CHAPTER 1: INTRODUCTION TO FRACTIONS SKILLS FOR TRADES

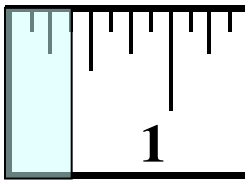
Construction related measurements and calculations require knowledge of fractions. Fractions are a way of expressing a **part of something**. If you cut a piece of wood, you are using a fraction of the whole board. If you go home from work at lunch, you are only working a fraction of the day.

There are two parts to every fraction, the numerator and the denominator.

The **Numerator** (top number) refers to a specific part of the whole.

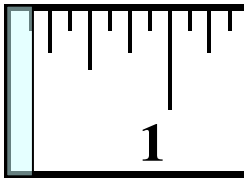
The **Denominator** (bottom number) identifies the number of equal parts into which the whole has been divided.

Example: The fraction $\frac{3}{8}$ tells you what part of the figure below is shaded. Three of the eight equal parts are shaded. Therefore, the shaded portion represents $\frac{3}{8}$ of an inch.

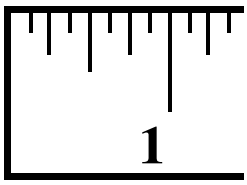


Darken or write fractions that represent the part of each inch that is indicated:

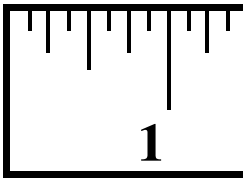
1) _____



2) $\frac{5''}{8}$



3) $\frac{7''}{8}$



FRACTIONS IN WRITTEN FORM

Write the correct fraction for each of these.

_____ 1) A yard contains 36 inches. 13 inches is what fraction of a yard?

_____ 2) There are 12 inches in a foot. 7 inches is what fraction of the whole?

_____ 3) 59 cents is what fraction of a dollar?

_____ 4) There are 16 ounces in a pound. What fraction of a pound is 7 ounces?

_____ 5) Alicia worked 11 months of the year. What fraction of the year did Alicia work?

_____6) Laura has to cut 150 2 x 4's. This morning she cut 103. What fraction of the job has she completed?

_____7) There are 4 quarts in a gallon of paint. Tabitha used 1 quart to paint the entryway. What fraction of the gallon did she use?

_____8) 2,000 people applied to the pipefitters' apprenticeship program. The program accepted 147 people. What fraction of the applicants were accepted?

EQUIVALENT FORMS OF FRACTIONS-VOCABULARY

PROPER FRACTION- The numerator is *less than* the denominator.

Examples: $\frac{3}{5}$ $\frac{4}{7}$ $\frac{15}{16}$

A proper fraction is less than all the parts into which the whole is divided. The value of a proper fraction is *always less than one*.

IMPROPER FRACTION- The numerator is *equal to* or *larger than* the denominator.

Examples: $\frac{8}{5}$ $\frac{3}{2}$ $\frac{9}{9}$

An improper fraction may include all the parts into which a whole has been divided ($\frac{8}{8}$), or it may include more than the total parts of the whole. The value of an improper fraction is either *equal to or more than one.*

UNREDUCED FRACTION-The numerator is less than the denominator, but because it could be reduced, it isn't a proper fraction.

Examples: $\frac{2}{6}$ $\frac{9}{12}$ $\frac{32}{48}$

MIXED NUMBER- A whole number is written next to a proper fraction

Examples: $3\frac{3}{8}$ $5\frac{9}{10}$ $12\frac{5}{6}$

REDUCING/SIMPLIFYING FRACTIONS

Reducing or simplifying a fraction means writing it in its lowest term. Anyone who uses money is familiar with the concept of reducing fractions. A quarter is 25 out of 100 pennies $\frac{25}{100}$ or one of four quarters $\frac{1}{4}$. 10 dimes equals 1 dollar, therefore one dime equals $\frac{1}{10}$ of a dollar. 10 out of 100 pennies has the same value, 10 cents, and is written not as $\frac{10}{100}$ but in its simplified form as $\frac{1}{10}$.

Below are examples of simplifying fractions.

Example 1: Simplify $\frac{25}{100}$

Step 1) First find a number that goes evenly into both the numerator and the denominator, in this case 25 is the only number that will work.

$$\frac{25 \div 25}{100 \div 25} = \frac{1}{4}$$

Step 2) Next, see if another number will go evenly into the now reduced fraction. If no further reduction is possible, then the fraction is said to be at its lowest terms.

Example 2: Reduce $\frac{54}{81}$

Step 1) Find a number that goes evenly into the numerator and denominator. In this example, both numbers can be divided evenly by 9.

$$\frac{54 \div 9}{81 \div 9} = \frac{6}{9}$$

Step 2) Now that the fraction has been reduced once, check to see if it is possible to reduce it further. In this case, both numbers can be further divided by 3.

$$\frac{6 \div 3}{9 \div 3} = \frac{2}{3}$$

Step 3) Now check again to determine if the fraction can be reduced further. If not, the fraction is at its lowest terms. $\frac{2}{3}$ can not be reduced: it is the answer.

Remember that no matter how much the numerator and denominator are reduced, the value of the fraction remains equal to the original just as 10 out of 100 pennies is equal to 1 out of 10 dimes.

Short cut: You can shorten the process if the numerator and denominator both end in zero, by crossing out the last zero in the numerator and the last zero in the denominator. This does not change the value, but does reduce the fraction.

Example 3: Simplify $\frac{70}{100}$

Step 1) Cross out a 0 at the end of each number.

Since you can only cross out one zero in the numerator, you can only cross out one zero in the denominator.

$$\frac{70}{100} = \frac{7}{10}$$

Step 2) Check to see whether another number goes evenly into both the numerator and denominator of the fraction. Since no other number goes evenly into both 7 and 10 (besides 1), the fraction is reduced as far as it will go.

Example 4: Reduce $\frac{80}{200}$

Step 1) Cross out ending zeros.

$$\frac{80}{200} = \frac{\cancel{8}}{\cancel{2}0}$$

Step 2) Reduce further by dividing both the numerator and the denominator by 4.

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

Step 3) Check to determine if the fraction can be reduced further. It cannot.

Simplify each fraction to the lowest term.

1) $\frac{8}{16}$ = ____ 2) $\frac{480}{560}$ = ____ 3) $\frac{8}{400}$ = ____ 4) $\frac{45}{70}$ = ____ 5) $\frac{4}{32}$ = ____

6) $\frac{18}{81}$ = ____ 7) $\frac{33}{77}$ = ____ 8) $\frac{28}{32}$ = ____ 9) $\frac{35}{100}$ = ____ 10) $\frac{10}{25}$ = ____

11) $\frac{28}{49}$ = ____ 12) $\frac{48}{64}$ = ____ 13) $\frac{30}{120}$ = ____ 14) $\frac{40}{400}$ = ____ 15) $\frac{90}{210}$ = ____

REVIEW

- Fractional parts show equal divisions of a whole
- Fractions with the same number on the top and bottom equal a whole
- Answers to fraction problems should always be in lowest terms.

ADDING AND SUBTRACTING FRACTIONS WITH THE SAME DENOMINATOR

With this much information you can easily add or subtract fractions with the same denominators (bottom numbers) by adding or subtracting the numerators (top numbers) and keeping the denominator the same.

To work problems with mixed numbers (whole numbers and fractions), add or subtract the fractions first and then move to the whole numbers.

Remember to reduce to their lowest terms all the fractions in your answers.

Example 1: Adding two fractions with the same denominator: $\frac{1}{9} + \frac{1}{9}$

Step 1) Add the numerators: 1 + 1 = 2

Step 2) Write the sum from Step 1 over the denominator: $\frac{2}{9}$

Example 2: Adding several fractions with a common denominator and reducing the answer to lowest terms: $\frac{5}{22} + \frac{7}{22} + \frac{2}{22} = \frac{5+7+2}{22} = \frac{14}{22} = \frac{7}{11}$

Example 3: Adding mixed numbers to fractions with the same denominator:
$5\frac{1}{3} + \frac{1}{3}$

Step 1) Add the fractions: $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

Step 2) Place the whole number before the fraction: $5\frac{2}{3}$

(When adding two or more sets of mixed numbers, first add the fractions and then add the whole numbers separately).

Example 4: Subtracting one fraction from another with a common denominator:
$\frac{3}{5} - \frac{2}{5}$

Step 1) Subtract the numerators: $3 - 2 = 1$

Step 2) Write the difference from Step 1 over the common denominator: $\frac{1}{5}$

Example 5: $6\frac{9}{10} - 2\frac{1}{10}$

Step 1) Subtract the fractions and simplify/reduce: $\frac{9}{10} - \frac{1}{10} = \frac{8}{10} = \frac{4}{5}$

Step 2) Subtract the whole numbers: $6 - 2 = 4$

Step 3) Put the whole number to the left of the fraction: $4\frac{4}{5}$

Work these problems. Simplify/reduce if possible:

1) $\frac{2}{8} + \frac{3}{8} =$ ____

2) $\frac{3}{17} + \frac{1}{17} =$ ____

3) $\frac{1}{4} + \frac{2}{4} =$ ____

4) $\frac{1}{16} + \frac{5}{16} + \frac{2}{16} =$ ____

5) $\frac{42}{64} - \frac{20}{64} =$ ____

6) $\frac{7}{16} - \frac{2}{16} =$ ____

7) $7\frac{1}{9} + 3\frac{1}{9} =$ ____

8) $\frac{15}{31} - \frac{7}{31} =$ ____

9) $\frac{10}{81} - \frac{1}{81} =$ ____

10) $\frac{8}{36} + \frac{4}{36} + \frac{12}{36} =$ ____

11) $\frac{46}{48} - \frac{32}{48} =$ ____

12) $\frac{48}{65} - \frac{3}{65} =$ ____

13) $\frac{9}{19} + \frac{5}{19} =$ ____

14) $2\frac{10}{30} + \frac{10}{30} =$ ____

15) $8\frac{2}{13} + 8\frac{2}{13} =$ ____

16) $3\frac{9}{21} - 3\frac{2}{21} =$ ____

17) $8\frac{15}{40} - 6\frac{5}{40} =$ ____

18) $5\frac{9}{10} - \frac{2}{10} =$ ____

19) $1\frac{6}{32} + 15\frac{10}{32} =$ ____

20) $53\frac{5}{18} + 9\frac{7}{18} =$ ____

21) $82\frac{7}{9} - 3\frac{1}{9} =$ ____

22) $62\frac{5}{16} + 19\frac{5}{16} =$ ____

23) $3\frac{13}{49} + 4\frac{15}{49} =$ ____

24) $11\frac{10}{99} + 3\frac{23}{99} =$ ____

25) $13\frac{5}{8} - 7\frac{3}{8} =$ ____

26) $21\frac{4}{5} - 3\frac{1}{5} =$ ____

27) $41\frac{80}{600} - 3\frac{30}{600} =$ ____

Extra Effort

28) $14\frac{6}{49} + 2\frac{4}{49} + 7\frac{18}{49} =$ ____

29) $22\frac{40}{54} - 3\frac{5}{54} - 4\frac{8}{54} =$ ____

30) $13\frac{87}{88} - 4\frac{3}{88} - 2\frac{7}{88} =$ ____

Some problems contain a whole number and a mixed number (or a fraction) where there is nothing to be added or subtracted from the fraction. In this case, deal with the fraction first by transferring it directly to your answer, then move to the whole numbers.

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

Step 1) There is no fraction to be added to $\frac{2}{7}$

```
   9
+  2/7
```

write 2/7 in the answer space

Step 2) There is no whole number to be added to 9.

```
   9
+  2/7
```

write 9 in the answer space **answer: 9 2/7**

Example 2: $1+12\frac{1}{5}=$

Step 1) There is no fraction to be added to $1/5$.

```
   1
+12 1/5
```

write 1/5 in the answer space

Step 2) There is a whole number, 1, to be added to 12

```
   1
+12 1/5
```

write 13 in the answer space **answer: 13 1/5**

Example 3: $16\frac{5}{9}-6=$

Step 1) There is no fraction to be subtracted from $5/9$.

```
  16 5/9
-  6
```

write 5/9 in the answer space

Step 2) There is a whole number, 6, to be subtracted from 16

```
  16 5/9
-  6
```

write 10 in the answer space **answer**: 10 5/9

Work these problems:

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

2) $\frac{3}{4}+11=$ ____

3) $15+1\frac{9}{16}=$ ____

4) $17\frac{11}{17}+3=$ ____

5) $14+4+10\frac{15}{29}=$ ____

6) $7\frac{5}{8}-6=$ ____

7) $4\frac{5}{6}-2=$ ____

8) $99\frac{1}{2}-99=$ ____

9) $82\frac{77}{78}-33=$ ____

10) $3+6\frac{2}{3}=$ ____

11) $40\frac{2}{15}-8=$ ____

12) $6\frac{3}{8}-3=$ ____

13) $4+\frac{1}{3}=$ ____

14) $8+\frac{3}{8}=$ ____

15) $\frac{4}{17}+9=$ ____

16) $77\frac{77}{83}-9=$ ____

17) $55+49\frac{1}{7}=$ ____

18) $100\frac{2}{9}-92=$ ____

19) $431\frac{1}{8}-78=$ ____

20) $82\frac{5}{6}-21-2=$ ____

You can only add or subtract fractions that have the same denominators.

To this point all the fractions have had the same denominators, but that isn't always the case. Turn the page to find out how to change problems with different denominators so that you can add or subtract them./

RAISING FRACTIONS

To add and subtract fractions with different denominators you will also need to learn how to raise fractions to higher terms. (This creates improper fractions. That's okay – leave them alone for now)

There are 2 ways to do this: one is by dividing the old denominator into the new.

Example 1: Raise $\frac{4}{5}$ to 20ths. $\frac{4}{5} = \frac{?}{20}$

Step 1) In this problem 20 becomes the new denominator.
To find the new numerator, divide the old denominator
Into the new one: 20 ÷ 5 = 4

Step 2) Then multiply the numerator by that number, (4): $\frac{4 \times 4}{} = \frac{16}{20}$

Step 3) Check your answer by dividing the raised fraction by 4.

$$\frac{16 \div 4}{20 \div 4} = \frac{4}{5}$$

The second way to raise fractions is by multiplying. Multiply the old denominator by whatever it takes to get to the new one, then multiply the original numerator by the same number. What you do to the bottom number, you must do to the top.

Example 2: Raise $\frac{7}{9}$ to 27ths. $\frac{7}{9} = \frac{?}{27}$

Step 1) In this problem 27 becomes the new denominator.
Multiply 9 X 3 to get 27

Step 2) Then multiply the numerator by that number, (3):

$$\frac{7 \times 3}{9 \times 3} = \frac{21}{27}$$

Step 3) Check your answer by dividing the raised fraction by 3.

$$\frac{21 \div 3}{27 \div 3} = \frac{7}{9}$$

Raise each fraction to higher terms.

1) $\frac{3}{5} = \frac{\quad}{25}$ 2) $\frac{9}{12} = \frac{\quad}{36}$ 3) $\frac{7}{8} = \frac{\quad}{32}$ 4) $\frac{3}{4} = \frac{\quad}{24}$

5) $\frac{7}{9} = \frac{\quad}{27}$ 6) $\frac{5}{10} = \frac{\quad}{100}$ 7) $\frac{2}{7} = \frac{\quad}{49}$ 8) $\frac{3}{6} = \frac{\quad}{48}$

9) $\frac{1}{2} = \frac{\quad}{16}$ 10) $\frac{2}{3} = \frac{\quad}{18}$ 11) $\frac{3}{8} = \frac{\quad}{72}$ 12) $\frac{2}{3} = \frac{\quad}{15}$

13) $\frac{7}{8} = \frac{\quad}{56}$ 14) $\frac{1}{4} = \frac{\quad}{48}$ 15) $\frac{5}{6} = \frac{\quad}{30}$ 16) $\frac{4}{5} = \frac{\quad}{50}$

CREATING MIXED/WHOLE NUMBERS FROM FRACTIONS

When adding fractions, the answer may be an improper fraction, such as $\frac{9}{5}$, a fraction that is greater than the whole. To finish solving a problem resulting in an improper fraction, you must convert it to a mixed number by dividing the denominator into the numerator and writing the remainder, if any, over the original denominator.

Example 1: Change $\frac{26}{4}$ to a mixed/whole number.

Step 1) Divide the denominator into the numerator: $\begin{array}{r} 6 \\ 4\overline{)26} \\ \underline{24} \\ 2 \end{array}$

Step 2) Write the 6 as a whole number. (There is a remainder of 2)

Step 3) Write the remainder as a fraction over the original denominator: $6\frac{2}{4}$

Step 4) Reduce answer: $6\frac{2}{4} = 6\frac{1}{2}$

Example 2: Change $\frac{56}{7}$ to a whole number

Step 1) Divide the denominator into the numerator $\begin{array}{r} 8 \\ 7\overline{)56} \end{array}$

Step 2) Write 8 as a whole number (There is no remainder)

Step 3) No reducing necessary. The answer is 8.

Practice changing improper fractions into mixed/whole numbers

1) $\frac{22}{11}$ = ____ 2) $\frac{35}{9}$ = ____ 3) $\frac{100}{5}$ =____

4) $\frac{50}{5}$ = ____ 5) $\frac{42}{7}$ = _____ 6) $\frac{41}{2}$ = _____

7) $\frac{13}{5}$ = ____ 8) $\frac{104}{90}$ = ____ 9) $\frac{12}{12}$ = ____

10) $\frac{77}{3}$ = _____ 11) $\frac{345}{8}$ = _____ 12) $\frac{691}{27}$ = _____

13) $\frac{447}{17}$ = _____ 14) $\frac{1{,}000}{100}$ = _____ 15) $\frac{563}{31}$ = _____

HOW TO FIND THE COMMON DENOMINATOR

A **common denominator** is that number which can be divided evenly by all the denominators in a problem. The smallest number that can be divided evenly by all denominators is called the **lowest common denominator (LCD)**.

First try using the largest denominator in the original problem as the LCD.

Example: $\frac{1}{8}+\frac{1}{4}=$

Since 4 can go into 8 evenly, 8 can be used as the common denominator.

$\frac{1}{8}=\frac{1}{8}\,and\,\frac{1}{4}=\frac{2}{8}$ Rewritten, the problem becomes $\frac{1}{8}+\frac{2}{8}=$ Answer: $\frac{3}{8}$

Solve these problems and reduce if necessary.

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

2) $\frac{5}{6}-\frac{1}{3}=$ ____

3) $\frac{5}{8}+\frac{3}{4}=$ ____

4) $\frac{7}{12}-\frac{1}{4}=$ ____

5) $\frac{1}{2}+\frac{7}{10}+\frac{3}{5}=$ ____

6) $\frac{4}{5}+\frac{3}{25}=$ ____

7) $\frac{1}{9}+\frac{12}{54}=$ ____

8) $\frac{32}{77}-\frac{4}{11}=$ ____

9) $\frac{15}{32}-\frac{3}{8}=$ ____

10) $\frac{7}{21}-\frac{2}{7}=$ ____

11) $\frac{4}{12}+\frac{1}{3}+\frac{5}{6}=$ ____

12) $\frac{9}{40}+\frac{5}{8}+\frac{13}{20}=$ ____

13) $\frac{32}{56}-\frac{3}{7}=$ ____

14) $\frac{4}{15}+\frac{1}{3}+\frac{4}{5}=$ ____

15) $\frac{25}{30}-\frac{1}{2}=$ ____

16) $\frac{3}{8}+\frac{4}{11}+\frac{15}{88}=$ ____

17) $\frac{4}{12}+\frac{1}{3}+\frac{5}{6}=$ ____

18) $\frac{11}{24}-\frac{1}{3}=$ ____

19) $\frac{27}{36}-\frac{5}{9}=$ ____

20) $\frac{21}{64}+\frac{1}{2}+\frac{9}{8}=$ ____

21) $\frac{4}{7}+\frac{1}{28}+\frac{5}{2}=$ ____

22) $\frac{7}{10}+\frac{9}{20}+\frac{3}{5}=$ ____

23) $\frac{3}{19}+\frac{1}{2}+\frac{17}{38}=$ ____

24) $\frac{110}{180}-\frac{2}{6}-\frac{1}{6}=$ ____

When none of the denominators will work as the (LCD), try:

- Going through the multiplication tables of the denominators to see if there are common multiples
- Multiplying 2 small denominators together, then checking that number against any other denominator (sometimes ½ of this will work—try it just to see)
- Multiply all the denominators together (Use this if all else fails: it always works, but results in a VERY large number which means you will have a lot of reducing/simplifying to do at the end)

Example 1: $\frac{1}{3}+\frac{5}{6}+\frac{1}{4}=$

- Go through the multiplication table of the 3's.
- 3 X 2 = 6 which cannot be divided by 4.
- 3 X 3 = 9 which cannot be divided by either 6 or 4.
- 3 X 4 = 12 which <u>*can*</u> be divided by 3, 6 and 4. Use 12 as the common denominator.
  - Raise each fraction to 12ths. $\frac{1}{3}=\frac{4}{12,}\quad \frac{5}{6}=\frac{10}{12,}\quad \frac{1}{4}=\frac{3}{12}=$
  - Rewrite and add: $\frac{4}{12}+\frac{10}{12}+\frac{3}{12}=\frac{17}{12}$
  - Answer (reduced): $1\frac{5}{12}$

  If there are whole numbers in the problem, deal with them separately

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

- Multiply the denominators to find the LCD: 4 x 5 = 20
- Raise each fraction to 20ths. $\frac{3}{4}=\frac{15}{20}\,and\,\frac{4}{5}=\frac{16}{20}$
- Rewrite and add: 2 $\frac{15}{20}+\frac{16}{20}=2\frac{31}{20}$
- Answer: $3\frac{11}{20}$

Solve these programs and simplify/reduce.

1) $3\frac{15}{16} - \frac{3}{8}$ = ____

2). $4\frac{7}{10} + \frac{1}{5}$ =____

3) $5\frac{3}{4} + \frac{5}{16}$ =____

4) $7\frac{2}{3} + \frac{1}{6}$ = _____

5) $7\frac{10}{14} - \frac{1}{2}$ =____

6) $2\frac{8}{9} - \frac{1}{3}$ = ____

7) $14\frac{1}{15} + \frac{2}{5}$ =_____

8) $8\frac{19}{21} - \frac{2}{3}$ = ____

9) $3\frac{1}{2} + \frac{7}{7}$ = ____

10) $9\frac{3}{8} + \frac{4}{12}$ =_____

11) $\frac{2}{6} + 6\frac{1}{4}$ =_____

12) $7\frac{5}{9} + 17\frac{2}{3}$ =_____

13) $9\frac{3}{5} - \frac{1}{4} =$ _____

14) $\frac{15}{16} - \frac{2}{3} =$ ____

15) $\frac{7}{10} - \frac{1}{8}$ =_____

16) $\frac{3}{4} - \frac{2}{7} =$ ____

17) $7\frac{1}{2} + \frac{2}{3}$ = _____

18) $2\frac{4}{5} - \frac{5}{9}$ = ____

19) $8\frac{4}{10} + \frac{3}{4}$ = _____

20) $9\frac{5}{6} - \frac{3}{8}$ = _____

21) $4\frac{3}{4} + \frac{5}{6}$ = ____

Extra effort

22) $\frac{2}{3} + \frac{2}{9} + 5\frac{5}{12}$ = _____

23) $\frac{2}{5} + \frac{3}{10} + 7\frac{3}{15}$ = ____

24) $5\frac{3}{7} + 9\frac{5}{11} + 12\frac{1}{2}$ = _____

BORROWING: A MULTI-STEP PROCESS

In some cases, to solve a subtraction problem you will have to borrow 1 from a whole number to create a needed fraction. This involves several critical steps:

1) **<u>LCD</u> (Identify/create the Lowest Common Denominator)**
2) **<u>Borrow</u> 1 from the larger whole number** (never the smaller one)
3) **<u>Change</u> the borrowed 1 into the fraction you need it to be**
   - you may NOT change the value of the number, but you may state it differently ($1 can be a single bill **or** 10 dimes **or** 4 quarters **or** 100 pennies)
   - fractions with the same top and bottom numbers equal 1: $\frac{4}{4}=1; \frac{7}{7}=1; \frac{16}{16}=1$
4) **<u>Merge</u> the fraction from the borrowed 1 with that given in the problem** (rewrite)
5) **<u>Subtract</u>**

Example 1: This is the easiest, involving only steps 1, 2, 3 & 5 (step 4 is not needed)

$8-6\frac{2}{3}=$

Step 1) **<u>LCD</u>** (you have only one: use 3rds as the LCD)

There is nothing above the $\frac{2}{3}$, yet you have to subtract it from something.

Step 2) **<u>Borrow</u>** 1 from the 8, replacing the 8 with a 7 (+1)

$8=7(+1)$

$7\frac{3}{3}$

Step 3) **<u>Change</u>** (You need more 3rds) Change the (+1) to $\frac{3}{3}$

You now have a workable subtraction problem.

Step 4) is not needed

$7\frac{3}{3}-6\frac{2}{3}=1\frac{1}{3}$

Step 5) **Subtract**

Example 2: The first fraction is smaller than the second fraction. Make it larger.

$13\frac{1}{5} - 7\frac{4}{5} =$ *Step 1)* **<u>LCD</u> (**you have only one: use 5ths as the LCD

$13 \rightarrow 12(+1)\frac{1}{5}$ *Step 2)* **<u>Borrow</u>** 1 from the 13, replacing it with 12 (+1)

$(+1 = \frac{5}{5})$ *Step 3)* **<u>Change</u>** the (+1) into 5/5

$12\frac{1}{5} + \frac{5}{5} = 12\frac{6}{5}$ *Step 4)* **<u>Merge and rewrite</u> the borrowed fraction with the problem**

$12\frac{6}{5} - 7\frac{4}{5} = 5\frac{2}{5}$ *Step 5)* **<u>Subtract</u>**

Practice borrowing by solving the following problems. Reduce if possible.

1) $4\frac{1}{2} - \frac{6}{7} =$ ____

2) $6 - \frac{4}{5} =$ ____

3) $1\frac{3}{10} - \frac{1}{2} =$ ____

4) $4 - \frac{1}{4} =$ ____

5) $9\frac{2}{5} - \frac{7}{10} =$ ____

6) $7\frac{2}{3} - \frac{3}{4} =$ ____

7) $31\frac{1}{3} - \frac{7}{15} =$ ____

8) $15\frac{1}{3} - 6\frac{2}{3} =$ ____

9) $9 - 6\frac{2}{3} =$ ____

10) $21 - \frac{4}{5} =$ ____

11) $13\frac{3}{10} - 3\frac{3}{5} =$ ____

12) $19\frac{7}{12} - 9\frac{2}{3} =$ ____

13) $42 - 1\frac{7}{8} =$ ____

14) $51\frac{1}{4} - 12\frac{7}{12} =$ ____

15) $93\frac{2}{11} - 5\frac{1}{2} =$ ____

16) $52\frac{1}{2} - 26\frac{7}{11} =$ ____

17) $63 - 2\frac{5}{6} =$ ____

18) $9\frac{3}{7} - 7\frac{4}{5} =$ ____

19) $47 - 2\frac{7}{9} =$ ____

20) $7\frac{1}{3} - 3\frac{5}{7} =$ ____

21) $13\frac{1}{8} - 2\frac{3}{4} =$ ____

22) $18\frac{3}{5} - 4\frac{9}{10} =$ ____

23) $1\frac{1}{5} - \frac{5}{8} =$ ____

24) $21 - 6\frac{5}{7} =$ ____

25) $11\frac{5}{12} - 3\frac{3}{4} =$ ____ 26) $2 - \frac{3}{10} =$ _____ 27) $10\frac{3}{5} - 2\frac{7}{9} =$ ___

WORD PROBLEMS: ADDITION AND SUBTRACTION

Many of the trades use word problems on their qualifying tests. Look for key words that tell you whether you need to add or subtract. Words such as **sum** or **total**, or any problem that asks you to combine more than two numbers can be solved through addition. **Difference, left,** & **remaining** are some key words that tell you this is a subtraction problem. Figuring out an **increase** or **decrease** also may involve subtraction, as does the concept of something getting smaller (**cut, shrunk, eaten or lost**). In setting up subtraction problems the larger number always goes above the smaller one.

To be correct, each answer must include numbers and words or symbols.

1) Vanessa cut off $3\frac{3}{8}$ inches from an 8" inch brick. How long was the remaining piece?

2) Annette weighs 174 pounds. When she puts on her $17\frac{3}{4}$ pound tool belt and her 5 lb. steel toed boots, how much does she weigh?

3) LaShawn cut a length of PVC into three pieces measuring, $42\frac{1}{16}$", $7\frac{3}{4}$" and $13\frac{1}{8}$". How much PVC did she use?

4) Sue only used her truck for work. Monday morning the odometer on the truck showed 60,345 $\frac{3}{10}$ miles. Back at home Friday afternoon it showed 60,830 $\frac{7}{10}$ miles. How far did she travel to work that week?

5) From an 80 pound bag of cement, Mary used 33 $\frac{5}{8}$ pounds to make concrete. How much was left in the bag?

6) Kelly used up a box of nails to compete two projects. She used 24 $\frac{1}{4}$ lbs of nails for the first project and 25 $\frac{3}{4}$ nails for the second one. How heavy was the box originally?

7) Before break, Crystal made up $11\frac{2}{3}$ sets of nuts, bolts and washers. Before lunch, she made up 9 more sets and after lunch, she finished another $10\frac{2}{5}$ sets. How many sets did she make?

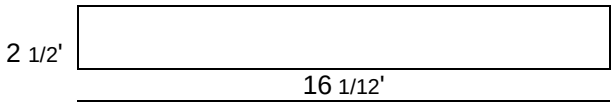
8) If you lower the speed of a cement mixer from 12 rpms to $5\frac{1}{3}$ rpms, how much slower does it spin?

9) Rosa's $2\frac{3}{4}$ pound work boots weighed $10\frac{3}{8}$ pounds after she worked in the mud all day. How much was the increase?

PERIMETER

Perimeter is a measurement of the distance around an object. You will need to know how to measure perimeters to build a fence or to do other construction jobs that involve perimeters. To determine the perimeter of a shape, you must measure the sides, **then add the sides together**.

Example: What is the perimeter of the following shape?

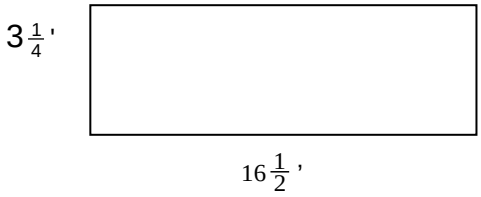


Add 2 1/2' + 2 1/2' (for each end of the figure) and 16 1/12' + 16 1/12' (for each side). The perimeter is then 37 1/6'. **Use the symbol ' for feet and " for inches.**

Note: Answers to perimeter problems must always include a unit of measurement.

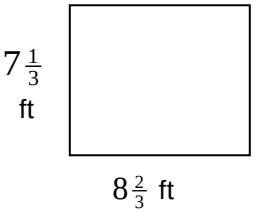
Determine the perimeter of the following shapes.

1)



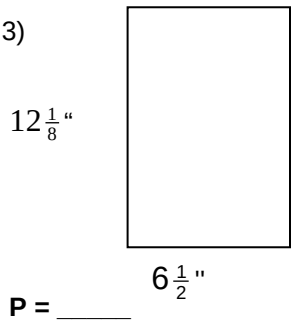
P = _____

2)



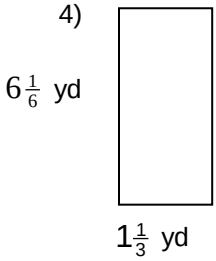
P = _____

3)



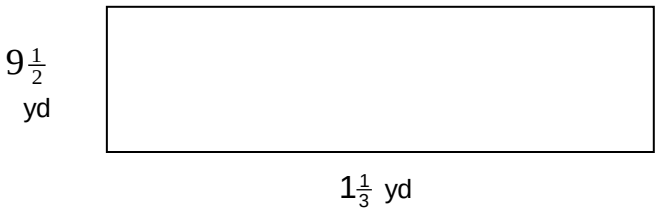
P = _____

4)



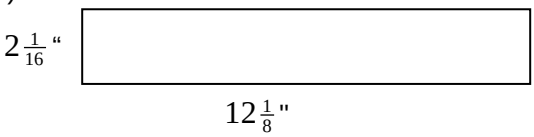
P = _____

5)



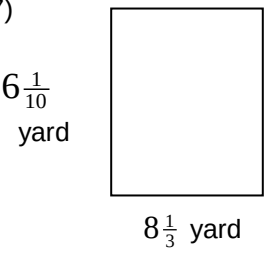
P = _____

6)



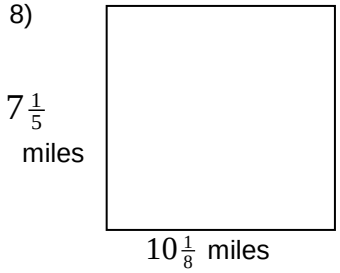
P = _____

7)



P = _____

8)



P = _____

PRACTICE PROBLEMS: ADDITION AND SUBTRACTION

1) $\frac{1}{3}+\frac{1}{6}=$ ____

2) $\frac{3}{8}+\frac{9}{32}=$ ____

3) $\frac{7}{8}-\frac{3}{4}=$ ____

4) $3\frac{1}{3}-\frac{1}{2}=$ ____

5) $1\frac{5}{9}-\frac{5}{9}=$ ____

6) $7\frac{7}{10}+1\frac{2}{5}=$ ____

7) $10\frac{1}{8}-2\frac{7}{8}=$ ____

8) $\frac{1}{2}+11\frac{5}{12}+3=$ ____

9) $13\frac{7}{16}-2\frac{2}{3}=$ ____

10) $\frac{7}{9}-\frac{1}{2}=$ ____

11) $16\frac{2}{11}+10\frac{1}{22}+11=$ ____

12) $6\frac{2}{3}+6\frac{2}{3}=$ ____

13) $8\frac{7}{12}+8\frac{7}{12}+8\frac{7}{12}=$ ____

14) $31\frac{1}{32}-19\frac{31}{64}=$ ____

15) $4\frac{2}{3}+9\frac{3}{5}+7\frac{1}{2}=$ ____

16) $13\frac{13}{20}+6\frac{7}{8}+3\frac{1}{5}=$ ____

17) $92\frac{23}{35}+17\frac{1}{5}+5\frac{6}{7}=$ ____

18) $55\frac{29}{30}+33\frac{1}{6}+76\frac{4}{5}=$ ____

19) $14\frac{3}{10}-4\frac{5}{10}=$ ____

20) $23\frac{5}{9}-6\frac{11}{12}-1\frac{1}{6}=$ ____

21) $15\frac{7}{30}-3\frac{4}{15}=$ ____

22) If a yard has 5 sides: 7', $16\frac{1}{2}$', $13\frac{1}{4}$', $18\frac{1}{2}$' and $6\frac{1}{3}$', what is its perimeter?

Extra Effort

23) If the perimeter of a park is $399\frac{1}{4}$', and 3 sides are $143\frac{1}{2}$', $142\frac{1}{4}$', and $55\frac{1}{3}$', what length is the 4th side?

24) The perimeter of a triangle is 96 yards. If one side is $29\frac{2}{3}$ yards and another side is $30\frac{1}{3}$ yards, how long is the remaining side?

MULTIPLICATION OF FRACTIONS

When multiplying fractions, you simply multiply the numerators together and the denominators together: no need for common denominators!

Reduce/simplify if possible.

Example: $\frac{2}{5} \times \frac{3}{5} =$

Step 1) Multiply the numerators. 2 x 3 = 6

Step 2) Multiply the denominators 5 x 5 = 25 Answer: $\frac{6}{25}$

Multiply and reduce.

1) $\frac{3}{7} \times \frac{5}{8} =$ _____

2) $\frac{2}{3} \times \frac{5}{7} =$ _____

3) $\frac{3}{5} \times \frac{4}{7} =$ _____

4) $\frac{1}{3} \times \frac{5}{9} =$ _____

5) $\frac{7}{13} \times \frac{2}{3} =$ _____

6) $\frac{5}{6} \times \frac{1}{2} =$ _____

7) $\frac{3}{4} \times \frac{3}{4} =$ _____

8) $\frac{3}{10} \times \frac{7}{8} =$ _____

9) $\frac{3}{11} \times \frac{5}{8} =$ _____

10) $\frac{1}{2} \times \frac{1}{4} =$ _____

11) $\frac{2}{5} \times \frac{2}{3} =$ _____

12) $\frac{6}{7} \times \frac{6}{7} =$ _____

13) $\frac{3}{8} \times \frac{2}{3} =$ _____

14) $\frac{3}{6} \times \frac{1}{5} =$ _____

15) $\frac{1}{2} \times \frac{2}{3} =$ _____

Extra effort

16) $\frac{4}{7} \times \frac{5}{2} =$ _____

17) $\frac{2}{3} \times \frac{10}{15} =$ _____

18) $\frac{2}{6} \times \frac{5}{1} =$ _____

19) $\frac{7}{3} \times \frac{2}{3} =$ _____

20) $\frac{13}{11} \times \frac{8}{9} =$ _____

21) $\frac{31}{32} \times \frac{9}{4} =$ _____

Shortcut

Cross canceling is a shortcut in multiplication of fractions. It is similar to simplifying or reducing. To cross cancel, divide **any numerator and any denominator** by a number that goes evenly into both. This process, though not required, makes the numbers smaller and, therefore, easier to multiply.

Example: $\frac{7}{8} \times \frac{12}{21}$

Step 1) Cancel 8 and 12 by 4. 8 ÷4 = 2 and 12 ÷ 4 = 3.
Cross out the 8 and the 12 and replace them with 2 and 3.

$$\frac{7}{\cancel{8}\to 2} \times \frac{\cancel{12}\to 3}{21} = \frac{7}{2} \times \frac{3}{21}$$

Step 2) Cancel 7 and 21 by 7.
Cross out the 7 and the 21 and replace them with 1 and 3.

$$\frac{7}{2} \times \frac{3}{21} = \frac{\cancel{7}\to 1}{2} \times \frac{3}{\cancel{21}\to 3}$$

Step 3) Multiply across by the new numbers.

Step 4) Simplify/ reduce.

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

Cross cancel and multiply.

1) $\frac{5}{8} \times \frac{12}{20} =$ _____

2) $\frac{4}{5} \times \frac{5}{6} =$ _____

3) $\frac{3}{4} \times \frac{8}{12} =$ _____

4) $\frac{3}{7} \times \frac{7}{9} =$ _____

5) $\frac{5}{12} \times \frac{3}{10} =$ _____

6) $\frac{12}{15} \times \frac{1}{3} =$ _____

7) $\frac{5}{6} \times \frac{9}{10} =$ _____

8) $\frac{7}{24} \times \frac{12}{28} =$ _____

9) $\frac{3}{8} \times \frac{4}{9} =$ _____

10) $\frac{5}{11} \times \frac{3}{10} =$ _____

11) $\frac{5}{12} \times \frac{4}{15} =$ _____

12) $\frac{1}{2} \times \frac{10}{13} =$ _____

13) $\frac{4}{35} \times \frac{7}{20} =$ _____

14) $\frac{3}{15} \times \frac{3}{9} =$ _____

15) $\frac{8}{27} \times \frac{9}{16} =$ _____

When there are three fractions in an equation, check to see if you can cross cancel to simplify the problem. Multiply the first two numerators together then multiply that answer by the third numerator. Do the same for the denominators. Simplify/reduce.

Example: $\frac{\cancel{4}\to 1}{7} \times \frac{3}{5} \times \frac{2}{\cancel{8}\to 4} = \frac{1}{7} \times \frac{3}{5} \times \frac{2}{2}$

Multiply the first two numerators then multiply the answer times the last numerator.

$1 \times 3 = 3$ $\qquad$ $3 \times 2 = 6$

Multiply the first two denominators then multiply the answer times the last denominator.

$7 \times 5 = 35$ $\qquad$ $35 \times 2 = 70$

Simplify/ reduce. $\frac{6}{70} = \frac{3}{35}$

Multiply and simplify/reduce the following:

1) $\frac{2}{3} \times \frac{3}{4} \times \frac{1}{2} =$ _____

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

3) $\frac{2}{3} \times \frac{3}{4} \times \frac{5}{6} =$ _____

4) $\frac{3}{5} \times \frac{5}{6} \times \frac{7}{8} =$ _____

5) $\frac{2}{5} \times \frac{5}{7} \times \frac{1}{2} =$ _____

6) $\frac{3}{4} \times \frac{5}{6} \times \frac{6}{7} =$ _____

7) $\frac{3}{7} \times \frac{2}{9} \times \frac{1}{8} =$ _____

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

9) $\frac{7}{8} \times \frac{8}{9} \times \frac{1}{3} =$ _____

10) $\frac{5}{12} \times \frac{3}{10} \times \frac{2}{5} =$ _____

11) $\frac{3}{8} \times \frac{5}{8} \times \frac{7}{9} =$ _____

12) $\frac{9}{14} \times \frac{7}{8} \times \frac{3}{5} =$ _____

13) $\frac{7}{18} \times \frac{9}{21} \times \frac{5}{11} =$ _____

14) $\frac{9}{22} \times \frac{5}{9} \times \frac{11}{15} =$ _____

15) $\frac{4}{7} \times \frac{1}{12} \times \frac{3}{8} =$ _____

16) $\frac{1}{20} \times \frac{3}{4} \times \frac{5}{12} =$ _____

17) $\frac{2}{7} \times \frac{2}{3} \times \frac{12}{5} =$ _____

18) $\frac{77}{81} \times \frac{1}{2} \times \frac{9}{11} =$ _____

CREATING IMPROPER FRACTIONS FROM WHOLE AND MIXED NUMBERS

You cannot multiply fractions by whole or mixed numbers: **you can only multiply a fraction by another fraction.** To change a whole number into a fraction, use the given number as the numerator and put it over a 1 as its denominator. To change a mixed number into an improper fraction multiply the denominator by the whole number and add the numerator. Place the total over the original denominator. This changes the whole/mixed number into an improper fraction without changing its value.

Example 1: Change 5 to an improper fraction. Place a 1 under the 5, creating $\frac{5}{1}$, which is an improper fraction.

Example 2: Change $3\frac{3}{4}$ to an improper fraction.

Step 1) Multiply the denominator by the whole number: $3 \times 4 = 12$

Step 2) Add the result to the numerator: 12 + 3 = 15

Step 3) Place the total over the original denominator: $\frac{15}{4}$

Example 3: Change $7\frac{1}{3}$ to an improper fraction.

Step 1) $7 \times 3 = 21$

Step 2) 21 + 1 = 22

Step 3) $\frac{22}{3}$

Create improper fractions from the whole and mixed numbers below.

1) $4\frac{1}{4} =$ _____ 2) $3 =$ _____ 3) $7\frac{2}{3} =$ _____ 4) $8\frac{4}{7} =$ _____ 5) $2\frac{4}{5} =$ _____

6) $9\frac{3}{10} =$ _____ 7) $5\frac{3}{8} =$ _____ 8) $11 =$ _____ 9) $12\frac{3}{4} =$ _____ 10) $4\frac{2}{5} =$ _____

11) $20\frac{2}{3} =$ _____ 12) $13\frac{3}{5} =$ _____ 13) $2\frac{3}{11} =$ _____ 14) $4\frac{5}{8} =$ _____ 15) $14 =$ _____

16) $32\frac{5}{12} =$ _____ 17) $23\frac{1}{6} =$ _____ 18) $18\frac{6}{7} =$ _____ 19) $43\frac{9}{10} =$ _____ 20) $14\frac{2}{9} =$ _____

Note: on this page all of the answers are left in improper fraction form!

MULTIPLYING WITH MIXED NUMBERS

Once you have converted whole or mixed numbers to improper fractions, multiply as shown in the following example:

Example 1: $5 \times \frac{17}{20}$

Step 1) Write 5 as an improper fraction. $5 = \frac{5}{1}$

Step 2) Cross cancel 5 and 20 by 5. $\frac{\cancel{5} \rightarrow 1}{1} \times \frac{17}{\cancel{20} \rightarrow 4}$

Step 3) Multiply the numerators and denominators. $\frac{1}{1} \times \frac{17}{4} = \frac{17}{4}$

Step 4) Simplify/reduce $\frac{17}{4} = 4\frac{1}{4}$

Example 2: $6\frac{2}{3} \times \frac{9}{16} =$

Step 1) Change $6\frac{2}{3}$ to an improper fraction. $6\frac{2}{3} = \frac{20}{3}$

Step 2) Cross cancel 20 and 16 by 4. $\frac{\cancel{20} \rightarrow 5}{3} \times \frac{9}{\cancel{16} \rightarrow 4} = \frac{5}{3} \times \frac{9}{4}$

Cross cancel 9 and 3 by 3. $\frac{5}{\cancel{3} \rightarrow 1} \times \frac{\cancel{9} \rightarrow 3}{4}$

Step 3) Multiply the numerators and denominators. $\frac{5 \times 3 =}{1 \times 4 =} \frac{15}{4}$

Step 4) Simplify/reduce. $\frac{15}{4} = 3\frac{3}{4}$

Multiply and reduce.

1) $4\frac{13}{14} \times 2\frac{1}{3} =$ _____

2) $\frac{3}{5} \times 6\frac{4}{7} =$ _____

3) $5 \times \frac{7}{10} =$ _____

4) $4\frac{3}{8} \times 5\frac{5}{7} =$ _____

5) $2\frac{7}{8} \times \frac{1}{4} =$ _____

6) $2\frac{1}{3} \times 1\frac{1}{5} =$ _____

7) $9 \times 4\frac{7}{9} =$ _____

8) $4\frac{2}{10} \times 7\frac{10}{21} =$ _____

9) $12\frac{3}{12} \times 3\frac{3}{7} =$ _____

10) $12 \times 3\frac{11}{12} =$ _____

11) $1\frac{5}{9} \times 2\frac{9}{14} =$ _____

12) $9\frac{5}{6} \times 6\frac{4}{5} =$ _____

13) $6\frac{12}{20} \times 4\frac{2}{3} =$ _____

14) $10\frac{3}{4} \times 1\frac{5}{11} =$ _____

15) $2\frac{5}{14} \times 2\frac{6}{11} =$ _____

16) $7 \times \frac{9}{49} \times 1\frac{3}{4} =$ _____

17) $8\frac{8}{15} \times 2\frac{16}{37} =$ _____

18) $1\frac{2}{7} \times 8\frac{4}{9} =$ _____

19) $1\frac{3}{4} \times \frac{8}{9} \times 3\frac{3}{5} =$ ____

20) $7\frac{1}{2} \times 5\frac{3}{15} \times 2\frac{1}{4} =$ _____

21) $\frac{2}{15} \times \frac{4}{21} \times \frac{7}{8} =$ ____

22) $9 \times \frac{21}{27} \times 3\frac{4}{7} =$ ____

23) $6\frac{5}{7} \times 2\frac{1}{6} \times 1\frac{5}{13} =$ _____

24) $7\frac{1}{5} \times 4\frac{5}{9} \times \frac{5}{6} =$ ____

WORD PROBLEMS: MULTIPLICATION

Use multiplication to solve word problems that ask you to:

1. Find a part of something
2. Use the information given about one thing to determine the weight/size/cost of several things.

Remember than fractional answers must be in simplified terms and include a word or symbol.

1) From home to work Lynn has to drive 75 miles. She usually stops for breakfast $\frac{2}{3}$ of the way there. How far has she already driven when she stops for breakfast? _____

2) If one gallon of fresh water weighs $8\frac{1}{2}$ pounds, what is the weight of $1\frac{1}{2}$ gallons? _____

3) For an entertainment center Kris plans to build, she wants four shelves that are each $3\frac{2}{3}$ feet long. What is the total length of the four shelves Kris needs? _____

4) Mary gets paid $48/hour when she works overtime. If she worked $3\frac{3}{4}$ hours overtime, how much would she be paid for the overtime work? _____

Extra effort (Hint: eliminate all but the essential numbers)

5) While on a 5 day vacation in Cancun, Aimee wanted to be outside 8 hours a day. She spent $\frac{3}{5}$ of her days lounging at the beach. How many days did Aimee spend lounging at the beach? _____

6) If one fifty foot roll of $\frac{1}{8}$ inch copper tubing costs $59.98, how much will $3\frac{1}{2}$ rolls cost? _____

7) Nancy makes $14 an hour for regular time. When she works overtime she gets paid time and a half. If she works $6\frac{1}{2}$ hours overtime in one week, how much extra

pay will she get for the overtime worked? _____

DIVISION OF FRACTIONS

Now that you have mastered the processes required to multiply fractions, you are just one step away from division.

To solve any division of fractions problem, remember:

1. You can only divide fractions by fractions, so change any whole/mixed numbers to improper fractions.
2. **Invert** (turn upside down) the fraction to the **right** of the division sign.
3. **Change the division sign to a multiplication sign.**
4. Multiply

Example 1: $\frac{3}{4} \div \frac{5}{8}$

Step 1) is not needed

$\frac{5}{8} \rightarrow \frac{8}{5}$ *Step 2)* Invert the fraction on the right ($\frac{5}{8}$) to $\frac{8}{5}$

$\frac{3}{4} \times \frac{8}{5}$ *Step 3)* change ÷ to x :

$\frac{3}{1} \times \frac{2}{5}$ Cancel 4 and 8 by 4.

$\frac{3}{1} x \frac{2}{5} = \frac{6}{5} = 1\frac{1}{5}$ *Step 4)* Multiply and simplify/reduce

Example 2: $8 \div \frac{6}{7}$

$\frac{8}{1}$ *Step 1)* Write 8 as a fraction.

$\frac{6}{7} \rightarrow \frac{7}{6}$ *Step 2)* Invert $\frac{6}{7}$

Step 3) Change ÷ sign to x.

$\frac{8}{1} \div \frac{6}{7} = \frac{8}{1} \times \frac{7}{6}$ Cancel 8 and 6 by 2

.

$\frac{4}{1} \times \frac{7}{3} = \frac{28}{3} = 9\frac{1}{3}$ *Step 4)* Multiply and simplify/reduce.

Example 3: $2\frac{1}{3} \div \frac{1}{4}$

$\frac{7}{3} \div \frac{1}{4}$ *Step 1)* Change $2\frac{1}{3}$ to an improper fraction: $\frac{7}{3}$

$\frac{1}{4} \div \frac{4}{1}$ *Step 2)* Invert $\frac{1}{4}$

$\frac{7}{3} \div \frac{4}{1} = \frac{7}{3} \times \frac{4}{1}$ *Step 3)* Change ÷ sign to x.

$\frac{7}{3} x \frac{4}{1} = \frac{28}{3} = 9\frac{1}{3}$ *Step 4)* Multiply and simplify/reduce

Divide and simplify/reduce.

1) $\frac{2}{3} \div \frac{1}{2} =$ _____ 2) $\frac{1}{16} \div \frac{1}{16} =$ _____ 3) $\frac{1}{10} \div \frac{1}{100} =$ _____ 4) $4 \div \frac{4}{9} =$ _____

5) $\frac{15}{16} \div 3 =$ _____ 6) $\frac{5}{8} \div 4 =$ _____ 7) $18 \div \frac{6}{7} =$ _____ 8) $\frac{14}{15} \div 1\frac{1}{6} =$ _____

9) $\frac{7}{9} \div 4\frac{2}{3} =$ _____ 10) $\frac{7}{12} \div \frac{7}{8} =$ _____ 11) $\frac{12}{25} \div 5 =$ _____ 12) $3\frac{1}{7} \div 2 =$ _____

13) $2 \div 1\frac{1}{3} =$ _____ 14) $2\frac{9}{10} \div \frac{19}{20} =$ _____ 15) $7\frac{7}{11} \div \frac{9}{22} =$ ___ 16) $1\frac{7}{12} \div \frac{3}{4} =$ ___

17) $4\frac{2}{9} \div 1\frac{7}{12} =$ _____ 18) $7\frac{1}{8} \div 2\frac{1}{16} =$ _____ 19) $9\frac{7}{9} \div 1\frac{5}{6} =$ _____ 20) $2\frac{2}{3} \div \frac{11}{12} =$ ___

21) $3\frac{3}{8} \div \frac{3}{32}$ _____ 22) $3\frac{3}{7} \div 1\frac{5}{7} =$ _____ 23) $2\frac{40}{64} \div 4\frac{1}{3} =$ _____

Extra effort

24) $\frac{2}{5} \div \frac{5}{6} \div \frac{3}{4}$ = ___ 25) $\frac{22}{7} \div \frac{4}{5} \div 64$ ___ 26) $\frac{1}{64} \div \frac{7}{8} \times \frac{3}{4} =$ _____

Word Problems: Division

To solve division of fractions word problems, first read the problem and determine-- "What is the entire thing to be evenly divided?" Write that number first, followed by the ÷ sign. The last number represents how many will be sharing or made from the first.

The concept is: ***The whole*** divided/cut/packaged into ***how many*** equal parts.

Remember to invert the number to the right of the ÷ sign. Always simplify your answer and include a word or symbol.

1) How many $7\frac{1}{2}$ inches pieces can be cut from 90 inches of rebar?

2) Kelly's goal was to run $2\frac{1}{2}$ miles. She wanted to mark each $\frac{1}{4}$ mile with balloons. How many would she need?

3) If Olivia needs $1\frac{1}{8}$ yards of denim to make 1 nail apron, how many can she make from $3\frac{3}{4}$ yards of material?

4) How many $2\frac{2}{3}$ pound candles can be made from $10\frac{2}{3}$ pounds of candle wax?

5) How many $\frac{1}{2}$ pound boxes of nails can be filled from $16\frac{1}{2}$ pounds of nails?

6) Sheet metal 52 feet long is to be cut into $4\frac{1}{3}$ foot pieces. How many can be cut?

7) Leslie needs $2\frac{1}{4}$ gallons to paint a room. If all the rooms she's painting are the same size, how many can she paint with 9 gallons?

8) Marisol and Agnes are on a diet. They want to split $\frac{1}{4}$ pound of chocolate evenly between them. How much would each get?

PRACTICE PROBLEMS: MULTIPLICATION AND DIVISION

1) $\frac{1}{3}\times\frac{1}{6}$ = _____

2) $21\times\frac{9}{32}$ = _____

3) $7\frac{7}{8}\div\frac{3}{4}$ =_____

4) $3\frac{1}{2}\div5\frac{1}{3}$ = _____

5) $13\frac{1}{2}\times\frac{8}{9}$ = _____

6) $7\frac{7}{10}\div1\frac{2}{5}$ = _____

7) $3\frac{7}{9}\div\frac{3}{27}$ = _____

8) $\frac{3}{8}\times16\times\frac{3}{4}$ = _____

9) $7\frac{5}{9}\div3\frac{1}{3}$ =_____

10) $\frac{24}{25}\div40$ = _____

11) $3\frac{5}{9}\div1\frac{13}{15}$ = _____

12) $6\frac{2}{3}\times6\frac{2}{5}\times\frac{5}{8}$ = _____

13) $\frac{16}{37}\div\frac{16}{21}$ = _____

14) $\frac{11}{12}\times\frac{5}{11}\times\frac{8}{15}$ =_____

15) $3\div\frac{9}{21}\div\frac{1}{7}$ = _____

16) $3\times\frac{4}{5}$ =_____

17) $\frac{11}{80}\times20$ =_____

18) $4\times\frac{9}{10}$ = _____

Extra Effort

19) $5\frac{25}{30}\times3\frac{2}{6}\times7\frac{1}{5}$ =_____

20) $8\frac{3}{8}\div\frac{1}{7}\times5\frac{5}{7}$ = _____

21) $3\frac{2}{32}\times\frac{11}{15}\times\frac{3}{7}$ = _____

22) $10\frac{23}{46}\times2\frac{5}{9}$ = _____

23) $\frac{7}{16}\times11\frac{5}{12}\times\frac{1}{7}$ = _____

24) $13\frac{11}{16}\div2\frac{2}{3}$ = _____

Fractions packet answer key

Page 1

1) $\frac{1}{8}$
2)
3)

Page 2

1) $\frac{13}{36}$
2) $\frac{7}{12}$
3) $\frac{59}{100}$
4) $\frac{7}{16}$
5) $\frac{11}{12}$
6) $\frac{103}{150}$
7) $\frac{1}{4}$
8) $\frac{147}{2000}$

Page 5

1) $\frac{1}{2}$
2) $\frac{6}{7}$
3) $\frac{1}{50}$
4) $\frac{9}{14}$
5) $\frac{1}{8}$
6) $\frac{2}{9}$
7) $\frac{3}{7}$

Page 5 cont.

8) $\frac{7}{8}$
9) $\frac{7}{20}$
10) $\frac{2}{5}$
11) $\frac{4}{7}$
12) $\frac{3}{4}$
13) $\frac{1}{4}$
14) $\frac{1}{10}$
15) $\frac{3}{7}$

Page 7

1) $\frac{5}{8}$
2) $\frac{4}{17}$
3) $\frac{3}{4}$
4) $\frac{1}{2}$
5) $\frac{11}{32}$
6) $\frac{5}{16}$
7) $10\frac{2}{9}$
8) $\frac{8}{31}$
9) $\frac{1}{9}$
10) $\frac{2}{3}$
11) $\frac{7}{24}$

Page 7 cont.

12) $\frac{9}{13}$
13) $\frac{14}{19}$
14) $2\frac{2}{3}$
15) $16\frac{4}{13}$
16) $\frac{1}{3}$
17) $2\frac{1}{4}$
18) $5\frac{7}{10}$
19) $16\frac{1}{2}$
20) $62\frac{2}{3}$
21) $79\frac{2}{3}$
22) $81\frac{5}{8}$
23) $7\frac{4}{7}$
24) $14\frac{1}{3}$
25) $6\frac{1}{4}$
26) $18\frac{3}{5}$
27) $38\frac{1}{12}$
28) $23\frac{4}{7}$
29) $15\frac{1}{2}$
30) $7\frac{7}{8}$

Page 9

1) $7\frac{2}{3}$
2) $11\frac{3}{4}$
3) $16\frac{9}{16}$
4) $20\frac{11}{17}$
5) $28\frac{15}{29}$
6) $1\frac{5}{8}$
7) $2\frac{5}{6}$
8) $\frac{1}{2}$
9) $49\frac{77}{78}$
10) $9\frac{2}{3}$
11) $32\frac{2}{15}$
12) $3\frac{3}{8}$
13) $4\frac{1}{3}$
14) $8\frac{3}{8}$
15) $9\frac{4}{17}$
16) $68\frac{77}{83}$
17) $104\frac{1}{7}$
18) $8\frac{2}{9}$
19) $353\frac{1}{8}$
20) $59\frac{5}{6}$

Page 10

1) $\frac{15}{25}$
2) $\frac{27}{36}$
3) $\frac{28}{32}$
4) $\frac{18}{24}$
5) $\frac{21}{27}$
6) $\frac{50}{100}$
7) $\frac{14}{49}$
8) $\frac{24}{48}$
9) $\frac{8}{16}$
10) $\frac{12}{18}$
11) $\frac{27}{72}$
12) $\frac{10}{15}$
13) $\frac{49}{56}$
14) $\frac{12}{48}$
15) $\frac{25}{30}$
16) $\frac{40}{50}$

Answer Key Continued

Page 11

1) 2

2) $3\frac{8}{9}$

3) 20

4) 10

5) 6

6) $20\frac{1}{2}$

7) $2\frac{3}{5}$

8) $1\frac{7}{45}$

9) 1

10) $25\frac{2}{3}$

11) $43\frac{1}{8}$

12) $25\frac{16}{27}$

13) $26\frac{5}{17}$

14) 10

15) $18\frac{5}{31}$

Page 12

1) $\frac{3}{4}$

2) $\frac{1}{2}$

3) $1\frac{3}{8}$

4) $\frac{1}{3}$

5) $1\frac{4}{5}$

Page 12 cont.

6) $\frac{23}{25}$

7) $\frac{1}{3}$

8) $\frac{4}{77}$

9) $\frac{3}{32}$

10) $\frac{1}{21}$

11) $1\frac{1}{2}$

12) $1\frac{1}{2}$

13) $\frac{1}{7}$

14) $1\frac{2}{5}$

15) $\frac{1}{3}$

16) $\frac{10}{11}$

17) $1\frac{1}{2}$

18) $\frac{1}{8}$

19) $\frac{7}{36}$

20) $1\frac{61}{64}$

21) $3\frac{3}{28}$

22) $1\frac{3}{4}$

23) $1\frac{2}{19}$

24) $\frac{1}{9}$

Page 14

1) $3\frac{9}{16}$

2) $4\frac{9}{10}$

3) $6\frac{1}{16}$

4) $7\frac{5}{6}$

5) $7\frac{3}{14}$

6) $2\frac{5}{9}$

7) $14\frac{7}{15}$

8) $8\frac{5}{21}$

9) $4\frac{1}{2}$

10) $9\frac{17}{24}$

11) $6\frac{7}{12}$

12) $25\frac{2}{9}$

13) $9\frac{7}{20}$

14) $\frac{13}{48}$

15) $\frac{23}{40}$

16) $\frac{13}{28}$

17) $8\frac{1}{6}$

18) $2\frac{11}{45}$

19) $9\frac{3}{20}$

20) $9\frac{11}{24}$

21) $5\frac{7}{12}$

Page 14 cont.

22) $6\frac{11}{36}$

23) $7\frac{9}{10}$

24) $27\frac{59}{154}$

Page 16

1) $3\frac{9}{14}$

2) $5\frac{1}{5}$

3) $\frac{4}{5}$

4) $3\frac{3}{4}$

5) $8\frac{7}{10}$

6) $6\frac{11}{12}$

7) $30\frac{13}{15}$

8) $8\frac{2}{3}$

9) $2\frac{1}{3}$

10) $20\frac{1}{5}$

11) $9\frac{7}{10}$

12) $9\frac{11}{12}$

13) $40\frac{1}{8}$

14) $38\frac{2}{3}$

15) $87\frac{15}{22}$

16) $25\frac{19}{22}$

17) $60\frac{1}{6}$

Page 16 & 17

18) $1\frac{22}{35}$

19) $44\frac{2}{9}$

20) $3\frac{13}{21}$

21) $10\frac{3}{8}$

22) $13\frac{7}{10}$

23) $\frac{23}{40}$

24) $14\frac{2}{7}$

25) $7\frac{2}{3}$

26) $1\frac{7}{10}$

27) $7\frac{37}{45}$

Page 17 & 18

1) $4\frac{5}{8}$ inch

2) $196\frac{3}{4}$ pounds

3) $62\frac{15}{16}$ inch

4) $485\frac{2}{5}$ miles

5) $46\frac{3}{8}$ lbs.

6) 50 lbs.

7) $31\frac{1}{15}$ sets

8) $6\frac{2}{3}$ rpms

9) $7\frac{5}{8}$ lbs.

Page 19

1) $39\frac{1}{2}$ feet

2) 32 feet

3) $37\frac{1}{4}$ in.

4) 15 yds.

5) $21\frac{2}{3}$ yds.

6) $28\frac{3}{8}$ in.

7) $28\frac{13}{15}$ yards

8) $34\frac{13}{20}$ miles

Page 20

1) $\frac{1}{2}$

2) $\frac{21}{32}$

3) $\frac{1}{8}$

4) $2\frac{5}{6}$

5) 1

6) $9\frac{1}{10}$

7) $7\frac{1}{4}$

8) $14\frac{11}{12}$

9) $10\frac{37}{48}$

10) $\frac{5}{18}$

11) $37\frac{5}{22}$

12) $13\frac{1}{3}$

13) $25\frac{3}{4}$

14) $11\frac{35}{64}$

15) $21\frac{23}{30}$

16) $23\frac{29}{40}$

17) $115\frac{5}{7}$

18) $165\frac{14}{15}$

19) $9\frac{4}{5}$

20) $15\frac{17}{36}$

21) $11\frac{29}{30}$

22) $61\frac{7}{12}$,

23) $58\frac{1}{6}$,

24) 36 yds.

Page 21

1) $\frac{15}{56}$

2) $\frac{10}{21}$

3) $\frac{12}{35}$

4) $\frac{5}{27}$

5) $\frac{14}{39}$

6) $\frac{5}{12}$

7) $\frac{9}{16}$

8) $\frac{21}{80}$

9) $\frac{15}{88}$

10) $\frac{1}{8}$

Page 21 cont.

11) $\frac{4}{15}$

12) $\frac{36}{49}$

13) $\frac{1}{4}$

14) $\frac{1}{10}$

15) $\frac{1}{3}$

16) $1\frac{3}{7}$

17) $\frac{4}{9}$

18) $1\frac{2}{3}$

19) $1\frac{5}{9}$

20) $1\frac{5}{99}$

21) $2\frac{23}{128}$

Page 22

1) $\frac{3}{8}$

2) $\frac{2}{3}$

3) $\frac{1}{2}$

4) $\frac{1}{3}$

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

6) $\frac{4}{15}$

7) $\frac{3}{4}$

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

9) $\frac{1}{6}$

Page 22 cont.

10) $\frac{3}{22}$

11) $\frac{1}{9}$

12) $\frac{5}{13}$

13) $\frac{1}{25}$

14) $\frac{1}{15}$

15) $\frac{1}{6}$

Page 23

1) $\frac{1}{4}$

2) $\frac{5}{54}$

3) $\frac{5}{12}$

4) $\frac{7}{16}$

5) $\frac{1}{7}$

6) $\frac{15}{28}$

7) $\frac{1}{84}$

8) $\frac{1}{24}$

9) $\frac{7}{27}$

10) $\frac{1}{20}$

11) $\frac{35}{192}$

12) $\frac{27}{80}$

13) $\frac{5}{66}$

14) $\frac{1}{6}$

Page 23 cont.

15) $\frac{1}{56}$

16) $\frac{1}{64}$

17) $\frac{16}{35}$

18) $\frac{7}{18}$

Page 24

1) $\frac{17}{4}$

2) $\frac{3}{1}$

3) $\frac{23}{3}$

4) $\frac{60}{7}$

5) $\frac{14}{5}$

6) $\frac{93}{10}$

7) $\frac{43}{8}$

8) $\frac{11}{1}$

9) $\frac{51}{4}$

10) $\frac{22}{5}$

11) $\frac{62}{3}$

12) $\frac{68}{5}$

13) $\frac{25}{11}$

14) $\frac{37}{8}$

15) $\frac{14}{1}$

16) $\frac{389}{12}$

Page 24 cont.

17) $\frac{139}{6}$

18) $\frac{132}{7}$

19) $\frac{439}{10}$

20) $\frac{128}{9}$

Page 26

1) $11\frac{1}{2}$

2) $3\frac{33}{35}$

3) $3\frac{1}{2}$

4) 25

5) $\frac{23}{32}$

6) $2\frac{4}{5}$

7) 43

8) $31\frac{2}{5}$

9) 42

10) 47

11) $4\frac{1}{9}$

12) $66\frac{13}{15}$

13) $30\frac{4}{5}$

14) $15\frac{7}{11}$

15) 6

16) $2\frac{1}{4}$

17) $20\frac{28}{37}$

Page 25/26 cont.

18) $10\frac{6}{7}$

19) $5\frac{3}{5}$

20) $87\frac{3}{4}$

21) $\frac{1}{45}$

22) 25

23) $20\frac{1}{7}$

24) $27\frac{1}{3}$

Page 27

1) 50 miles

2) $12\frac{3}{4}$ lbs.

3) $14\frac{2}{3}$ feet

4) $180

5) 3 days

6) $209.93

7) $136.50

Page 29

1) $1\frac{1}{3}$

2) 1

3) 10

4) 9

5) $\frac{5}{16}$

6) $\frac{5}{32}$

Page 29 cont.

7) 21

8) $\frac{4}{5}$

9) $\frac{1}{6}$

10) $\frac{2}{3}$

11) $\frac{12}{125}$

12) $1\frac{4}{7}$

13) $1\frac{1}{2}$

14) $3\frac{1}{19}$

15) $18\frac{2}{3}$

16) $2\frac{1}{9}$

17) $2\frac{2}{3}$

18) $3\frac{5}{11}$

19) $5\frac{1}{3}$

20) $2\frac{10}{11}$

21) 36

22) 2

23) $\frac{63}{104}$

24) $\frac{16}{25}$

25) $\frac{55}{896}$

26) $\frac{3}{224}$

Page 30

1) 12 pieces

2) 10 markers

3) $3\frac{1}{3}$ aprons

4) 4 candles

5) 33 boxes

6) 12 pieces

7) 4 rooms

8) $\frac{1}{8}$ pound

Page 31

1) $\frac{1}{18}$

2) $5\frac{29}{32}$

3) $10\frac{1}{2}$

4) $\frac{21}{32}$

5) 12

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

7) 34

8) $4\frac{1}{2}$

9) $2\frac{4}{15}$

10) $\frac{3}{125}$

11) $1\frac{19}{21}$

12) $26\frac{2}{3}$

Page 31 cont.

13) $\frac{21}{37}$

14) $\frac{2}{9}$

15) 49

16) $2\frac{2}{5}$

17) $2\frac{3}{4}$

18) $3\frac{3}{5}$

19) 140

20) 335

21) $\frac{77}{80}$

22) $26\frac{5}{6}$

23) $\frac{137}{192}$

24) $5\frac{17}{128}$