Fractionease

by

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Preface

From the very beginning I would like to set the record straight and give credit where credit is due. It is none other than the God of Abraham and Isaac and Jacob who has given me the ability to cut through to the very heart of many arithmetical and mathematical processes and to express them simply and concisely. And I thank Him and praise Him for this ability. Were it not for His inspiration and His gentle nudging and encouragement, these materials would not have been written.

Of course, God often uses humans through which to do His nudging and encouraging. And chief among those He uses with me is my precious wife, Sue. I thank God for Sue and I thank Sue for her willingness to be an instrument and a servant of His.

I also thank God for my beloved colleague, Dr. Jay K. Amburgey, with whom I spent many enjoyable and encouraging hours "brainstorming" together over the years we taught together at Angelo State University.

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Addition

Fractions are really quite easy to add and subtract. As turns out, the method of getting least common denominators that most of us learned in school is not really necessary for adding or subtracting fractions. There is a much easier way to do it. Let's look at an example.

$$\overset{15}{}\quad + \quad\overset{14}{}$$

$$\frac{3}{7}+\frac{2}{5} = \frac{15+14}{35} = \frac{29}{35}$$

We get the numerator (the top) by simply adding the products 5×3 and 7×2 along the crossed arrows. The denominator (the bottom) is then the product 7×5 along the bottom arrow. Isn't that simple? It always works too! Let's try another example.

$$\overset{32}{}\quad + \quad\overset{21}{}$$

$$\frac{4}{7}+\frac{3}{8} = \frac{32+21}{56} = \frac{53}{56}$$

The numerator is the sum $32+21$ of the cross products 8×4 and 7×3 and the denominator is the product 7×8 across the bottom. Of course, with a little practice you can probably do many such problems in your head and just write down the answer. Try these.

$$\frac{2}{5}+\frac{1}{4} = \qquad\qquad \frac{3}{5}+\frac{2}{7} =$$

The first answer is $\frac{13}{20}$ and the second is $\frac{31}{35}$. How did you do? Most likely you did just fine. But if you think you could use a little more practice, try these.

Exercise 1:

1. $\frac{1}{2}+\frac{2}{5}$	4. $\frac{1}{3}+\frac{2}{7}$	7. $\frac{1}{4}+\frac{1}{5}$
2. $\frac{3}{5}+\frac{1}{3}$	5. $\frac{2}{5}+\frac{3}{8}$	8. $\frac{3}{7}+\frac{1}{5}$
3. $\frac{1}{5}+\frac{1}{7}$	6. $\frac{2}{5}+\frac{1}{3}$	9. $\frac{3}{8}+\frac{2}{9}$

Answers: $\frac{9}{10}$, $\frac{14}{15}$, $\frac{12}{35}$, $\frac{13}{21}$, $\frac{31}{40}$, $\frac{11}{15}$, $\frac{9}{20}$, $\frac{22}{35}$, $\frac{43}{72}$

Please avoid the temptation to make up problems of your own at this point. We are not yet finished showing you all of the techniques needed to make all fraction addition and subtraction problems as easy as possible. We have "rigged" the problems thus far to avoid some special cases that we will examine as we go on. Just progress through this short booklet and by the time you reach the end you will be ready to tackle any fraction addition or subtraction problem that you might run into.

We will not attempt to teach you all about fractions in this booklet. We will assume that you already know the the following concepts: factors, reducing fractions, and changing from improper fractions (top bigger than bottom) to mixed numbers.

So far all the examples we have given have been such that their sums were proper fractions (tops smaller than bottoms). Now we will consider a few whose sums are improper. When this happens we can change the improper fraction into a mixed number. Here's an example.

15 + 8

$$\frac{3}{4}+\frac{2}{5} = \frac{15+8}{20} = \frac{23}{20} = 1\frac{3}{20}$$

Exercise 2: 1. $\frac{2}{3}+\frac{3}{5}$ 4. $\frac{3}{4}+\frac{2}{3}$ 7. $\frac{3}{5}+\frac{4}{7}$

2. $\frac{8}{9}+\frac{2}{5}$ 5. $\frac{5}{6}+\frac{1}{5}$ 8. $\frac{5}{6}+\frac{3}{5}$

3. $\frac{7}{9}+\frac{3}{4}$ 6. $\frac{7}{9}+\frac{5}{8}$ 9. $\frac{5}{8}+\frac{3}{7}$

Answers: $1\frac{4}{15}$, $1\frac{13}{45}$, $1\frac{19}{36}$, $1\frac{5}{12}$, $1\frac{1}{30}$, $1\frac{29}{72}$, $1\frac{6}{35}$, $1\frac{13}{30}$, $1\frac{3}{56}$

So far none of our examples have had common factors in their denominators. Now let's see what to do in that case. Consider $\frac{3}{4}+\frac{1}{6}$. The denominators 4 and 6 have the common factor 2 because $4 = 2 \times 2$ and $6 = 2 \times 3$.

common factor

There are two simple ways to handle this situation. The first way is to add just as before and then reduce the sum by the common factor 2.

18 + 4

$$\frac{3}{4}+\frac{1}{6} = \frac{18+4}{24} = \frac{22}{24} = \frac{2\times 11}{2\times 12} = \frac{11}{12}$$

When using this method the sum will always reduce by the common factor.

The second method is to get the common factor out at the beginning and then put it back in at the end.

9 + 2

$$\frac{3}{4}+\frac{1}{6} = \frac{3}{2\times 2}+\frac{1}{2\times 3} = \frac{1}{2}\times\left[\frac{3}{2}+\frac{1}{3}\right] = \frac{1}{2}\times\frac{11}{6} = \frac{11}{12}$$

common factor taken out here

put back in here

This can be shortened to

9 + 2

$$\frac{3}{\underset{2}{4}}+\frac{1}{\underset{3}{6}} = \frac{9+2}{2\times 6} = \frac{11}{2\times 6} = \frac{11}{12}$$

2 taken out

2 put back

Notice that the original denominators 4 and 6 are replaced by 2 and 3 when the common factor 2 is taken out. These "new" denominators 2 and 3 are used in the cross product, not the original 4 and 6.

When the common factor is small the first method will probably be easier; but when the common factor is large the second method will probably be easier. Here's an example where the common factor is a little larger.

First method: $$\overset{140 \;+\; 63}{\frac{4}{21} + \frac{3}{35}} = \frac{203}{735} = \frac{7 \times 29}{7 \times 105} = \frac{29}{105}$$

Second method: $$\overset{20 \;+\; 9}{\underset{3 \quad 5}{\frac{4}{21} + \frac{3}{35}}} = \frac{29}{7 \times 15} = \frac{29}{105}$$

Exercise 3: Try both methods on these.

1. $\frac{5}{6} + \frac{3}{8}$	5. $\frac{1}{12} + \frac{1}{16}$	9. $\frac{25}{36} + \frac{11}{45}$
2. $\frac{3}{10} + \frac{2}{15}$	6. $\frac{5}{42} + \frac{2}{49}$	10. $\frac{11}{42} + \frac{5}{24}$
3. $\frac{7}{15} + \frac{4}{25}$	7. $\frac{6}{35} + \frac{7}{45}$	11. $\frac{11}{16} + \frac{9}{20}$
4. $\frac{5}{6} + \frac{7}{9}$	8. $\frac{13}{15} + \frac{11}{35}$	12. $\frac{23}{42} + \frac{19}{48}$

Answers: $1\frac{5}{24}$, $\frac{13}{30}$, $\frac{47}{75}$, $1\frac{11}{18}$, $\frac{7}{48}$, $\frac{47}{294}$, $\frac{103}{315}$, $1\frac{19}{105}$, $\frac{169}{180}$, $\frac{79}{168}$, $1\frac{11}{80}$, $\frac{317}{336}$

Now let's see what happens when there is a common factor in the numerators of the fractions. It works very much the same as it did for common factors in the denominators except the taking out and putting back in occurs in the top instead of the bottom. Here are a couple of examples.

Example 1: take 2's out here

$$\overset{92}{} \qquad \overset{45}{}$$

$$\frac{\overset{4}{\cancel{8}}}{15} + \frac{\overset{3}{\cancel{6}}}{23} = \frac{2 \times 137}{345} = \frac{274}{345}$$

put 2 back in here

Example 2: take 7's out here

$$81 + 50$$

$$\frac{\overset{3}{\cancel{21}}}{25} + \frac{\overset{2}{\cancel{14}}}{27} = \frac{7 \times 131}{675} = \frac{917}{675} = 1\frac{242}{675}$$

7 put back in here

Notice that the denominators are not changed in these examples, so the product across the bottom is not either.

As in the case of the common factor in the denominator, there isn't much advantage in taking out the common factor when it is quite small. For example $\frac{2}{5}+\frac{2}{7}$ *can be worked quickly by the cross method without taking out the common factor 2 in the numerators.*

$$14 + 10$$

$$\frac{2}{5} + \frac{2}{7} = \frac{24}{35}$$

Try the problems below first without taking the common factor out, then with taking the common factor out. With a little experience you will soon develope a feel for which way will be the fastest and easiest for you on any particular problem.

Exercise 4:

1. $\frac{6}{7}+\frac{4}{5}$	4. $\frac{15}{27}+\frac{10}{49}$	7. $\frac{6}{25}+\frac{3}{14}$
2. $\frac{6}{7}+\frac{9}{25}$	5. $\frac{9}{16}+\frac{9}{25}$	8. $\frac{5}{9}+\frac{5}{11}$
3. $\frac{2}{7}+\frac{4}{15}$	6. $\frac{18}{25}+\frac{21}{32}$	9. $\frac{22}{25}+\frac{33}{49}$

Answers: $1\frac{23}{35}$, $1\frac{38}{175}$, $\frac{58}{105}$, $\frac{335}{441}$, $\frac{369}{400}$, $1\frac{301}{800}$, $\frac{159}{350}$, $1\frac{1}{99}$, $1\frac{678}{1225}$

Now we will look at some examples with common factors in both the numerators and denominators. Here we can take out the common factors in both places and put them back later.

Example 1:

$$\overset{10 \;+\; 7}{\frac{\cancel{8}^{\,2}}{\cancel{21}_{\,7}} + \frac{\cancel{4}^{\,1}}{\cancel{15}_{\,5}}} = \frac{4\times 17}{3\times 35} = \frac{68}{105}$$

put 4 back in here

put 3 back in here

Example 2:

$$\overset{54 \;+\; 35}{\frac{\cancel{45}^{\,9}}{\cancel{49}_{\,7}} + \frac{\cancel{25}^{\,5}}{\cancel{42}_{\,6}}} = \frac{5\times 89}{7\times 42} = \frac{445}{294} = 1\frac{151}{294}$$

Now let's work example 2 without first taking out these common factors.

reduces by 7

$$\overset{1890 \;+\; 1225}{\frac{45}{49} + \frac{25}{42}} = \frac{3115}{2058} = \frac{7\times 447}{7\times 294} = \frac{447}{294} = 1\frac{151}{294}$$

As you can see, the arithmetic is considerably harder in this latter method.

Exercise 5:

1. $\frac{14}{15}+\frac{21}{25}$
2. $\frac{8}{15}+\frac{12}{25}$
3. $\frac{10}{49}+\frac{5}{42}$
4. $\frac{15}{16}+\frac{25}{32}$
5. $\frac{15}{22}+\frac{10}{33}$
6. $\frac{21}{44}+\frac{14}{33}$
7. $\frac{25}{36}+\frac{5}{24}$
8. $\frac{25}{27}+\frac{35}{63}$
9. $\frac{36}{77}+\frac{24}{121}$
10. $\frac{27}{35}+\frac{18}{25}$
11. $\frac{3}{4}+\frac{3}{16}$
12. $\frac{8}{15}+\frac{6}{25}$
13. $\frac{14}{15}+\frac{7}{45}$
14. $\frac{3}{4}+\frac{9}{16}$
15. $\frac{4}{9}+\frac{2}{27}$

Answers: $1\frac{58}{75}$, $1\frac{1}{75}$, $\frac{95}{294}$, $1\frac{23}{32}$, $\frac{65}{66}$, $\frac{119}{132}$, $\frac{65}{72}$, $1\frac{13}{27}$, $\frac{564}{847}$, $1\frac{86}{175}$, $\frac{15}{16}$, $\frac{58}{75}$, $1\frac{4}{45}$, $1\frac{5}{16}$, $\frac{14}{27}$, *Notice that in the last three problems of exercise 5 that one of the denominators is a factor of the other denominator. This kind of problem is fairly easy to work also by the least common denominator method. For example problem 13 cane be done as follows.*

$$\frac{14}{15}+\frac{7}{45}=\frac{3\times 14}{3\times 15}+\frac{7}{45}=\frac{42}{45}+\frac{7}{45}=\frac{49}{45}=1\frac{4}{45}$$

Of course if two fractions already have the same denominator, then that denominator is the least common denominator. In this case we simply add the numerators and put that sum over the common denominator.

Example 1: $\frac{5}{7}+\frac{4}{7}=\frac{9}{7}=1\frac{2}{7}$

Example 2: $\frac{5}{18}+\frac{7}{18}=\frac{12}{18}=\frac{\cancel{6}\times 2}{\cancel{6}\times 3}=\frac{2}{3}$

<u>CURIOUS</u> <u>NOTE</u>: You have probably done this cross type of fraction addition in very special cases since grade school. Changing a mixed number into an improper fraction is essentially addition by this cross multiplication technique.

Examples:

$$4\frac{2}{3}=4+\frac{2}{3}=\overset{12\ +\ 2}{\frac{4}{1}+\frac{2}{3}}=\frac{14}{3}$$

$$2\frac{1}{3}=2+\frac{1}{3}=\overset{6\ +\ 1}{\frac{2}{1}+\frac{1}{3}}=\frac{7}{3}$$

Now with all these techniques you should (after a bit of practice) be able to add any two fractions (of Reasonable Size!) that are thrown at you.

Subtraction

As you have already guessed perhaps, subtraction is just as easy as addition and it works essentially the same. We compare an addition problem with a subtraction problem so you can see the similarity.

$$\frac{2}{3} + \frac{1}{4} = \frac{8+3}{12} = \frac{11}{12} \qquad \frac{2}{3} - \frac{1}{4} = \frac{8-3}{12} = \frac{5}{12}$$

As you can see the only difference between these two problems is what we do with the cross products. For addition we add them and for subtraction we subtract them. Let's look at some more subtractions.

$$\frac{4}{5} - \frac{2}{3} = \frac{12-10}{15} = \frac{2}{15} \qquad \frac{2}{15} - \frac{1}{21} = \frac{14-5}{3\times35} = \frac{\overset{3}{\cancel{9}}}{\cancel{3}\times35} = \frac{3}{35}$$

$$\frac{8}{9} - \frac{6}{7} = \frac{56-54}{63} = \frac{2}{63} \quad \text{or} \quad \frac{8}{9} - \frac{6}{7} = \frac{(28-27)\times2}{63} = \frac{1\times2}{63} = \frac{2}{63}$$

$$\frac{8}{35} - \frac{4}{25} = \frac{40-28}{5\times35} = \frac{12}{175} \quad \text{or} \quad \frac{8}{35} - \frac{4}{25} = \frac{4\times(10-7)}{5\times35} = \frac{4\times3}{175} = \frac{12}{175}$$

$$\frac{16}{35} - \frac{12}{49} = \frac{4\times(28-15)}{7\times35} = \frac{4\times13}{7\times35} = \frac{52}{245}$$

Notice that taking out common factors and putting them back in again (numerators and/or denominators) works exactly like it did for addition. This should be no problem for you if you have already worked all the addition exercises.

CAUTION: *When doing subtraction always write the cross products on top so that the difference will always be in the right order.*

Example: *THIS* $\overset{8 \quad - \quad 3}{\frac{2}{3} \quad \frac{1}{4}} = \frac{8-3}{12} = \frac{5}{12}$

NOT THIS $\underset{3 \quad - \quad 8}{\frac{2}{3} \quad \frac{1}{4}} = \frac{3-8}{12}$

Writing cross products on the bottom would clutter up the bottom too much anyway! So let's agree to always write cross products on the top, even when we are doing addition problems.

You might wonder how to tell which of two fractions is larger. It's easy! Just do a cross product. The larger fraction will always have the larger number "over" it.

Example 1: *Which of $\frac{4}{9}$ and $\frac{7}{15}$ is larger?*

$\overset{60 \quad\quad 63}{\frac{4}{9} \quad \frac{7}{15}}$ $\left[\text{or } \overset{63 \quad\quad 60}{\frac{7}{15} \quad \frac{4}{9}}\right]$ *Since 63 is larger than 60, $\frac{7}{15}$ is larger than $\frac{4}{9}$.*

Example 2: $\overset{65 \quad\quad 66}{\frac{5}{22} \quad \frac{3}{13}}$ *Since 66 is larger than 65, $\frac{3}{13}$ is larger than $\frac{5}{22}$.*

(Now you have an easy way to tell which fraction to subtract from the other in making up new problems.)

Example 3: $\overset{44 \quad\quad 45}{\frac{\overset{4}{\cancel{16}}}{\underset{9}{\cancel{63}}} \quad \frac{\overset{5}{\cancel{20}}}{\underset{11}{\cancel{77}}}}$ *(It helps to take common factors out first as if starting to add.)*

45 is larger than 44 so $\frac{20}{77}$ is larger than $\frac{16}{63}$.

Now you can go back through each of the exercises for addition and treat them as subtraction exercises. For example, if the problem was $\frac{3}{4}+\frac{2}{5}$ now make it $\frac{3}{4}-\frac{2}{5}$. (The larger fraction is always given first in the addition exercises so the subtractions will "work.") Do as many of the problems from each exercise as you need to to get subtraction going for you.

Answers for subtraction exercises:

Ex. 1: $\frac{1}{10}, \frac{4}{15}, \frac{2}{35}, \frac{1}{21}, \frac{1}{40}, \frac{1}{15}, \frac{1}{20}, \frac{8}{35}, \frac{11}{72}$

Ex. 2: $\frac{1}{15}, \frac{22}{45}, \frac{1}{36}, \frac{1}{12}, \frac{19}{30}, \frac{11}{72}, \frac{1}{35}, \frac{7}{30}, \frac{11}{56}$

Ex. 3: $\frac{11}{24}, \frac{1}{6}, \frac{23}{75}, \frac{1}{18}, \frac{1}{48}, \frac{23}{294}, \frac{1}{63}, \frac{58}{105}, \frac{9}{20}, \frac{3}{56}, \frac{19}{80}, \frac{17}{112}$

Ex. 4: $\frac{2}{35}, \frac{87}{175}, \frac{2}{105}, \frac{155}{441}, \frac{81}{400}, \frac{51}{800}, \frac{9}{350}, \frac{10}{99}, \frac{253}{1225}$

Ex. 5: $\frac{7}{75}, \frac{4}{75}, \frac{25}{294}, \frac{5}{32}, \frac{25}{66}, \frac{7}{132}, \frac{35}{72}, \frac{10}{27}, \frac{228}{847}, \frac{9}{175}, \frac{9}{16}, \frac{22}{75}, \frac{7}{9}, \frac{3}{16}, \frac{10}{27}$

This method of adding and subtracting fractions can also be used in algebra. For those interested in pursuing this further we give a few examples to get you started.

$2y \quad + \quad 3x$

$$\frac{2}{\cancel{x}} + \frac{3}{\cancel{y}} = \frac{2y+3x}{xy}$$

$4y \quad - \quad 3x$

$$\frac{4}{\cancel{xz}} - \frac{3}{\cancel{yz}} = \frac{4y-3x}{(z)(xy)} = \frac{4y-3x}{xyz}$$

$x \quad y$

$3z(x-1) \quad + \quad 2x$

$3z \quad 2$

$$\frac{\cancel{6zy}}{\cancel{x(x+1)}} + \frac{\cancel{4y}}{\cancel{(x+1)(x-1)}} = \frac{(2y)[3z(x-1)+2x]}{(x+1)[x(x-1)]} = \frac{2y(3zx+2x-3z)}{x(x+1)(x-1)}$$

$x \quad x-1$

$$= \frac{6xyz+4xy-6yz}{x^3-x}$$

Notice the taking out and putting back in common factors in tops and/or bottoms.

Mixed Numbers

Now lets look at an easy way to add and subtract mixed numbers. We'll try $2\frac{1}{3} + 3\frac{2}{5}$. First we ignore the fractions and just add the whole numbers (the boxed part below). Then we ignore the whole numbers and just add the fractions (the circled part below).

Example 1:

$2 + 3$

$$\boxed{2}\,\frac{1}{3} + \boxed{3}\,\frac{2}{5} = \boxed{5}\,\frac{11}{15}$$

$\frac{1}{3} + \frac{2}{5}$

Example 2:

$5 + 2$

$$\boxed{5}\,\frac{4}{7} + \boxed{2}\,\frac{2}{3} = \boxed{7}\,\frac{26}{21} = 8\frac{5}{21}$$

$\frac{4}{7} + \frac{2}{3}$

The $7\frac{26}{21}$ becomes $8\frac{5}{21}$ as follows:

$$7\frac{26}{21} = 7 + \frac{26}{21} = 7 + 1\frac{5}{21} = 7 + 1 + \frac{5}{21} = 8\frac{5}{21}$$

Of course we add the fractions in these examples by the cross-method explained earlier.

Example 3:

$8 - 5$

$$\boxed{8}\,\frac{2}{3} - \boxed{5}\,\frac{1}{4} = \boxed{3}\,\frac{5}{12}$$

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

Example 4: $7\frac{1}{4} - 2\frac{2}{3}$. *Here the second fraction is larger than the first so we "borrow" from the 7 first as follows.*

$$7\frac{1}{4} = 7 + \frac{1}{4} = 6 + 1 + \frac{1}{4} = 6 + 1\frac{1}{4} = 6 + \frac{5}{4} = 6\frac{5}{4}$$

Now we subtract using $6\frac{5}{4}$ *since* $\frac{5}{4}$ *is larger than* $\frac{2}{3}$.

$$6-4$$

$$\boxed{6}\frac{5}{4} - \boxed{2}\frac{2}{3} = \boxed{4}\frac{7}{12}$$

$$\frac{5}{4} - \frac{2}{3}$$

Example 5: $12\frac{2}{7} - 8\frac{3}{5} = 11\frac{9}{7} - 8\frac{3}{5} = 3\frac{24}{35}$

Exercise 6:

1. $5\frac{3}{5} + 2\frac{1}{3}$
2. $3\frac{2}{5} + 2\frac{2}{7}$
3. $8\frac{5}{9} + 7\frac{3}{7}$
4. $8\frac{1}{4} + 2\frac{1}{5}$
5. $5\frac{3}{4} + 5\frac{3}{5}$
6. $2\frac{3}{5} + 1\frac{4}{7}$
7. $12\frac{15}{16} + 7\frac{7}{15}$
8. $3\frac{19}{20} + 2\frac{17}{25}$
9. $7\frac{8}{9} + 2\frac{12}{35}$
10. $4\frac{15}{49} + 3\frac{5}{42}$
11. $3\frac{2}{3} + \frac{4}{7}$
12. $7\frac{21}{45} + \frac{4}{15}$

Answers: $7\frac{14}{15}$, $5\frac{24}{35}$, $15\frac{62}{63}$, $10\frac{9}{20}$, $11\frac{7}{20}$, $4\frac{6}{35}$, $20\frac{97}{240}$, $6\frac{63}{100}$, $10\frac{73}{315}$, $7\frac{125}{294}$, $4\frac{5}{21}$, $7\frac{11}{15}$

Now do Exercise 6 again as subtraction problems. For example problem 1 would be $5\frac{3}{5} - 2\frac{1}{3}$.

Answers: $3\frac{14}{15}$, $1\frac{4}{35}$, $1\frac{8}{63}$, $6\frac{1}{20}$, $\frac{3}{20}$, $1\frac{1}{35}$, $5\frac{113}{240}$, $1\frac{27}{100}$, $5\frac{172}{315}$, $1\frac{55}{294}$, $3\frac{2}{21}$, $7\frac{1}{5}$

Since none of the subtractions above involved borrowing we give you some that do.

Exercise 7:

1. $5\frac{1}{3} - 2\frac{3}{4}$
2. $7\frac{2}{5} - 3\frac{2}{3}$
3. $12\frac{1}{10} - 3\frac{2}{5}$
4. $2\frac{3}{7} - 1\frac{3}{5}$
5. $7\frac{5}{6} - 6\frac{6}{7}$
6. $8\frac{1}{4} - 2\frac{2}{7}$
7. $13\frac{1}{2} - 3\frac{5}{8}$
8. $7\frac{9}{16} - 1\frac{7}{12}$
9. $11\frac{11}{25} - 4\frac{18}{35}$
10. $3\frac{5}{16} - \frac{4}{7}$

Answers: $2\frac{7}{12}$, $3\frac{11}{15}$, $8\frac{7}{10}$, $\frac{29}{35}$, $\frac{41}{42}$

$5\frac{27}{28}$, $9\frac{7}{8}$, $5\frac{47}{48}$, $6\frac{162}{175}$, $2\frac{83}{112}$

Adding Three or More Fractions

To add three fractions we can add two of them together (your choice) and then add the third one to the sum you got for the first two.

Example 1:

$$\frac{1}{2} + \overbrace{\frac{2}{3} + \frac{1}{5}}^{10\ +\ 3} = \overbrace{\frac{1}{2} + \frac{13}{15}}^{15\ +\ 26} = \frac{41}{30} = 1\frac{11}{30}$$

1^{st} add these to get this

For four fractions just add two pairs, then add the sums you just got.

Example 2:

$$\overbrace{\frac{1}{3} + \frac{1}{2}}^{2\ +\ 3} \to 6 \quad + \quad \overbrace{\frac{3}{4} + \frac{1}{5}}^{15\ +\ 4} \to 20 \quad = \quad \overbrace{\frac{5}{6} + \frac{19}{20}}^{50\ +\ 57} = \frac{107}{2 \times 30}$$

$$= \frac{107}{60}$$

$$= 1\frac{47}{60}$$

This method can obviously be extended to adding more than four fractions should the need arise.

Exercise 8: 1. $\frac{1}{2}+\frac{2}{3}+\frac{3}{4}$
2. $\frac{3}{5}+\frac{2}{7}+\frac{7}{25}$
3. $\frac{2}{5}+\frac{1}{3}+\frac{4}{15}$
4. $\frac{3}{7}+\frac{4}{5}+\frac{17}{35}$
5. $\frac{3}{8}+\frac{7}{12}+\frac{5}{36}$
6. $\frac{4}{55}+\frac{3}{44}+\frac{5}{33}$
7. $\frac{1}{2}+\frac{1}{3}+\frac{5}{6}+\frac{3}{8}$
8. $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}$
9. $\frac{2}{3}+\frac{1}{2}+\frac{2}{5}+\frac{13}{30}$
10. $\frac{1}{6}+\frac{1}{42}+\frac{1}{49}+\frac{1}{35}$

Answers: $1\frac{11}{12}$, $1\frac{29}{175}$, 1, $1\frac{5}{7}$, $1\frac{7}{72}$, $\frac{193}{660}$, $2\frac{1}{24}$, $\frac{15}{16}$, 2, $\frac{176}{735}$

If you've been faithful in doing all the exercises, then you should be able to do fraction addition and subtraction faster and easier than ever before. We hope that you pass these methods on to family, friends, neighbors, relatives, etc. We want everyone to know that it's not really hard to add and subtract fractions. Thank you for bearing with us and helping us spread this method around.

By the way, it's not hard either to have life full of love, peace and joy. All you need to do is realize
(1) God loves you and wants you to have everlasting life (John 3:16,17; Romans 5:8),
(2) You have blown it trying it on your own (Romans 3:23; Romans 3:10),
(3) There is a way out for you (Romans 6:23; John 1:12; Romans 10:9,10).
Take the way out (Revelations 3:20). That's infinitely more important than learning to do fractions easier!