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Real numbers

Part 2 (Fractions)

General Form

$$\frac{a}{b}$$

- a is called numerator
  b is called denominator
- a and b are integers.
- $b \neq 0$
- $\frac{a}{b} = a \div b$

Fundamental rules

- If the two terms of a fraction are multiplied of divided by the same number, the answer of the fraction will not change.

Example:

$\frac{6}{4} = 1.5 \quad ; \quad \frac{6\times2}{4\times2} = \frac{12}{8} = 1.5 \; ; \; \frac{6\div2}{4\div2} = \frac{3}{2} = 1.5$

- $\frac{-a}{b} = \frac{a}{-b} = -\frac{a}{b} \qquad (b \neq 0)$
- $\frac{-a}{-b} = \frac{a}{b}$

Example:

$\frac{6}{4} = \frac{-6}{-4} = 1.5 \quad ; \quad \frac{-6}{4} = \frac{6}{-4} = -\frac{6}{4} = -1.5$

Fundamental rules

❖ a and b are called inverse numbers (reciprocal) if $\boldsymbol{a \times b = 1}$.

In this case, $b = \frac{1}{a}$.

Example:

0.5 and 2 are inverse since $0.5 \times 2 = 1$. $\left(0.5 = \frac{1}{2}\right)$

0.125 and 8 are inverse since $0.125 \times 8 = 1$. $\left(0.125 = \frac{1}{8}\right)$

Fundamental rules

❖ $\frac{a}{b}+\frac{c}{b}=\frac{a+c}{b}$ and $\frac{a}{b}-\frac{c}{b}=\frac{a-c}{b}$ $(b \neq 0)$

Example:

$\frac{5}{6}+\frac{2}{6}=\frac{5+2}{6}=\frac{7}{6}$ and $\frac{5}{6}-\frac{2}{6}=\frac{5-2}{6}=\frac{3}{6}$

❖ $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$ and $\frac{a}{b}-\frac{c}{d}=\frac{ad-bc}{bd}$ $(b,d \neq 0)$

Example:

$\frac{5}{2}+\frac{2}{3}=\frac{5\times3}{2\times3}+\frac{2\times2}{3\times2}=\frac{15}{6}+\frac{4}{6}=\frac{19}{6}$

$\frac{5}{2}-\frac{2}{3}=\frac{5\times3}{2\times3}-\frac{2\times2}{3\times2}=\frac{15}{6}-\frac{4}{6}=\frac{11}{6}$

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Fundamental rules

❖ $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$ $(b, d \neq 0)$

Example:

$\frac{5}{6} \times \frac{2}{3} = \frac{5 \times 2}{6 \times 3} = \frac{10}{18}$

$k \times \frac{a}{b} = \frac{ka}{b} \neq \frac{ka}{kb}$ $(k, b \neq 0)$

Example:

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

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Fundamental rules

❖ $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$ $(b, c, d \neq 0)$

Example:

$$\frac{5}{6} \div \frac{2}{3} = \frac{5}{6} \times \frac{3}{2} = \frac{5 \times 3}{6 \times 2} = \frac{15}{12}$$

$\frac{a}{b} \div k = \frac{a}{b} \times \frac{1}{k} = \frac{a}{bk}$ $(k, b \neq 0)$

Example:

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

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Fundamental rules

❖ Irreducible fraction is a fraction in its simplest form

Example:

$\frac{12}{18}$ is not an irreducible fraction since $\frac{12}{18} = \frac{12\div6}{18\div6} = \frac{2}{3}$

❖ Decimal fraction is a fraction of denominator a power of 2 or 5

Example:

$\frac{1}{10}$ is a decimal fraction ; $\frac{3}{1000}$ is a decimal fraction ;

$\frac{1}{4} = \frac{1}{2^2}$ is a decimal fraction ; $\frac{9}{15} = \frac{9\div3}{15\div3} = \frac{3}{5}$ is a decimal fraction

Fundamental rules

IMPORTANT

When calculating, pay attention to the order of operations.

- "×" and "÷" are stronger than '+" and "-" so you must start by the strongest.
- If you have two operations of same power, start from the left to the right.

Example:

$$\frac{2}{3}\times\frac{1}{5}-\frac{1}{15}=\frac{2\times1}{3\times5}-\frac{1}{15}$$

$$=\frac{2}{15}-\frac{1}{15}$$

$$=\frac{1}{15}$$

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Calculate and write the answer in the simplest form.

1) $\frac{6}{5} - \frac{4}{5} \times \frac{7}{2}$

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

$$= \frac{6}{5} - \frac{28}{10}$$

$$= \frac{6 \times 2}{5 \times 2} - \frac{28}{10}$$

$$= \frac{12}{10} - \frac{28}{10}$$

$$= \frac{12 - 28}{10}$$

$$= -\frac{16}{10} = -\frac{8}{5}$$

Calculate and write the answer in the simplest form.

2) $\frac{5}{14} - \frac{2}{7} \div \frac{10}{21}$

$$\frac{5}{14} - \frac{2}{7} \div \frac{10}{21} = \frac{5}{14} - \frac{\cancel{2}^{1}}{\cancel{7}_{1}} \times \frac{\cancel{21}^{3}}{\cancel{10}_{5}}$$

$$= \frac{5}{14} - \frac{3}{5}$$

$$= \frac{5\times5}{14\times5} - \frac{3\times14}{5\times14}$$

$$= \frac{25}{70} - \frac{42}{70}$$

$$= -\frac{17}{70}$$

Calculate and write the answer in the simplest form.

3) $4-\frac{3}{2}\div\left(\frac{3}{4}-\frac{2}{3}\right)$

$$4-\frac{3}{2}\div\left(\frac{3}{4}-\frac{2}{3}\right)=4-\frac{3}{2}\div\left(\frac{3\times3}{4\times3}-\frac{2\times4}{3\times4}\right)$$

$$=4-\frac{3}{2}\div\left(\frac{9}{12}-\frac{8}{12}\right)$$

$$=4-\frac{3}{2}\div\frac{1}{12}$$

$$=4-\frac{3}{2}\times\frac{12}{1}$$

$$=4-\frac{36}{2}$$

$$=4-18$$

$$=-14$$