

Rational Numbers

Ex 1E

Q1.

Answer :

(i)

$$\begin{aligned}\frac{4}{9} \div \frac{-5}{12} \\&= \frac{4}{9} \times \frac{12}{-5} \\&= \frac{4 \times 12}{9 \times -5} \\&= \frac{48}{-45} \\&= \frac{-48}{45} \\&= \frac{-16}{15}\end{aligned}$$

(ii)

$$\begin{aligned}-8 \div \frac{-7}{16} \\&= -8 \times \frac{16}{-7} \\&= \frac{8 \times 16}{7} \\&= \frac{128}{7}\end{aligned}$$

(iii)

$$\begin{aligned}\frac{-12}{7} \div (-18) \\&= \frac{-12}{7} \times \frac{1}{-18}\end{aligned}$$

$$\begin{aligned}
&= \frac{12}{126} \\
&= \frac{12 \div 3}{126 \div 3} \\
&= \frac{4}{42} \\
&= \frac{4 \div 2}{42 \div 2} \\
&= \frac{2}{21}
\end{aligned}$$

(iv)

$$\begin{aligned}
&\frac{-1}{10} \div \frac{-8}{5} \\
&= \frac{-1}{10} \times \frac{5}{-8} \\
&= \frac{5}{80} \\
&= \frac{5 \div 5}{80 \div 5} \\
&= \frac{1}{16}
\end{aligned}$$

(v)

$$\begin{aligned}
&\frac{-16}{35} \div \frac{-15}{14} \\
&= \frac{-16}{35} \times \frac{14}{-15} \\
&= \frac{224}{525}
\end{aligned}$$

(vi)

$$\begin{aligned}
&\frac{-65}{14} \div \frac{13}{7} \\
&= \frac{-65}{14} \times \frac{7}{13} \\
&= \frac{-5}{2}
\end{aligned}$$

Q2.

Answer :

(i)

$$\frac{13}{5} \div \frac{26}{10} = \frac{26}{10} \div \frac{13}{5}$$

LHS

$$\begin{aligned}
&\frac{13}{5} \div \frac{26}{10} \\
&= \frac{13}{5} \times \frac{10}{26} \\
&= \frac{130}{130} \\
&= 1
\end{aligned}$$

RHS

$$\begin{aligned}
&\frac{26}{10} \div \frac{13}{5} \\
&= \frac{26}{10} \times \frac{5}{13} \\
&= \frac{130}{130} \\
&= 1
\end{aligned}$$

TRUE

$$(ii) -9 \div \frac{3}{4} = \frac{3}{4} \div (-9) \text{ LHS } -9 \div \frac{3}{4} = -9 \times \frac{4}{3} = \frac{-36}{3} = -12 \text{ RHS } \frac{3}{4} \div (-9) = \frac{3}{4} \times \frac{1}{-9}$$

$$= \frac{3}{-36} = \frac{-1}{12} \text{ FALSE iii) } \frac{-8}{9} \div \frac{-4}{3} = \frac{-4}{3} \div \frac{-8}{9} \text{ LHS } \frac{-8}{9} \div \frac{-4}{3}$$

$$= \frac{-8}{9} \times \frac{3}{-4} = \frac{24}{36} = \frac{2}{3} \text{ RHS } \frac{-4}{3} \div \frac{-8}{9} = \frac{-4}{3} \times \frac{9}{-8} = \frac{36}{24}$$

$$= \frac{3}{2} \text{ FALSE (iv) } \frac{-7}{24} \div \frac{3}{-16} = \frac{3}{-16} \div \frac{-7}{24} \text{ LHS } \frac{-7}{24} \times \frac{-16}{3}$$

$$= \frac{112}{72} \text{ RHS } \frac{3}{-16} \div \frac{-7}{24} = \frac{3}{-16} \times \frac{24}{-7} = \frac{72}{112} \text{ FALSE}$$

Q3.

Answer :

(i)

$$\left(\frac{5}{9} \div \frac{1}{3}\right) \div \frac{5}{2} = \frac{5}{9} \div \left(\frac{1}{3} \div \frac{5}{2}\right)$$

LHS

$$\begin{aligned} &\left(\frac{5}{9} \div \frac{1}{3}\right) \div \frac{5}{2} \\ &= \left(\frac{5}{9} \times \frac{3}{1}\right) \times \frac{2}{5} \\ &= \frac{5 \times 3 \times 2}{9 \times 1 \times 5} \\ &= \frac{30}{45} \\ &= \frac{2}{3} \end{aligned}$$

RHS

$$\begin{aligned} &\frac{5}{9} \div \left(\frac{1}{3} \div \frac{5}{2}\right) \\ &= \frac{5}{9} \div \left(\frac{1}{3} \times \frac{2}{5}\right) \\ &= \frac{5}{9} \div \left(\frac{2}{15}\right) \\ &= \frac{5}{9} \times \left(\frac{15}{2}\right) = \frac{75}{18} \\ &= \frac{25}{6} \end{aligned}$$

LHS $\neq$ RHS

FALSE

(ii)

$$\left[\left(-16\right) \div \frac{6}{5}\right] \div \frac{-9}{10} = \left(-16\right) \div \left[\frac{6}{5} \div \frac{-9}{10}\right]$$

LHS

$$\begin{aligned} &= \left[\left(-16\right) \div \frac{6}{5}\right] \div \frac{-9}{10} \\ &= \left[\left(-16\right) \times \frac{5}{6}\right] \times \frac{10}{-9} \\ &= \frac{(-16) \times 5 \times 10}{6 \times (-9)} \\ &= \frac{800}{54} \\ &= \frac{400}{27} \end{aligned}$$

RHS

$$\begin{aligned} &\left(-16\right) \div \left(\frac{6}{5} \div \frac{-9}{10}\right) \\ &= \left(-16\right) \div \left(\frac{6}{5} \times \frac{10}{-9}\right) \\ &= -16 \div \left\{\frac{-60}{45}\right\} \\ &= -16 \times \left(\frac{-45}{60}\right) \end{aligned}$$

$$= \frac{48}{4}$$

$$= 12$$

LHS $\neq$ RHS

FALSE

(iii)

$$\left(\frac{-3}{5} \div \frac{-12}{35} \right) \div \frac{1}{14} = \frac{-3}{5} \div \left(\frac{-12}{35} \div \frac{1}{4} \right)$$

LHS

$$= \left(\frac{-3}{5} \times \frac{35}{-12} \right) \times 14$$

$$= \frac{(-3) \times 35 \times 14}{5 \times (-12)}$$

$$= \frac{1470}{60}$$

$$= \frac{49}{2}$$

RHS

$$= \frac{-3}{5} \div \left(\frac{-12}{35} \div \frac{1}{4} \right)$$

$$= \frac{-3}{5} \div \left(\frac{-12}{35} \times \frac{4}{1} \right)$$

$$= \frac{-3}{5} \div \left(\frac{-12 \times 4}{35} \right)$$

$$= \frac{-3}{5} \div \left(\frac{-12 \times 4}{35} \right)$$

$$= \frac{-3}{5} \div \left(\frac{-48}{35} \right)$$

$$= \frac{-3}{5} \times \frac{35}{-48}$$

$$= \frac{3 \times 35}{5 \times 48}$$

$$= \frac{105}{240}$$

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

LHS $\neq$ RHS

FALSE

Q4.

Answer :

Let the number be x.

Now,

$$x \times (-12) = -9$$

$$\Rightarrow x = -9 \div (-12)$$

$$\Rightarrow x = (-9) \times \frac{1}{-12}$$

$$\Rightarrow x = \frac{-9}{-12}$$

$$\Rightarrow x = \frac{3}{4}$$

Q5.

Answer :

Let the number be x. .

Now,

$$x \times \frac{-4}{3} = \frac{-16}{9}$$

$$\Rightarrow x = \frac{-16}{9} \div \frac{-4}{3}$$

$$\Rightarrow x = \frac{-16}{9} \times \frac{3}{-4}$$

$$\Rightarrow x = \frac{-16 \times 3}{9 \times (-4)}$$

$$\Rightarrow x = \frac{48}{36}$$

$$\Rightarrow x = \frac{4}{3}$$

Q6.

Answer :

Let the number be x.

Now,

$$\begin{aligned}x \times \frac{-15}{50} &= \frac{-5}{7} \\ \Rightarrow x &= \frac{-5}{7} \div \frac{-15}{50} \\ \Rightarrow x &= \frac{-5}{7} \times \frac{50}{-15} \\ \Rightarrow x &= \frac{280}{105} \\ \Rightarrow x &= \frac{280 \div 5}{105 \div 5} \\ \Rightarrow x &= \frac{56}{21} \\ \Rightarrow x &= \frac{56 \div 7}{21 \div 7} \\ \Rightarrow x &= \frac{8}{3}\end{aligned}$$

Q7.

Answer :

Let the number be x.

Now,

$$\begin{aligned}x \times \frac{-8}{39} &= \frac{1}{26} \\ \Rightarrow x &= \frac{1}{26} \div \frac{-8}{39} \\ \Rightarrow x &= \frac{1}{26} \times \frac{39}{-8} \\ \Rightarrow x &= \frac{39}{-208} \\ \Rightarrow x &= \frac{39 \times -1}{-208 \times -1} \\ \Rightarrow x &= \frac{-39}{208} \\ \Rightarrow x &= \frac{-39 \div 13}{208 \div 13} \\ \Rightarrow x &= \frac{-3}{16}\end{aligned}$$

Q8.

Answer :

Let the number be x.

Now,

$$\begin{aligned}\frac{-33}{8} \div x &= \frac{-11}{2} \\ \Rightarrow \frac{-33}{8} \times \frac{1}{x} &= \frac{-11}{2} \\ \Rightarrow \frac{1}{x} &= \frac{-11}{2} \div \frac{-33}{8} \\ \Rightarrow \frac{1}{x} &= \frac{-11}{2} \times \frac{8}{-33} \\ \Rightarrow \frac{1}{x} &= \frac{88}{66} \\ \Rightarrow \frac{1}{x} &= \frac{4}{3} \\ \Rightarrow x &= \frac{3}{4} \quad \left(\text{Reciprocal of } \frac{4}{3}\right)\end{aligned}$$

Q9.

Answer :

$$\begin{aligned}\left(\frac{13}{5} + \frac{-12}{7}\right) &\div \left(\frac{-31}{7} \times \frac{1}{-2}\right) \\ &= \left(\frac{91-60}{35}\right) \div \left(\frac{-31}{-14}\right) \\ &= \left(\frac{31}{35}\right) \div \left(\frac{31}{14}\right) \\ &= \left(\frac{31}{35}\right) \times \left(\frac{14}{31}\right) \\ &= \frac{14}{35} \\ &= \frac{14 \div 7}{35 \div 7} \\ &= \frac{2}{5}\end{aligned}$$

Q10.

Answer :

$$\begin{aligned}& \left(\frac{65}{12} + \frac{8}{3} \right) \div \left(\frac{65}{12} - \frac{8}{3} \right) \\&= \left(\frac{65}{12} + \frac{32}{12} \right) \div \left(\frac{65}{12} - \frac{32}{12} \right) \\&= \left(\frac{97}{12} \right) \div \left(\frac{33}{12} \right) \\&= \frac{97}{12} \times \frac{12}{33} \\&= \frac{97}{33}\end{aligned}$$

Q11.

Answer :

(i)

$$\begin{aligned}& \text{Let } \frac{9}{8} \div x = \frac{-3}{2} \\& \Rightarrow \frac{9}{8} \times \frac{1}{x} = \frac{-3}{2} \\& \Rightarrow \frac{1}{x} = \frac{-3}{2} \div \frac{9}{8} \\& \Rightarrow \frac{1}{x} = \frac{-3}{2} \times \frac{8}{9} \\& \Rightarrow \frac{1}{x} = \frac{-24}{18} \\& \Rightarrow \frac{1}{x} = \frac{-4}{3} \\& \Rightarrow x = \frac{-3}{4} \quad \left[\text{Reciprocal of } \frac{-4}{3} \right]\end{aligned}$$

(ii)

$$\begin{aligned}& \text{Let } x \div \left(\frac{-7}{5} \right) = \frac{10}{19} \\& \Rightarrow x \times \left(\frac{5}{-7} \right) = \frac{10}{19} \\& \Rightarrow x = \left(\frac{10}{19} \right) \div \left(\frac{5}{-7} \right) \\& \Rightarrow x = \frac{10}{19} \times \frac{-7}{5} \\& \Rightarrow x = \frac{-14}{19}\end{aligned}$$

(iii)

$$\begin{aligned}& \text{Let } x \div (-3) = \frac{-4}{15} \\& \Rightarrow x \times \left(\frac{1}{-3} \right) = \frac{-4}{15} \\& \Rightarrow x = \frac{-4}{15} \times (-3) \\& \Rightarrow x = \frac{12}{15} \\& \Rightarrow x = \frac{4}{5}\end{aligned}$$

(iv)

$$\begin{aligned}& \text{Let } (-12) \div x = \frac{-6}{5} \\& \Rightarrow (-12) \times \frac{1}{x} = \frac{-6}{5} \\& \Rightarrow \frac{1}{x} = \frac{-6}{5} \div (-12) \\& \Rightarrow \frac{1}{x} = \frac{-6}{5} \times \frac{1}{-12} \\& \Rightarrow \frac{1}{x} = \frac{1}{10} \\& \Rightarrow x = 10\end{aligned}$$

Q12.

Answer :

(i) No, rational numbers are not closed under division in general.

$\frac{a}{0} = \infty$; it is not a rational number.

(ii) No

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{ad}{bc}$$

Also,

$$\frac{c}{d} \div \frac{a}{b} = \frac{c}{d} \times \frac{b}{a} = \frac{cb}{da} \text{ Thus, } \frac{a}{b} \div \frac{c}{d} \neq \frac{c}{d} \div \frac{a}{b}$$

Therefore, division is not commutative.

(iii) No, rational numbers are not associative under division.

$$\frac{a}{b} \div \left(\frac{c}{d} \div \frac{e}{f} \right) \neq \left(\frac{a}{b} \div \frac{c}{d} \right) \div \frac{e}{f}$$

(iv) No, we cannot divide 1 by 0. The answer will be ∞ , which is not defined.