

T H E
H A N D B O O K
F O R

MathTalk FRACTIONS™

One of the Talking Notebook Series.

*A Powerful Learning Tool
for Mathematics Mastery*



First Byte®

THE WORLD'S LEADER IN SOFTWARE SPEECH TECHNOLOGY.

MathTalk FRACTIONS™

H A N D B O O K

TABLE OF CONTENTS

License and Use Agreement	IV
Getting Started	1
Main Menu Learning Modules	2
Problem Factory	2
Fraction Shuffle	4
Fun [^] House	6
Team Challenge	8
Control Panel	9
Words to Remember	11
Conversions	14
Making Changes	15
Problem Solving Steps	17
Problem Teasers	29

Copyright © 1987 by First Byte

First Byte
2845 Temple Avenue
Long Beach, CA 90806

SmoothTalker®, *MathTalk FRACTIONS*™, *Talking Notebook*®,
and *Gives Your Computer the Freedom of Speech*®, are
trademarks of First Byte. First Byte® and SmoothTalker® are
registered trademarks of First Byte.

First Byte

LICENSE AND USE AGREEMENT

MathTalk FRACTIONS Software

READ ALL OF THE TERMS AND CONDITIONS OF THIS AGREEMENT PRIOR TO INITIAL USE OF THE PROGRAM. USE OF THE PROGRAM DISK INDICATES YOUR ACCEPTANCE OF THESE TERMS AND CONDITIONS. If you do not agree to these terms and conditions, return the unused disk packet and the other components of this product to the place of purchase and your money will be refunded. No refunds will be given for products that have been used or have missing components.

PARTIES: This Agreement is entered into by and between First Byte ("FB"), a California corporation, and the individual (the "Customer") who receives the enclosed software (the "Software") and uses the program disk.

LICENSE: Subject to the terms and conditions set forth in this Agreement, FB hereby grants to Customer, and Customer accepts from FB, a non-exclusive and non-transferrable license (the "License") to use the Software.

TITLE TO SOFTWARE AND CONFIDENTIALITY: The Software and all programs developed hereunder and all copies thereof are proprietary to FB and title thereto remains in FB. All applicable rights to patents, copyrights, trademarks and trade secrets in the Software, including any rights which FB may have in the trademarks "First Byte" and "MathTalk FRACTIONS", are owned by and shall remain in FB. Without FB's prior written permission, Customer may not copy or otherwise reproduce, sell, transfer, publish, disclose, display or otherwise make available the Software or copies thereof to others. Customer agrees to secure and protect the Software in a manner consistent with the maintenance of FB's rights therein and to take appropriate action to satisfy its obligations hereunder. All copies of the Software made by Customer, whether authorized or unauthorized, shall be the property of FB. Violation of any provision of this paragraph shall be the basis for immediate termination of this Agreement without further action by FB.

USE AND RESTRICTIONS: This Agreement authorizes Customer to use the Software only on a stand-alone computer system owned by Customer. Customer may physically transfer the program from one computer system owned by Customer to another computer system owned by Customer provided that the Software is used only on one computer system at a time and that the Software is not transferred from one computer system to another over a network. Customer shall neither modify nor translate the Software or related documentation without the prior written consent of FB.

LIMITED WARRANTY: THE LICENSED SOFTWARE IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LICENSED SOFTWARE IS WITH CUSTOMER. FB does not warrant that the functions contained in this program will meet Customer's requirements or that the operation of this program will be uninterrupted or error free. However, FB warrants the disk on which this program is furnished to be free from defects under normal use for a period of ninety (90) days from the date of initial purchase.

LIMITATIONS OF REMEDIES: FB's entire liability and Customer's exclusive remedy shall be the replacement of any disk not meeting the limited warranty set forth above, which disk is returned at Customer's expense to FB or an authorized FB dealer with a copy of Customer's paid invoice. FB, in its sole discretion, will recopy or replace the defective disk with the same version of the Software, and return same to Customer at FB's expense.

In no event will FB be liable for any damages, including any direct, indirect, incidental or consequential damages arising out of the use or performance of the Software even if FB or an authorized dealer of FB has been advised of the possibility of such damages. Customer agrees that FB's liability arising out of contract, negligence, strict liability and tort or warranty shall not exceed any amounts paid by Customer for the Software.

TERM AND TERMINATION: This License is effective until terminated. Customer may terminate this License either by destroying the Software, any related documentation and all copies thereof, or by written notice of termination to FB. FB may terminate this License at any time by written notice if the Customer fails to comply with any of the terms of this Agreement. Within thirty (30) days after notice of termination is given by either FB or Customer, the Customer shall furnish a statement to FB certifying that, to the best of the Customer's knowledge, the original and all copies of the Software, in whole or part and in any form, have been returned to FB or destroyed. Termination pursuant to this paragraph shall not relieve Customer of its confidentiality obligations with respect to the Software.

MISCELLANEOUS: FB shall have the right to collect from Customer its reasonable expenses incurred in enforcing this Agreement, including attorneys' fees and costs.

This Agreement and performance hereunder shall be governed by and construed in accordance with the laws of the State of California.

Written inquiries concerning this Agreement may be directed to First Byte, Attention: President at 2845 Temple Avenue, Long Beach, CA 90806.

GETTING STARTED

WELCOME TO MathTalk FRACTIONS!

Professor Matt A. Matics of **MATHTALK** fame is back again. This time he is ready to help you master Fractions, Decimals, and Percents. You can enter your own problems to check your homework. With his help you will increase your understanding of the Fraction, Decimal, and Percent problems that you have to solve at school. The Professor has also "cooked up" some exciting games that challenge you to solve all types of problems, particularly those that show the interrelationship between Decimals, Fractions, and Percents. Get ready for new confidence in math class as you check your work in the **Problem Factory**, meet the **Team Challenge**, out-wager the Professor in **Fraction Shuffle**, and get the highest score in the **Fun House**.

Get out your paper, pencil, and calculator. All are helpful tools as you meet the **MathTalk FRACTION** challenge. Consult this Handbook for helpful hints, definitions, problem solving steps, and even extra problems to solve when you're ready.

GETTING STARTED

1. Select **New User** or **Main Menu**: If you select **New User**, the Professor supplies you with instructions and helpful hints at the beginning of each activity. By selecting **Main Menu** you will skip all the introductory instructions.
2. Once you reach the Main Menu, select a **Learning Module** or the **Control Panel**. Consult the next section of this Handbook to learn about each Module and **Control Panel** options.

MAIN MENU LEARNING MODULES

PROBLEM FACTORY:

The **Problem Factory** is the place to enter your own Fraction and Decimal problems. The Professor and his amazing calculating machine will not only tell you if you have answered the problem correctly but give you clues to help you correct mistakes. Here's how **Problem Factory** works!

Using the Problem Factory:

1. Select the type of problems you want to enter: Fractions or Decimals.
2. Enter your first problem

Fractions: Fractions must be entered as Proper Fractions or Mixed Numbers. The largest Fraction you can enter is 99 98/99.

Decimals: The largest Decimal you can enter is 99.999.

Incorrect Problems: When entering a subtraction problem the number (Fraction or Decimal) being subtracted must be smaller than the number from which it is being subtracted.

3. Solve the problem using pencil and paper or a calculator if necessary. Enter your answer and send it into the Professor's Problem Factory Calculating Machine.

Fraction Answers: Answers to Fraction problems must be reduced to their lowest terms and be Proper Fractions. For example, $\frac{2}{4}$, $\frac{5}{4}$, or $\frac{3}{3}$ would be considered incorrect while $\frac{1}{2}$, $1\frac{1}{4}$, and 1 would be correct answers.

Decimal Answers: Answers to Decimal problems must be rounded to the nearest thousandth. For example, 4.5678 should be entered as 4.568.

4. If your answer is correct you will earn 5 points.
5. If your answer is incorrect you will get a chance to try again. Here's how the Professor will help you solve the problem.

Clues: The Professor will let you know if your answer is an Improper Fraction or needs to be reduced to lowest terms. The second time you answer the problem incorrectly, you will see your answer with question marks replacing the numbers that are incorrect.

Answers: After you have answered the problem wrong three times the Professor will show you the correct answer and you can enter a new problem.

Helpful Hints:

1. *Scoring:* You only earn points when you enter a correct answer. If you enter a correct answer the first try you will earn 5 points. Every incorrect answer after that will cause a point to be deducted. If you answer the problem incorrectly 3 times, the Professor will show you the correct answer. If you click on New Problem without answering the current problem correctly, you will not earn any points.
2. *New Problem:* If you enter a problem or part of a problem incorrectly, select New Problem and the Problem Box will clear.
3. *I'm Done:* Select I'm Done to leave the **Problem Factory**. If you have not answered any problems, you will return to the Main Menu. If you have answered one or more problems you will see the Score Box that displays the points you have earned.
4. Enter numbers by using the keyboard. To select an Operand, you can either use the keyboard or make your selection on the screen.

FRACTION SHUFFLE

Fraction Shuffle is a great way to practice adding, subtracting, multiplying, and dividing Fractions. Your skill will grow and your points will rise until you can enter your initials as the highest **Fraction Shuffle** scorer. Here's how to play this challenging game of cards and wagers.

1. Twelve cards appear on the game board face down. A Fraction problem appears at the bottom of the screen. You will only see part of the problem: one Fraction and the Operand sign. When you select a card on the board the other side of the card will supply the second Fraction needed to complete the problem.
2. Before you select a card, even though you only see part of the problem, you must wager points on your ability to answer the problem correctly. For example if the problem is $1/2 + ? = ?$ you might wager all of your points because you think you will have no trouble answering a Fraction addition problem. The most you can wager is your current score. When the game begins you are given 2 free points to wager. You can wager zero points if you don't think you can answer the problem. If you wager all your points you will be asked to verify that wager. If you select "Oops", backspace and enter a new wager.
3. Once you have entered your wager, select a card and solve the problem. All answers must be reduced to lowest terms and be Proper Fractions, Mixed Numbers, or Whole Numbers. If you answer the problem correctly, the points you wagered will be added to your score. If you answer incorrectly, the points you wagered will be deducted from your score. If you wagered all your points and answered incorrectly, the game is over. If you get the highest **Fraction Shuffle** score you will be asked to enter your initials.
4. Each correct answer and each card you turn over gives you a more challenging problem!

FUN HOUSE

The Professor has a terrific **Fun House** full of special effects and math challenges. There are three games in the **Fun House** that come up randomly. You'll get a score for each game but you must play all three games to get a final **Fun House** score. Beat the best score and enter your initials. Here's an introduction to the **Fun House** games!

Laser:

Learn more about Fractions and test your skill as the Professor activates his magic Laser. You can choose an Easy (2 pts), Medium (3 pts), or Hard (5 pts) game. The object is to get the highest score possible and add that to your total **Fun House** score which is displayed at the top right corner of the screen. Depending on the level you select, you will be asked to meet these challenges:

Equivalent Fractions and Decimals: You will be asked if the two numbers displayed are *Equivalent* or equal to each other.

Fractions to Fit Pictures: After seeing a laser activated picture of a Fractional part of a whole object, you will be asked to enter a Fraction that describes what you see.

Bonus Points: You will be given a Fraction and asked to color the portion of the whole object that matches that Fraction. Select boxes to color them. Selecting a colored box will un-color it if you want to make changes. Select DONE when you are finished. If you answer correctly, 2 bonus points will be added to your score.

Popper

Popper takes you into a carnival midway game to help you master Fraction, Decimal, and Percent problems. You can choose an Easy (2 pts), Medium (3 pts), or Hard (5 pts) game. The object is to get the highest score possible and add that to your total **Fun House** score which is displayed at the top right corner of the screen.

Pick the number of balloons (2-20) that you want to try to pop in this game. To pop a balloon solve the Fraction problem that the Professor gives you, expressing your answer as a Proper Fraction, or Mixed Number in lowest terms. If you answer the problem incorrectly, the Professor will show you the correct answer.

You can earn important Bonus Points by taking your current score and converting it into a Fraction, Decimal, and Percent.

Coin Drop

Flipping coins has never been like this! You decide the number of coins to send into the Professor's coin tossing machine and select Heads or Tails. If you pick Heads, the Professor will take Tails. Each of you estimates how many times the coins will land on the side you picked. To beat the Professor, your guess will have to be closest to the coin toss results displayed when the machine is finished! If you hit the mark exactly, you get 10 bonus points!

The game is not over until you convert the coin toss results into Fraction and Percent scores! Every time you are correct your **Fun House** score grows!

TEAM CHALLENGE

You've heard of the Math Olympics where students compete against other students to bring a trophy back to their school for the best Math Team. To prepare for the event, students in the Math Olympics practice and study to increase their math skills so they can answer any question given to them. **Team Challenge** makes you a team of 1 player competing against a Team of 3 players you select. The Emcee, Professor Matt A. Matics, will give each Fraction, Decimal, or Percent question and then let the best team win!

Selecting a Team: As you enter **Team Challenge** you will see 6 potential Team members. You can select 3 players to be on the team you will play against. Before making your choices, select a player and then click on *Tell Me About Them*. Each player has different skills and experiences that reflect how fast and accurately they can answer questions. The top notch math students have 4 stars (****) and are worth 40 bonus points if you win. The average math students have 3 stars (***) and are worth 25 bonus points. The math students that would be the easiest to beat have 2 stars (**) and are worth 10 bonus points if you win. Your bonus points will be determined by adding the bonus point value of each opposing team member.

Helpful Hint: A selected player has a black box around him. A red box indicates the last player you selected and the one you will learn about if you select *Tell Me About Them*. To un-select a player click on him a second time and the box will disappear.

Playing the Game: Once you have selected an opposing team you are ready to play Team Challenge. Select either an Easy (2 pts), Medium (5 pts), or Hard (10 pts) game level and then get ready for the first question. Here are the Team Challenge rules!

Professor Matt A. Matics asks a question and you try to answer it correctly before the opposing team does.

Click on **I Know** or press the Enter key after you think you know the answer to the question.

If you answer incorrectly, the opposing Team will have a chance to answer the question. If they answer incorrectly, you get the same opportunity to answer correctly and win the points.

If both you and the Team miss the question, the Professor will give you the correct answer.

CONTROL PANEL:

Open the **Control Panel** to set speech volume and reset game scores.

Speech: Lower the speech volume to 1 for the softest voice. If you go below 1 you will turn the speech off. In that case you will see the program instructions but not hear them spoken. To get the highest speech volume set the level to 9.

Reset Game Scores: You can reset the game scores for **Fun House** and **Fraction Shuffle** in the **Control Panel**. This will make it possible for kids of all ages to play these games. A twelve year-old playing **Fraction Shuffle** most often will score much higher than a six year-old doing her best. If the game score is reset even the youngest player will have a chance at getting the best score.

WORDS TO REMEMBER

- **Whole Number:** A Whole Number is a number that has not been divided into fractional parts. It can be zero or any positive or negative number that can evenly be divided by 1. The number 5 is a Whole Number. The Fraction $1/2$ describes a part of a Whole Number. The Decimal .50 or the Percent 50% also describe a part of a Whole Number.
- **Fraction:** A Fraction is a part of a whole. For example, if you take an apple and cut it into three equal pieces you have created 3 parts of a whole apple. If you take 1 of the pieces you have $1/3$ of the apple in your hand. If you hold 2 pieces you have $2/3$ of the apple. A Whole Number can also be divided into equal parts. For example, the number 1 can be divided into 8 equal Fractional parts. Each part is $1/8$ of the Whole Number and $8/8$ equals 1. Decimals and Percents are also ways of describing part of a whole.
- **Numerator:** The Numerator is the top or left of the line number in a fraction. It stands for the number of parts being considered. For example, in the fraction $2/3$, the number 2 is the Numerator. It tells you that you are considering 2 parts of the whole. If you cut a candy bar into 4 equal pieces and give 3 to your friend, the Numerator 3 in the fraction $3/4$ describes how many pieces of the candy bar your friend received.

- **Denominator:** The Denominator is the bottom or right of the line number in the Fraction. It tells you the number of equal parts into which the whole has been divided. If you cut a pie into 8 equal parts, 8 becomes the Denominator. Each equal part is $1/8$ of the whole.
- **Common Denominator:** Sometimes you need to add or subtract Fractions that have different Denominators (for example: $2/3 + 1/6 = ?$ or $4/5 - 1/3 = ?$). In order to solve these problems with unlike Fractions you will need to find a Common Denominator so you are adding or subtracting like Fractions ($2/3 + 1/6$ becomes $4/6 + 1/6 = ?$ and $4/5 - 1/3$ becomes $12/15 - 5/15 = ?$). Please see the *Problem Solving Steps* section of this Manual to learn more!
- **Equivalent Fractions:** Equivalent is a word that means equal. Fractions are equivalent when they both describe the same part of the whole. For example, imagine that you have baked two apple pies. You divide one pie into 8 pieces. Half of that pie is $4/8$ or 4 pieces. You divide the other pie into 4 equal pieces. Half of that pie is $2/4$ or 2 pieces. You can see that $4/8$ and $2/4$ are Equivalent Fractions.
- **Lowest Terms:** A Fraction is stated in its lowest terms when the only number that will divide both the Numerator and Denominator is 1. For example $5/8$ is a Fraction stated in its lowest terms. However, $2/4$ is a Fraction that must be reduced to $1/2$ before it is stated in its lowest terms.

- **Proper Fraction:** A Proper Fraction has a Numerator that is smaller than the Denominator. For example, $2/5$ is a Proper Fraction.
- **Improper Fractions:** An Improper Fraction has a Numerator that is larger than or equal to the Denominator. It results when a Mixed Number ($4 \frac{1}{5}$) or a Whole Number (1) are written as a Fraction. For example, $4 \frac{1}{5} = \frac{21}{5}$ and $1 = \frac{5}{5}$.
- **Mixed Numbers:** A Mixed Number like $2 \frac{2}{3}$ describes the sum of a Whole Number (2) and a Fraction ($2/3$). A Mixed Number can result when you convert an Improper Fraction. When you divide the Numerator by the Denominator it does not divide evenly. For example, the Improper Fraction $\frac{26}{5}$ when converted becomes the Mixed Number $5 \frac{1}{5}$.
- **Reciprocal:** Two numbers are Reciprocals of each other if the answer that results when you multiply them together is 1. For example, $2/3$ and $3/2$ are Reciprocals because $2/3 \times 3/2 = 6/6 = 1$
- **Decimal:** A Decimal is a Fraction with an unwritten Denominator of 10 or some power of 10 indicated by a point before the Numerator. For example $.20$ is the same as $2/10$ or $.32$ is the same as $32/100$.
- **Percent (%):** A Percent is another way of stating a part of a whole. Percent means "per hundred" so 20% is another way of saying 20 per 100 (or $.20$ or $20/100$).

CONVERSIONS

Converting Fractions to . . .

- **Decimals:** To convert a Fraction to a Decimal divide the Numerator by the Denominator. For example, to convert $3/4$ divide 3 by 4. When a smaller number is divided by a larger number, the answer is stated as a Decimal. In this example the answer is $.75$. The Fraction $3/4$ and the Decimal $.75$ are equal or equivalent to each other. Calculators are very helpful tools to use when making Fraction to Decimal conversions.
- **Percents:** When converting to a Percent what you are trying to do is state the Fraction as a number per hundred. You know that $3/4$ of the students ride the bus, but by converting $3/4$ to a Percent you will find out how many students per 100 ride the bus. The first step is to convert the Fraction $3/4$ into the Decimal $.75$ (see above). Another way to express $.75$ is $75/100$ or 75 per 100. Take away the Decimal Point and insert the Percent sign %. What you have found is that $3/4 = .75$ or 75%.

Converting Decimals to . . .

- **Fractions:** To convert a Decimal to a Fraction, express the Decimal as a Numerator with the correct power of 10 for the Denominator. For example $.75$ would be $75/100$ and $.20$ would be $20/100$ or $2/10$. The final step is to reduce this Fraction to its lowest terms. In this case $75/100 = 3/4$ and $2/10 = 1/5$.

- **Percents:** To convert a Decimal to a Percent (when the Decimal is expressed as hundredths) you can usually just omit the Decimal Point and insert a % symbol. For example $.20 = 20\%$. Here are some other examples to consider: $.02 = 2\%$, $.457 = 46\%$ (rounded to the nearest hundredth), $3.15 = 315\%$, and $1.00 = 100\%$

Converting Percents to . . .

- **Decimals:** Since Percents always express a number per 100 you can quickly convert them to Decimals. For example, 20% becomes $.20$, likewise 4% becomes $.04$ and 125% becomes 1.25 .
- **Fractions:** To convert Percents to Fractions, the Percent number becomes the Numerator. Since a Percent expresses a number per 100, the Denominator must be 100. For example, 75% becomes $75/100$. If necessary the final step is to reduce the Fraction to its lowest terms. In this example 75% becomes $75/100$ or $3/4$.

MAKING CHANGES

- **Reducing Fractions to their Lowest Terms:** When you reduce a Fraction to its Lowest Terms you are changing it to an Equivalent Fraction whose Numerator and Denominator can only be divided by 1. For example, the Fraction $2/4$ is not in its lowest terms because both the Numerator and Denominator can be divided by 2. Dividing each number by 2 creates the new Equivalent Fraction $1/2$. Stated in its lowest terms, $2/4 = 1/2$. To reduce a Fraction to its lowest terms, divide both the Numerator and Denominator by the same number.

- **Changing Improper Fractions to Mixed Numbers:** An Improper Fraction has a Numerator larger than or equal to the Denominator; $2\ 2/5$ and $6/6$ are examples of Improper Fractions. To change them to Mixed Numbers or a Whole Number, divide the Numerator by the Denominator. In these examples 22 divided by 5 equals $4\ 2/5$ and 6 divided by 6 equals 1 .
- **Changing Mixed Numbers to Improper Fractions:** To change a Mixed Number into an Improper Fraction multiply the Whole Number by the Denominator, add the Numerator to this product, and place this sum over the Denominator. Here's an example. To change a Mixed Number like $3\ 2/5$ to an Improper Fraction, you must state the Whole Number 3 as a Fraction with 5 as the Denominator. By multiplying 3 by 5 you find out that 3 equals $15/5$. You have converted the Whole Number part of the Mixed Number. Now add $15/5$ to $2/5$, the Fraction part of the Mixed Number, and the answer is $17/5$. The Mixed Number $3\ 2/5$ equals the Improper Fraction $17/5$.
- **Finding an Equivalent Fraction:** There are two ways to find an Equivalent Fraction. You can either multiply or divide both the Numerator and Denominator by the same number. For example you can find an Equivalent Fraction for $1/3$ by multiplying both numbers by 2 ($1/3 = 2/6$). You can find an Equivalent Fraction for $2/4$ by dividing both numbers by 2 ($2/4 = 1/2$).

PROBLEM SOLVING STEPS

Check here if you get stuck!

FRACTION ADDITION PROBLEMS

- Adding Fractions with the same Denominator:

Sample Problem: $\frac{2}{5} + \frac{1}{5} = ?$

1. Add the Numerators $\frac{2+1}{5} = \frac{3}{5}$

2. Write the sum over the Denominator $\frac{2+1}{5} = \frac{3}{5}$

- Adding Fractions with different Denominators:

1. To add Fractions when the Denominators are different, rename the Fractions with a Common Denominator.
2. When one of the Denominators in the problem is a factor of the other, use the greater Denominator as the Common Denominator.

$$\frac{3}{8} + \frac{1}{4} = ? \rightarrow \frac{1}{4} = \frac{?}{8} \quad \boxed{(8 \div 4) \times 1 = 2}$$

$$\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$$

3. If it is not possible to use a Denominator already in the problem find a Common Denominator by multiplying the two Denominators together.

$$\frac{3}{5} + \frac{1}{3} = ? \rightarrow (5 \times 3 = 15) \rightarrow \left\{ \begin{array}{l} \frac{3}{5} = \frac{?}{15} \quad \boxed{(15 \div 5) \times 3 = 9} \\ \frac{1}{3} = \frac{?}{15} \quad \boxed{(15 \div 3) \times 1 = 5} \end{array} \right.$$

$$\frac{9}{15} + \frac{5}{15} = \frac{14}{15}$$

- Adding Mixed Numbers

Sample Problem:

$$\begin{array}{r} 4\frac{5}{8} \\ + 3\frac{4}{8} \\ \hline ? \end{array}$$

1. Add the Fractions

$$\begin{array}{r} 4\frac{5}{8} \\ + 3\frac{4}{8} \\ \hline 7\frac{9}{8} \end{array}$$

2. Add the Whole Numbers

$$\begin{array}{r} 4\frac{5}{8} \\ + 3\frac{4}{8} \\ \hline 7\frac{9}{8} \end{array}$$

3. If necessary, convert the Improper Fraction and rename the Whole Number

$$\begin{array}{r} 4\frac{5}{8} \\ + 3\frac{4}{8} \\ \hline 7\frac{9}{8} \end{array} \rightarrow \left\{ \begin{array}{l} \boxed{9 \div 8 = 1\frac{1}{8}} \\ \downarrow \\ \boxed{7+1=8} \end{array} \right\} 8\frac{1}{8}$$

FRACTION SUBTRACTION PROBLEMS

• **Subtracting Fractions with the same Denominator:**

1. Subtract the Numerators

$$\frac{5}{8} - \frac{2}{8} = ? \quad \frac{5-2}{8} = \frac{3}{8}$$

2. Write the difference over the Denominator

$$\frac{5-2}{8} = \frac{3}{8}$$

• **Subtracting Fractions with different Denominators:**

1. To subtract Fractions when the Denominators are different, rename the Fractions with a Common Denominator.
2. When one of the Denominators in the problem is a factor of the other, use the greater Denominator as the Common Denominator.

$$\frac{3}{4} - \frac{5}{8} = ? \rightarrow \frac{3}{4} = \frac{?}{8} \quad \boxed{(8 \div 4) \times 3 = 6}$$

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

3. If it is not possible to use a Denominator already in the problem, find a Common Denominator by multiplying the two Denominators together.

$$\frac{4}{5} - \frac{1}{3} = ? \rightarrow (5 \times 3 = 15) \rightarrow \begin{cases} \frac{4}{5} = \frac{?}{15} \quad \boxed{(15 \div 5) \times 4 = 12} \\ \frac{1}{3} = \frac{?}{15} \quad \boxed{(15 \div 3) \times 1 = 5} \end{cases}$$

$$\frac{12}{15} - \frac{5}{15} = \frac{7}{15}$$

• **Subtracting Mixed Numbers**

Sample Problem:
$$\begin{array}{r} 5\frac{5}{8} \\ -2\frac{2}{8} \\ \hline ? \end{array}$$

1. Subtract the Fractions

$$\begin{array}{r} 5\frac{5}{8} \\ -2\frac{2}{8} \\ \hline 3\frac{3}{8} \end{array}$$

2. Subtract the Whole Numbers

$$\begin{array}{r} 5\frac{5}{8} \\ -2\frac{2}{8} \\ \hline 3\frac{3}{8} \end{array}$$

• **Subtracting Mixed Numbers that require Renaming:**

Sample Problem:
$$\begin{array}{r} 6\frac{1}{5} \\ -4\frac{4}{5} \\ \hline ? \end{array}$$

1. Rename the Whole Number and Fraction

$$\begin{array}{l} 6\frac{1}{5} = 5\frac{6}{5} \\ 4\frac{4}{5} = 4\frac{4}{5} \\ \hline ? \end{array}$$

2. Subtract the Fractions

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

3. Subtract the Whole Numbers

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

FRACTION MULTIPLICATION PROBLEMS

- **Multiplying Fractions with the same or different Denominators:**

Sample Problem: $\frac{2}{3} \times \frac{4}{5} = ?$

1. Multiply the Numerators $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

2. Multiply the Denominators $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

- **Multiplying Mixed Numbers:**

Sample Problem: $2\frac{1}{2} \times 1\frac{1}{3} = ?$

1. Convert the Mixed Numbers to Improper Fractions

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

$$1\frac{1}{3} = \frac{(1 \times 3) + 1 = 4}{3} = \frac{4}{3}$$

2. Multiply the Numerators $\frac{5}{2} \times \frac{4}{3} = \frac{20}{?}$

3. Multiply the Denominators $\frac{5}{2} \times \frac{4}{3} = \frac{20}{6}$

4. If necessary, change the Improper Fraction to a Proper Fraction and reduce to lowest terms.

$$\frac{20}{6} = 20 \div 6 = 3\frac{2}{6} = 3\frac{1}{3}$$

FRACTION DIVISION PROBLEMS

- **Dividing Fractions with the same or different Denominators:**

Sample Problem: $\frac{1}{8} \div \frac{2}{3} = ?$

1. Find the Reciprocal of the Divisor

$$\frac{1}{8} \div \frac{2}{3} \times \frac{3}{2} = ?$$

2. Multiply the Numerators $\frac{1}{8} \times \frac{3}{2} = \frac{3}{16}$

3. Multiply the Denominators $\frac{1}{8} \times \frac{3}{2} = \frac{3}{16}$

• **Dividing Mixed Numbers:**

Sample Problem:

$$2\frac{3}{5} \div 1\frac{2}{3} = ?$$

1. Convert the Mixed Numbers to Improper Fractions

$$\left. \begin{aligned} 2\frac{3}{5} &= \boxed{(2 \times 5) + 3 = 13} = \frac{13}{5} \\ 1\frac{2}{3} &= \boxed{(1 \times 3) + 2 = 5} = \frac{5}{3} \end{aligned} \right\} \frac{13}{5} \div \frac{5}{3} = ?$$

2. Find the Reciprocal of the Divisor

$$\frac{13}{5} \div \frac{5}{3} \times \frac{3}{5} = ?$$

3. Multiply the Numerators

$$\frac{13}{5} \times \frac{3}{5} = \frac{39}{25}$$

4. Multiply the Denominators

$$\frac{13}{5} \times \frac{3}{5} = \frac{39}{25}$$

5. Convert the Improper Fraction to a Mixed Number

$$\frac{39}{25} = (39 \div 25) = 1\frac{14}{25}$$

DECIMAL PROBLEMS

• **Adding Decimals**

Sample Problem:

$$\begin{array}{r} 4.6 \\ +2.8 \\ \hline ? \end{array}$$

1. Add the Decimals (Renaming if necessary)

$$\begin{array}{r} 4.6 \\ +2.8 \\ \hline 4 \end{array}$$

2. Bring down the Decimal Point

$$\begin{array}{r} 4.6 \\ +2.8 \\ \hline .4 \end{array}$$

3. Add the Whole Numbers

$$\begin{array}{r} 4.6 \\ +2.8 \\ \hline 7.4 \end{array}$$

• **Subtracting Decimals**

Sample Problem:

$$\begin{array}{r} 7.4 \\ -3.8 \\ \hline \end{array}$$

1. Subtract the Decimals (Renaming if necessary)

$$\begin{array}{r} 7.4 \\ -3.8 \\ \hline 6 \end{array}$$

2. Bring down the Decimal Point

$$\begin{array}{r} 7.4 \\ -3.8 \\ \hline .6 \end{array}$$

3. Subtract the Whole Numbers

$$\begin{array}{r} 7.4 \\ -3.8 \\ \hline 3.6 \end{array}$$

- **Multiplying Decimals**

Sample Problem:
$$\begin{array}{r} 21.35 \\ \times .31 \\ \hline ? \end{array}$$

1. Multiply the numbers just like you do when you are solving Whole Number problems.

$$\begin{array}{r} 21.35 \\ \times .31 \\ \hline 2135 \\ 6405 \\ \hline 66185 \end{array}$$

2. To place the Decimal Point correctly, write the answer so that there are the same number of Decimal places as there are in the problem.*

$$\begin{array}{r} 21.35 \\ \times .31 \\ \hline 2135 \\ 6405 \\ \hline 6.6185 \end{array}$$

- * You can also use these steps when you need to carry your answer to Decimal places.

$$\begin{array}{r} 3.75 \\ 4 \overline{)15.00} \\ \underline{12} \\ 30 \\ \underline{28} \\ 20 \end{array}$$

- **Multiplying Decimals by 10, 100, and 1000.**

1. When multiplying a Decimal by 10, move the Decimal point one place to the right.

$$\begin{aligned} 8.6 \times 10 &= 86 \\ 2.54 \times 10 &= 25.4 \\ 21.300 \times 10 &= 213.00 \end{aligned}$$

2. When multiplying a Decimal by 100, move the Decimal point two places to the right.

$$\begin{aligned} 8.62 \times 100 &= 862 \\ 4.236 \times 100 &= 423.6 \\ 2.1 \times 100 &= 210 \end{aligned}$$

3. When multiplying a Decimal by 1000, move the Decimal point three places to the right.

$$\begin{aligned} 4.326 \times 1000 &= 4,326 \\ 21.40068 \times 1000 &= 21,400.68 \end{aligned}$$

- **Dividing a Decimal by a Whole Number**

Sample Problem:
$$4 \overline{)20.48}$$

1. Divide as you would Whole Numbers.

$$\begin{array}{r} 512 \\ 4 \overline{)20.48} \end{array}$$

2. Place the Decimal Point directly above the Decimal Point of the number being divided.

$$\begin{array}{r} 5.12 \\ 4 \overline{)20.48} \end{array}$$

- **When dividing a Decimal by 10, move the Decimal Point one place to the left.**

$$\begin{aligned} 860 \text{ divided by } 10 &= 86 \\ 103.4 \text{ divided by } 10 &= 10.34 \\ 61.340 \text{ divided by } 10 &= 6.1340 \end{aligned}$$

- **When dividing a Decimal by 100, move the Decimal Point two places to the left.**

$$\begin{aligned} 288 \text{ divided by } 100 &= 2.88 \\ 6043.1 \text{ divided by } 100 &= 60.431 \\ 21.4068 \text{ divided by } 100 &= .214068 \end{aligned}$$

- When dividing a Decimal by 1000, move the Decimal Point three places to the left.

$$43.260 \text{ divided by } 1000 = .043260$$

$$2523.18 \text{ divided by } 1000 = 2.52318$$

$$8123 \text{ divided by } 1000 = 8.123$$

- Dividing a Whole Number by a larger Whole Number ***

Sample Problem: $4 \overline{)2}$

- Add a Decimal Point and additional zeroes to the number being divided.

$$4 \overline{)2.00}$$

- Divide as you would Whole Numbers.

$$4 \overline{)2.00} \begin{array}{r} 50 \\ \end{array}$$

- Place the Decimal Point directly above the Decimal Point of the number being divided.

$$4 \overline{)2.00} \begin{array}{r} .50 \\ \end{array}$$

- * You can also use these steps when you need to carry your answer to Decimal places.

$$4 \overline{)15.00} \begin{array}{r} 3.75 \\ 12 \\ \hline 30 \\ 28 \\ \hline 20 \end{array}$$

- Dividing a Decimal by a Decimal**

Sample Problem:

$$2.4 \overline{)48.48}$$

- Change the Divisor to a Whole Number moving the Decimal Point to the right. To do this multiply the Divisor by the multiple of ten that will make it a Whole Number.

$$2.4 \times 10 = 24$$

- Multiply the number being divided (Dividend) by the same multiple of ten and move the Decimal Point.

$$48.48 \times 10 = 484.8$$

- Divide as Whole Numbers adding zeroes if necessary.

$$24 \overline{)484.8} \begin{array}{r} 202 \\ \end{array}$$

- Place the Decimal Point directly above the Decimal Point of the number being divided (Dividend)

$$24 \overline{)484.8} \begin{array}{r} 20.2 \\ \end{array}$$

PROBLEM TEASERS

Solve these challenging word problems and be ready to tackle every-day problems that use Fractions, Decimals, and Percents! (The answers can be found on the back page.)

1. Larry just finished baking a big apple pie! He carefully cut it into 8 pieces. When his hungry friends came over after school they ate 4 pieces of the pie before Larry could stop them. What part of the pie did Larry have left?
2. Sarah, Tom, and Ryan were working on the new mural for Open House at school. They had a big box of 12 color crayons to use. Each of them used 2 different crayons to make the mural. What part of the crayons were used?
3. Mike carefully collected a bag of 20 marbles to trade with his friends. While he was sitting on the floor counting them, his dog Jasper ran through the room chasing a cat and the marbles flew everywhere. Mike picked up the 12 marbles he could find. What part of the marbles were missing?
4. Jenifer loved to go to the zoo! She always bought a big bag of peanuts to eat as she watched the animals. When she reached the elephant's house she had 40 peanuts in her bag. Suddenly an elephant's trunk swooped down and grabbed peanuts out of her bag! Now she only had 10 peanuts left. What part of the peanuts did he take?
5. Randy ate one-fifth of his 10 pieces of pizza at the pizza party last night. How many pieces did he eat?
6. Every year the school holds a pie eating contest on the last day of class. George ate $\frac{5}{8}$ of his 8 pieces of apple pie. Alice ate $\frac{7}{10}$ of her 10 pieces of cherry pie. Who won the prize for eating the most pieces of pie?
7. John and Bill were brothers and neither of them liked to mow the lawn. They decided to work on the job together. Last Saturday John mowed $\frac{3}{5}$ of the lawn and Bill mowed $\frac{6}{5}$ of the lawn. Which one did the most work?
8. Alan has a vegetable garden in his backyard. He grew all the vegetables himself and he waters them every morning before school. He has 8 tomato plants and uses $\frac{1}{4}$ of a can of water for each plant. How many cans of water does he use each morning to water all the tomato plants?
9. The school's spring program is a huge success! Thirty and two-fifths rows of chairs are filled in the auditorium and there are 5 chairs in each row. How many people came to the program?
10. Paula entered the Walk-a-thon for the Children's Hospital. Last Sunday she walked $\frac{6}{10}$ k from her house to City Hall and then $\frac{3}{10}$ k from City Hall to the Fire Station. How far did she walk?

11. Nicole and Meagan are always arguing about who lives the farthest from school. With some help from their bus drivers they found out that Nicole lives $4/10$ k from school and Meagan lives $7/10$ k from school. How much farther from school does Meagan live?
12. Jenifer and Steven went camping with their parents. They each got to bring a friend. The first morning Steven and his friend spent 2.5 hours walking around the lake. At the same time Jenifer and her friend spent 1.2 hours paddling the canoe around the lake. How much longer did it take to walk?
13. Tracy went to the store to buy all the snacks for her slumber party. The popcorn cost \$1.50, the juice cost \$.75, and the chocolate covered ants cost \$2.45. How much did she spend on snacks for the party?
14. Mike got a new job working as a cashier at the Creepo Feature movie theater on the weekends. The most difficult part of his job was making the correct change from large bills. Help him out! Each ticket cost \$4.50. A customer bought 2 tickets and gave him a \$20 bill. How much change should Mike give him?
15. Kim saw a beautiful stereo system that she wanted to buy. The price was \$534.95, more money than Kim had, so she decided to buy it on the store's installment plan. She made 3 payments of \$185.00. How much more did the stereo cost on the installment plan?
16. Josh saved his money to buy a small television set for his room. It was on sale for \$235.00, the exact amount of money he had saved. He rushed down to the store only to find out that he had forgotten to save the extra charge for the sales tax. The sales tax rate in his state was 6%. How much more money does he have to save?
17. Linda opened her own checking account with a deposit of \$300.00. During the first month she wrote 3 checks for a total of \$124.50. The bank also charged her a \$0.03 service charge for each check she wrote. How much money does she have left in her checking account at the end of the month?
18. Richard's mom sent him to the store to buy oranges. The store had two types of oranges. Navel oranges were selling for 3 for \$.29 and Valencia oranges were selling for \$2.00 per dozen. Which is the best price for 12 oranges?
19. There are 16 boys and 14 girls on the tennis team. Twenty players ride the bus to the tennis meets. What is the least number of girls that can ride the bus?
20. Tyler's school held a Read-a-thon to raise money for charity. In 1 hour Tyler read $1/3$ of his 250 page book and Sarah read $5/12$ of her 400 page book. If they were paid \$0.05 per page, what was the amount paid to the winner?

21. Ken's government class planned a trip to Washington D.C. during the summer. Each student had to raise \$1200.00 to be able to go on the trip. Ken took an after school baby-sitting job earning \$2.00 per hour. In one week he worked $3\frac{1}{2}$ hours each school day. How much did he earn in one week?
22. Can you keep track of this savings account? Find the month end balance! Beginning Balance: \$234.36, withdrawal: \$23.54, Deposit: \$769.34, withdrawal: \$457.70, Deposit: \$210.00, Interest Earned: 5% of final balance.
23. Andy and Leslie both bought mopeds when they turned 16 years old. Their parents told them they had to pay for their own insurance. Andy found a company that charged him \$468.00 for 6 months or 24 weeks. Leslie found a different company that charged her \$15.25 per week. Who got the best deal?
24. Two sisters, Megan and Cary, shared a bedroom. They promised their parents that they would pay the telephone bills if they could have their own telephone installed in their room. Their first month's bill was \$56.65 plus an installation fee of \$32.25 and a service charge of \$6.86. Find their average weekly telephone charges for this first 4-week month.
25. The student council of Fairmont Jr. High sponsored a school dance with a live band. On the night of the dance 230 of the 650 students attended the dance. What percentage of the Fairmont students came to the dance?
26. The Marshall High School drama teacher held tryouts for the school musical. Of the 78 students auditioning for the play, 23% were selected for the chorus. How many students will be in the chorus?
27. Jean wanted to buy a new winter coat. The one she liked cost \$85.99. One morning Jean opened the paper and saw that the store was offering a 40% discount on the same coat. How much money would she save if she bought it at the discount price?
28. Elwood school set a student body goal of having 500 of its 750 students make the Honor Roll this grading period. When the grades were tabulated, 40% of the students made the Honor Roll. How many students over or under the goal were they?
29. The best baseball player in Castle Rock went to bat 340 times during the season. Looking at his record, 30% of his times at bat he got a base hit. How many times did he get on base?

ANSWERS TO PROBLEM TEASERS

Fractional answers are expressed in lowest terms and
Decimal answers are rounded to the nearest hundredth.

After you have solved the problems using the printed
numbers, try new numbers and find out what happens
to your answers.

1. $\frac{1}{2}$ or .50 or 50% of the pie was left.
2. $\frac{1}{3}$ or .33 or 33% of the crayons were used.
3. $\frac{2}{5}$ or .40 or 40% of the marbles were missing.
4. $\frac{3}{4}$ or .75 or 75% of the peanuts were taken by
the elephant.
5. 2 pieces
6. Alice
7. Bill
8. 2 cans
9. 152 people
10. $\frac{9}{10}$ kilometers
11. $\frac{3}{10}$ kilometers
12. 1.3 hours
13. \$4.70
14. \$11.00 change
15. \$20.05 more
16. \$14.10
17. \$175.41
18. 3 for \$.29 (\$1.16 for 12 oranges)
19. 4 girls
20. \$8.33 was paid to Sarah
21. \$35.00
22. Final balance: \$769.08
23. Leslie
24. \$23.94 per week
25. 35% came to the dance
26. 17 students
27. \$34.40
28. 200 students under the goal
29. 102 times



First Byte®

2845 Temple Avenue, Long Beach, CA 90806 (213) 595-7006