2}$	Sum in reduced form.

Example 4: $\frac{x^2-2}{x-1} - \frac{x}{1-x}$

Solution

Step 1. Rewrite $1 - x$ in terms of $x - 1$.

$1 - x$	$=$	$-x + 1$	Commutative Property of Addition
	$=$	$-1(x - 1)$	Factor out -1.

Step 2. Use $-1(x - 1)$ to rewrite $\frac{x}{1-x}$.

$\dfrac{x}{1 - x}$	$=$	$\dfrac{x}{-1(x - 1)}$	Factor out -1 to the denominator.
	$=$	$\dfrac{-x}{(x - 1)}$	Simplifying $\frac{x}{-1} = -x$.

Step 3. Write the given as one expression.

$\dfrac{x^2 - 2}{x - 1} - \dfrac{-x}{x - 1}$	$=$	$\dfrac{x^2 - 2 - (-x)}{?}$	Collectthe numerators.
	$=$	$\dfrac{x^2 - 2 - (-x)}{x - 1}$	Copy the common denominator.

Step 4. Combine like terms in the numerator by subtraction.

$x^2 - 2 - (-x)$	$=$	$x^2 - 2 - (-x)$	There are no like terms.
	$=$	$x^2 - 2 + x$	Multiply the two successive signs (negative times negative equals positive.
	$=$	$\mathbf{x^2 + x - 2}$	Rearrange terms.
$\dfrac{x^2 - 2 - (-x)}{x - 1}$	$=$	$\dfrac{x^2 + x - 2}{x - 1}$	Difference not yet reduced.

Step 5. Express the difference in reduced form.

$\dfrac{x^2 - 2}{x - 1} - \dfrac{-x}{x - 1}$	$=$	$\dfrac{x^2 + x - 2}{x - 1}$	Look for GCF of the numerator and denominator.
	$=$	$\dfrac{(x+2)(x-1)}{(x-1)}$	Factoring Trinomial (numerator)
	$=$	$\dfrac{(x+2)\cancel{(x-1)}}{\cancel{(x-1)}}$	Divide out GCF.
	$=$	$x + 2$	Difference in reduced form.

Example 5: $\frac{2x-3}{3x^2+x-2} - \frac{-x-1}{3x^2+x-2}$

Solution

Step 1. Write the given as one expression.

$\dfrac{2x - 3}{3x^2 + x - 2} - \dfrac{-x - 1}{3x^2 + x - 2}$	$=$	$\dfrac{(2x-3) - (-x-1)}{?}$	Collect the numerators.
	$=$	$\dfrac{(2x-3) - (-x-1)}{3x^2 + x - 2}$	Copy the common denominator.

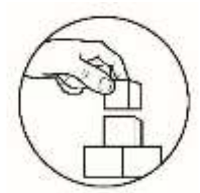
Step 2. Combine like terms in the numerator by subtraction.

$(2x - 3) - (-x - 1))$	➡	$2x \;\&\; -x$	Look for terms that have the same variables of the same exponent.
	➡	$-3 \;\&\; -1$	Constants are always alike.

$2x-(-x)$	?	$2x-(-x)$	Multiply the two successive signs.
	$=$	$2x+x$	Negative times negative equals positive.
$2x-(-x)$	$=$	$\mathbf{3x}$	Add numerical coefficients and copy common variable.
$-3-(-1)$	?	$-3-(-1)$	Multiply two successive signs.
	?	$-3+1$	Negative times negative equals positive.
	?	$3-1$	Subtract 1 from 3 because of unlike signs .
$-3-(-1)$	$=$	$\mathbf{-2}$	Copy the sign of the greater number in the difference.
$\dfrac{(2x-3)-(-x-1)}{3x^2+x-2}$	$=$	$\dfrac{3x-2}{3x^2+x-2}$	Difference not yet reduced.

Step 3. Express the difference in reduced form.

$\dfrac{2x-3}{3x^2+x-2} - \dfrac{-x-1}{3x^2+x-2}$	$=$	$\dfrac{3x-2}{3x^2+x-2}$	Look for GCF of the numerator and denominator.
	$=$	$\dfrac{(3x-2)}{(3x-2)(x+1)}$	Factoring Trinomial (denominator)
	$=$	$\dfrac{(\cancel{3x-2})}{(\cancel{3x-2})(x+1)}$	Divide out GCF.
	$=$	$\dfrac{1}{x+1}$	Difference in reduced form.



What's More

Directions: Perform the indicated operation and answer the questions that follow.

A. $\frac{3y}{4}+\frac{5y}{4}$

Questions:

1. What did you do to the numerators? What did you do too to the denominators?
2. How did you simplify your sum?

B. $\frac{5x-3}{6}+\frac{x-9}{6}$

Questions:

1. What did you do to the numerators? What did you do too to the denominators?
2. Did you find like terms among the collected terms of the numerator? What did you do to terms?
3. What factoring technique did you apply?
4. How did you simplify your sum?

C. $\frac{2x^2+x}{2x-2}+\frac{x-4}{2x-2}$

Questions:

1. What did you do to the numerators? What did you do to the denominators?
2. Did you find like terms among the collected terms of the numerator? What did you do to terms?
3. What factoring techniques did you apply?
4. How did you simplify your sum?

D. $\frac{3x^2-2}{3x-2}-\frac{x}{2-3x}$

Questions:

1. How did you make the denominators alike?
2. Did you find any successive signs in the numerator? What did you do to these signs?
3. What factoring technique did you apply?
4. How did you simplify your difference?

E. $\frac{2x-3}{4x^2+5x+1}-\frac{x-4}{4x^2+5x+1}$

Questions:

1. Did you find like terms among the collected terms in the numerator? What did you do to the terms?
2. Did you find successive signs in the numerator? What did you do to these signs?
3. What factoring technique did you apply?
4. How did you simplify your difference?

What I Have Learned

Situation: Your classmate failed to attend the class when the topic on adding and subtracting similar rational algebraic expressions was discussed and you decided to help. Complete your explanation of the problem below to make your classmate understand. You may choose and use repeatedly phrases, words, terms, factors, or expressions from the table.

$$\frac{2p+6}{3}+\frac{p-1}{3}-\frac{2}{3}$$

copy common denominator	addition	write the given as one expression	subtraction	combine like terms in the numerator
reduced form	3	6	-1	2
$3p$	the same variable of like exponents	$p+1$	similar rational algebraic expressions	

I know that the given are ________________________. To add or subtract the rational algebraic expressions, first______________________. After that, ___________________. The next thing to do is to ____________________________. Like terms are those that have ________________________. From the given, the like terms in the numerator are: $2p$ & $p$and _______, ______ & ______. Then, these terms need to be combined by _______________ and ______________ because there are two operations in the given. As a result, ________ and _______ are the terms of the numerator. Because the final answer has to be in ______________, we need to factor the Greatest Common Monomial Factor (GCMF) in the numerator. Then, ________ has to be divided out. Finally, our answer is _________.

What I Can Do

Situation: Harvesting time of your father's sweet potatoes came. The whole family, including you, became very busy in the farm for one whole day. By the next day, the yield was delivered to the market and the whole family was happy because all of the potatoes were sold. When all have rested, your father asked you to compute for the profit. Your father showed you the following list.

Yield: $\frac{100p+200}{p}$

Expenses:

Labor $\frac{10p+50}{p}$ Fertilizers $\frac{10p-20}{p}$

Question: How will you solve for the profit of your father? Show your solution.

Lesson 2 Adding and Subtracting Dissimilar Rational Algebraic Expressions

Certainly, the previous lesson made you understand that adding and subtracting similar rational algebraic expressions are the same as adding and subtracting similar fractions. Like fractions also, there are dissimilar rational algebraic expressions or those that have different denominators. Do you think adding and subtracting dissimilar rational algebraic expressions are like adding and subtracting dissimilar fractions? You will find out as this lesson unfolds.

What's In

Directions: Perform what is required in each of the sections below. Answer also the questions that follow.

A. Find the LCM of the following real numbers.

1. 32 & 14
2. 15 & 12

B. Find the LCD of the following fractions.

1. $\frac{3}{32}$ & $\frac{7}{14}$
2. $\frac{6}{15}$ & $\frac{3}{12}$

C. Supply the missing number to make the two sides of the equation equal.

1. $\frac{3}{5} = \frac{?}{30}$
2. $\frac{6}{7} = \frac{?}{21}$

D. Perform the indicated operation. The first one is done as illustration.

1. $\frac{3}{5} + \frac{7}{6} = \frac{(3)(6)}{(5)(6)} + \frac{(7)(5)}{(5)(6)} = \frac{18}{30} + \frac{35}{30} = \frac{43}{30}$
2. $\frac{5}{6} + \frac{4}{8}$
3. $\frac{8}{9} - \frac{2}{3}$

Questions:

1. How did you find the LCM in Activity A?
2. How did you find the LCD in Activity B?
3. Do you see the relationship of LCM and LCD?
4. How did you find the missing number in Activity C?

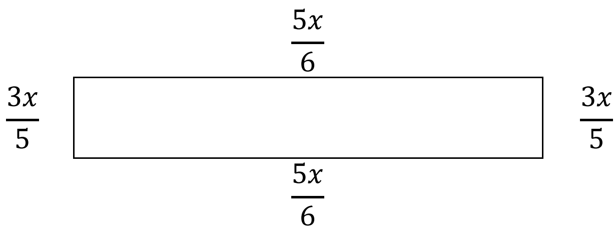
5. Identify from among the following steps the ones that you used to answer the activity. Write Yes for the steps that you used and No for those that you did not use.
______a. Find the LCD.
______b. Find the equivalent fractions of the given.
______c. Perform the indicated operation using the equivalent fractions with the LCD as denominators.
______d. If the resulting numerator and denominator in the sum or difference have common factors, reduce by dividing out the common factors.

What's New

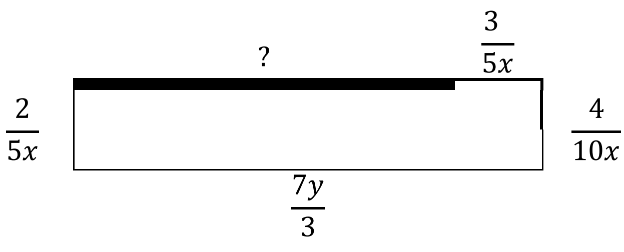
Situation: The next planting season of sweet potatoes has come. Your father decided to extend the area to be planted by creating additional plots and you are requested again by your father to measure the distance around the plots as shown below.

Consider the situation above and supply what is asked in the illustration. Remember that $Side\ 1 + Side\ 2 + Side\ 3 + \cdots = Distance\ around\ the\ plot.$

1. Find the distance around the rectangular plot as illustrated.



2. Find how long the other side of the plot that is illustrated below.



Questions:

1. What should you call rational algebraic expressions that have the dissimilar denominators?
2. How did you answer Item 1?
3. How did you answer item 2?
4. Identify from among the following steps the ones that you used to answer Activity D. Write Yes for the steps that you used and No for those that you did not use.
______a. Find the LCD.
______b. Find the equivalent expression of the given.

______c. Perform the indicated operation using the equivalent expressions with the LCD as denominators.

______d. If the resulting numerator and denominator in the sum or difference have common factors, reduce by dividing out the common factors.

5. Do you find similarities between the rules of adding & subtracting dissimilar fractions and adding & subtracting dissimilar rational algebraic expressions?

What is It

The distance around the plots in the previous activity was solved by adding and subtracting dissimilar rational algebraic expressions in the same manner as dissimilar fractions. See below more examples of adding and subtracting dissimilar rational algebraic expressions.

A. Finding Least Common Multiple (LCM) of Monomials and Polynomials

Example 1. Find the LCM of $15x^2y, 12xy, \& \ 3y^2$.

Solution:

Step 1. Factorize the given monomials and arrange like factors in one column.

$15x^2y$	$=$	$5\cdot$	$3\cdot$			$x\cdot$	$x\cdot$	$y\cdot$		Prime factorization
$12xy$	$=$		$3\cdot$	$2\cdot$	$2\cdot$	$x\cdot$		$y\cdot$		
$3y^2$	$=$		$3\cdot$					$y\cdot$	y	

Step 2. Bring down each kind of factor in each column.

$15x^2y$	$=$	$5\cdot$	$3\cdot$			$x\cdot$	$x\cdot$	$y\cdot$		
$12xy$	$=$		$3\cdot$	$2\cdot$	$2\cdot$	$x\cdot$		$y\cdot$		
$3y^2$	$=$		$3\cdot$					$y\cdot$	y	
		$5\cdot$	$3\cdot$	$2\cdot$	$2\cdot$	$x\cdot$	$x\cdot$	$y\cdot$	y	➡ Factors that are brought down.

Step 3. Multiply all the factors that are brought down. Their product is the LCM.

$15x^2y$ =	$5 \cdot$	$3 \cdot$			$x \cdot$	$x \cdot$	$y \cdot$		
$12xy$ =		$3 \cdot$	$2 \cdot$	$2 \cdot$	$x \cdot$		$y \cdot$		
$3y^2$ =		$3 \cdot$					$y \cdot$	y	
	$5 \cdot$	$3 \cdot$	$2 \cdot$	$2 \cdot$	$x \cdot$	$x \cdot$	$y \cdot$	y	Multiply all the factors in this row.

$LCM = 60x^2y^2$

Example 2: Find the LCM of $x^2 + 2x + 1$ and $2x + 2$.

Solution.

Step 1. Factorize the given monomials and arrange like factors in one column.

$x^2 + 2x + 1$ =		$(x + 1)$	$(x + 1)$	Factoring Trinomial
$2x + 2$ =	(2)	$(x + 1)$		Factoring GCMF

Step 2. Bring down each kind of factor in each column.

$x^2 + 2x + 1$ =		$(x+1)$	$(x+1)$	
$2x + 2$ =	(2)	$(x + 1)$		
	(2)	$(x + 1)$	$(x + 1)$	Factors that are brought down.

Step 3. Multiply all the factors that are brought down. Their product is the LCM.

$x^2 + 2x + 1$ =		$(x+1)$	$(x+1)$	
$2x + 2$ =	(2)	$(x + 1)$		
	(2)	$(x + 1)$	$(x + 1)$	Multiply all the factors in this row

$LCM = (2)(x + 1)(x + 1)$ Factored form of the LCM

$= 2x^2 + 4x + 2$ Expanded form of LCM

B. Adding and Subtracting Dissimilar Rational Algebraic Expressions

As you go along in this section you have to bear in mind that the Least Common Multiple (LCM) of the denominators of dissimilar rational algebraic expressions is the Least Common Denominator (LCD) of the expressions.

Example 1. $\frac{x+y}{x} + \frac{x+y}{y}$

Solution

Step 1. Find the LCD of the expressions.

x	$=$	x		Prime factorization
y	$=$		y	
		x	y	Bring down each kind of factor in each column.
$LCM = LCD$	$=$	xy		Multiply all the factors that are brought down.

Step 2. Find the equivalent expression of each of the given using the LCD as denominator.

$$\frac{x+y}{x} = \frac{?}{xy}$$ Equivalent of expression 1 with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{xy}{x} = \frac{\cancel{x}y}{\cancel{x}}$$ Divide out common factor.

$$= y$$ Simplified.

2b. Multiply the result in 2a with the original numerator.

$$y(x+y) = xy + y^2$$ Distributive Property

2c. The answer in 2b is the missing numerator of the equivalent expression.

$$\frac{x+y}{x} = \frac{?}{xy}$$ Equivalent of expression 1 with missing numerator

$$= \boldsymbol{\frac{xy+y^2}{xy}}$$ Equivalent expression of expression 1

$$\frac{x+y}{y} = \frac{?}{xy}$$ Equivalent of expression 2 with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{xy}{y} = \frac{x\cancel{y}}{\cancel{y}}$$ Divide out common factor.

$$= x$$ Simplified.

2b. Multiply the result in 2a with the original numerator.

$$x(x+y) = x^2 + xy$$ Distributive Property

2c. The answer in 2b is the missing numerator of the equivalent expression.

$$\frac{x+y}{y} = \frac{?}{xy}$$ Equivalent of expression 2 with missing numerator

$$= \frac{\boldsymbol{x^2 + xy}}{\boldsymbol{xy}}$$ Equivalent expression of expression 2

Step 3. Proceed to perform the operation using the equivalent fractions and using the steps of similar algebraic expressions.

$$\frac{x+y}{x} + \frac{x+y}{y} = \frac{\boldsymbol{xy + y^2}}{\boldsymbol{xy}} + \frac{\boldsymbol{x^2 + xy}}{\boldsymbol{xy}}$$ Given transformed into similar rational algebraic expressions.

$$= \frac{xy + y^2 + x^2 + xy}{xy}$$ Write as one expression.

$$= \frac{xy + y^2 + x^2 + xy}{xy}$$ Determine like terms in the numerator.

$$xy + xy = 2xy$$ Like terms combined by addition.

$$\frac{x+y}{x} + \frac{x+y}{y} = \frac{x^2 + 2xy + y^2}{xy}$$ Simplified numerator.

$$= \frac{(x+y)(x+y)}{xy}$$ Factoring Trinomial (numerator)

$$= \frac{\boldsymbol{x^2 + 2xy + y^2}}{\boldsymbol{xy}}$$ Sum in expanded form

Example 2. $\frac{3x+1}{x^2+2x+1} + \frac{5}{2x+2}$

Solution

Step 1. Find the LCD of the expressions.

$x^2 + 2x + 1$	$=$		$(x+1)$	$(x+1)$	Factoring Trinomial
$2x + 2$	$=$	(2)	$(x+1)$		Factoring GCMF
		(2)	$(x+1)$	$(x+1)$	Bring down each kind of factor in each column.

$LCM = LCD \quad = \quad (2)(x+1)(x+1)$ — Multiply all the factors that are brought down.

Step 2. Find the equivalent expression of each of the given both using the LCD as denominator.

$$\frac{3x+1}{x^2+2x+1} = \frac{3x+1}{(x+1)(x+1)}$$ Factoring Trinomial (denominator)

$$\frac{3x+1}{(x+1)(x+1)} = \frac{?}{(2)(x+1)(x+1)}$$ Equivalent expression with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{(2)(x+1)(x+1)}{(x+1)(x+1)} = \frac{(2)\cancel{(x+1)}\cancel{(x+1)}}{\cancel{(x+1)}\cancel{(x+1)}}$$ Divide out common factor.

$$= 2$$ Simplified.

2b. Multiply the result in 2a with the original numerator.

$$2(3x+1) = 6x + 2$$ Distributive Property

2c. The answer in 2b is the missing numerator of the equivalent expression.

$$\frac{3x+1}{(x+1)(x+1)} = \frac{?}{(2)(x+1)(x+1)}$$ Equivalent expression with missing numerator

$$= \frac{\mathbf{6x+2}}{\mathbf{(2)(x+1)(x+1)}}$$ Equivalent expression of expression 1

$$\frac{5}{2x+2} = \frac{5}{2(x+1)}$$ Factoring GCMF (denominator)

$$\frac{5}{2(x+1)} = \frac{?}{(2)(x+1)(x+1)}$$

Equivalent expression with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{(2)(x+1)(x+1)}{(2)(x+1)} = \frac{\cancel{(2)}\cancel{(x+1)}(x+1)}{\cancel{(2)}\cancel{(x+1)}}$$

Divide out common factor.

$$= x+1$$

Simplified.

2b. Multiply the result in 2a with the original numerator.

$$5(x+1) = 5x+5$$

Distributive Property

2c. The answer in 2b is the missing numerator of the equivalent expression.

$$\frac{5}{2(x+1)} = \frac{?}{(2)(x+1)(x+1)}$$

Equivalent expression with missing numerator

$$= \frac{\mathbf{5x+5}}{\mathbf{(2)(x+1)(x+1)}}$$

Equivalent expression of expression 2

Step 3. Proceed to perform the operation using the equivalent fractions and using the steps of similar algebraic expressions.

$$\frac{3x+1}{x^2+2x+1} + \frac{5}{2x+2} = \frac{\mathbf{6x+2}}{\mathbf{(2)(x+1)(x+1)}} + \frac{\mathbf{5x+5}}{\mathbf{(2)(x+1)(x+1)}}$$

Given transformed into similar rational algebraic expressions.

$$= \frac{6x+2+5x+5}{(2)(x+1)(x+1)}$$

Write as one expression

$$= \frac{6x+2+5x+5}{(2)(x+1)(x+1)}$$

Determine like terms of the numerator.

$$6x+5x = 11x$$

Like terms combined by addition.

$$2+5 = 7$$

$$\frac{3x+1}{x^2+2x+1} + \frac{5}{2x+2} = \frac{11x+7}{(2)(x+1)(x+1)}$$

Simplified numerator.

$$= \frac{\mathbf{11x+7}}{\mathbf{2x^2+4x+2}}$$

Sum in expanded form

Example 3. $\frac{x+1}{x+2} - \frac{x+1}{x+3}$

Solution

Step 1. Find the LCD of the expressions.

$x+2$	$=$	$(x+2)$		Prime factorization
$x+3$	$=$		$(x+3)$	
		$(x+2)$	$(x+3)$	Bring down each kind of factor in each column.
$LCM = LCD$	$=$	$(x+2)(x+3)$		Multiply all the factors that are brought down.

Step 2. Find the equivalent expression of each of the given both using the LCD as denominator.

$$\frac{x+1}{x+2} = \frac{?}{(x+2)(x+3)}$$ Equivalent of expression 1 with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{(x+2)(x+3)}{(x+2)} = \frac{\cancel{(x+2)}(x+3)}{\cancel{(x+2)}}$$ Divide out common factor.

$$= x+3$$ Simplified.

2b. Multiply the result in 2a with the original numerator.

$(x+3)(x+1)$	?	x^2	Multiply **F**irst Terms.
$(x+3)(x+1)$	?	$x^2 + x$	Multiply **O**uter Terms.
$(x+3)(x+1)$	?	$x^2 + x + 3x$	Multiply **I**nner Terms.
$(x+3)(x+1)$	$=$	$x^2 + x + 3x + 3$	Multiply **L**ast Terms.
$(x+3)(x+1)$	$=$	$x^2 + x + 3x + 3$	Determine like terms.
	$=$	$x^2 + 4x + 3$	Combine like terms.

2c. The answer in 2b is the missing numerator of the equivalent expression.

$$\frac{x+1}{x+2} = \frac{?}{(x+2)(x+3)}$$ Equivalent of expression 1 with missing numerator

$$= \frac{\mathbf{x^2 + 4x + 3}}{\mathbf{(x+2)(x+3)}}$$ Equivalent expression of expression 1

$$\frac{x+1}{x+3} = \frac{?}{(x+2)(x+3)}$$ Equivalent of expression 2 with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{(x+2)(x+3)}{(x+3)} = \frac{(x+2)\cancel{(x+3)}}{\cancel{(x+3)}}$$ Divide out common factor.

$$= x + 2$$ Simplified.

2b. Multiply the result in 2a with the original numerator.

$(x+2)(x+1)$	?	x^2	Multiply **F**irst Terms.
$(x+2)(x+1)$	?	$x^2 + x$	Multiply **O**uter Terms.
$(x+2)(x+1)$	?	$x^2 + x + 2x$	Multiply **I**nner Terms.
$(x+2)(x+1)$	$=$	$x^2 + x + 2x + 2$	Multiply **L**ast Terms.
$(x+2)(x+1)$	$=$	$x^2 + x + 2x + 2$	Determine like terms.
	$=$	$x^2 + 3x + 2$	Combine like terms.

2c. The answer in 2b is the missing numerator of the equivalent expression.

$$\frac{x+1}{x+3} = \frac{?}{(x+2)(x+3)}$$ Equivalent of expression 2 with missing numerator

$$= \frac{\mathbf{x^2 + 3x + 2}}{\mathbf{(x+2)(x+3)}}$$ Equivalent expression of expression 2

Step 3. Proceed to perform the operation using the equivalent fractions and using the steps of similar algebraic expressions.

$$\frac{x+1}{x+2} - \frac{x+1}{x+3} = \frac{\mathbf{x^2 + 4x + 3}}{\mathbf{(x+2)(x+3)}} - \frac{\mathbf{x^2 + 3x + 2}}{\mathbf{(x+2)(x+3)}}$$ Given transformed into similar rational algebraic expressions.

$$= \frac{x^2 + 4x + 3 - (x^2 + 3x + 2)}{(x+2)(x+3)}$$ Write as one expression.

$$= \frac{x^2 + 4x + 3 - (x^2 + 3x + 2)}{(x+2)(x+3)}$$ Determine like terms in the numerator.

$$x^2 - x^2 = 0$$ Like terms combined by subtraction.

$$4x - 3x = x$$
$$3 - 2 = 1$$

$$\frac{x+1}{x+2} - \frac{x+1}{x+3} = \frac{x+1}{(x+2)(x+3)}$$ Simplified numerator.

$$= \frac{\boldsymbol{x+1}}{\boldsymbol{x^2+5x+6}}$$ Difference in expanded form

Example 4. $\frac{2}{x^2-2x-3} - \frac{2}{x^2-x-2}$

Solution

Step 1. Find the LCD of the expressions.

$x^2 - 2x - 3$	$=$	$(x+1)$		$(x-3)$	Factoring Trinomial
$x^2 - x - 2$	$=$	$(x+1)$	$(x-2)$		Factoring Trinomial
		$(x+1)$	$(x-2)$	$(x-3)$	Bring down each kind of factor in each column.

$$LCM = LCD = (x+1)(x-2)(x-3)$$ Multiply all the factors that are brought down.

Step 2. Find the equivalent expression of each of the given both using the LCD as denominator.

$$\frac{2}{x^2-2x-3} = \frac{2}{(x+1)(x-3)}$$ Factoring Trinomial (denominator)

$$\frac{2}{(x+1)(x-3)} = \frac{?}{(x+1)(x-2)(x-3)}$$ Equivalent of expression 1 with missing numerator

2a. Divide the LCD by the original denominator.

$$\frac{(x+1)(x-2)(x-3)}{(x+1)(x-3)} = \frac{\cancel{(x+1)}(x-2)\cancel{(x-3)}}{\cancel{(x+1)}\cancel{(x-3)}}$$ Divide out common factor.

$$= x - 2$$ Simplified.

2b. Multiply the result in 2a with the original numerator.

$$(x-2)(2) = (x)(2) - (2)(2)$$ Distributive Property

$$= 2x - 4$$ Simplified.

2c. The answer in 2b is the missing numerator of the equivalent expression.

$\dfrac{2}{(x+1)(x-3)}$	$= \dfrac{?}{(x+1)(x-2)(x-3)}$	Equivalent of expression 1 with missing numerator
	$= \dfrac{\mathbf{2x-4}}{\mathbf{(x+1)(x-2)(x-3)}}$	Equivalent expression of expression

---

$\dfrac{2}{x^2-x-2}$	$= \dfrac{2}{(x+1)(x-2)}$	Factoring Trinomial (denominator)
$\dfrac{2}{(x+1)(x-2)}$	$= \dfrac{?}{(x+1)(x-2)(x-3)}$	Equivalent of expression 2 with missing numerator

2a. Divide the LCD by the original denominator.

$\dfrac{(x+1)(x-2)(x-3)}{(x+1)(x-2)}$	$= \dfrac{\cancel{(x+1)}\cancel{(x-2)}(x-3)}{\cancel{(x+1)}\cancel{(x-2)}}$	Divide out common factor.
	$= x-3$	Simplified.

2b. Multiply the result in 2a with the original numerator.

$(x-3)(2)$	$= (x)(2)-(3)(2)$	Distributive Property
	$= 2x-6$	Simplified.

2c. The answer in 2b is the missing numerator of the equivalent expression.

$\dfrac{2}{(x+1)(x-2)}$	$= \dfrac{?}{(x+1)(x-2)(x-3)}$	Equivalent of expression 2 with missing numerator
	$= \dfrac{\mathbf{2x-6}}{\mathbf{(x+1)(x-2)(x-3)}}$	Equivalent expression of expression 2

Step 3. Proceed to perform the operation using the equivalent fractions and using the steps of similar algebraic expressions.

$\dfrac{2}{x^2-2x-3} - \dfrac{2}{x^2-x-2}$	$= \dfrac{\mathbf{2x-4}}{\mathbf{(x+1)(x-2)(x-3)}} - \dfrac{\mathbf{2x-6}}{\mathbf{(x+1)(x-2)(x-3)}}$	Given transformed into similar rational algebraic expressions.
	$= \dfrac{2x-4-(2x-6)}{(x+1)(x-2)(x-3)}$	Write as one expression.
	$= \dfrac{2x-4-(2x-6)}{(x+1)(x-2)(x-3)}$	Determine like terms in the numerator.

$$2x - 2x = 0$$

Like terms combined by subtraction.

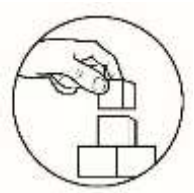
$$-4-(-6) = -4+6$$
$$= 2$$

Simplified numerator.

$$\frac{2}{x^2-2x-3} - \frac{2}{x^2-x-2} = \frac{2}{(x+1)(x-2)(x-3)}$$

$$= \mathbf{\frac{2}{x^3-4x^2+x+6}}$$

Difference in expanded form



What's More

Directions: Perform what is asked in each of the sections. Answer also the questions that follow.

A. Find the LCM of the following expressions.

1. $12x^2y^3$ *and* $15x^3y$
2. x^2-7x+6 *and* x^2-1

Questions:

1. How did you get the LCM of the given?
2. What factoring techniques did you apply in Item 2?

B. Perform the indicated operation and answer the questions that follow.

1. $\frac{2y-1}{y} + \frac{2x-1}{x}$
2. $\frac{2x-1}{2x^2+5x+3} + \frac{2}{3x+3}$
3. $\frac{2x-1}{x+3} - \frac{x+1}{x-3}$
4. $\frac{3}{2x^2-x-3} - \frac{2}{x^2-5x-6}$

Questions:

1. How did you find the LCD of the unlike expressions above?
2. How did you transform the given into similar rational algebraic expressions?
3. When expressions in Item 3 became similar, how many like terms in the numerator did you find?
4. In Items 3 and 4, what did you do to the signs of the terms that follow the subtraction operation?
5. What factoring techniques did you use to factor the denominators of Items 2 and 4?

What I Have Learned

Situation: Your classmate is finalizing the solution-explanation card project but is unsure of the solution and explanation. Please do help complete the project!

$$\frac{5x+1}{2}+\frac{x-3}{3}-\frac{x}{4}$$

Solution

Explanation

I know how to ____________.

$$LCM = LCD = (\_\_\_\_)(\_\_\_)$$

First, ___________________.

$$\frac{5x+1}{2}=\frac{?}{(\_\_\_)(4)}$$

After that, _______________.

$$\frac{x-3}{3}=\frac{?}{(3)(\_\_\_)}$$

$$\frac{x}{4}=\frac{?}{(3)(4)}$$

$$\frac{5x+1}{2}+\frac{x-3}{3}-\frac{x}{4}=\frac{30x+6+4x-12-(\_\_)}{12}$$

Then, __________________.

$$=\frac{31x-\_\_\_\_\_\_\_}{12}$$

Finally, ________________.

What I Can Do

Situation: Next harvesting time of your father's sweet potatoes came. Again, all of you became very busy in the farm for a day. The harvest by the grace of God was plenty. The yield was delivered to the market and all of the potatoes were sold. After having rested, your father showed you the list below and asked you to compute for the profit of the season.

Yield: $\frac{100p+200}{2p}$

Expenses:

Labor $\frac{10p+20}{3p}$ Fertilizers $\frac{5p-10}{p}$

Question:

1. How will you solve for the profit of your father? Show your solution.

Assessment

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

1. Give the least common denominator $\frac{4}{2ab^2}$ and $\frac{5}{4ab}$

   A. ab^2
   B. $2ab^2$
   C. $4ab^2$
   D. $6ab^2$

2. Look for the sum of $\frac{2a}{bc} + \frac{a}{bc}$.

   A. $\frac{2a^2}{bc}$
   B. $\frac{3a^2}{bc}$
   C. $\frac{3a}{bc}$
   D. $\frac{4a}{bc}$

3. Find the simplified form of $\frac{2x}{3} + \frac{x}{4}$.

   A. $\frac{8x}{12}$
   B. $\frac{9x}{12}$
   C. $\frac{10x}{12}$
   D. $\frac{11x}{12}$

4. Perform the indicated operation. $\frac{x-2}{2} - \frac{x+2}{5}$

   A. $\frac{3x}{10}$
   B. $\frac{-14}{10}$
   C. $\frac{3x-14}{10}$
   D. $\frac{3x+14}{10}$

5. Given $\frac{x+3}{3}$ as one addend of the sum $\frac{8x-2}{3}$, find the other addend.

   A. $\frac{6x-4}{3}$
   B. $\frac{7x-5}{3}$
   C. $\frac{8x-6}{3}$
   D. $\frac{9x-7}{3}$

6. Perform the indicated operation. $\frac{2x-5}{4} + \frac{x+3}{4}$

   A. $\frac{3x-2}{4}$
   B. $\frac{3x-4}{4}$
   C. $\frac{3x-6}{4}$
   D. $\frac{3x-8}{4}$

7. Find the least common denominator of $\frac{7}{9-3a}$ and $\frac{2}{3-a}$.

   A. 3
   B. $3-a$
   C. $3(3-a)$
   D. $4(4-a)$

8. Write as one fraction and simplify $\frac{2}{x^2+x} - \frac{3}{x+1}$.

   A. $\frac{2}{x+1}$
   B. $\frac{-3}{x+1}$
   C. $\frac{2-3x}{x}$
   D. $\frac{2-3x}{x(x+1)}$

9. Find among the choices below the sum of $\frac{3}{x} + \frac{5}{x-1}$.

   A. $\frac{8x-1}{x(x+1)}$
   B. $\frac{8x-2}{x(x+1)}$
   C. $\frac{8x-3}{x(x+1)}$
   D. $\frac{8x-4}{x(x+1)}$

10. Subtract $\frac{r+9}{r-2}$ from $\frac{2r+1}{r-2}$.

    A. $\frac{r-7}{r-2}$
    B. $\frac{r-8}{r-2}$
    C. $\frac{r-9}{r-2}$
    D. $\frac{r-10}{r-2}$

11. Using the LCD 9, look for the equivalent rational algebraic expression of $\frac{x+1}{3}$.

A. $\frac{x+1}{9}$ C. $\frac{3x+3}{9}$

B. $\frac{2x+2}{9}$ D. $\frac{4x+4}{9}$

12. Using the LCD ab, look for the equivalent rational algebraic expression of each of $\frac{b+1}{b}$ and $\frac{c+1}{a}$.

A. $\frac{b+1}{ab}, \frac{c+1}{ab}$ C. $\frac{b+1}{bc}, \frac{bc+b}{bc}$

B. $\frac{ab+a}{ab}, \frac{bc+b}{ab}$ D. $\frac{bc+c}{bc}, \frac{bc+b}{bc}$

13. Find among the following the truth about similar rational algebraic expressions.

A. The denominators are sometimes different but always with prime numerators.

B. The numerators are sometimes the same but always with different denominators.

C. The numerators are sometimes different but always with the same denominators.

D. The numerators are sometimes the same but always with prime denominators.

14. Find among the following the truth about dissimilar rational algebraic expressions.

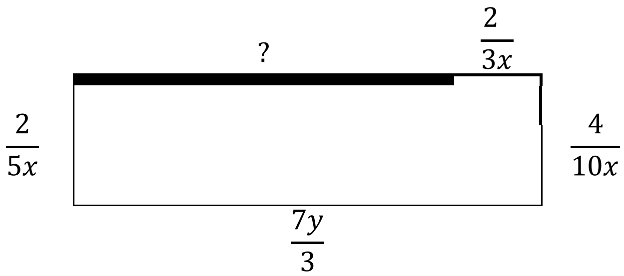
A. The numerators are sometimes the same but always with different denominators.

B. The numerators are sometimes different but always with the same denominators.

C. The numerators are sometimes the same but always with prime denominators.

D. The denominators are sometimes different but always with prime numerators.

15. The rectangular plot for the carrots has the dimensions shown below. Find the length of the side labeled with a question mark is.



A. $\frac{7y-2}{3x}$ C. $\frac{7x-4}{3x}$

B. $\frac{7xy-2}{3x}$ D. $\frac{7xy-4}{3x}$

Additional Activities

Direction: Perform the indicated operations in the expression $\frac{5x}{x+2} + \frac{-3}{x-3} - \frac{2x}{x-3}$.

Answer Key

Lesson 1

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

What's In
1. B
2. C
3. A
4. E
5. F

B. Directions: Perform the indicated operations and reduce your answers to the lowest form. Write your answers on a separate sheet of paper.

1. $\frac{11}{15}$ 2. $\frac{1}{4}$ 3. 1

Questions:
1. Divide out GCF
2. Reduced; The numerator and denominator do not have GCF anymore.
3.
 B Numerators are added or subtracted and the common denominator is copied.
 A The fractions are combined into one fraction.
 C Common factor or factors of the numerator and denominator is/are divided out.
 D The numerators and denominators are expressed into prime factors.

What I Can Do
Question:
1. Subtract the total expenses from the yield;
$\frac{100p+200}{p} - (\frac{10p+50}{p}+\frac{10p-20}{p})= \frac{80p+230}{p}$

What's New
1. $\frac{18x}{3}$
2. $\frac{4}{5y}$

Questions:
1. Similar rational algebraic expressions
2. Add the sides
3. Subtract one side from the other
4.
Yes; Numerators are added or subtracted and the common denominator is copied.
Yes; The fractions are combined into one fraction.
Yes; Common factor or factors of the numerator and denominator is/are divided out.
Yes; The numerators and denominators are expressed into prime factors.
5. Yes

What's More
A. $2y$
Questions:
1. Added; Copied
2. Divide out GCF

B. $x-2$
Questions:
1. Added; Copied
2. Yes; Combined
3. Factoring GCMF
4. Divide out GCF

C. $x+2$
Questions:
1. Added; Copied
2. Yes; Combined
3. Factoring Trinomial and GCMF
4. Divide out GCF

D. $x+1$
Questions:
1. Express one denominator in terms of the other
2. Yes; Multiply
3. Factoring Trinomial
4. Divide out GCF

E. $\frac{1}{4X+1}$
Questions:
1. Yes; Combined
2. Yes; Multiply
3. Factoring Trinomial
4. Divide out GCF

Lesson 2

What's In

A.

1. 224 2. 60

B.

1. 224 2. 60

C.

1. $\frac{3}{5} = \frac{18}{30}$ 2. $\frac{6}{7} = \frac{18}{21}$

D.

2. $\frac{13}{6}$

3. $\frac{2}{9}$

Questions:

1. Factorize and multiply all unique factors
2. Find the LCM of the denominators
3. Yes, LCM is also the LCD
4. Divide the denominator of the incomplete fraction by the denominator of the complete fraction, multiply the result to the numerator of the complete fraction, write the result as the numerator of the incomplete fraction.
5.

Yes a. Find the LCD.
Yes b. Find the equivalent fractions of the given.
Yes c. Perform the indicated operation using the equivalent fractions with the LCD as denominators.
Yes d. If the resulting numerator and denominator in the sum or difference have common factors, reduce by dividing out the common factors.

What's New

1. $\frac{43x}{15}$
2. $\frac{35xy-9}{15x}$

Questions:

1. Rational algebraic expressions
2. Add the sides
3. Subtract one side from the other
4.

Yes a. Find the LCD.
Yes b. Find the equivalent expression of the given.
Yes c. Perform the indicated operation using the equivalent expressions with the LCD as denominators.
Yes d. If the resulting numerator and denominator in the sum or difference have common factors, reduce by dividing out the common

5. Yes

What I Have Learned

Solution:

$$LCM = LCD = (2)(3)$$

$$\frac{5x+1}{2} = \frac{30x+6}{(3)(4)}$$

$$\frac{x-3}{3} = \frac{4x-12}{(3)(4)}$$

$$\frac{x}{4} = \frac{-3x}{(3)(4)}$$

$$\frac{5x+1}{2} + \frac{x-3}{3} - \frac{x}{4} = \frac{30x+6+4x-12-3x}{12}$$

$$= \frac{31x-6}{12}$$

What's More

A. Find the LCM of the following expressions.

1. $60x^3y^3$ 2. $(x-1)(x-6)(x+1)$

Questions:

1. Factorize each expression and multiply all the unique factors
2. Factoring Trinomial and Factoring Difference of Two Squares

B. Perform the indicated operation and answer the questions that follow.

1. $\frac{4xy-x-y}{xy}$ 2. $\frac{1}{3(x+1)}$
3. $\frac{x^2-11x-6}{x^2-9}$ 4. $\frac{-x-12}{(2x-3)(x+1)(x-6)}$

Questions:

1. Find the LCM of the denominators
2. Divide the LCD by the denominator of the given, multiply the answer to the numerator of the given fraction, the result is the numerator of the equivalent fraction.
3. 3 pairs of like terms
4. Change the sign into its opposite
5. Factoring GCMF and Trinomial

Additional Activities

I CAN DO THIS

$$\frac{5x}{x+2} + \frac{-3}{x-3} - \frac{2x}{x-3} = \frac{3x^2-18x-10}{x^2-x-6}$$

What I Can Do

Question:

1. Subtract the total expenses from the yield; $\frac{250p+640}{6p}$.

Assessment

Direction: Choose the correct answer. Write your answers on a separate sheet of paper.

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

What I Have Learned

I know that the given are **similar rational algebraic expressions**. To add or subtract them, first **write the given as one expression**. After that, **copy common denominator**. The next thing to do is to **combine like terms in the numerator**. Like terms are those that have the **same variable of like exponents**. From the given, the like terms in the numerator are: $2p$ & $p$and $\mathbf{6}$, $\mathbf{-1}$ & $\mathbf{2}$. Then, these terms need to be combined by **addition** and **subtraction**. because there are two operations in the given. As a result, $\mathbf{3p}$ and $\mathbf{3}$ are the terms of the numerator. Because the final answer has to be in **reduced form**, we need to factor the Greatest Common Monomial Factor (GCMF) in the numerator. Then, $\mathbf{3}$ has to be divided out. Finally, our answer is $\boldsymbol{p+1}$.

References

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