## THE MATH PAK

## Fractions and Decimals

## FRACTION AND DECIMAL MATH PAK INSTRUCTIONS

## Welcome to Math Team!

This package contains drills on fraction and decimal arithmetic. If you complete all these drills, you will be well on your way to Math Team! Here's what we want you to do:

1. Work each unit in order.

Work as many problems are you can in as many units as you can. You don't have to work all the problems in every unit. Just do your best!
2. Please don't use a calculator to work these problems.
3. Check your answers with the answers in the answer page.

If you missed any, try to figure out where you made your mistakes. If you still can't figure it out, ask your parents, or get someone to help you. Don/t erase! Just correct your problem over the old answer.
4. Turn in your completed Math Pak (complete with corrected problems) when Math Team begins!

Yay! You are on your way!

## INTRODUCTION TO FRACTIONS

Fractions are expressed as one number over another number, like this:

$$
\frac{1}{2}<==\text { This mean a half of something! }
$$

The number on the top is called the numerator and the number on the bottom is called the denominator.
When you think of a fraction, think of a PIZZA!!
Suppose a pizza is cut evenly into the number of pieces in the DENOMINATOR.
If the number of pieces YOU get is the NUMERATOR, the fraction of the pizza you get is:
$\frac{1}{2}$
$\frac{1}{4}$
$\frac{3}{8}$
$\frac{2}{3}$
$\frac{3}{4}$


Adding and taking away (subtracting) fractions can be pictured using slices of pizza. For example:
$+$
$=\frac{3}{4}$
$\frac{1}{2}-\frac{1}{4}=\frac{1}{4}$


| Multiplying fractions means cutting a portion into smaller portions. |  |
| :---: | :---: |
| Example 1: | Example 2: |
| $1 \begin{array}{lll}1 & 1\end{array}$ | $1 \begin{array}{lll}1 & 1\end{array}$ |
| $2 \quad 2 \quad 4$ | $2 \quad 3 \quad 6$ |
| Means: half of a half = a fourth! | Means: half of a third = a sixth! |

Unit 1 show you how to do this multiplication.

## INTRODUCTION TO FRACTIONS (CONTINUED) DIVIDING FRACTIONS

Dividing fractions means determining how many smaller pieces there are in a larger piece.
For example:


Means: one-half divided by one-fourth is 2
This means there are $\mathbf{2}$ one-fourth pieces of pizza in a half pizza.

Unit 4 shows you how to do this division.
Here's another way to look at fractions. Imagine that you have a board and you want to cut it into halves, thirds, fourths, sixths, and fifths. Here is what those board fractions look like:

| <===================0ne whole board!!====================>> |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1/2 board |  |  | 1/2 board |  |  |
| 1/4 board | 1/4 board |  | 1/4 board | 1/4 board |  |
| 1/3 board | 1/3 board |  | 1/3 board |  |  |
| 1/6 board | 1/6 board | 1/6 board | 1/6 board | 1/6 board | 1/6 board |
| 1/5 board | 1/5 board | 1/5 boar | d 1/5 board |  | 1/5 board |

Notice that the $21 / 4$ th boards add up to a half board and that the $21 / 6$ boards add up to a $1 / 3$ board.
This means that there are 2 one-fourth boards in a half-board and that there are two one-sixth boards in a one-third board!

So now, let's begin!
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 1: FRACTION MULTIPLICATION

To multiply fractions, you multiply the numerators together and then multiply the denominators together. The numerator is the number on top and the denominator is the number on the bottom. The result (the "product") is always smaller than either of the original fractions.

EXAMPLES:
$\frac{1}{2} \times \frac{1}{2}=\frac{1 \times 1}{2 \times 2}=\frac{1}{4}$
$\frac{1}{8} \times \frac{3}{4}=\frac{1 \times 3}{8 \times 4}=\frac{3}{32}$

Means:
"one-half of one-half is one fourth"

Means:
"three fourths of one eighth is three thirty-seconds"

Multiply these fractions: (I will get you started with the first one)

1) $\frac{1}{2} \times \frac{1}{4}=\frac{1 \times 1}{2 \times 4}=-$
2) $\frac{1}{3} \times \frac{1}{3}=$
3) $\frac{1}{3} \times \frac{1}{2}=$
4) $\frac{1}{5} \times \frac{1}{4}=$
5) $\frac{1}{9} \times \frac{1}{9}=$
6) $\frac{3}{11} \times \frac{1}{4}=$
7) $\frac{1}{8} \times \frac{1}{2}=$
8) $\frac{1}{6} \times \frac{1}{2}=$
9) $\frac{1}{9} \times \frac{1}{8}=$
10) $\frac{3}{5} \times \frac{1}{5}=$
11) $\frac{1}{4} \times \frac{1}{4}=$
12) $\frac{1}{4} \times \frac{3}{4}=$
13) $\frac{2}{7} \times \frac{1}{7}=$
14) $\frac{1}{12} \times \frac{1}{2}=$
15) $\frac{7}{8} \times \frac{1}{4}=$
16) $\frac{5}{9} \times \frac{1}{3}=$
17) $\frac{1}{6} \times \frac{1}{6}=$
18) $\frac{5}{8} \times \frac{7}{9}=$
19) $\frac{1}{6} \times \frac{1}{8}=$
20) $\frac{1}{4} \times \frac{1}{8}=$
21) $\frac{3}{8} \times \frac{1}{8}=$
22) $\frac{3}{8} \times \frac{1}{4}=$
23) $\frac{1}{3} \times \frac{1}{5}=$
24) $\frac{5}{6} \times \frac{5}{6}=$
25) This problem is hard! $\frac{1}{12} \times \frac{1}{12}=$
26) This
problem is $\quad \frac{1}{50} \times \frac{1}{10}=$ hard!
27) This problem is $\frac{126}{254} \times \frac{50}{61}=$ hard!
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 2: FRACTION ADDITION- SAME DENOMINATORS

To add fractions that have the same denominators, you just add the numerators (the top numbers). You keep the same denominator.

## EXAMPLES:

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

$$
<=====\text { Don't add denominators }=====>
$$

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

## Add these fractions:

1) $\frac{1}{18}+\frac{1}{18}=\frac{}{18}$
2) $\frac{1}{8}+\frac{2}{8}=$
3) $\frac{1}{25}+\frac{1}{25}=$
4) $\frac{1}{56}+\frac{2}{56}=$
5) $\frac{1}{5}+\frac{1}{5}=$
6) $\frac{3}{11}+\frac{6}{11}=$
7) $\frac{16}{21}+\frac{1}{21}=$
8) $\frac{18}{23}+\frac{2}{23}=$
9) $\frac{6}{17}+\frac{4}{17}=$
10) 

$\frac{9}{11}+\frac{2}{11}=$
31) This
$\underset{\text { problem is }}{\text { This }} \quad \frac{342}{831}+\frac{288}{831}=$
2) $\frac{3}{5}+\frac{2}{5}=\frac{}{5}$
5) $\frac{1}{9}+\frac{1}{9}=$
8) $\frac{1}{36}+\frac{4}{36}=$
11) $\frac{1}{21}+\frac{3}{21}=$
14) $\frac{3}{8}+\frac{4}{8}=$
17) $\frac{4}{6}+\frac{1}{6}=$
20) $\frac{5}{61}+\frac{8}{61}=$
23) $\frac{1}{17}+\frac{8}{17}=$
26)
$\frac{9}{28}+\frac{10}{28}=$
29)
$\frac{1}{2}+\frac{1}{2}=$
3) $\frac{1}{3}+\frac{1}{3}=$
6) $\frac{1}{16}+\frac{1}{16}=$
9) $\frac{1}{27}+\frac{3}{27}=$
12) $\frac{1}{18}+\frac{6}{18}=$
15) $\frac{1}{7}+\frac{3}{7}=$
18) $\frac{7}{81}+\frac{6}{81}=$
21) $\frac{2}{23}+\frac{11}{23}=$
24) $\frac{6}{15}+\frac{5}{15}=$
27) $\frac{4}{91}+\frac{5}{91}=$
30) This problem is hard! $\frac{126}{251}+\frac{126}{251}=$
32) This This $\quad$ problem is $\quad \frac{1251}{2555}+\frac{899}{2555}=$ hard!
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 3: FRACTION SUBTRACTION - SAME DENOMINATORS

Fraction subtraction is similar to fraction addition. If the denominators are the same, just subtract the second numerator from the first one. The denominator stays the same. You $D O N^{\prime} T$ subtract the denominators!

EXAMPLES:

$$
\frac{3}{4}-\frac{1}{4}=\frac{3-1}{4}=\frac{2}{4} \quad<====\text { Don't subtract denominators! }=====>\quad \frac{4}{5}-\frac{2}{5}=\frac{4-2}{5}=\frac{2}{5}
$$

Subtract these fractions:

1) $\frac{4}{5}-\frac{1}{5}=\frac{}{5}$
2) $\frac{7}{8}-\frac{1}{8}=\frac{}{8}$
3) $\frac{5}{6}-\frac{1}{6}=$
4) $\frac{3}{7}-\frac{1}{7}=$
5) $\frac{5}{8}-\frac{3}{8}=$
6) $\frac{7}{9}-\frac{2}{9}=$
7) $\frac{9}{10}-\frac{1}{10}=$
8) $\frac{9}{11}-\frac{1}{11}=$
9) $\frac{15}{16}-\frac{1}{16}=$
10) $\frac{9}{11}-\frac{7}{11}=$
11) $\frac{15}{16}-\frac{11}{16}=$
12) $\frac{11}{13}-\frac{9}{13}=$
13) $\frac{8}{9}-\frac{7}{9}=$
14) $\frac{5}{7}-\frac{4}{7}=$
15) $\frac{6}{7}-\frac{4}{7}=$
16) $\frac{14}{21}-\frac{9}{21}=$
17) $\frac{55}{60}-\frac{50}{60}=$
18) $\frac{11}{23}-\frac{8}{23}=$
19) $\frac{17}{21}-\frac{13}{21}=$
20) $\frac{44}{56}-\frac{22}{56}=$
21) $\frac{27}{32}-\frac{22}{32}=$
22) $\frac{81}{90}-\frac{80}{90}=$
23) $\frac{14}{15}-\frac{11}{15}=$
24) $\frac{13}{56}-\frac{9}{56}=$
25) $\frac{21}{23}-\frac{11}{23}=$
26) $\frac{18}{31}-\frac{9}{31}=$
27) 

$$
\frac{77}{78}-\frac{58}{78}=
$$

27) $\frac{11}{14}-\frac{9}{14}=$
28) This problem is hard!

$$
\frac{126}{255}-\frac{88}{255}=
$$

28) 

$\frac{58}{51}-\frac{26}{51}=$
31) This
problem is $\frac{811}{812}-\frac{188}{812}=$ hard!
32) This

This problem is $\frac{1241}{2560}-\frac{899}{2560}=$ hard!
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 4: FRACTION DIVISION

To divide one fraction by another, you merely turn the second fraction upside-down (invert it) and then multiply!

## EXAMPLES:

$$
\begin{aligned}
& \frac{1}{2} \div \frac{1}{3}=\frac{1}{2} \times \frac{3}{1}=\frac{3}{2} \\
& \frac{1}{4} \div \frac{2}{5}=\frac{1}{4} \times \frac{5}{2}=\frac{5}{8}
\end{aligned}
$$

$<==$ Rewrite
the whole problem as a multiply by inverting the second fraction, then multiplying $=======>$

Sometimes, fraction division problems look like this:
$\frac{1 / 8}{1 / 4}=\frac{1}{8} \div \frac{1}{4}=\frac{1}{8} \times \frac{4}{1}=\frac{4}{8}$

Divide these fractions: (I'll invert the first two for you!)
Rewrite the whole problem as a multiply!

1) $\frac{1}{2} \div \frac{1}{4}=\frac{1}{2} \times \frac{4}{1}=$
2) $\frac{1}{3} \div \frac{1}{9}=$
3) $\frac{1}{5} \div \frac{1}{4}=$
4) $\frac{1}{4} \div \frac{1}{8}=$
5) $\frac{3}{4} \div \frac{8}{1}=$
6) $\frac{1}{2} \div \frac{1}{16}=$
7) $\frac{1 / 5}{2 / 10}=$
8) $\frac{3}{5} \div \frac{1}{10}=$
9) $\frac{1}{5} \div 10$
10) $\frac{3}{8} \div 3=$
11) $\frac{5}{8} \div \frac{8}{5}=$
12) $\frac{7}{8} \div \frac{5}{8}=$
13) $\frac{1}{2} \div \frac{3}{4}=\frac{1}{2} \times \frac{4}{3}=$
14) $\frac{1}{3} \div \frac{2}{9}=$
15) $\frac{1}{2} \div \frac{1}{9}=$
16) $\frac{1}{4} \div \frac{8}{1}=$
17) $\frac{1}{4} \div 8=$
18) $\frac{3}{4} \div \frac{1}{16}=$
19) $\frac{2}{5} \div \frac{1}{10}=$
20) $\frac{1}{4} \div \frac{8}{12}=$
21) $\frac{3}{8} \div \frac{3}{1}=$
22) $\frac{3 / 8}{8 / 5}=$
23) $\frac{5}{8} \div \frac{5}{8}=$
24) This problem is hard!

$$
\frac{16}{31} \div \frac{8}{81}=
$$

$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 5: FRACTIONS: CHANGING DENOMINATORS

To change the denominator of a fraction to another number, divide the denominator you want by the denominator you have and then multiply by your numerator to get the new numerator.
EXAMPLES: $\frac{1}{2}=\frac{?}{8} \quad \begin{aligned} & \quad \begin{array}{l}\quad \\ \text { because } 8 / 2=4, \\ \text { and } 1 \times 4=4\end{array}\end{aligned}$

$$
\frac{3}{4}=\frac{?}{8} \quad \begin{aligned}
& \quad=6 \text { is the answer } \\
& \text { because } 8 / 4=2 \\
& \text { and } 3 \times 2=6
\end{aligned}
$$

Change these fractions to their new denominators (fill in the missing number):

1) $\frac{1}{2}=\frac{}{4}$
( $4 / 2$ ) $=2$ and then
$2 \times 1=$ what?
2) 

$\frac{1}{3}=\frac{}{9}$
5)
$\frac{3}{4}=-$
8)
$\frac{5}{6}=\frac{}{12}$
11)
$\frac{1}{9}=\frac{}{18}$
14)
$\frac{9}{15}=\frac{}{30}$
17) $\frac{1}{32}=\frac{}{64}$
20) $\frac{9}{11}=\frac{}{44}$
23) $\frac{8}{9}=\frac{}{81}$
26) This problem is hard!
$\frac{8}{211}=\frac{}{422}$
3)

$$
\frac{2}{3}=\frac{-}{9}
$$

6) $\frac{1}{8}=\frac{}{16}$
7) $\frac{1}{8}=\frac{}{32}$
8) $\frac{2}{9}=\frac{}{18}$
9) $\frac{4}{15}=\frac{}{30}$
10) $\frac{12}{18}=\frac{}{36}$
11) $\frac{5}{16}=\frac{}{32}$
12) $\frac{5}{7}=\frac{}{49}$
$\qquad$ Parent: $\qquad$ Points: $\qquad$
UNIT 6: FRACTION ADDITION - DIFFERENT DENOMINATORS (PART 1)

| To add fractions with different denominators, you must first change both denominators to be the same. | EXAMPLES: |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\frac{1}{2}+\frac{1}{4}$ change the | $\frac{1}{2}$ to |  | then add: | $\frac{2}{4}$ |  |  |
| The denominator will be the LARGER of the 2 denominators. | $\frac{3}{8}+\frac{1}{4}$ change the | $\frac{1}{4} \text { to }$ | 8 | then add: | $\frac{3}{8}+$ |  |  |

To do this you will need the skills you learned in Unit 5 . Once you have both denominators the same, then you just add the numerators. If the denominator of one fraction divides evenly (no remainder) into the other, then change the fraction with the smaller denominator to a fraction with the larger denominator, then add numerators.

Add these fractions: (I will give you the first $\mathbf{3}$ common denominators!)

1) $\frac{3}{4}+\frac{1}{2}=\frac{3}{4}+\frac{-}{4}=$
2) $\frac{1}{3}=\frac{1}{9}=\frac{1}{9}+\frac{1}{9}=$
3) $\frac{2}{3}=\frac{1}{9}=\frac{-}{9}+\frac{1}{9}=$
4) $\frac{1}{4}+\frac{1}{8}=$
5) $\frac{1}{4}+\frac{3}{8}=$
6) $\frac{1}{4}+\frac{2}{8}=$
7) $\frac{1}{5}+\frac{6}{10}=$
8) $\frac{1}{5}+\frac{7}{10}=$
9) $\frac{2}{5}+\frac{7}{10}=$
10) $\frac{3}{5}+\frac{1}{10}=$
11) $\frac{3}{5}+\frac{2}{10}=$
12) $\frac{1}{16}+\frac{1}{32}=$
13) $\frac{3}{4}+\frac{1}{8}=$
14) $\frac{1}{5}+\frac{1}{10}=$
15) $\frac{1}{5}+\frac{3}{10}=$
16) $\frac{1}{4}+\frac{5}{16}=$
17) $\frac{1}{4}+\frac{7}{16}=$
18) $\frac{3}{4}+\frac{3}{16}=$
19) $\frac{3}{4}+\frac{5}{16}=$
20) $\frac{1}{16}+\frac{9}{32}=$
21) $\frac{1}{16}+\frac{3}{32}=$
22) $\frac{3}{16}+\frac{3}{32}=$
23) $\frac{1}{4}+\frac{1}{16}=$
24) $\frac{3}{4}+\frac{1}{16}=$

These 3 problems are hard!
25)
$\frac{3}{8}+\frac{1}{64}=$
26)
$\frac{3}{9}+\frac{5}{81}=$
27)
$\frac{126}{256}+\frac{9}{512}=$
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 7: FRACTION ADDITION - DIFFERENT DENOMINATORS (PART 2)

To add fractions with different denominators, you must first change both denominators to be the same. To do this you will need the skills you learned in Unit 5 . Once you have both denominators the same, then you just add the numerators. Sometimes one denominator does not divide evenly into the other, as they did in Unit 6. In this case you must change BOTH denominators into a number that both original denominators will divide into evenly.

An easy way to find this new denominator is to multiply the 2 original denominators
together to get your new one!


Add these fractions:
(I will give you the first $\mathbf{3}$ common denominators!)

1) $\frac{1}{4}+\frac{1}{6}=\frac{}{24}+\frac{}{24}=$
2) $\frac{1}{4}+\frac{2}{6}=\frac{}{24}+\frac{}{24}=$
3) $\frac{1}{4}+\frac{2}{5}=$
4) $\frac{1}{4}+\frac{3}{5}=$
5) $\frac{1}{4}+\frac{1}{5}=$
6) $\frac{3}{4}+\frac{2}{5}=$
7) $\frac{3}{4}+\frac{3}{5}=$
8) $\frac{1}{5}+\frac{1}{6}=$
9) $\frac{1}{5}+\frac{2}{6}=$
10) $\frac{3}{4}+\frac{1}{5}=$
11) $\frac{4}{5}+\frac{1}{6}=$
12) $\frac{1}{5}+\frac{5}{6}=$
13) $\frac{1}{8}+\frac{1}{7}=$
14) $\frac{5}{6}+\frac{6}{8}=$
15) $\frac{3}{4}+\frac{1}{3}=\frac{1}{12}+\frac{}{12}=$
16) $\frac{3}{4}+\frac{3}{6}=$
17) $\frac{2}{5}+\frac{1}{6}=$
18) $\frac{3}{5}+\frac{1}{6}=$
19) $\frac{1}{8}+\frac{3}{7}=$
20) $\frac{8}{11}+\frac{5}{8}=$
21) $\frac{15}{13}+\frac{8}{11}=$

Name: $\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 8: FACTORING

To 'factor' a number means to break it up into numbers that can be multiplied together to get the original number.

## EXAMPLES:

$6=3 \times 2<==$ The factors of 6 are 3 and 2
Sometimes, numbers can be factored into different combinations.

For example: $8=4 \times 2$ and $2 \times 2 \times 2$
Two different ways to factor:
How about 18? 18=9 X 2 or $6 \times 3$

Factor the following numbers. I will factor the first one for you!

1) $10=5 \times 2$
2) $15=$
3) $20=$
4) $21=$
5) $22=$
6) $4=$
7) $12=$
8) $14=$
9) $26=$
10) $27=$
11) $25=$
12) $30=$
13) $28=$
14) $50=$
15) $33=$
16) $34=$
17) $70=$
18) $46=$
19) $39=$
20) This problem is hard!
21) This problem is hard!
$169=$
$95=$
22) This problem is hard!
$221=$
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 9: FRACTIONS - REDUCING TO LOWEST TERMS

Sometimes the numerator of a fraction will divide evenly into the denominator. The fraction can be reduced by replacing the numerator with a 1 and dividing the original denominator by the numerator to get a new denominator.
EXAMPLES:

$$
\frac{2}{4}=\frac{1}{2} \quad \text { because } \mathbf{4} / \mathbf{2}=\mathbf{2} \quad \frac{2}{6}=\frac{1}{3} \quad \text { because } \mathbf{6} / \mathbf{2}=\mathbf{3}
$$

Fractions in which the numerator and denominator contain the same factor can also be reduced by removing the common factor from both the numerator and the denominator.
EXAMPLES: $\frac{6}{9}=\frac{9 \times 2}{9 \times 3}$

The 3s cancel because they are in both the numerator and the denominator, and you get

$$
\frac{21}{28}=\frac{\nabla \times 3}{8 \times 4}
$$ 2/3

The 7s cancel and you get:

3/4

## Reduce these fractions to their lowest terms:

(I will give you the common factors for the first 3 problems!)

1) $\frac{10}{15}=\frac{5 \times 2}{5 \times 3}=$
(common factor is $\mathbf{5}$ )
2) $\frac{9}{27}=$
3) $\frac{6}{10}=$
4) 

$$
\frac{6}{20}=
$$

13) $\frac{5}{20}=$
14) $\frac{10}{12}=$
15) $\frac{8}{14}=$
16) $\frac{3}{15}=$
17) $\frac{18}{36}=$
18) $\frac{6}{12}=$
(common factor is $\mathbf{6}$ )
19) $\frac{12}{18}=$
20) $\frac{6}{14}=$
21) $\frac{8}{16}=$
22) $\frac{5}{25}=$
23) $\frac{10}{14}=$
24) $\frac{7}{14}=$
25) $\frac{5}{15}=$
26) This
problem is $\quad \frac{55}{66}=$ hard!
27) $\frac{4}{8}=$
(common factor is 4)
28) $\frac{6}{8}=$
29) $\frac{6}{18}=$
30) $\frac{3}{9}=$
31) $\frac{5}{30}=$
32) $\frac{12}{14}=$
33) $\frac{6}{16}=$
34) $\frac{18}{27}=$

Name: $\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 10: FRACTIONS - MIXED NUMBERS

A fraction in which the numerator is larger than the denominator is called an improper fraction.
These are improper fractions:

$$
\begin{array}{llll}
\frac{10}{8} & \frac{12}{6} & \frac{15}{9} & \frac{21}{10}
\end{array}
$$

Fractions like these can be turned into mixed numbers. A mixed number is a whole number with a fraction added to it. You turn an improper fraction into a mixed number by dividing the numerator by the denominator and making a fraction that goes with it (if there is one) by putting the remainder over the denominator.
The above improper fractions change into mixed numbers by dividing the numerator by the denominator, like this:

| $\frac{10}{8}$ | $\frac{12}{6}$ | $\frac{15}{9}$ | $\frac{21}{10}$ |
| :---: | :---: | :---: | :---: |
| $\begin{gathered} 8 \frac{1}{110}=1 \quad 2 / 8 \\ \frac{8}{2} \text { <remainder } \end{gathered}$ | $6 \begin{aligned} & 6 \frac{2}{12} \\ & \frac{12}{0}<- \text { no remainder, } \\ & \text { no fraction } \end{aligned},$ | $\begin{array}{r} 9 \frac{1}{15} \\ \frac{9}{6} \text { 〔-remainder } \\ \\ \\ \hline \end{array}$ | $\begin{array}{r} 10 \begin{array}{r} 2 \\ \frac{21}{1} \end{array}=2 \quad 1 / 10 \\ \frac{20}{} \text { <-remainder } \end{array}$ |

## Turn these improper fractions into mixed numbers:

1) $\frac{20}{8}=$

Hint: $\mathbf{8}$ goes into 20 how many times? $\qquad$
2)
$\frac{6}{4}=$
3)
$\frac{6}{5}=$

What is left over? $\qquad$
4) $\frac{12}{8}=$
5) $\frac{12}{9}=$
8) $\frac{18}{6}=$
11) $\frac{18}{9}=$
6) $\frac{12}{10}=$
7) $\frac{12}{11}=$
10) $\frac{18}{8}=$
14) $\frac{7}{4}=$
9) $\frac{18}{7}=$
12) $\frac{25}{12}=$
15)
$\frac{7}{3}=$
16) $\frac{7}{2}=$
17) This problem is hard! $\frac{50}{8}=$
18) This problem is hard! $\frac{250}{9}=$
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 11: FRACTIONS - MULTIPLYING MIXED NUMBERS

To multiply mixed numbers by any other number (fraction, whole number or another mixed number) you must first convert the mixed number to an improper fraction.
To convert a mixed number to an improper fraction, you multiply the denominator by the whole number and then add the numerator to get your new numerator. The denominator stays the same.
This is just the opposite of what we did in unit 10.

$$
\text { EXAMPLES: } \quad 5 \frac{1}{8}=\frac{8 \times 5+1}{8}=\frac{41}{8} \quad 2 \frac{3}{5}=\frac{5 \times 2+3}{5}=\frac{13}{5} \quad 4 \frac{1}{3}=\frac{3 \times 4+1}{3}=\frac{13}{3}
$$

Here's how to think about this:

- Take the first mixed number: $51 / 8 \mathrm{th}$.
- How many 8ths are there in 5? There are 40 of them. (Each whole number has 8 8ths.)
- Add 1 to get 41/8ths.

```
WARNING: IT DOESN'T WORK TO JUST
MULTIPLY THE WHOLE NUMBERS
AND THE FRACTIONS SEPARATELY!
\[
\rightarrow 2 \frac{1}{2} \times 2 \frac{1}{2} \quad \text { IS NOT } 2 \times 2+\frac{1}{2} \times \frac{1}{2}=4+\frac{1}{4}
\]
```

Multiply the following: (I will convert the first mixed number for you!)
1)

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

Note: the 2 becomes $2 / 1$ as a fraction
2)

$$
3 \frac{1}{8} \times \frac{1}{2}=\square \times \square=\square
$$

4) 

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

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

10) 

$4 \frac{1}{8} \times 4 \frac{1}{8}=$ $\qquad$ $\times-=-$
3)

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

$\qquad$ $\times \square=-$
5)
$6 \frac{1}{5} \times \frac{1}{3}=$ $\qquad$
$\qquad$
7) $6 \frac{4}{5} \times 1 \frac{1}{2}=$ $\qquad$ $\times \square=\square$
9) $\qquad$
11) This problem is hard!

$$
15 \frac{1}{2} \times 15 \frac{1}{2}=
$$

$\qquad$
$\qquad$ Points: $\qquad$

## UNIT 12: INTRODUCTION TO DECIMALS

|  |  | Decimals are numbers that contain a decimal point, like: |  |  |
| :--- | :--- | :--- | :--- | :--- |
| 1.5 | $\mathbf{2 . 8}$ | $\mathbf{. 2}$ | $\mathbf{3 . 1 4}$ | $\mathbf{6 6 . 6 6}$ |

The number to the left of the decimal point is an integer (positive or negative whole number or zero).
The number to the right of the decimal is called the "tenths" digit and tells you the number of tenths ( $1 / 10$ 's) that are added to the whole number to the left of the decimal point. So...
1.5 is the same as the mixed number

$$
1 \text { and } \frac{5}{10} \text {, or } 1 \frac{5}{10}
$$

$\mathbf{2 . 8}$ is 2 and $\frac{8}{10}$, or $2 \frac{8}{10} \quad . \mathbf{2}$ is $\frac{2}{10}$

If there are 2 numbers to the right of the decimal point then both numbers to the right of the decimal point are the number of "hundredths" ( $1 / 100$ 's) to be added to the whole number, so.....
3.14 is the same as the mixed number 3 and $\frac{14}{100}$, or $3 \frac{14}{100}$
66.66 is the same
66 and $\frac{66}{100}$, or $66 \frac{66}{100}$

Convert these decimals to mixed numbers:

1) $1.6=$
2) $2.9=$
3) $14.4=$
4) $\mathbf{1 6 . 1 7}=$
5) $22.88=$
6) This problem is hard! $1.04=$

## Convert these mixed numbers to decimals:

7) 

$4 \frac{6}{10}$
8) $2 \frac{3}{10}$
9) $6 \frac{8}{10}$
10)
$9 \frac{56}{100}$
11) $15 \frac{88}{100}$
12) This problem is hard!
$88 \frac{5}{100}$
$\qquad$ Points: $\qquad$

## UNIT 13: DECIMAL ADDITION

To add decimals, you must write one above the other with their decimal points lined up, like this:
1.5
8.95
44.91
14.
$+2.6+1.9+.2+.04$

Where one decimal doesn't have digits that the other one does, you put in zeroes, like this:

| 1.5 | 8.95 | 44.91 | 14.00 |
| ---: | ---: | ---: | ---: |
| +2.6 | $+\quad 1.90$ | +00.20 |  |

Now, its easy! You just add the two numbers as you would two whole numbers, with carries if necessary, but you keep track of where the decimal point goes and put it in the result right under the decimal points in the two numbers being added, like this:

| 1.5 | 8.95 | 44.91 | 14.00 |
| :---: | :---: | :---: | :---: |
| + 2.6 | $\begin{array}{r}\text { P } \\ +1.90 \\ \hline 10.95\end{array}$ | + 00.20 | + 00.04 |
| 4.1 | 10.85 | 45.11 | 14.04 |

## Add these decimals: (I will line up the first decimal for you!)

1) 

2.2
$\begin{array}{r}+\quad .1 .1 \\ \hline\end{array}$
2) $4.4+8.8$
3) $9.09+.2$
4) $16 .+1.05$
5)
$.3+1.55$
6) This problem is hard!
$9.99+100.99$

Name: $\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 14: DECIMAL SUBTRACTION

Decimal subtraction is similar to decimal addition. You write down both decimals one above the other with their decimal points lined up. Then you just substract as you would 2 whole numbers, with borrows if necessary, but you bring down the decimal point like you did with decimal addition.

## EXAMPLES:

$$
\begin{array}{rrr}
23.06 & 1.44 & 2.3 \\
-14.07 & - & 0.06 \\
\hline 8.99 & \underline{1.38} & \underline{1.5}
\end{array}
$$

Subtract these decimals: (Allow me to line up the first one!)

1) $2.3-1.1=$
2.3

- 1.1

2) $44.2-.2$
3) $9.31-1.2$
4) $6.66-4.48$
5) $16.23-1.4$
6) 1.06-. 1
7) 144.2-128.3
8) 29-1.4
9) 14.4-13.9
10) $18.1-1.44$
11) 32.6-2.88
12) This problem is hard! . 228 - . 01
$\qquad$ Parent: $\qquad$ Points: $\qquad$

## UNIT 15: DECIMAL MULTIPLICATION

To multiply 2 decimals, you merely multiply the 2 numbers together, ignoring the decimal points. Then, when you have your answer (called the "product"), you add the number of digits to the right of the decimal point in each number together and place the decimal in your answer (product) that many places from the RIGHT.

YOU DON'T LINE UP THE DECIMAL POINTS!

## EXAMPLES:



Multiply these decimals (don't use your calculator and DON'T LINE UP THE DECIMAL POINTS!):
1)

$$
\begin{aligned}
3.6<-- & (3 \times 1=3 \\
\times 1.3 & \text { so your answer } \\
& \text { should be close to } 3)
\end{aligned}
$$

2) 

$18.2<--\quad(18 \times 1=18$,
$\times 1.1$ so your answer should be close to 18)
3)

| 1.2 |
| ---: |
| $\times \quad 9$ |

4) 

8.6
$\begin{array}{r} \\ \times 4.4 \\ \hline\end{array}$
5)

$$
\begin{array}{r}
11.22 \\
\times \quad .4 \\
\hline
\end{array}
$$

6) 

4.44
1.6
$\times \quad$
7)
$\begin{array}{r}.44 \\ \times \quad 6 \\ \hline\end{array}$
8)
. 49
$\times . .06$
9) This problem is hard!
. 12
$\times . .06$
$\qquad$ Parent: $\qquad$ Points: $\qquad$
UNIT 16: DECIMAL DIVISION

Here's how you divide one decimal by another: Suppose you want to divide 4.5 by 1.8
First, you write your problem as you normally would:

$$
1 . 8 \longdiv { 4 . 5 }
$$

Next, you move the decimals in both the numbers to the right the same number of times until the divisor is a whole number.

$$
\text { divisor } \longrightarrow 1.8 \sqrt[4]{4.5}
$$

The decimal point in your answer will be lined up with the one in the number you are dividing into. Now, you do your division:

$$
\begin{aligned}
& \frac{2 .}{} \\
& \frac{36}{9} \longleftarrow \text { remainder }
\end{aligned}
$$

Next, if you have a remainder, bring down a zero from the number being divided and continue:

$$
\text { 18. } \begin{array}{r}
2.5 \\
\frac{35.0}{36} \downarrow \\
\\
\\
\\
\\
\hline 90 \\
\hline 0 \\
\hline
\end{array} \text { no remainder }
$$

Check your answer for reasonableness by ignoring the part past the decimal and dividing in your head! For example, in this last problem $45 / 18$ is about $\mathbf{2}$ so the answer should be near 2.

Divide these decimals: (These problems are all hard but don't use your calculator!)
1)

2)
$2 . 4 \longdiv { 8 . 4 }$
3) $4 . 0 \longdiv { 5 . 0 }$
4)

$$
2 . 0 \longdiv { 1 5 . 5 }
$$

5) 

$. 0 4 \longdiv { 1 . 8 8 }$
6)
$8 . 8 \longdiv { . 4 4 0 }$

## Congratulations! You have finished!

MATH PAK ANSWERS

| UNIT 1: | UNIT 2: | UNIT 3: | UNIT 4: |
| :---: | :---: | :---: | :---: |
| FRACTION | FRACTION ADDITION | FRACTION | FRACTION |
| MULTIPLICATION | SAME | SUBTRACTION | DIVISION |
|  | DENOMINATORS | SAME DENOMINATORS |  |
| 1. $1 / 8$ |  |  | 1. $4 / 2$ or 2 |
| 2. $1 / 9$ | 1. $2 / 18$ or $1 / 9$ | 1. $3 / 5$ | 2. $4 / 6$ or $2 / 3$ |
| 3. $1 / 6$ | 2. 1 | 2. $6 / 8$ or $3 / 4$ | 3. $9 / 3$ or 3 |
| 4. $1 / 20$ | 3. $2 / 3$ | 3. $4 / 6$ or $2 / 3$ | 4. $9 / 6$ or $11 / 2$ |
| 5. $1 / 12$ | 4. $3 / 8$ | 4. $2 / 7$ | 5. $4 / 5$ |
| 6. $1 / 36$ | 5. $2 / 9$ | 5. $2 / 8$ or $1 / 4$ | 6. $9 / 2$ or $41 / 2$ |
| 7. $1 / 81$ | 6. $2 / 16$ or $1 / 8$ | 6. 5/9 | 7. $8 / 4$ or 2 |
| 8. $1 / 72$ | 7. $2 / 25$ | 7. $8 / 10$ or $4 / 5$ | 8. $1 / 32$ |
| 9. $35 / 72$ | 8. $5 / 36$ | 8. $8 / 11$ | 9. $3 / 32$ |
| 10. $3 / 44$ | 9. $4 / 27$ | 9. $14 / 16$ or $7 / 8$ | 10. $1 / 32$ |
| 11. $3 / 25$ | 10. $3 / 56$ | 10. $2 / 11$ | 11. $16 / 2$ or 8 |
| 12. $1 / 48$ | 11. $4 / 21$ | 11. $4 / 16$ or $1 / 4$ | 12. $48 / 4$ or 12 |
| 13. $1 / 16$ | 12. $7 / 18$ | 12. $2 / 13$ | 13. $10 / 10$ or 1 |
| 14. $1 / 16$ | 13. $2 / 5$ | 13. $1 / 9$ | 14. $20 / 5$ or 4 |
| 15. $1 / 32$ | 14. $7 / 8$ | 14. $1 / 7$ | 15. $30 / 5$ or 6 |
| 16. $3 / 32$ | 15. $4 / 7$ | 15. $2 / 7$ | 16. $12 / 32$ or $3 / 8$ |
| 17. $3 / 16$ | 16. $9 / 11$ | 16. $5 / 21$ | 17. $1 / 50$ |
| 18. $3 / 64$ | 17. 5/6 | 17. $5 / 60$ or $1 / 12$ | 18. $3 / 24$ or $1 / 8$ |
| 19. $3 / 20$ | 18. $13 / 81$ | 18. $3 / 23$ | 19. $3 / 24$ or $1 / 8$ |
| 20. $2 / 49$ | 19. $17 / 21$ | 19. $4 / 21$ | 20. 15/64 |
| 21. $3 / 32$ | 20. 13/61 | 20. 5/32 | 21. $25 / 64$ |
| 22. $1 / 25$ | 21. $13 / 23$ | 21. $1 / 90$ | 22. $40 / 40$ or 1 |
| 23. $1 / 24$ | 22. $20 / 23$ | 22. $22 / 56$ or $11 / 28$ | 23. $56 / 40$ or $12 / 5$ |
| 24. $1 / 15$ | 23. $9 / 17$ | 23. $3 / 15$ or $1 / 5$ | 24. $1296 / 248$ or 5 |
| 25. $8 / 27$ | 24. $11 / 15$ | 24. $4 / 56$ or $1 / 14$ | 7/31 |
| 26. $7 / 32$ | 25. 10/17 | 25. 10/23 |  |
| 27. 25/36 | 26. 19/28 | 26. $9 / 31$ |  |
| 28. $16 / 25$ | 27. 9/91 | 27. $2 / 14$ or $1 / 7$ |  |
| 29. 5/27 | 28. $11 / 11$ or 1 | 28. 32/51 |  |
| 30. 1/144 | 29. $2 / 2$ or 1 | 29. 19/78 |  |
| 31. 1/500 | 30. $252 / 251$ or $11 / 251$ | 30. 38/255 |  |
| 32. $6300 / 15494$ | 31. 630/831 | 31. $623 / 812$ |  |
|  | 32. $2150 / 2555$ | 32. $342 / 2560$ |  |


| UNIT 5: | UNIT 6: | UNIT 7: | UNIT 8: |
| :---: | :---: | :---: | :---: |
| FRACTIONS: | FRACTION ADDITION: | FRACTION ADDITION: | FRACTIONS: |
| CHANGING | DIFFERENT | DIFFERENT | FACTORING |
| DENOMINATORS | DENOMINATORS | DENOMINATORS | 1. $5 \times 2$ |
| 1. $2 / 4$ |  |  | 2. $5 \times 3$ |
| 2. $3 / 9$ | 1. $5 / 4$ or $11 / 4$ | 1. $10 / 24$ or | 3. $5 \times 2 \times 2$ |
| 3. $6 / 9$ | 2. $4 / 9$ | 5/12 | or |
| 4. $2 / 8$ | 3. $7 / 9$ | 2. $14 / 24$ or | $5 \times 4$ |
| 5. $6 / 8$ | 4. $3 / 8$ | 7/12 | 4. $7 \times 3$ |
| 6. $2 / 16$ | 5. $5 / 8$ | 3. $13 / 12$ or | 5. $11 \times 2$ |
| 7. $12 / 16$ | 6. $4 / 8$ or $1 / 2$ | $11 / 12$ | 6. $2 \times 2$ |
| 8. $10 / 12$ | 7. $8 / 10$ or $4 / 5$ | 4. $9 / 20$ | 7. $4 \times 3$ or |
| 9. $4 / 32$ | 8. $9 / 10$ | 5. $13 / 20$ | $2 \times 2 \times 3$ |
| 10. $4 / 16$ | 9. $11 / 10$ or $11 / 10$ | 6. $17 / 20$ | 8. $7 \times 2$ |
| 11. $2 / 18$ | 10. $7 / 10$ | 7. $30 / 24$ or | 9. $13 \times 2$ |
| 12. $4 / 18$ | 11. $8 / 10$ or $4 / 5$ | $11 / 4$ | 10. $9 \times 3$ or |
| 13. $10 / 16$ | 12. $3 / 32$ | 8. $23 / 20$ or | $3 \times 3 \times 3$ |
| 14. $18 / 32$ | 13. $7 / 8$ | $13 / 20$ | 11. $5 \times 5$ |
| 15. $8 / 30$ | 14. $3 / 10$ | 9. $27 / 20$ or | 12. $5 \times 6$ or |
| 16. $18 / 30$ | 15. $5 / 10$ or $1 / 2$ | 17/20 | $5 \times 3 \times 2$ |
| 17. 2/64 | 16. $9 / 16$ | 10. $31 / 20$ or | 13. $7 \times 4$ or |
| 18. $24 / 36$ | 17. $11 / 16$ | $111 / 20$ | $7 \times 2 \times 2$ |
| 19. $22 / 88$ | 18. $15 / 16$ | 11. $11 / 30$ | 14. $10 \times 5$ or |
| 20. $36 / 44$ | 19. $17 / 16$ or $11 / 16$ | 12. $16 / 30$ or | $5 \times 5 \times 2$ |
| 21. $10 / 32$ | 20. 11/32 | 8/15 | 15. $11 \times 3$ |
| 22. $30 / 62$ | 21. $5 / 32$ | 13. $17 / 30$ | 16. $17 \times 2$ |
| 23. $72 / 81$ | 22. 9/32 | 14. $23 / 30$ | 17. $7 \times 10$ or |
| 24. $35 / 49$ | 23. $5 / 16$ | 15. 19/20 | $7 \times 5 \times 2$ |
| 25. 32/64 | 24. $13 / 16$ | 16. $29 / 30$ | 18. $23 \times 2$ |
| 26. 16/422 | 25. 25/64 | 17. $31 / 30$ or $11 / 30$ | 19. $13 \times 3$ |
|  | 26. $32 / 81$ | 18. $15 / 56$ | 20. $13 \times 13$ |
|  | 27. $261 / 512$ | 19. $31 / 56$ | 21. $19 \times 5$ |
|  |  | 20. $76 / 48$ or | 22. $17 \times 13$ |
|  |  | 21. 119/88 or |  |
|  |  | $131 / 88$ |  |
|  |  | 22. $269 / 143$ or |  |
|  |  | $1126 / 143$ |  |


| UNIT 9: | UNIT 10: | UNIT 11: | UNIT 12: |
| :---: | :---: | :---: | :---: |
| FRACTIONS: | FRACTIONS: | FRACTIONS: | INTRODUCTION |
| REDUCING TO | MIXED NUMBERS | MULTIPLYING MIXED NUMBERS | TO DECIMALS |
| LOWEST TERMS |  |  |  |
| 1. $2 / 3$ | 1. $24 / 8$ or | 1. $\begin{aligned} & 8 / 3 \text { or } \\ & 22 / 3\end{aligned}$ | 1. $\begin{aligned} & 16 / 10 \text { or } \\ & 13 / 5\end{aligned}$ |
| 2. $1 / 2$ | 2. $12 / 4$ or | 2. $25 / 16$ or | 2. $29 / 10$ |
| 3. $1 / 2$ | $11 / 2$ | $19 / 16$ | 3. $144 / 10$ or |
| 4. $1 / 3$ | 3. $11 / 5$ | 3. $13 / 18$ | $142 / 5$ |
| 5. $2 / 3$ | 4. $14 / 8$ or | 4. $11 / 12$ | 4. $1617 / 100$ |
| 6. $3 / 4$ | $11 / 2$ | 5. $31 / 15$ or | 5. $2288 / 100$ or |
| 7. $3 / 5$ | 5. $13 / 9$ or | $21 / 15$ | 22 22/25 |
| 8. $3 / 7$ | $11 / 3$ | 6. $65 / 6$ or | 6. $14 / 100$ or |
| 9. $1 / 3$ | 6. $12 / 10$ or | 10 5/6 | $11 / 25$ |
| 10. $3 / 10$ | $11 / 5$ | 7. $102 / 10$ or | 7. 4.6 |
| 11. $1 / 2$ | 7. $11 / 11$ | $101 / 5$ | 8. 2.3 |
| 12. $1 / 3$ | 8. 3 | 8. $25 / 4$ or | 9. 6.8 |
| 13. $1 / 4$ | 9. $24 / 7$ | $61 / 4$ | 10. 9.56 |
| 14. $1 / 5$ | 10. $22 / 8 \mathrm{OR}$ | 9. $14 / 2$ or 7 | 11. 15.88 |
| 15. $1 / 6$ | $21 / 4$ | 10. 1089/64 or | 12. 88.05 |
| 16. $5 / 6$ | 11. 2 | 17 1/64 |  |
| 17. 5/7 | 12. $21 / 12$ | 11. $961 / 4$ or |  |
| 18. $6 / 7$ | 13. $112 / 13$ | $2401 / 4$ |  |
| 19. $4 / 7$ | 14. $13 / 4$ |  |  |
| 20. $1 / 2$ | 15. $21 / 3$ |  |  |
| 21. $3 / 8$ | 16. $31 / 2$ |  |  |
| 22. $1 / 5$ | 17. $62 / 8$ or |  |  |
| 23. $1 / 3$ | $61 / 4$ |  |  |
| 24. $2 / 3$ | 18. $277 / 9$ |  |  |
| 25. $1 / 2$ |  |  |  |
| 26. 5/6 |  |  |  |


| UNIT 13: | UNIT 14: | UNIT 15: | UNIT 16: |
| :---: | :---: | :---: | :---: |
| DECIMAL | DECIMAL | DECIMAL | DECIMAL |
| ADDITION | SUBTRACTION | MULTIPLICATION | DIVISION |
| 1. 3.3 | 1. 1.2 | 1. 4.68 | 1. 5.0 or 5 |
| 2. 13.2 | 2. 44. | 2. 20.02 | 2. 3.5 |
| 3. 9.29 | 3. 8.11 | 3. 10.8 | 3. 1.25 |
| 4. 17.05 | 4. 2.18 | 4. 37.84 | 4. 7.75 |
| 5. 1.85 | 5. 14.83 | 5. 4.488 | 5. 47. |
| 6. 110.98 | 6. . 96 | 6. 7.104 | 6. . 05 |
|  | 7. 15.9 | 7. 2.64 |  |
|  | 8. 27.6 | 8. . 0294 |  |
|  | 9. . 5 | 9. . 0072 |  |
|  | 10. 16.66 |  |  |
|  | 11. 29.72 |  |  |
|  | 12. . 218 |  |  |

