Key to

Fractions®

3 Student Workbook

Adding and Subtracting

By Steven Rasmussen

Name Class

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Fractions, as we write them and work with them today, were developed in India. The Hindus were the greatest masters of arithmetic in the ancient world. Equipped with a simple yet powerful system of writing numbers, the Hindus originated the rules for simplifying, multiplying, dividing, adding and subtracting fractions. They wrote their fractions with the numerator above the denominator as we do now but they did not use a fraction bar.

Although we know that Hindu fractions date back to at least 200 A.D., the early history of work with fractions is not complete because few ancient Hindu books on mathematics have survived. Those books that have been found are mainly about astronomy and only incidentally include sections on arithmetic, geometry and algebra. They were written in Sanskrit verse and they used poetic names for numbers instead of number symbols. Early Hindu books were written on palm leaves before the invention of paper. Famous Hindu mathematicians included Aryabhata (500 B.C.), Brahmagupta (650 A.D.), Mahavira (850 A.D.) and Bhaskara (1150 A.D.).

If you were a young Hindu student who wanted to learn about fractions, you would first have to memorize all the fraction rules. When you could recite the rules perfectly, you would have to do many problems using the rules. In this booklet you will learn to add and subtract fractions. Brahmagupta wrote the rule for this well over 1000 years ago.

> If the denominators of fractions are different, then reduce these fractions to a common denominator. Now, for the additions, unite the numerators and take their difference in case of subtraction.

If Brahmagupta's rule sounds confusing to you, don't worry. You don't have to memorize it. This book will make adding and subtracting fractions much clearer.

Cover Art by James Dyekman

On the cover of this booklet, a young Hindu student in the time of Brahmagupta is learning to work with fractions. He writes with his finger on a board covered with dust while his teacher looks on. The fraction on the board is $\frac{3}{4}$. Notice the teacher's book. It is written on a bundle of palm leaves.

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Published by Key Curriculum Press, 1150 65th Street, Emeryville, CA 94608
Printed in the United States America 17 16 15 14 13 12 02 01 00 99 ISBN 0-913684-93-7

Simplifying Fractions Review

Sometimes after you add, subtract, multiply or divide fractions, you will be able to simplify your answer. To simplify a fraction, first find the greatest common factor (GCF) of the numerator and denominator and then divide both by the GCF.

Simplify.

GCF of 8 and 20 is 4.

$\frac{8 \div 4}{20 \div 4} = \frac{2}{5}$

GCF of 4 and 6 is ___.

$\frac{4}{6} =$

GCF of 9 and 12 is ___.

$\frac{9}{12} =$

GCF is ___.

$\frac{5}{10} =$

GCF is ___.

$\frac{4}{16} =$

GCF is ___.

$\frac{8}{10} =$

$\frac{3}{15} =$

$\frac{12}{18} =$

$\frac{7}{14} =$

Some of the fractions below are already in simplest form. Circle them. Simplify the others.

$\frac{2}{6} = \frac{1}{3}$	$\frac{8}{9}$	$\frac{6}{6} = 1$	$\frac{10}{12}$	$\frac{1}{4}$
$\frac{5}{5}$	$\frac{9}{27}$	$\frac{7}{11}$	$\frac{10}{40}$	$\frac{20}{50}$
$\frac{2}{21}$	$\frac{3}{12}$	$\frac{6}{24}$	$\frac{10}{10}$	$\frac{4}{5}$
$\frac{14}{20}$	$\frac{15}{25}$	$\frac{1}{2}$	$\frac{9}{18}$	$\frac{18}{21}$

Multiplying Fractions Review

It is easy to multiply fractions. You multiply their numerators together and multiply their denominators together.

Multiply.

$\frac{1}{3} \times \frac{5}{8} =$ $\frac{2}{5} \times \frac{3}{5} =$ $\frac{1}{9} \times \frac{1}{4} =$

$\frac{6}{7} \times \frac{2}{5} =$ $\frac{3}{8} \times \frac{1}{2} =$ $\frac{2}{3} \times \frac{2}{7} =$

Multiply and then simplify.

$\frac{3}{5} \times \frac{1}{6} =$ $\frac{4}{5} \times \frac{5}{12} =$

$\frac{1}{2} \times \frac{4}{7} =$ $\frac{1}{4} \times \frac{8}{9} =$

$\frac{2}{3} \times \frac{3}{8} =$ $\frac{4}{5} \times \frac{1}{6} =$

Simplify and then multiply. Find a numerator and a denominator with a common factor. Divide them by their common factor. Then multiply.

8 (3 divides into 3. 3 divides into 6.)

$\frac{\cancel{3}^{1}}{5} \times \frac{1}{\cancel{6}_{2}} = \frac{1}{10}$ $\frac{1}{2} \times \frac{4}{7} =$ $\frac{2}{3} \times \frac{3}{8} =$

$\frac{4}{5} \times \frac{5}{12} =$ $\frac{1}{4} \times \frac{8}{9} =$ $\frac{4}{5} \times \frac{1}{6} =$

Look carefully at the last two groups of problems. Same problems, same answers! Whether you multiply and then simplify or simplify and then multiply, your answer will be the same.

Reciprocals and Dividing Fractions Review

Two fractions whose product equals one are called reciprocals. Switch a fraction's numerator and denominator to find its reciprocal.

Find the reciprocal of each fraction.

$\frac{3}{4}$, $\frac{4}{3}$ $\quad\frac{5}{8}$, ◯ $\quad\frac{2}{3}$, ◯ $\quad\frac{25}{27}$, ◯ $\quad\frac{1}{4}$, ◯

To divide by a fraction, rewrite the problem as multiplication by the reciprocal of that fraction. Then multiply. Here are the steps:

1. Copy the first fraction.
2. Change division to multiplication.
3. Change the second fraction to its reciprocal.
4. Multiply.

$\frac{3}{10} \div \frac{2}{3} = \frac{3}{10} \times \frac{3}{2} = \frac{9}{20}$ $\qquad \frac{5}{12} \div \frac{3}{5} =$

$\frac{2}{9} \div \frac{3}{4} =$ $\qquad \frac{1}{9} \div \frac{1}{4} =$

$\frac{2}{5} \div \frac{1}{2} =$ $\qquad \frac{4}{7} \div \frac{5}{6} =$

After you rewrite the division problems below, simplify and then multiply.

$\frac{3}{5} \div \frac{3}{4} = \frac{\cancel{3}}{5} \times \frac{4}{\cancel{3}_1} = \frac{4}{5}$ $\qquad \frac{1}{10} \div \frac{3}{5} =$

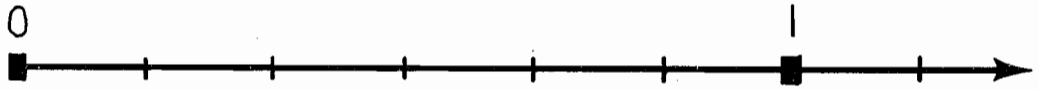
$\frac{1}{6} \div \frac{1}{2} =$ $\qquad \frac{4}{9} \div \frac{2}{3} =$

Adding Fractions on Number Lines

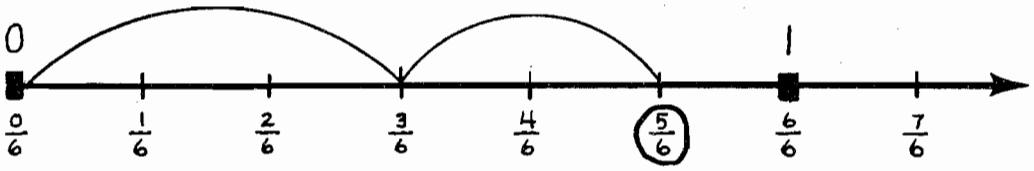
Here's an addition problem with sixths:

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

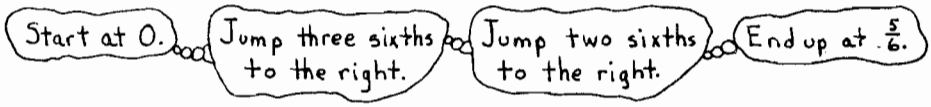
Here's a number line divided into sixths:



Here's how to do the problem on the number line:



Here are the steps that you follow:



The place where you finish is the answer to the problem.

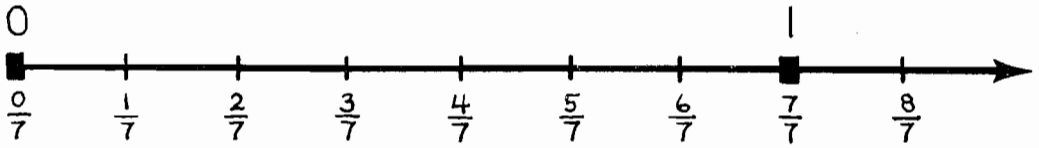
$$\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$$

Below is a problem for you to do.

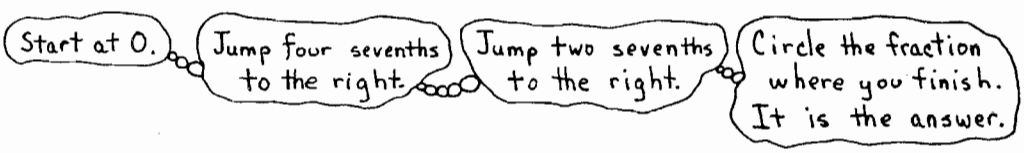
Here's an addition problem with sevenths:

$$\frac{4}{7} + \frac{2}{7} =$$

Do the problem on this number line.



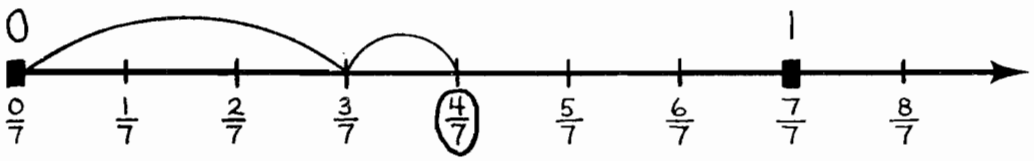
Here are the steps that you follow:



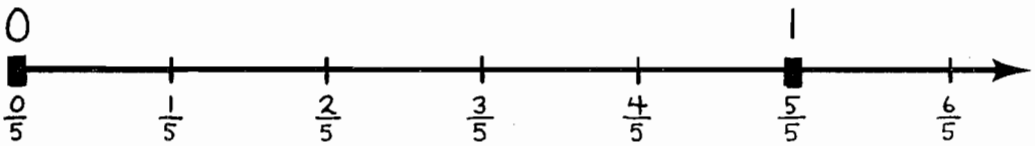
Add using the number lines. On each number line:

1. Start at 0.
2. Show a jump to the right for the first fraction.
3. Show a jump to the right for the second fraction.
4. Circle the fraction where you finish.

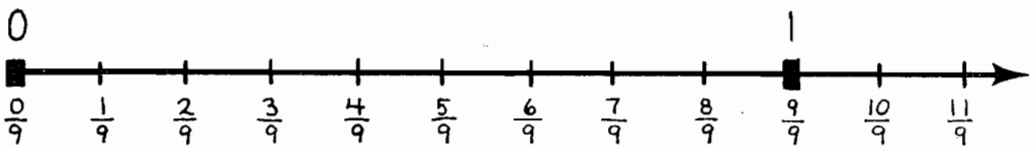
$\frac{3}{7} + \frac{1}{7} = \frac{4}{7}$



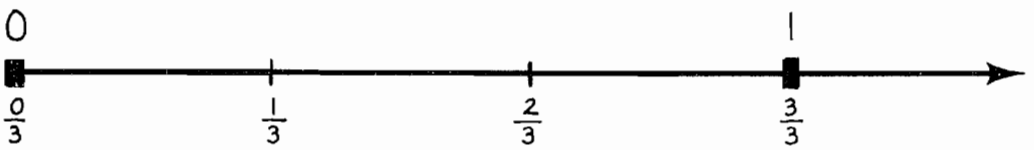
$\frac{1}{5} + \frac{3}{5} =$



$\frac{4}{9} + \frac{4}{9} =$



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

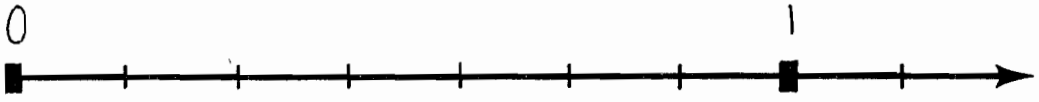


Subtracting Fractions on Number Lines

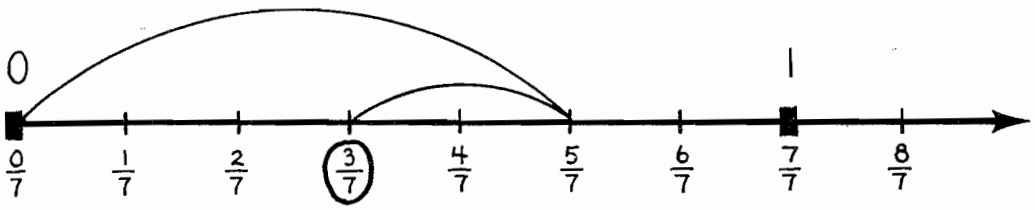
Here's a subtraction problem with sevenths:

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

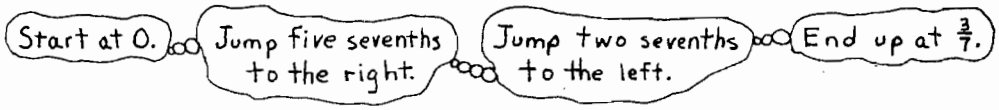
Here's a number line divided into sevenths:



Here's how to do the problem on the number line:



Here are the steps that you follow:



The place where you finish is the answer to the problem.

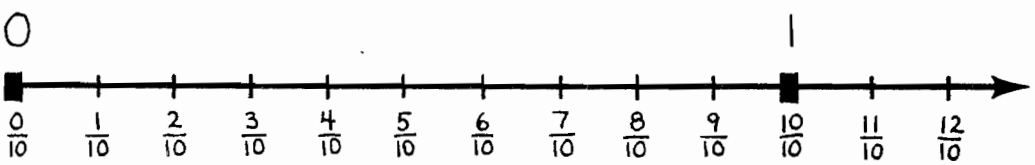
$$\frac{5}{7} - \frac{2}{7} = \mathbf{\frac{3}{7}}$$

Below is a problem for you to do.

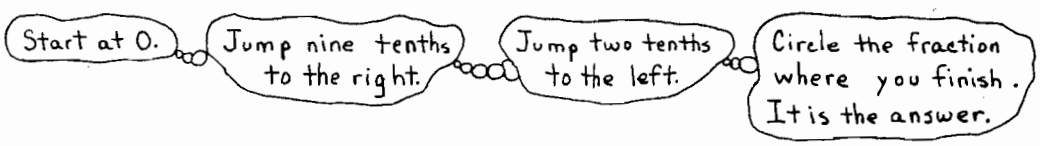
Here's a subtraction problem with tenths:

$$\frac{9}{10} - \frac{2}{10} =$$

Do the problem on this number line.



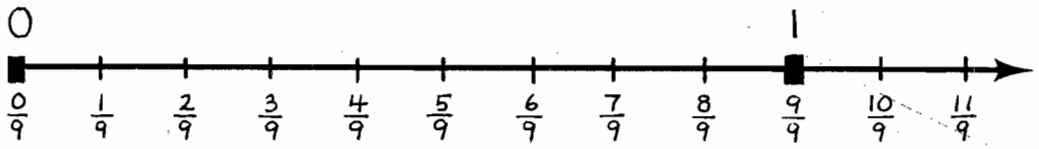
Here are the steps that you follow:



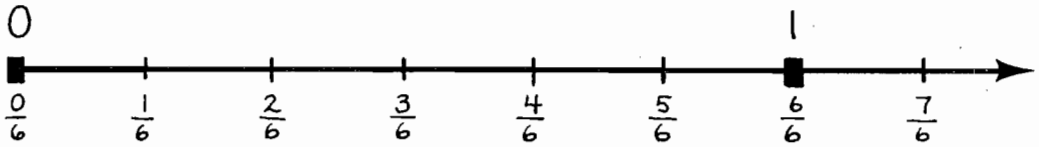
Subtract using the number lines. On each number line:

1. Start at 0.
2. Show a jump to the right for the first fraction.
3. Show a jump to the left for the second fraction.
4. Circle the fraction where you finish.

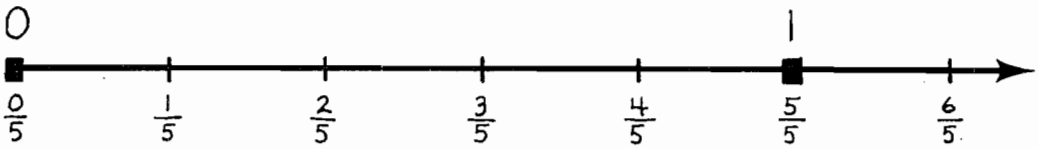
$\frac{7}{9} - \frac{2}{9} =$



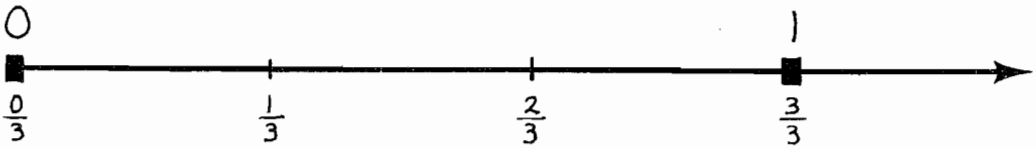
$\frac{5}{6} - \frac{1}{6} =$



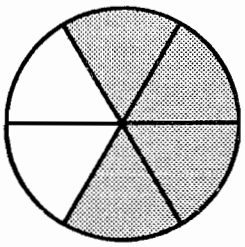
$\frac{4}{5} - \frac{3}{5} =$



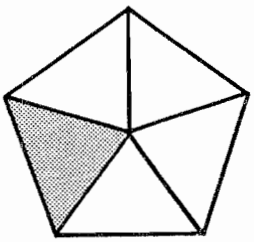
$\frac{2}{3} - \frac{2}{3} =$



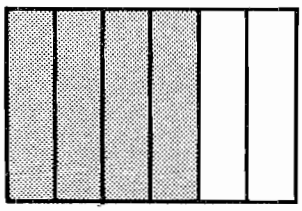
Adding Fractional Parts



$\frac{4}{6} + \frac{2}{6} = \frac{6}{6}$



+ =



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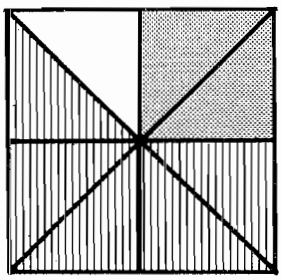

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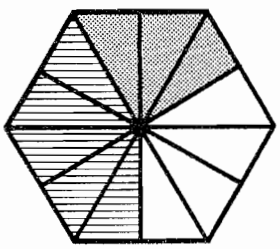

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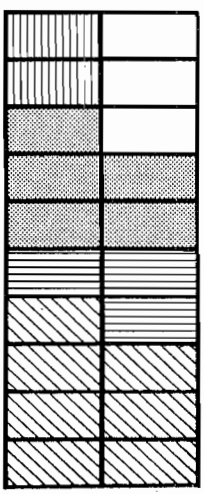

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Adding and Subtracting Fractions with Common Denominators

If fractions have the same denominator they have a common denominator. It is easy to add and subtract fractions with a common denominator.

Put a loop around each problem below where the fractions have a common denominator.

$\frac{1}{3} + \frac{1}{3} =$ $\frac{7}{9} - \frac{3}{5} =$ $\frac{3}{11} + \frac{8}{11} =$ $\frac{21}{20} \times \frac{2}{3} =$ $\frac{4}{7} + \frac{1}{7} + \frac{1}{7} =$ $\frac{5}{17} - \frac{5}{20} =$

$\frac{2}{3} + \frac{5}{8} =$ $\frac{6}{5} - \frac{1}{6} =$ $\frac{3}{4} - \frac{1}{2} =$ $\frac{5}{7} - \frac{1}{4} =$ $\frac{6}{5} \times \frac{1}{8} =$ $\frac{1}{4} \times \frac{1}{4} \times \frac{1}{4} =$

When you add or subtract fractions with a common denominator, you add or subtract the numerators and keep the common denominator in your answer.

$$\frac{2}{5} + \frac{1}{5} = \frac{2+1}{5} = \frac{3}{5}$$ ← add numerators ← keep the common denominator

$$\frac{2}{5} - \frac{1}{5} = \frac{2-1}{5} = \frac{1}{5}$$ ← subtract numerators ← keep the common denominator

Add or subtract.

$\frac{1}{3} + \frac{1}{3} = \mathbf{\frac{2}{3}}$ $\frac{2}{7} + \frac{4}{7} =$ $\frac{7}{9} - \frac{5}{9} =$

$\frac{3}{5} + \frac{1}{5} =$ $\frac{4}{15} - \frac{2}{15} =$ $\frac{6}{35} + \frac{6}{35} =$

$\frac{5}{21} + \frac{8}{21} =$ $\frac{10}{21} - \frac{8}{21} =$ $\frac{6}{7} - \frac{2}{7} =$

$\frac{3}{11} - \frac{2}{11} =$ $\frac{8}{17} - \frac{3}{17} - \frac{2}{17} =$ $\frac{2}{13} + \frac{4}{13} + \frac{5}{13} =$

Addition and subtraction problems can be written in two ways.

$\frac{4}{7} + \frac{2}{7} = \mathbf{\frac{6}{7}}$

$$\begin{array}{r} \frac{4}{7} \\ +\ \frac{2}{7} \\ \hline \mathbf{\frac{6}{7}} \end{array}$$

$\frac{4}{7} - \frac{2}{7} = \mathbf{\frac{2}{7}}$

$$\begin{array}{r} \frac{4}{7} \\ -\ \frac{2}{7} \\ \hline \mathbf{\frac{2}{7}} \end{array}$$

Add or subtract.

$$\begin{array}{r} \frac{4}{9} \\ +\ \frac{1}{9} \\ \hline \end{array} \qquad \begin{array}{r} \frac{9}{13} \\ -\ \frac{5}{13} \\ \hline \end{array} \qquad \begin{array}{r} \frac{2}{11} \\ +\ \frac{6}{11} \\ \hline \end{array}$$

$\frac{4}{25} + \frac{17}{25} + \frac{3}{25} =$

$\frac{10}{11} - \frac{8}{11} =$

$$\begin{array}{r} \frac{4}{15} \\ -\ \frac{2}{15} \\ \hline \end{array} \qquad \begin{array}{r} \frac{1}{7} \\ +\ \frac{1}{7} \\ \hline \end{array} \qquad \begin{array}{r} \frac{8}{9} \\ -\ \frac{1}{9} \\ \hline \end{array}$$

$\frac{1}{7} + \frac{2}{7} + \frac{2}{7} + \frac{1}{7} =$

$\frac{15}{19} - \frac{7}{19} =$

The problems below combine addition and subtraction. Add or subtract from left to right.

$\frac{5}{7} + \frac{2}{7} - \frac{4}{7} = \mathbf{\frac{3}{7}}$

$\frac{12}{13} - \frac{8}{13} + \frac{3}{13} =$

$\frac{7}{8} - \frac{3}{8} + \frac{3}{8} =$

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

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

$\frac{3}{11} + \frac{4}{11} - \frac{1}{11} + \frac{2}{11} =$

$\frac{11}{16} - \frac{1}{16} + \frac{5}{16} =$

$\frac{11}{28} - \frac{9}{28} + \frac{17}{28} =$

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

After you add or subtract fractions, always check to see if you can simplify your answer.

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ $\qquad$ $\frac{7}{8} - \frac{1}{8} = \frac{6}{8} = \frac{3}{4}$

Add or subtract. Simplify each answer.

$\frac{1}{6} + \frac{1}{6} =$

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

$\frac{5}{12} + \frac{1}{12} =$

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

$\frac{1}{18} + \frac{1}{18} =$

$\frac{4}{15} + \frac{8}{15} =$

$\frac{1}{10} + \frac{7}{10} =$

$\frac{15}{22} + \frac{3}{22} =$

$\frac{5}{8} - \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$

$\frac{11}{12} - \frac{1}{12} =$

$\frac{7}{16} - \frac{3}{16} =$

$\frac{5}{6} - \frac{1}{6} =$

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

$\frac{8}{9} - \frac{2}{9} =$

$\frac{1}{18} + \frac{7}{18} - \frac{5}{18} + \frac{7}{18} - \frac{1}{18} =$

Add or subtract. Express your answer in simplest form.

$\frac{7}{12} - \frac{1}{12} =$

$\frac{5}{13} + \frac{6}{13} =$

$\frac{2}{21} + \frac{5}{21} =$

$\frac{8}{15} - \frac{4}{15} =$

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

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

$\frac{1}{25} + \frac{8}{25} + \frac{6}{25} =$

$\frac{7}{15} + \frac{4}{15} - \frac{11}{15} =$

$\frac{9}{10} - \frac{7}{10} + \frac{3}{10} =$

$$\begin{array}{r} \frac{1}{8} \\ + \frac{5}{8} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{9}{11} \\ - \frac{1}{11} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{6}{35} \\ \frac{6}{35} \\ + \frac{13}{35} \\ \hline \end{array}$$

$\frac{7}{20} + \frac{7}{20} - \frac{1}{20} - \frac{1}{20} =$

$\frac{1}{12} + \frac{1}{12} + \frac{5}{12} + \frac{5}{12} =$

$$\begin{array}{r} \frac{13}{24} \\ + \frac{5}{24} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{49}{50} \\ - \frac{9}{50} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{3}{16} \\ \frac{3}{16} \\ + \frac{3}{16} \\ \hline \end{array}$$

Adding, Subtracting, Multiplying and Dividing with Common Denominators

$\frac{7}{9} - \frac{2}{9} =$ $\quad$ $\frac{7}{9} + \frac{2}{9} =$ $\quad$ $\frac{7}{9} \times \frac{2}{9} =$

$\frac{2}{5} \times \frac{2}{5} =$ $\quad$ $\frac{2}{5} + \frac{2}{5} =$ $\quad$ $\frac{2}{5} - \frac{2}{5} =$

$\frac{2}{7} \div \frac{4}{7} =$ $\quad$ $\frac{2}{7} + \frac{4}{7} =$

$\frac{1}{6} \div \frac{5}{6} =$ $\quad$ $\frac{1}{6} \times \frac{5}{6} =$

Are all your answers in simplest form?

Most of the problems below use parentheses. Parentheses mean "Do me first." If a problem has parentheses:

1. Do what's in the parentheses first.
2. Write the answer above.
3. Complete the problem.

$\frac{7}{9} - \left(\overset{\frac{2}{9}}{\frac{1}{9} + \frac{1}{9}}\right) = \mathbf{\frac{5}{9}}$ $\quad$ $\frac{7}{9} - \frac{1}{9} + \frac{1}{9} =$

$\frac{6}{7} - \left(\frac{3}{7} - \frac{2}{7}\right) =$ $\quad$ $\frac{6}{7} - \frac{3}{7} - \frac{2}{7} =$

$\left(\frac{4}{11} + \frac{4}{11}\right) \times \frac{1}{3} =$ $\quad$ $\left(\frac{4}{11} \times \frac{1}{3}\right) + \left(\frac{4}{11} \times \frac{1}{3}\right) =$

$\frac{2}{3} \times \left(\frac{2}{5} - \frac{1}{5}\right) =$ $\quad$ $\left(\frac{2}{3} \times \frac{2}{5}\right) - \left(\frac{2}{3} \times \frac{1}{5}\right) =$

Multiples

A multiplication table is a table of multiples. Finish the table of multiples.

X	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6		10	12				
3	3	6			15	18				
4	4	8	12					32	36	40
5	5	10	15					40	45	50
6	6	12	18	24					54	60
7	7	14	21	28	35					70
8	8	16	24					64	72	80
9	9	18	27					72	81	90
10	10	20	30	40					90	100

The first ten multiples of 2 are: 2, 4, 6, ___, ___, ___, ___, ___, ___, ___

The first ten multiples of 4 are: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

The first ten multiples of 6 are: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

The first ten multiples of 8 are: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

The first eight multiples of 9 are: ___, ___, ___, ___, ___, ___, ___, ___

The first eight multiples of 12 are: ___, ___, ___, ___, ___, ___, ___, ___

The first two multiples of 15 are: ___, ___

The first multiple of 20 is: ___

Look at the multiples of 4 and 6. Can you find three numbers that are multiples of both 4 and 6? Circle them. They are ___, ___, ___.
4 and 6 have these multiples in common. They are the first three common multiples of 4 and 6.

Find two common multiples of 9 and 12. ___, ___

The smallest common multiple of two numbers is called their least common multiple.

List the first multiples of 10: 10, (20), 30, (40), 50, 60, 70, 80, 90, 100

List the first multiples of 4: 4, 8, 12, 16, (20), 24, 28, 32, 36, (40)

Circle the common multiples of 10 and 4. The least common multiple is 20.

List the first multiples of 5: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

List the first multiples of 3: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

Circle the common multiples of 5 and 3. The least common multiple is ___.

List the first multiples of 8: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

List the first multiples of 4: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

Circle the common multiples of 8 and 4. The least common multiple is ___.

List the first multiples of 7: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

List the first multiples of 5: ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

Circle the common multiples of 7 and 5. The least common multiple is ___.

Here are multiples of 9: 9, 18, 27, 36, 45, 54, 63, 72, 81, 90

Are they multiples of 6? no, yes, no, ___, ___, ___, ___, ___, ___, ___

What are the common multiples of 9 and 6? 18, ___, ___, ___, ___

The least common multiple of 9 and 6 is ___.

Here are multiples of 7: 7, 14, 21, 28, 35, 42, 49, 56, 63, 70

Are they multiples of 3? ___, ___, ___, ___, ___, ___, ___, ___, ___, ___

What are the common multiples of 7 and 3? ___, ___, ___

The least common multiple of 7 and 3 is ___.

Least Common Denominator

You know how to add and subtract fractions with a common denominator. It is harder to add and subtract fractions with different denominators.

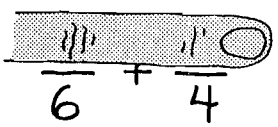
Put a loop around each problem below where the fractions have different denominators. Add or subtract the fractions with a common denominator.

$\frac{1}{6} + \frac{3}{4} =$ $\quad \frac{6}{7} - \frac{1}{3} =$ $\quad \frac{5}{8} - \frac{1}{2}$ $\quad \frac{3}{11} + \frac{1}{11} + \frac{5}{11} =$ $\quad \frac{5}{7} - \frac{4}{7}$

$3/1 \times 3/1 = 3/2$ $\quad \frac{3}{5} + \frac{1}{5} =$ $\quad \frac{3}{4} - \frac{1}{4} =$ $\quad \frac{7}{12} - \frac{3}{8} =$

The first step in completing the looped problems above is to find the least common multiple of the denominators. We call this the least common denominator (LCD).

Find the least common denominator of each pair of fractions below.

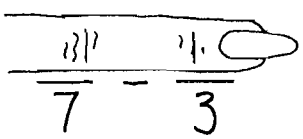


List each multiple of 6: ____, ____

Is this a multiple of 4? ____, ____

The least common multiple of 6 and 4 is ____.

The least common denominator is ____.

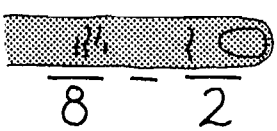


List each multiple of 7: ____, ____, ____

Is this a multiple of 3? ____, ____, ____

The least common multiple of 7 and 3 is ____.

The least common denominator is ____.



List each multiple of 8: ____

Is this a multiple of 2? ____

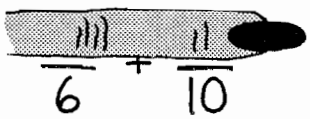
The least common multiple of 8 and 2 is ____.

The least common denominator is ____.

Finding the Least Common Denominator

Here is a way to find the least common denominator of two fractions:

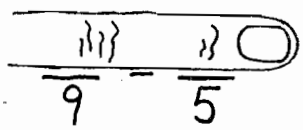
1. Pick the larger denominator.
2. Start listing its multiples. (Remember that the first multiple is the number itself.)
3. After you list each multiple ask, "Is this also a multiple of the smaller denominator?"
4. As soon as you answer "yes," stop. You have found the least common denominator.



List each multiple of 10: 10, 20, 30

Is this a multiple of 6? no, no, yes

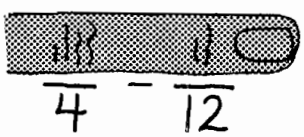
LCD is 30.



List each multiple of 9: ____, ____, ____, ____, ____

Is this a multiple of 5? ____, ____, ____, ____, ____

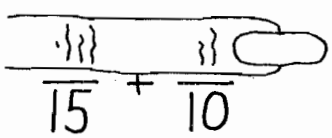
LCD is ____.



List each multiple of the larger denominator: ____

Is this a multiple of the smaller denominator? ____

LCD is ____.

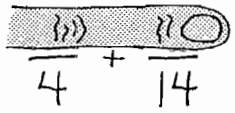


List each multiple of the larger denominator: ____, ____

Is this a multiple of the smaller denominator? ____, ____

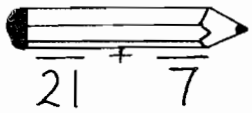
LCD is ____.

List each multiple of the larger: ____, ____
Is this a multiple of the smaller? ____, ____



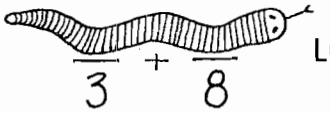
LCD is ____.

List each multiple of the larger: ____
Is this a multiple of the smaller? ____



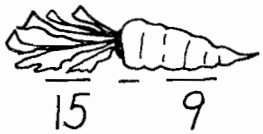
LCD is ____.

List each multiple of the larger: ____, ____, ____
Is this a multiple of the smaller? ____, ____, ____



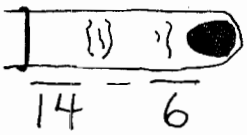
LCD is ____.

List each multiple of the larger: ____, ____, ____
Is this a multiple of the smaller? ____, ____, ____



LCD is ____.

List each multiple of the larger: ____, ____, ____
Is this a multiple of the smaller? ____, ____, ____

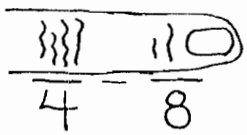


LCD is ____.

List each multiple of the larger:
Is this a multiple of the smaller?

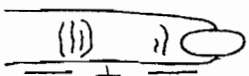
LCD is ____.

List each multiple of the larger:
Is this a multiple of the smaller?



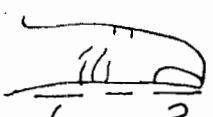
LCD is ____.

List each multiple of the larger:
Is this a multiple of the smaller?

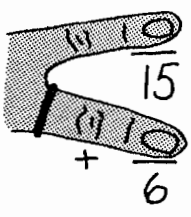


LCD is ____.

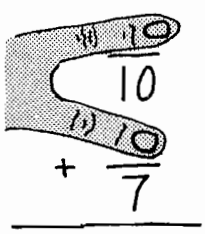
List multiples of the larger denominator. Stop when you find one that's also a multiple of the smaller denominator.



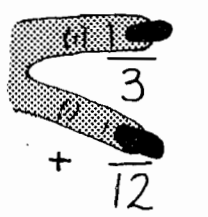
LCD is ____.



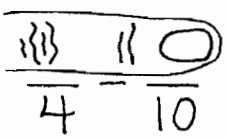
LCD is ____.



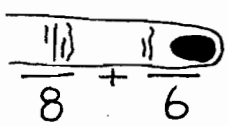
LCD is ____.



LCD is ____.



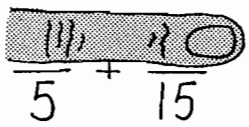
LCD is ____.



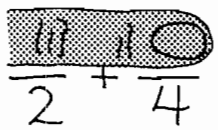
LCD is ____.

Sometimes the LCD will be one of the given denominators.

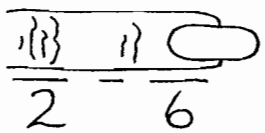
LCD is ___.



LCD is ___.

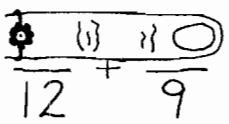


LCD is ___.

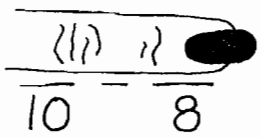


LCD is ___.

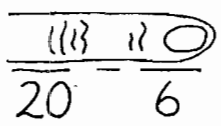
Sometimes the LCD will be larger than either given denominator but smaller than their product.



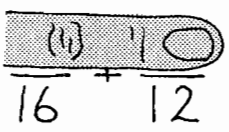
LCD is ___.



LCD is ___.

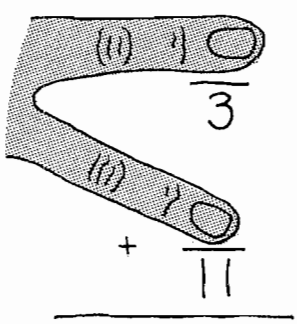


LCD is ___.

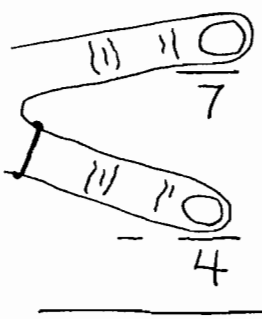


LCD is ___.

Sometimes the LCD will be the product of the given denominators.



LCD is ___.



LCD is ___.

LCD is short for _____ _____ _____.

Equal Fractions Review

$\frac{2}{5} = \frac{\quad}{15}$ What numerator will make the fraction equal $\frac{2}{5}$?

If you multiply the numerator and denominator of a fraction by the same number (not zero), you will make an equal fraction.

$\frac{2^{\times 3}}{5_{\times 3}} = \frac{6}{15}$ First figure out what the denominator of $\frac{2}{5}$ was multiplied by and then multiply the numerator by the same number.

Make equal fractions.

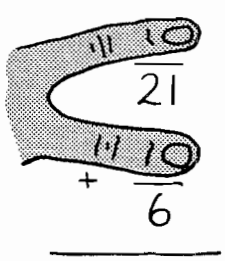
$\frac{1}{7} = \frac{\quad}{28}$ $\frac{3}{4} = \frac{\quad}{8}$ $\frac{2}{5} = \frac{\quad}{15}$ $\frac{1}{2} = \frac{\quad}{12}$

$\frac{2}{5} = \frac{\quad}{10}$ $\frac{1}{3} = \frac{\quad}{9}$ $\frac{1}{2} = \frac{\quad}{20}$ $\frac{5}{8} = \frac{\quad}{32}$

$\frac{3}{7} = \frac{\quad}{35}$ $\frac{1}{6} = \frac{\quad}{12}$ $\frac{1}{4} = \frac{\quad}{24}$ $\frac{3}{10} = \frac{\quad}{50}$

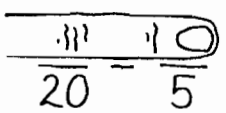
$\frac{2}{3} = \frac{\quad}{3}$ $\frac{1}{10} = \frac{\quad}{10}$ $\frac{3}{8} = \frac{\quad}{8}$ $\frac{5}{9} = \frac{\quad}{9}$

Don't forget how to find the least common denominator.



List each multiple of the larger: ___, ___
Is this a multiple of the smaller? ___, ___

LCD is ___.



LCD is ___.

Adding and Subtracting Fractions with Different Denominators

	Step 1	Step 2	Step 3	Step 4
	Find the least common denominator.	Rename both fractions using the LCD.	Find the missing numerators to make equal fractions.	Add or subtract fractions with a common denominator.
	LCD is **15**.			
$\frac{3}{5}$	$\frac{3}{5}$	$\frac{3}{5} = \frac{\quad}{15}$	$\frac{3^{\times 3}}{5_{\times 3}} = \frac{9}{15}$	$\frac{3^{\times 3}}{5_{\times 3}} = \frac{9}{15}$
$+\frac{2}{15}$	$+\frac{\quad}{15}$	$+\frac{2}{15} = \frac{\quad}{15}$	$+\frac{2^{\times 1}}{15_{\times 1}} = \frac{2}{15}$	$+\frac{2^{\times 1}}{15_{\times 1}} = \frac{2}{15}$
				$\frac{11}{15}$

Add or subtract. Follow the four steps above to complete each problem. Each LCD on this page is one of the given denominators.

LCD is **8**.

$$\frac{3^{\times 1}}{8_{\times 1}} = \frac{3}{8}$$
$$-\frac{1^{\times 2}}{4_{\times 2}} = \frac{2}{8}$$
$$\frac{1}{8}$$

LCD is ____.

$$\frac{2}{3}$$
$$-\frac{7}{12}$$

LCD is ____.

$$\frac{4}{5}$$
$$+\frac{1}{10}$$

LCD is ____.

$$\frac{5}{7}$$
$$+\frac{1}{14}$$

LCD is ____.

$$\frac{5}{12}$$
$$-\frac{1}{3}$$

LCD is ____.

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

Step 1	Step 2	Step 3	Step 4
Find the least common denominator.	Rename both fractions using the LCD.	Find the missing numerators to make equal fractions.	Add or subtract fractions with a common denominator.

Add or subtract. Each LCD on this page is larger than either given denominator but smaller than their product.

LCD is 20 .

$$\frac{1}{10} \times 2 = \frac{2}{20}$$

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

$$\frac{17}{20}$$

$$\frac{1}{6} + \frac{5}{9}$$

$$\frac{9}{14} - \frac{1}{4}$$

$$\frac{11}{15} - \frac{3}{10}$$

$$\frac{1}{4} - \frac{1}{10}$$

$$\frac{3}{4} + \frac{1}{6}$$

$$\frac{2}{9} + \frac{5}{12}$$

$$\frac{3}{8} - \frac{1}{6}$$

$$\frac{5}{8} - \frac{7}{12}$$

Each LCD on this page is the product of the given denominators.

LCD is 42.

$$\frac{2}{7}\times\frac{6}{6}=\frac{12}{42}$$

$$+\frac{1}{6}\times\frac{7}{7}=\frac{7}{42}$$

$$\frac{19}{42}$$

$$\frac{2}{3}+\frac{1}{4}$$

$$\frac{5}{8}-\frac{1}{5}$$

$$\frac{4}{5}+\frac{1}{7}$$

$$\frac{1}{2}-\frac{2}{9}$$

$$\frac{3}{5}-\frac{1}{3}$$

$$\frac{7}{8}-\frac{2}{3}$$

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

$$\frac{1}{6}+\frac{2}{5}$$

$$\frac{4}{7}-\frac{1}{2}$$

$$\frac{1}{5}+\frac{1}{9}$$

$$\frac{5}{6}-\frac{1}{7}$$

Circle the multiples of 3.	1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , 10
Circle two fractions with a common denominator.	$\frac{6}{8}$, $\frac{9}{12}$, $\frac{1}{4}$, $\frac{3}{7}$, $\frac{4}{4}$, $\frac{4}{3}$
Circle the least common multiple of 8 and 2.	1 , 2 , 4 , 8 , 16 , 32
Circle two fractions with the same numerator but with different denominators.	$\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{5}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{5}{4}$
Circle the LCD of $\frac{5}{6}$ and $\frac{1}{9}$.	3 , 6 , 9 , 18 , 36 , 54

Add or subtract.

$\frac{1}{4} + \frac{2}{9} =$

$\frac{11}{12} - \frac{1}{3} =$

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

$\frac{6}{11} - \frac{1}{2} =$

$\frac{7}{9} + \frac{1}{6} =$

$\frac{1}{3} - \frac{2}{7} =$

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

$\frac{4}{5} - \frac{3}{4} =$

$\frac{3}{4} + \frac{1}{6} =$

Add $\frac{5}{6}$ and $\frac{1}{8}$. $\frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$ $+ \frac{1}{8} \times \frac{3}{3} = \frac{3}{24}$ $\frac{23}{24}$	Find the sum of $\frac{3}{7}$ and $\frac{1}{21}$.	Subtract $\frac{2}{5}$ from $\frac{5}{7}$.
$\frac{2}{5}$ is larger than $\frac{1}{4}$. What is the difference?	Add $\frac{1}{3}$ and $\frac{2}{9}$.	Find the sum of $\frac{1}{8}$ and $\frac{2}{3}$.
How much more is $\frac{2}{7}$ than $\frac{1}{4}$?	Subtract $\frac{1}{3}$ from $\frac{4}{5}$.	Add $\frac{1}{3}$ and $\frac{1}{4}$.
Find the sum of $\frac{3}{7}$ and $\frac{1}{4}$.	What is $\frac{6}{7}$ minus $\frac{1}{3}$?	What is $\frac{3}{4}$ plus $\frac{1}{8}$?

Add or subtract. Then simplify your answer.

$$\frac{3}{10} \times \frac{1}{1} = \frac{3}{10}$$
$$+ \frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$$
$$\frac{8}{10} = \frac{4}{5}$$

$$\frac{5}{6} - \frac{1}{12}$$

$$\frac{5}{24} + \frac{3}{8}$$

$$\frac{9}{10} - \frac{1}{15}$$

$$\frac{7}{10} + \frac{1}{6}$$

$$\frac{11}{15} - \frac{1}{3}$$

$$\frac{1}{20} + \frac{1}{30}$$

$$\frac{5}{6} - \frac{1}{3}$$

Word Problems

Answer each question below. Follow these four steps:

1. Read the problem.
2. Write it as addition or subtraction of two fractions.
3. Add or subtract.
4. State your answer in a sentence.

Pat and Sandy got a job painting a shed. The first morning they painted $\frac{1}{3}$ of the shed. In the afternoon they painted $\frac{1}{4}$ of the shed. What fraction of the shed did they paint on the first day?

Problem:

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

Answer: They painted $\frac{7}{12}$ of the shed.

The second morning Pat walked $\frac{3}{10}$ of a kilometer to the Paint Spot paint store and then $\frac{7}{10}$ of a kilometer to work. How far did Pat walk?

Problem:

Answer:

Pat and Sandy took a break for lunch. They spent $\frac{1}{2}$ of an hour resting and $\frac{1}{3}$ of an hour eating. What fraction of an hour was their break?

Problem:

Answer:

Pat needed more brushes. Pat knew that the Paint Spot was $\frac{7}{10}$ of a kilometer away. Sandy said, "People's Paint Store is $\frac{3}{10}$ of a kilometer closer." How far away was People's Paint Store?

Problem:

Answer:

Sandy brought a large bottle of soda to work. It was $\frac{3}{4}$ full. At noon it was only $\frac{1}{4}$ full. How much of the bottle did Sandy drink before noon?

Problem:

Answer:

Pat had $\frac{2}{3}$ of a liter of paint in an old can. Sandy kicked the can and spilled $\frac{1}{4}$ of a liter. How much of a liter of paint was left in the can?

Problem:

Answer:

Pat and Sandy painted the trim of the shed blue. They started with $\frac{1}{2}$ of a can of blue paint. They finished with $\frac{1}{5}$ of a can. How much of the can of blue paint did they use?

Problem:

Answer:

Add or subtract. Express your answer in simplest form.

$\frac{5^{\times 1}}{14_{\times 1}} + \frac{1^{\times 7}}{2_{\times 7}} = \frac{5}{14} + \frac{7}{14} = \frac{12}{14} = \frac{6}{7}$

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

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

$\frac{5}{6} + \frac{1}{10} =$

$\frac{8}{9} - \frac{1}{2} =$

$\frac{7}{10} - \frac{1}{5} =$

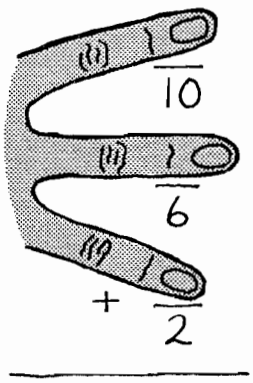
$\frac{6}{9} - \frac{1}{4} =$

$\frac{5}{6} - \frac{1}{4} =$

Finding the Least Common Denominator of Three Fractions

Here are the steps to find the least common denominator of three fractions:

1. Pick the largest denominator.
2. Start listing its multiples.
3. After you list each multiple ask, "Is this also a multiple of each of the other two denominators?"
4. As soon as you answer "yes" for both, stop. You have found the least common denominator.

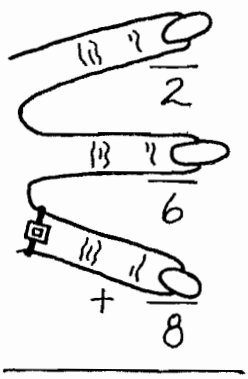


List each multiple of 10: 10, 20, 30
Is this a multiple of 6? no, no, yes
Is this a multiple of 2? yes, yes, yes

LCD is 30.

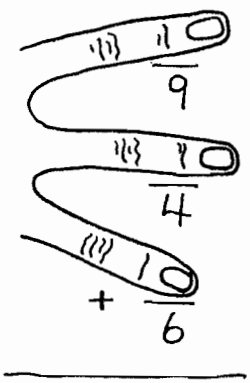
List each multiple of 8: 8, 16, ____
Is this a multiple of 6? no, ____, ____
Is this a multiple of 2? yes, ____, ____

LCD is ____.



List each multiple of 9: ____, ____, ____, ____
Is this a multiple of 6? ____, ____, ____, ____
Is this a multiple of 4? ____, ____, ____, ____

LCD is ____.



Adding Three Fractions with Different Denominators

To add three fractions with different denominators, you start by finding the least common denominator of the three fractions. This is the hard part. The rest of the job is easy.

List each multiple of 5: 5, 10, 15, 20
Is this a multiple of 4? no, no, no, yes
Is this a multiple of 2? no, yes, no, yes

LCD is 20.

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

$$\frac{1}{2}\times\frac{10}{10}=\frac{10}{20}$$

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

$$\frac{19}{20}$$

List each multiple of 6: 6, ____
Is this a multiple of 4? no, ____
Is this a multiple of 3? ____, ____

LCD is ____.

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

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

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

List each multiple of 6:
Is this a multiple of 5?
Is this a multiple of 3?

LCD is ____.

$$\frac{2}{5}$$

$$\frac{1}{6}$$

$$+\ \frac{1}{3}$$

List each multiple of 10:
Is this a multiple of 5?
Is this a multiple of 4?

LCD is ____.

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

$$\frac{2}{5}$$

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

Add. Express your answer in simplest form.

$$\begin{array}{r} \frac{1}{6} \\ \frac{2}{3} \\ +\ \frac{1}{9} \\ \hline \end{array} \qquad \begin{array}{r} \frac{1}{5} \\ \frac{3}{10} \\ +\ \frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{r} \frac{1}{8} \\ \frac{2}{3} \\ +\ \frac{1}{6} \\ \hline \end{array}$$

$$\begin{array}{r} \frac{1}{2} \\ \frac{1}{4} \\ +\ \frac{1}{8} \\ \hline \end{array} \qquad \begin{array}{r} \frac{2}{7} \\ \frac{1}{2} \\ +\ \frac{1}{14} \\ \hline \end{array} \qquad \begin{array}{r} \frac{1}{4} \\ \frac{3}{8} \\ +\ \frac{1}{16} \\ \hline \end{array}$$

Adding, Subtracting, Multiplying and Dividing with Different Denominators

$\frac{1\times5}{7\times5} + \frac{4\times7}{5\times7} = \frac{5}{35} + \frac{28}{35} = \frac{33}{35}$

$\frac{1}{7} \times \frac{4}{5} = \frac{4}{35}$

$\frac{1}{7} \div \frac{4}{5} = \frac{1}{7} \times \frac{5}{4} = \frac{5}{28}$

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

$\frac{3}{4} - \frac{1}{10} =$

$\frac{3}{4} \times \frac{1}{10} =$

$\frac{5}{9} - \frac{1}{3} =$

$\frac{5}{9} \times \frac{1}{3}$

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

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

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

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

$\frac{1}{8} \times \frac{5}{6} =$

$\frac{1}{8} \div \frac{5}{6} =$

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

$\frac{2}{11} \div \frac{2}{5} =$

$\frac{2}{11} + \frac{2}{5} =$

$\frac{2}{11} \times \frac{2}{5} =$

Practice Test - Key To Fractions Book 3

Name _____

Date _____

Simplify.

$\frac{8}{12} =$ $\frac{10}{12} =$

Multiply.

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

Divide.

$\frac{2}{9} \div \frac{1}{4} =$

Add or subtract.

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

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

$\frac{9}{13} - \frac{5}{13} =$

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

$\frac{7}{25} + \frac{9}{25} =$

$\frac{16}{21} - \frac{8}{21} =$

Add or subtract and then simplify.

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

$\frac{5}{21} + \frac{5}{21} + \frac{4}{21} =$

$\frac{23}{25} - \frac{3}{25} =$

$\frac{11}{16} - \left(\frac{1}{16} + \frac{1}{16} + \frac{1}{16}\right) =$

List the first multiples of 6: ____, ____, ____, ____, ____, ____, ____, ____, ____, ____

List the first multiples of 4: ____, ____, ____, ____, ____, ____, ____, ____, ____, ____

Circle the common multiples of 6 and 4. The least common multiple is ____.

Find the least common denominator.

$\frac{}{5} \; \frac{}{4}$ LCD is ____.

$\frac{}{2} \; \frac{}{6}$ LCD is ____.

$\frac{}{7} - \frac{}{4}$ LCD is ____.

Practice Test - Page 2

Add or subtract.

LCD is ____.

$$\begin{array}{r} \frac{3}{8} \\ +\ \frac{1}{4} \\ \hline \end{array} \qquad \begin{array}{r} \frac{5}{6} \\ -\ \frac{2}{9} \\ \hline \end{array} \qquad \begin{array}{r} \frac{1}{4} \\ +\ \frac{2}{3} \\ \hline \end{array}$$

Pat and Sandy got paid for painting the shed. Paint had cost them $\frac{1}{5}$ of their pay. Brushes had cost them $\frac{1}{10}$. What fraction of their pay had Pat and Sandy spent on supplies?

Answer:

Problem:

Add $\frac{3}{8}$ and $\frac{1}{6}$.

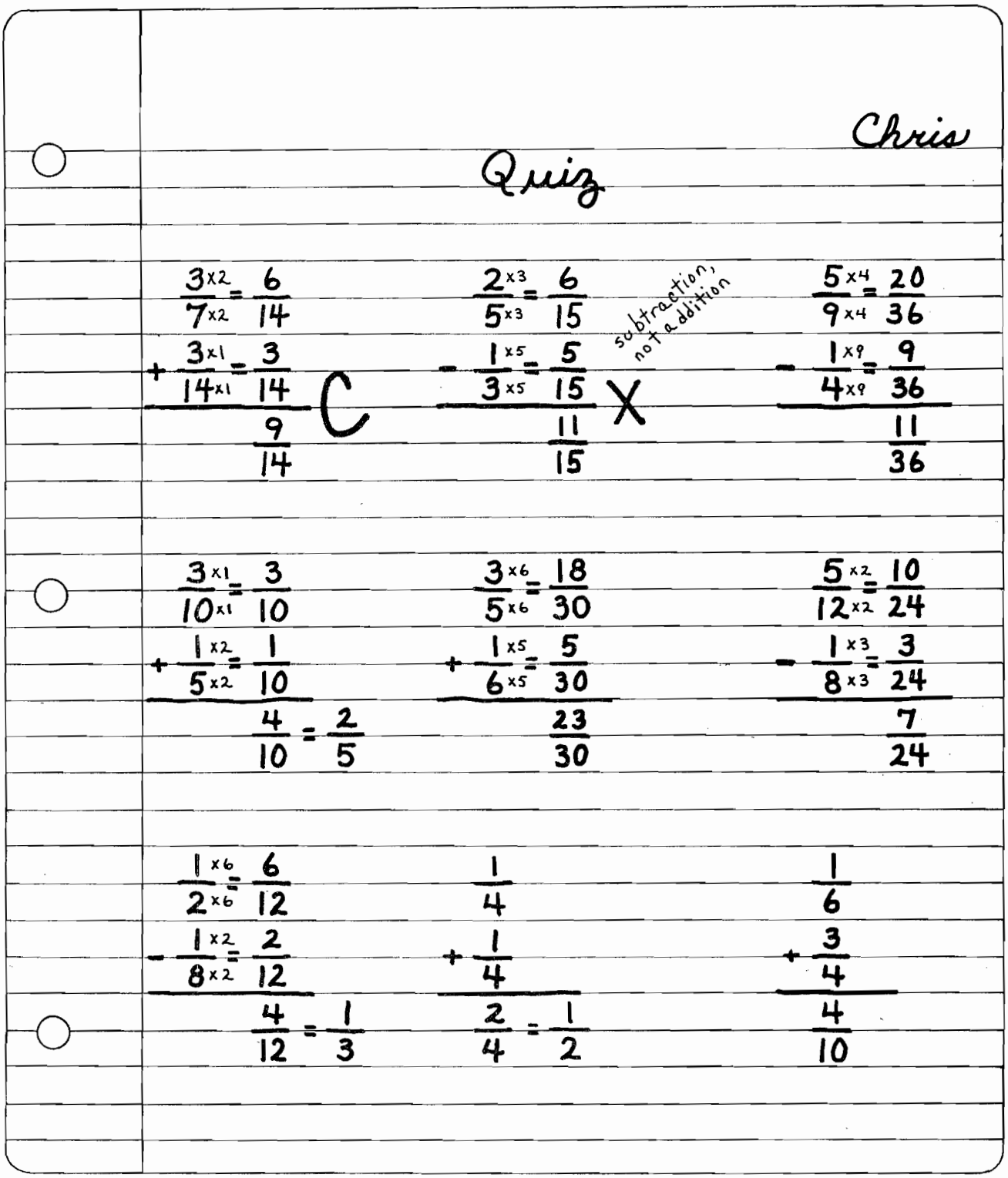
Add or subtract. Express your answer in simplest form.

$$\begin{array}{r} \frac{11}{12} \\ -\ \frac{2}{3} \\ \hline \end{array} \qquad \begin{array}{r} \frac{2}{15} \\ \frac{1}{6} \\ +\ \frac{3}{10} \\ \hline \end{array}$$

$\frac{3}{7} + \frac{1}{2} =$

$\frac{14}{15} - \frac{1}{3} =$

Chris took the quiz below. Put C or X by each problem Chris did.



There are 4 mistakes on Chris's paper.

Here is another way to write addition and subtraction problems:

$$\frac{2}{5} + \frac{1}{4} =$$

Follow the same four steps.

Step 1 Find the least common denominator.

LCD is 20.

$$\frac{(1)\cdot 10}{5} + \frac{\cdot 1\,0}{4} =$$

Step 2 Rename both fractions using the LCD.

$$\frac{2}{5} + \frac{1}{4} = \frac{}{20} + \frac{}{20}$$

Step 3 Find the missing numerators to make equal fractions.

$$\frac{2^{\times 4}}{5_{\times 4}} + \frac{1^{\times 5}}{4_{\times 5}} = \frac{8}{20} + \frac{5}{20}$$

Step 4 Add or subtract fractions with a common denominator.

$$\frac{2^{\times 4}}{5_{\times 4}} + \frac{1^{\times 5}}{4_{\times 5}} = \frac{8}{20} + \frac{5}{20} =$$

Add or subtract. Express your answer in simplest form.

LCD is ___.

$$\frac{1}{9} + \frac{1}{6} =$$

LCD is ___.

$$\frac{4}{9} + \frac{1}{2} =$$

LCD is ___.

$$\frac{5}{7} - \frac{1}{2} =$$

LCD is ___.

$$\frac{3}{10} - \frac{1}{6} =$$