

RATIONAL NUMBERS

MULTIPLICATION AND DIVISION OF RATIONAL NUMBERS

MULTIPLICATION OF RATIONAL NUMBERS

Multiplication is the process of successive addition.

Like $6 \times 8 = 8 + 8 + 8 + 8 + 8 + 8 = 48$.

Similarly, $6 \times \frac{1}{3} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{6}{3} = 2$

Alternatively, $6 \times \frac{1}{3} = \frac{6}{1} \times \frac{1}{3} = \frac{6 \times 1}{1 \times 3} = \frac{6}{3} = \frac{2}{1} = 2$

So, when we multiply two rational numbers, we multiply the numerator with the numerator and the denominator with the denominator.

Thus, $-5 \times (-7) = \frac{-5}{1} \times \left(\frac{-7}{1}\right) = \frac{(-5)(-7)}{1 \times 1} = 35$

and $\frac{-2}{11} \times \frac{3}{5} = \frac{-2 \times 3}{11 \times 5} = \frac{-6}{55}$

Ex.1 Find product of $\frac{-5}{7}$ and 9.

Sol. $\frac{-5}{7} \times 9 = \frac{-5}{7} \times \frac{9}{1} = \frac{-5 \times 9}{7 \times 1} = \frac{-45}{7}$

When we multiply two rational numbers :

$$\text{i.e., } \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d} = \frac{ac}{bd}$$

$$\text{e.g., } \frac{1}{2} \times \frac{-3}{4} = \frac{1 \times (-3)}{2 \times 4} = \frac{-3}{8}$$

On multiplying two rational numbers, we get result as a rational number.

$$e.g., \frac{-3}{4} \times \frac{5}{7} = \frac{-3 \times 5}{4 \times 7} = \frac{-15}{28} \quad (\text{Closure property})$$

Ex.2 Find the product:

$$(i) \frac{7}{2} \times \left(\frac{-5}{4} \right)$$

$$(ii) \frac{7}{10} \times (-9)$$

$$(iii) \frac{4}{-5} \times \frac{-5}{4}$$

$$(iv) \frac{4}{7} \times \left(\frac{-2}{5} \right)$$

$$\text{Sol.}(i) \frac{7}{2} \times \left(\frac{-5}{4} \right) = \frac{7 \times (-5)}{2 \times 4} = \frac{-35}{8}$$

$$(ii) \frac{7}{10} \times (-9) = \frac{7}{10} \times \frac{(-9)}{1} = \frac{7 \times (-9)}{10 \times 1} = \frac{-63}{10}$$

$$(iii) \frac{4}{-5} \times \frac{-5}{4} = \frac{4 \times (-5)}{(-5) \times 4} = \frac{-20}{-20} = 1$$

$$(iv) \frac{4}{7} \times \left(\frac{-2}{5} \right) = \frac{4}{7} \times \left(\frac{-2}{5} \right) = \frac{4 \times (-2)}{7 \times 5} = \frac{-8}{35}$$

DIVISION OF RATIONAL NUMBERS

Division is the inverse process of multiplication.

If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$.

$$\text{Ex.} \frac{2}{7} \div \frac{5}{9} = \frac{2}{7} \times \frac{9}{5} = \frac{18}{35}$$

$$\text{Ex.} \frac{3}{8} \div \frac{-4}{9} = \frac{3}{8} \times \left(\frac{-9}{4} \right) = \frac{-27}{32}$$

Ex.3 Find the value of:

(i) $(-6) \div \frac{2}{3}$

(ii) $\frac{-4}{5} \div 2$

(iii) $\frac{3}{13} \div \left(\frac{-4}{65}\right)$

(iv) $\frac{-2}{8} \div \frac{-2}{8}$

(v) $\left(\frac{-6}{9}\right) \div 1$

Sol. (i) $(-6) \div \frac{2}{3} = \frac{-6}{1} \times \frac{3}{2} = \frac{-6 \times 3}{1 \times 2} = \frac{-18}{2} = -9$

So, $(-6) \div \frac{2}{3} = -9$

(ii) $\frac{-4}{5} \div 2 = \frac{-4}{5} \times \frac{1}{2} = \frac{-4 \times 1}{5 \times 2} = \frac{-2 \times 1}{5} = \frac{-2}{5}$

So, $\frac{-4}{5} \div 2 = \frac{-2}{5}$

(iii) $\frac{3}{13} \div \left(\frac{-4}{65}\right) = \frac{3}{13} \times \frac{65}{-4} = \frac{3 \times 65}{13 \times -4} = \frac{15}{-4}$

So, $\frac{3}{13} \div \left(\frac{-4}{65}\right) = \frac{15}{-4}$

(iv) $\frac{-2}{8} \div \frac{-2}{8} = \frac{-2}{8} \times \frac{8}{-2} = \frac{(-2) \times 8}{8 \times (-2)} = \frac{1 \times 1}{1 \times 1} = 1$

So, $\frac{-2}{8} \div \frac{-2}{8} = 1$

$$(v) \left(\frac{-6}{9} \right) \div 1 = \left(\frac{-6}{9} \right) \div \frac{1}{1} = \frac{-6}{9} \times \frac{1}{1}$$

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

$$\text{So, } \left(\frac{-6}{9} \right) \div 1 = \frac{-2}{3}$$