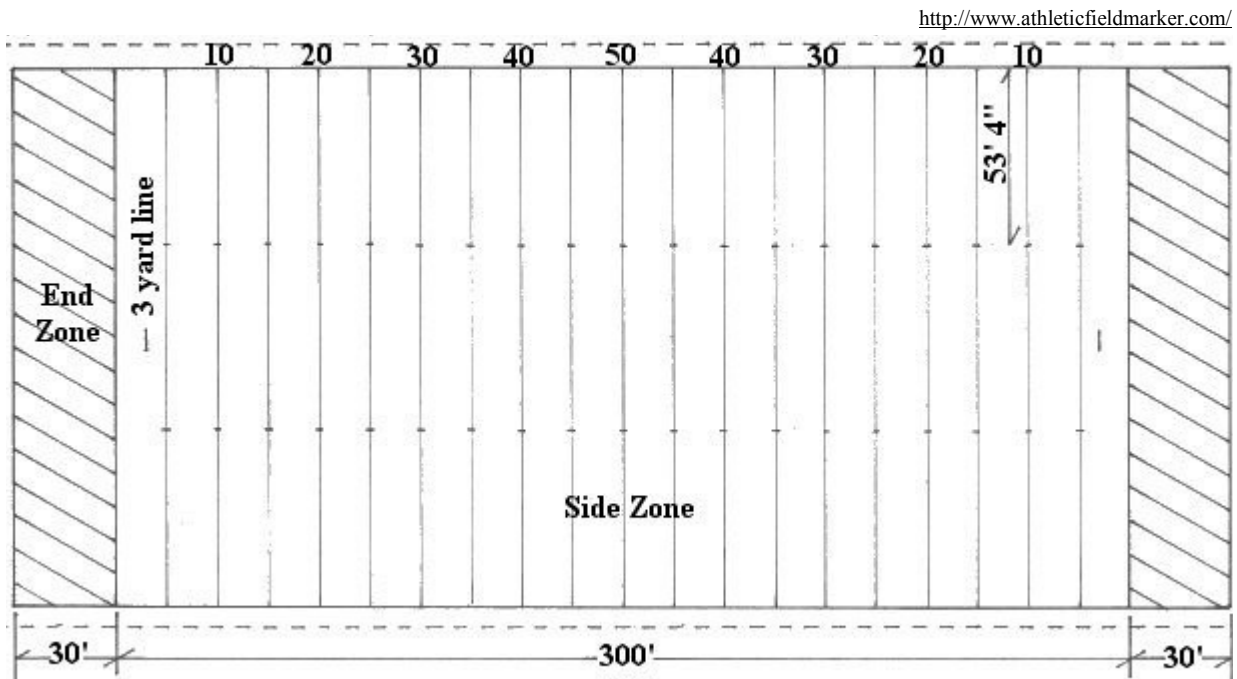


Dimensions:

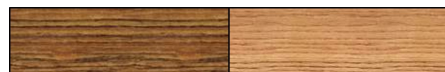
1. Give the sizes needed to fabricate the part.
2. Indicate the locations where the components of the part should be placed, assembled, drilled, or welded. These are known as location dimensions.

Example: A standard American football field.



- a. What is the width of the End Zone?
- b. What is the entire length of the football field including the End Zones?

Fractions - "To Break"



2 parts, each
one-half of the
whole



4 parts, each
one-fourth of
the whole

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

← Numerator, the number of parts

← Denominator, the name of parts

Proper fraction - A number less than one. The numerator is less than the denominator.

$$\frac{1}{2}, \frac{1}{100}, \frac{5}{6}, \frac{49}{50}$$

Improper fraction - A number greater than one. The numerator is larger than the denominator.

$$\frac{3}{2}, \frac{115}{100}, \frac{13}{6}, \frac{61}{50}$$

Rewrite improper fraction as a mixed number:

1. Divide numerator by the denominator to find the whole number part of the mixed number.
2. Write the remainder over the denominator as the fraction part of the mixed number

$$\frac{11}{2} = 11 \div 2 = 5 \frac{1}{2}$$

Diagram illustrating the conversion of the improper fraction $\frac{11}{2}$ to the mixed number $5 \frac{1}{2}$. The division $11 \div 2$ results in a quotient of 5 and a remainder of 1. The quotient (5) is the whole number part, and the remainder (1) over the denominator (2) forms the fraction part. A green arrow labeled "Same denominator" points from the denominator 2 of the original fraction to the denominator 2 of the mixed number's fraction part. A blue arrow labeled "remainder" points from the remainder 1 to the numerator of the fraction part. A grey arrow labeled "quotient" points from the quotient 5 to the whole number part.

Rewrite mixed number as an improper fraction:

1. Multiply the whole number by the denominator of the fraction part.
2. Add the numerator of the fraction part to this product.
3. Write this sum over the denominator of the fraction.

$$2 \frac{3}{4} = \frac{2 \times 4 + 3}{4} = \frac{11}{4}$$

Diagram illustrating the conversion of the mixed number $2 \frac{3}{4}$ to the improper fraction $\frac{11}{4}$. The whole number 2 is multiplied by the denominator 4 (labeled "Multiply" with a blue arrow). The product 8 is then added to the numerator 3 (labeled "Add" with a yellow arrow) to get the new numerator 11. The denominator remains 4.

Multiplication of Fractions:

1. Change any whole numbers or missed numbers into improper fractions.
2. Cross-reduce if possible.
3. Multiply numerators.
4. Multiply denominators.
5. Reduce in necessary.

Ex. 1

$$\frac{1}{3} \times \frac{5}{6} = \frac{1 \times 5}{3 \times 6} = \frac{5}{18}$$

Diagram illustrating the multiplication of $\frac{1}{3} \times \frac{5}{6}$. The numerators 1 and 5 are multiplied to get 5 (labeled "Multiply Numerators"). The denominators 3 and 6 are multiplied to get 18 (labeled "Multiply Denominators").

Ex. 2

$$4 \frac{1}{2} \times \frac{3}{4} = \frac{9}{2} \times \frac{3}{4} = \frac{9 \times 3}{2 \times 4} = \frac{27}{8} = 3 \frac{3}{8}$$

Diagram illustrating the multiplication of $4 \frac{1}{2} \times \frac{3}{4}$. The mixed number $4 \frac{1}{2}$ is converted to the improper fraction $\frac{9}{2}$. The numerators 9 and 3 are multiplied to get 27 (labeled "Multiply Numerators"). The denominators 2 and 4 are multiplied to get 8 (labeled "Multiply Denominators"). The final result is $\frac{27}{8} = 3 \frac{3}{8}$.

Division of Fractions:

1. Change any whole numbers or missed numbers into improper fractions.
2. Change the division sign to a multiplication sign and invert (flip) the following fraction.
3. Cross-reduce if possible.
4. Multiply numerators.
5. Multiply denominators.
6. Reduce in necessary.

Ex. 1

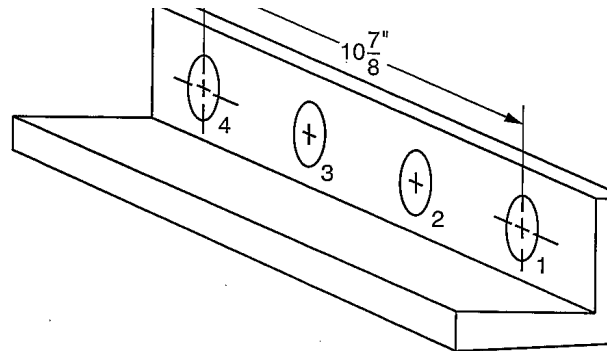
$$\frac{2}{3} \div \frac{4}{5} = \frac{2}{3} \times \frac{5}{4} = \frac{\overset{1}{\cancel{2}}}{3} \times \frac{5}{\underset{2}{\cancel{4}}} = \frac{5}{6}$$

Change sign

Invert Fraction

Practical Problems

1. This piece of angle is to be used for an anchor bracket. If the holes are equally spaced, what is the measurement between hole 1 and hole 2?



Addition of Like Fractions:

1. Add the numerators only.
2. The common denominator is the denominator of the sum.
3. Reduce the sum to lowest terms and change improper fractions to whole or mixed number.

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

Add Numerators

$$= \frac{6}{7}$$

Same Denominator

Addition of Unlike Fractions:

1. If the denominators are not the same, find the least common denominator.
2. Change each fraction not already expressed in terms of the common denominator to an equivalent fraction with the common denominator.
3. Add the numerators only.
4. The common denominator is the denominator of the sum.
5. Reduce the sum to lowest terms and change improper fractions to whole or mixed number.

$$\frac{15}{16} = \frac{15}{16}$$
$$+ \frac{1}{2} = \frac{8}{16}$$

$\frac{1}{2} = \frac{1 \times 8}{2 \times 8} = \frac{8}{16}$

$$\frac{23}{16} = 1 \frac{7}{16}$$

Subtraction of Fractions:

1. If the denominators are not the same, find the least common denominator.
2. Change each fraction not already expressed in terms of the common denominator to an equivalent fraction with the common denominator.
3. Add the numerators only.
4. The common denominator is the denominator of the sum.
5. Reduce the sum to lowest terms and change improper fractions to whole or mixed number.

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

Subtract Numerators

Same Denominator

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

Borrowing:

$$\begin{array}{r} 5\frac{1}{3} \\ - 3\frac{2}{3} \\ \hline \end{array}$$

$\frac{1}{3}$ cannot be subtracted from $\frac{2}{3}$

You have 2 options

Borrow

Improper Fractions

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

$$\begin{array}{r} 4\frac{4}{3} \\ - 3\frac{2}{3} \\ \hline 1\frac{2}{3} \end{array}$$

$$\frac{16}{3}$$

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

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



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