Multiplying and Dividing Fractions

Multiplying Fractions

$$\frac{2}{3}\times\frac{3}{4}=\frac{2\times3}{3\times4}=\frac{6}{12}=\frac{1}{2}$$

1. Multiply the numerators.
2. Multiply the denominators.
3. Cancel down.

Can you name the parts of a fraction?

numerator → ? → 3

denominator → ? → 4

$\frac{2}{5}\times\frac{3}{4}=\frac{6}{20}=\frac{3}{10}$

$\frac{1}{6}\times\frac{2}{5}=\frac{2}{30}=\frac{1}{15}$

$\frac{1}{4}\times\frac{1}{2}=\frac{1}{8}$

$\frac{5}{12}\times\frac{2}{5}=\frac{10}{60}=\frac{1}{6}$

$\frac{3}{4}\times\frac{4}{5}=\frac{12}{20}=\frac{3}{5}$

$\frac{5}{9}\times\frac{2}{3}=\frac{10}{27}$

$\frac{4}{7}\times\frac{2}{5}=\frac{8}{35}$

$\frac{3}{8}\times\frac{4}{9}=\frac{12}{72}=\frac{1}{6}$

What sort of fractions / numbers are these:

proper fraction → ? → $\frac{7}{8}$

mixed number → ? → $2\frac{3}{8}$

improper fraction → ? → $\frac{9}{7}$

Multiplying mixed numbers.

$$2\frac{2}{5}\times\frac{1}{2}=\frac{12}{5}\times\frac{1}{2}=\frac{12}{10}=\frac{6}{5}=1\frac{1}{5}$$

1. Change the mixed number to an improper fraction.
2. Multiply as before.
3. Cancel down and change to mixed number if necessary.

$1\frac{1}{4} \times \frac{2}{7} = \frac{5}{4} \times \frac{2}{7} = \frac{10}{28} = \frac{5}{14}$

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

$\frac{3}{4} \times 1\frac{4}{5} = \frac{3}{4} \times \frac{9}{5} = \frac{27}{20} = 1\frac{7}{20}$

$1\frac{4}{7} \times 1\frac{2}{5} = \frac{11}{7} \times \frac{7}{5} = \frac{77}{35} = \frac{11}{5} = 2\frac{1}{5}$

Cancelling down.

It is often easier to cancel down before you multiply. **When you are multiplying fractions**, any numerator can be cancelled against any denominator.

After multiplication

$\frac{5}{8} \times \frac{16}{25} = \frac{80}{200} = \frac{2}{5}$

Before multiplication

$\frac{\cancel{5}^{1}}{\cancel{8}_{1}} \times \frac{\cancel{16}^{2}}{\cancel{25}_{5}} = \frac{2}{5}$

Multiplying fractions and whole numbers

$12 \times \frac{5}{6} = \frac{12}{1} \times \frac{5}{6} = \frac{60}{6} = 10$

1. Whole numbers have a denominator of 1.
2. Multiply numerators and denominators.
3. Cancel down and change to a mixed number if necessary.

Cancelling after multiplication

$\frac{7}{12} \times \frac{16}{49} = \frac{112}{588} = \frac{4}{21}$

Cancelling before multiplication

$\frac{\cancel{7}^{1}}{\cancel{12}_{3}} \times \frac{\cancel{16}^{4}}{\cancel{49}_{7}} = \frac{4}{21}$

Which is easier?

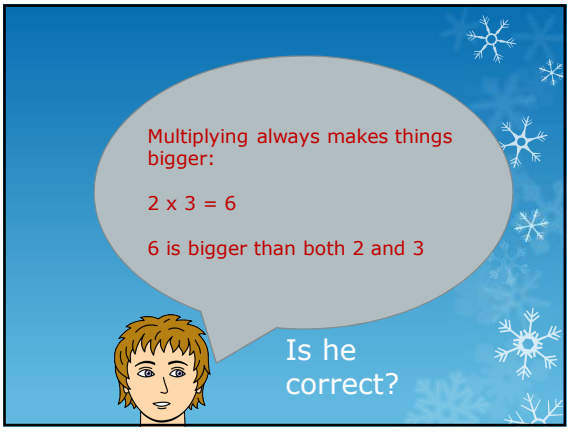
$\frac{3}{4} \times 6 = \frac{3}{4} \times \frac{6}{1} = \frac{18}{4} = 4\frac{1}{2}$

$\frac{7}{8} \times 12 = \frac{7}{8} \times \frac{12}{1} = \frac{84}{8} = 10\frac{1}{2}$

$5 \times \frac{3}{10} = \frac{5}{1} \times \frac{3}{10} = \frac{15}{10} = 1\frac{1}{2}$

$\frac{5}{7} \times 4 = \frac{5}{7} \times \frac{4}{1} = \frac{20}{7} = 2\frac{6}{7}$

$7 \times \frac{2}{5} = \frac{7}{1} \times \frac{2}{5} = \frac{14}{5} = 2\frac{4}{5}$



If you multiply a number by 1,
it does not increase or decrease.

3 x 1 = 3

If you multiply a number by 0, you get 0

3 x 0 = 0

If you multiply a number larger than 1 by a proper fraction, the product is less than the original number.

$4 \times \frac{1}{2} = 2 \quad (2 < 4)$

$\frac{2}{5} \div \frac{1}{4} = \frac{2}{5} \div \frac{4}{4} = \frac{8}{5} = 1\frac{3}{5}$

$\frac{3}{7} \div \frac{2}{5} = \frac{3}{7} \div \frac{5}{5} = \frac{15}{14} = 1\frac{1}{14}$

$\frac{3}{4} \div \frac{1}{8} = \frac{3}{4} \div \frac{8}{8} = \frac{24}{4} = 6$

$\frac{5}{6} \div \frac{1}{3} = \frac{5}{6} \div \frac{3}{3} = \frac{15}{6} = 2\frac{1}{2}$

$\frac{4}{9} \div \frac{1}{2} = \frac{4}{9} \div \frac{2}{2} = \frac{8}{9}$

If you multiply two proper fractions together, the product is less than either of them:

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

of means ×

$\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$

$\frac{3}{4}$ of $\frac{1}{2} = \frac{3}{8}$

Dividing mixed numbers.

$2\frac{2}{5} \div \frac{1}{2} = \frac{12}{5} \div \frac{1}{2} = \frac{12}{5} \times \frac{2}{1} = \frac{24}{5} = 4\frac{4}{5}$

1. Change the mixed number to an improper fraction.
2. Divide as before.
3. Cancel down and change to a mixed number if necessary.

Dividing Fractions

$\frac{3}{4} \div \frac{1}{3} = \frac{3}{4} \div \frac{3}{3} = \frac{9}{4} = 2\frac{1}{4}$

1. Turn the dividing fraction upside down and change ÷ to ×.
2. Multiply numerators and denominators.
3. If necessary cancel down and change to a mixed number.

$1\frac{4}{5} \div \frac{1}{3} = \frac{9}{5} \div \frac{1}{3} = \frac{9}{5} \times \frac{3}{1} = \frac{27}{5} = 5\frac{2}{5}$

$2\frac{1}{3} \div \frac{7}{9} = \frac{7}{3} \div \frac{7}{9} = \frac{7}{3} \times \frac{9}{7} = \frac{63}{21} = 3$

$3\frac{1}{2} \div \frac{3}{8} = \frac{7}{2} \div \frac{3}{8} = \frac{7}{2} \times \frac{8}{3} = \frac{56}{6} = 9\frac{1}{3}$

$3\frac{2}{3} \div 1\frac{1}{6} = \frac{11}{3} \div \frac{7}{6} = \frac{11}{3} \times \frac{6}{7} = \frac{66}{21} = 3\frac{1}{7}$

$\frac{9}{10} \div 1\frac{1}{5} = \frac{9}{10} \div \frac{6}{5} = \frac{9}{10} \times \frac{5}{6} = \frac{45}{60} = \frac{3}{4}$

Dividing fractions and whole numbers

$$8 \div \frac{3}{5} = \frac{8}{1} * \frac{5}{3} = \frac{40}{3} = 13\frac{1}{3}$$

1. Whole numbers have a denominator of 1.
2. Turn dividing fraction upside down and multiply numerators and denominators.
3. Cancel down and change to a mixed number if necessary.

If you divide a number by 1, it does not increase or decrease.

$3 \div 1 = 3$

If you divide 1, or a number larger than 1, by a proper fraction, the answer is greater than the original number.

$4 \div \frac{1}{2} = 8 \quad (8 > 4)$

$6 \div \frac{2}{3} = \frac{6}{1} \div \frac{2}{3} = \frac{6}{1} \times \frac{3}{2} = \frac{18}{2} = 9$

$4 \div \frac{2}{5} = \frac{4}{1} \div \frac{2}{5} = \frac{4}{1} \times \frac{5}{2} = \frac{20}{2} = 10$

$7 \div \frac{5}{6} = \frac{7}{1} \div \frac{5}{6} = \frac{7}{1} \times \frac{6}{5} = \frac{42}{5} = 8\frac{2}{5}$

$5 \div \frac{6}{7} = \frac{5}{1} \div \frac{6}{7} = \frac{5}{1} \times \frac{7}{6} = \frac{35}{6} = 5\frac{5}{6}$

$8 \div \frac{7}{9} = \frac{8}{1} \div \frac{7}{9} = \frac{8}{1} \times \frac{9}{7} = \frac{72}{7} = 10\frac{2}{7}$

$\frac{3}{4} \div 6 = \frac{3}{4} \div \frac{6}{1} = \frac{3}{4} \times \frac{1}{6} = \frac{3}{24} = \frac{1}{8}$

If you divide a larger fraction by a smaller one, the answer will be more than 1.

$$\frac{3}{4} \div \frac{1}{8} = 6$$

How many $\frac{1}{8}$ are there in $\frac{3}{4}$? 6

Division always makes things smaller. If I divide up a rich, tasty chocolate cake, I always get a smaller piece than the whole cake.

$12 \div 4 = 3$

3 is less than 12

Is she correct?

The end