Fix Those Fractions!! Self-Help Guide!

Dividing Fractions

Recall that division is often introduced as the process which determines how many times one number will "go into" another. For example, $24 \div 6$ is described as finding the number of times 6 will "go into" 24. This is also true of fractions. Dividing $\frac{2}{3}$ by $\frac{1}{3}$ means how many times will $\frac{1}{3}$ go into $\frac{2}{3}$, which of course is twice. Because it is possible to confuse operations with fractions, always determine if the process used produces a reasonable answer.

Division is also redefined as multiplying by the reciprocal. The *reciprocal* of a number "flips it" which means to interchange the numerator and denominator. To divide fractions, change the operation to multiplication and "flip" the divisor (the second term).

Example #13: $\dfrac{2}{3} \div \dfrac{1}{3}$

Multiply by the reciprocal of $\dfrac{1}{3}$: $\qquad \dfrac{2}{3} \cdot \dfrac{3}{1}$

Multiply numerator by numerator and denominator by denominator: $\qquad \dfrac{2 \cdot 3}{3 \cdot 1} = \dfrac{6}{3}$

Simplify (divide by the GCF): $\qquad \dfrac{6}{3} \div \dfrac{3}{3} = \dfrac{6 \div 3}{3 \div 3} = \dfrac{2}{1} = 2$

Note in the above example, it is possible to simplify before multiplying.

Example #14: $\dfrac{25}{49} \div \dfrac{65}{39}$

Multiply by the reciprocal of $\dfrac{65}{39}$: $\qquad \dfrac{25}{49} \cdot \dfrac{39}{65} = \dfrac{25 \cdot 39}{49 \cdot 65}$

Simplify before multiplying (5 is a common factor of 25 and 65): $\qquad \dfrac{\overset{5}{\cancel{25}} \cdot 39}{49 \cdot \underset{13}{\cancel{65}}} = \dfrac{5 \cdot 39}{49 \cdot 13}$

Continue to simplify before multiplying (13 is a common factor of 39 and 13): $\qquad \dfrac{5 \cdot \overset{3}{\cancel{39}}}{49 \cdot \underset{1}{\cancel{13}}} = \dfrac{5 \cdot 3}{49 \cdot 1}$

Multiply numerator by numerator and denominator by denominator: $\qquad \dfrac{5 \cdot 3}{49 \cdot 1} = \dfrac{15}{49}$

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<u>Dividing Fractions</u> (continued)

To divide a whole number by a fraction, place the whole number over 1 and follow the division process just presented. Change the operation to multiplication and "flip" the divisor (the second term). If necessary, simplify.

Example #15: $5 \div \dfrac{3}{16}$

Place the whole number over 1: $\dfrac{5}{1} \div \dfrac{3}{16}$

Multiply by the reciprocal of $\dfrac{3}{16}$: $\dfrac{5}{1} \cdot \dfrac{16}{3} = \dfrac{5 \cdot 16}{1 \cdot 3} = \dfrac{80}{3}$

Note: $\frac{80}{3}$ is an improper fraction. It is simplified because there are no common factors between the numerator and denominator. It can be changed to a mixed number if preferred.

Example #16: $\dfrac{\frac{2}{3}}{5}$

Rewrite (fraction bar is a division symbol): $\dfrac{2}{3} \div 5$

Place the whole number over 1: $\dfrac{2}{3} \div \dfrac{5}{1}$

Multiply by the reciprocal of $\dfrac{5}{1}$: $\dfrac{2}{3} \cdot \dfrac{1}{5}$

Multiply numerator by numerator and denominator by denominator: $\dfrac{2 \cdot 1}{3 \cdot 5} = \dfrac{2}{15}$

Example #17: $\dfrac{\frac{2}{3}}{\frac{1}{5}}$

Rewrite (fraction bar is a division symbol): $\dfrac{2}{3} \div \dfrac{1}{5}$

Multiply by the reciprocal of $\dfrac{1}{5}$: $\dfrac{2}{3} \cdot \dfrac{5}{1}$

Multiply numerator by numerator and denominator by denominator: $\dfrac{2 \cdot 5}{3 \cdot 1} = \dfrac{10}{3}$

Note: $\frac{10}{3}$ is an improper fraction. It is simplified because there are no common factors between the numerator and denominator. It can be changed to a mixed number if preferred.

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