

iv,

$$\begin{aligned}
 & \left(\frac{-7}{11} + \frac{6}{5} \right) \div \left((-4) + \left(\frac{-2}{5} \right) \right) \\
 &= \left(\frac{-35 + 66}{55} \right) \div \left(\frac{-4}{1} + \frac{-2}{5} \right) \\
 &= \frac{31}{55} \div \left(\frac{(-20) + (-2)}{5} \right) \\
 &= \frac{31}{55} \div \left(\frac{-20 - 2}{5} \right) \\
 &= \frac{31}{55} \div \left(\frac{-22}{5} \right) \\
 &= \frac{31}{55} \times \frac{5}{(-22)} \\
 &= \frac{31 \times \cancel{5}^1}{\cancel{55}_1 \times (-22)} \\
 &= \frac{31 \times 1}{11 \times (-22)} = \frac{31}{-242} \\
 &= \frac{-31}{242}
 \end{aligned}$$

v,

$$\begin{aligned}
 & \left[\frac{-6}{25} \times \left(\frac{-50}{24} \right) \right] \div \left[\frac{5}{9} \times \left(\frac{-81}{30} \right) \right] \\
 &= \left[\frac{(-6) \times (-50)}{25 \times 24} \right] \div \left[\frac{5 \times (-81)}{9 \times 30} \right] \\
 &= \left[\frac{(-6) \times (-50)}{25 \times 24} \right] \times \left[\frac{9 \times 30}{5 \times (-81)} \right]
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{1 \times 1 \times 1 \times 1}{\cancel{6} \times \cancel{50} \times \cancel{9} \times \cancel{30} \times 6} \\
 &= \frac{1 \times 1 \times 1 \times 1 \times 6 \times 1}{1 \times \cancel{2} \times 1 \times \cancel{6} \times (-9) \times 1} \\
 &= \frac{1 \times 1 \times 1 \times 1}{1 \times 1 \times 1 \times (-3)} \\
 &= \frac{1}{-3} = -\frac{1}{3}
 \end{aligned}$$

(3).

$$-\frac{9}{35} \times \text{other number} = \frac{-25}{81}$$

$$\therefore \text{other number} = \frac{-25}{81} \div \frac{-9}{35}$$

$$= \frac{-25}{81} \times \frac{35}{-9}$$

$$= \frac{25 \times 35}{81 \times 9}$$

$$= \frac{875}{729}$$

$$(4) \frac{-749}{18 \times 36} \times \text{other number} = \frac{49}{36}$$

$$\therefore \text{other number} = \frac{49}{36} \div \frac{-7}{18}$$

$$= \frac{49}{36} \times \frac{18}{-7} = \frac{49 \times 18}{36 \times (-7)}$$

$$= \frac{7 \times 1}{2 \times (-1)}$$

$$= \frac{7 \times 1}{2 \times (-1)} = \frac{7}{-2} = -\frac{7}{2}$$

Miscellaneous Exercise

I. Fill in the blanks:

i) Additive inverse of $\frac{-125}{-36}$

$$= -\left(\frac{-125}{-36}\right)$$

$$= \frac{-125}{36}$$

ii) $\frac{-315}{-15} = \frac{21}{1} = \frac{21}{1}$

∴ $\frac{-315}{-15}$ in standard form is $= \frac{21}{1}$

iii) Reciprocal of -1 is $= \frac{1}{-1}$

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

iv) a rational number + its additive inverse = zero.

v) $\frac{9}{-15}$ is a negative rational number.

vi) Negative of a negative rational number is a positive rational number.

vii, The reciprocal of 0 is $= \frac{1}{0}$, which is not defined.
 $\therefore 0$ ~~is~~ has no reciprocal.

viii, Rational number $\times \frac{1}{\text{Rational number}} = 1$

\therefore product of a rational number and its multiplicative inverse is 1

ix, Additive inverse of 0 = -0
= 0

x,

$$\frac{25}{35} = \frac{\square}{-7}$$

$$\Rightarrow \frac{5 \times \cancel{5}}{7 \times \cancel{5}} = \frac{\square}{-7}$$

$$\Rightarrow \frac{5}{7} \times -7 = \frac{\square}{-7} \times -7$$

$$\Rightarrow \frac{5 \times \cancel{(-7)}}{\cancel{7}} = \frac{\square \times \cancel{(-7)}}{\cancel{(-7)}}$$

$$= \square$$

$$\Rightarrow \frac{5 \times (-1)}{1} = \square$$

$$\Rightarrow -5 = \square$$

$$\therefore \frac{25}{35} = \frac{-5}{-7}$$

2) Simplify:

$$\begin{aligned}
 \text{i), } & \frac{3}{7} + \left(-\frac{2}{3}\right) + \left(-\frac{5}{42}\right) \\
 &= \frac{3}{7} - \frac{2}{3} - \frac{5}{42} \\
 &= \frac{(3 \times 6) - (14 \times 2) - (5 \times 1)}{42} \\
 &= \frac{18 - 28 - 5}{42} \\
 &= \frac{-15}{42} = \frac{-5}{14}
 \end{aligned}$$

$$\begin{array}{r}
 \text{LCM} \\
 7 \overline{) 7, 3, 42} \\
 3 \overline{) 1, 3, 6} \\
 2 \overline{) 1, 1, 2} \\
 \quad 1, 1, 1 \\
 \therefore \text{LCM} = 7 \times 3 \times 2 \\
 = 42
 \end{array}$$

$$\begin{aligned}
 \text{ii), } & \frac{-3}{29} \div \left(-\frac{9}{87}\right) \\
 &= \frac{-3}{29} \times \frac{87}{-9} \\
 &= \frac{\cancel{3} \times 87}{29 \times \cancel{9}} \begin{matrix} 31 \\ 31 \end{matrix} \\
 &= \frac{1 \times 1}{1 \times 1} = \frac{1}{1} = 1
 \end{aligned}$$

$$\begin{aligned}
 \text{iii), } & \frac{1}{5} - \left(-\frac{3}{7}\right) + \frac{9}{10} \\
 &= \frac{1}{5} + \frac{3}{7} + \frac{9}{10} \\
 &= \frac{14 + 30 + 63}{70} \\
 &= \frac{107}{70}
 \end{aligned}$$

$$\begin{array}{r}
 \text{LCM} \\
 5 \overline{) 5, 7, 10} \\
 2 \overline{) 1, 7, 2} \\
 7 \overline{) 1, 7, 1} \\
 \quad 1, 1, 1 \\
 \therefore \text{LCM} = 5 \times 2 \times 7 \\
 = 70
 \end{array}$$

$$\begin{aligned}
 \text{iv), } & \left[\frac{3}{4} \times \left(\frac{-5}{27} \right) \right] - \left(\frac{-6}{21} \times \frac{7}{18} \right) \\
 & = \left[\frac{\cancel{3} \times (-5)}{4 \times \cancel{27} 9} \right] - \left[\frac{\cancel{(-6)}^1 \times \cancel{7}^1}{\cancel{21}^3 \times \cancel{18}^3} \right] \\
 & = \left[\frac{1 \times (-5)}{4 \times 9} \right] - \left(\frac{-1 \times 1}{3 \times 3} \right) \\
 & = \left(\frac{-5}{36} \right) - \left(\frac{-1}{9} \right) \\
 & = \frac{-5}{36} + \frac{1}{9} \\
 & = \frac{-5 + 4}{36} \\
 & = \frac{-1}{36} .
 \end{aligned}$$

$$\begin{aligned}
 \text{v), } & \left[\frac{-15}{21} \times \left(\frac{-49}{5} \right) \right] \div \left(\frac{13}{15} \times \frac{45}{26} \right) \\
 & = \left[\frac{\cancel{(-15)}^{-3} \times \cancel{(-49)}^{-7}}{\cancel{21}^3 \times \cancel{5}^1} \right] \div \left(\frac{\cancel{13}^1 \times \cancel{45}^3}{\cancel{15}^1 \times \cancel{26}^2} \right) \\
 & = \left(\frac{-3 \times (-7)}{3 \times 1} \right) \div \left(\frac{1 \times 3}{1 \times 2} \right) \\
 & = \frac{7}{1} \div \frac{3}{2} \\
 & = \frac{7}{1} \times \frac{2}{3} = \frac{7 \times 2}{1 \times 3} = \frac{14}{3}
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad & -\left[\frac{2}{3} - \left(-\frac{4}{9}\right)\right] \times \frac{1}{\left[\frac{3}{9} - \left(-\frac{7}{2}\right)\right]} \\
 & = -\left(\frac{2}{3} + \frac{4}{9}\right) \times \frac{1}{\left(\frac{3}{9} + \frac{7}{2}\right)} \\
 & = -\left(\frac{6+4}{9}\right) \times \frac{1}{\left(\frac{6+63}{18}\right)} \\
 & = \left(-\frac{10}{9}\right) \times \frac{1}{\left(\frac{69}{18}\right)} \\
 & = -\frac{10}{9} \times \frac{18}{69} \\
 & = \frac{(-10) \times 18}{9 \times 69} \\
 & = \frac{-10 \times 2}{1 \times 69} \\
 & = \frac{-20}{69}
 \end{aligned}$$

(4)

$$\frac{1}{\frac{2}{9} + \left(-\frac{3}{5}\right) + \left(-\frac{4}{18}\right)} = \frac{1}{\frac{2}{9} - \frac{3}{5} - \frac{4}{18}}$$

$$= \frac{1}{\frac{20-54-20}{90}}$$

$$= \frac{1}{\frac{-54}{90}}$$

$$= \frac{90 \times 10}{-54 \times 10} = \frac{5}{-3} = -\frac{5}{3}$$

LCM	
9	9, 5, 18
2	1, 5, 2
5	1, 5, 1
	1, 1, 1
LCM = 9 × 2 × 5	
= 90	

(5)

$$\frac{9}{17} + \frac{\sqrt{5}}{34} = \frac{18 + \sqrt{5}}{34} = \frac{23}{34}$$

$$\text{reciprocal of } \frac{34}{23} = \frac{1}{\frac{34}{23}} = \frac{23}{34}$$

$$\therefore \text{Sum of } \left(\frac{9}{17} \text{ and } \frac{\sqrt{5}}{34} \right) - \text{reciprocal of } \frac{34}{23}$$

$$= \frac{23}{34} - \frac{23}{34} = \frac{23-23}{34}$$

$$= \frac{0}{34} = 0$$

(6)

$$-\frac{3}{4} + \frac{9}{20} = \frac{(-3 \times 5) + 9}{20}$$

$$= \frac{-15 + 9}{20}$$

$$= \frac{-6}{20} = \frac{-3}{10}$$

$$\frac{\sqrt{5}}{18} \times \left(\frac{-36}{20} \right) = \frac{3 \sqrt{5} \times (-36) \times (-2)}{1 \times 18 \times 20 \times 4}$$

$$= \frac{3 \times (-2)}{1 \times 4} = \frac{-6}{4} = \frac{-3}{2}$$

$$\therefore \left(-\frac{3}{4} + \frac{9}{20} \right) - \left[\frac{\sqrt{5}}{18} \times \left(\frac{-36}{20} \right) \right] = \left(\frac{-3}{10} \right) - \left(\frac{-3}{2} \right)$$

$$= \frac{-3}{10} + \frac{3}{2} = \frac{-3+15}{10}$$

$$= \frac{12}{10} = \frac{6}{5}$$

$$7) \quad -\frac{4}{9} \times = \frac{-4 \times 2}{9 \times 2} = \frac{-4 \times 6}{9 \times 6}$$

$$\therefore -\frac{4}{9} = \frac{-8}{18} = \frac{-24}{54}$$

$$\therefore -\frac{4}{9} = \frac{-8}{18} = \frac{24}{-54}$$

$\therefore -\frac{4}{9}, \frac{-8}{18}$ and $\frac{24}{-54}$ are equivalent.

$$-\frac{9}{15} = \frac{9}{-15} = \frac{9 \times 2}{-15 \times 2} = \frac{18}{-30}$$

$\therefore -\frac{9}{15}$ and $\frac{18}{-30}$ are equivalent.

$$8) \quad \frac{2}{3}, \frac{-4}{5}, \frac{7}{10}, \frac{5}{6}$$

$$\therefore \frac{2}{3} = \frac{2 \times 10}{3 \times 10} = \frac{20}{30}$$

$$-\frac{4}{5} = \frac{-4 \times 6}{5 \times 6} = \frac{-24}{30}$$

$$\frac{7}{10} = \frac{7 \times 3}{10 \times 3} = \frac{21}{30}$$

$$\frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}$$

$$\begin{array}{l} \text{LCM} \\ 3 \overline{) (3, 5, 10, 6)} \\ 2 \overline{) (1, 5, 10, 2)} \\ 5 \overline{) (1, 5, 5, 1)} \\ \quad 1, 1, 1 \end{array}$$

$$\therefore \text{LCM} = 3 \times 2 \times 5 = 30$$

$$\text{Now, } -\frac{24}{30} < \frac{20}{30} < \frac{21}{30} < \frac{25}{30}$$

$$\therefore \frac{25}{30} > \frac{21}{30} > \frac{20}{30} > \frac{-24}{30}$$

$$\therefore \frac{5}{6} > \frac{7}{10} > \frac{2}{3} > \frac{-4}{5}$$

$$9) \quad -\frac{4}{7}, -\frac{2}{3}, \frac{5}{4}, \frac{-1}{2}$$

$$\therefore -\frac{4}{7} = \frac{-4 \times 12}{7 \times 12} = \frac{-48}{84}$$

$$-\frac{2}{3} = \frac{-2 \times 28}{3 \times 28} = \frac{-56}{84}$$

$$\frac{5}{4} = \frac{5 \times 21}{4 \times 21} = \frac{105}{84}$$

$$-\frac{1}{2} = \frac{-1 \times 42}{2 \times 42} = \frac{-42}{84}$$

$$\begin{array}{l} \text{LCM} \\ 2 \overline{) 7, 3, 4, 12} \\ 2 \overline{) 7, 3, 2, 1} \\ 3 \overline{) 7, 3, 1, 1} \\ 7 \overline{) 7, 1, 1, 1} \\ \quad 1, 1, 1, 1 \end{array}$$

$$\therefore \text{LCM} = 2 \times 2 \times 3 \times 7 = 84$$

$$\therefore \frac{-56}{84} < \frac{-48}{84} < \frac{-42}{84} < \frac{105}{84}$$

$$\therefore -\frac{2}{3} < -\frac{4}{7} < -\frac{1}{2} < \frac{5}{4}$$

$$10) \quad \text{cloth required for 1 frock} = \frac{3}{8} \text{ m}$$

$$\text{Total cloth available} = \frac{15}{4} \text{ m}$$

$$\therefore \text{no. of frocks} = \frac{15}{4} \text{ m} \div \frac{3}{8} \text{ m}$$

$$= \frac{15}{4} \times \frac{8}{3}$$

$$= \frac{\cancel{15}^5 \times \cancel{8}_2}{\cancel{4}_1 \times \cancel{3}_1}$$

$$= \frac{5 \times 2}{1 \times 1}$$

$$= 10$$

\therefore 10 frocks can be made

Multiple choice questions.

Tick (✓) the correct option:

$$(1) \quad \frac{3}{8} = \frac{3 \times 7}{8 \times 7} = \frac{21}{56}$$

$\therefore \frac{3}{8}$ is equivalent to $\frac{21}{56}$

\therefore correct option is (b)

$$(2) \quad \text{For } \frac{a}{b}, b \neq 0$$

$\therefore b=0$ is incorrect. Ans: (c)

$$(3) \quad \frac{-18}{-7} = \frac{18}{7} = \text{a positive rational number.}$$

\therefore Ans: (c)

$$(4) \quad -\frac{5}{6}, \frac{7}{-15}, \frac{-4}{5}, \frac{2}{-3}$$

$$-\frac{5}{6} = \frac{-5 \times 5}{6 \times 5} = \frac{-25}{30}$$

$$\frac{7}{-15} = \frac{7 \times 2}{-15 \times 2} = \frac{14}{-30} = \frac{-14}{30}$$

$$\frac{-4}{5} = \frac{-4 \times 6}{5 \times 6} = \frac{-24}{30}$$

$$\frac{2}{-3} = \frac{2 \times 10}{-3 \times 10} = \frac{20}{-30} = \frac{-20}{30}$$

$$-\frac{25}{30} < \frac{-24}{30} < \frac{-20}{30} < \frac{-14}{30}$$

$$\therefore \text{Smallest} = \frac{-25}{30} = \frac{-5}{6}$$

Answer: (a)

$$\begin{array}{l} \text{LCM} \\ 3 \overline{) 6, 15, 5, 3} \\ \underline{2, 5, 5, 1} \\ 2 \overline{) 2, 5, 5, 1} \\ \underline{1, 5, 5, 1} \\ \quad 1, 1, 1, 1 \end{array}$$

$\therefore \text{LCM} = 3 \times 2 \times 5 = 30$

$$(5) \quad \frac{4}{3} > -\frac{4}{3} \text{ and } \frac{4}{3} > -\frac{3}{4}$$

$\therefore \frac{4}{3}$ does not lie between
 $-\frac{4}{3}$ and $-\frac{3}{4}$

\therefore Ans: (b)

$$(6) \quad \text{Additive inverse of } \frac{4}{9} = -\frac{4}{9}$$

\therefore Ans: (c)

(7) The rational number which is its own additive inverse is zero
additive inverse of $0 = -0 = 0$

\therefore Answer: (a)

$$(8) \quad x - y = x + (-y)$$

\therefore Answer: (d)

$$(9) \quad -\frac{8}{4} \times \frac{p}{9} = 1$$

$$\Rightarrow \frac{-8}{4} \times \frac{p}{9} = 1$$

$$\Rightarrow -\frac{2}{1} \times \frac{p}{9} = 1$$

$$\begin{aligned} \Rightarrow \frac{p}{9} &= 1 \div -\frac{2}{1} \\ &= 1 \times \frac{1}{-2} = \frac{1 \times 1}{1 \times -2} \\ &= \frac{1}{-2} \end{aligned}$$

∴ Answer : (C)

$$\begin{aligned}
 (10) \cdot \quad \frac{3}{10} \div \frac{3}{2} &= \frac{3}{10} \times \frac{2}{3} \\
 &= \frac{\cancel{3} \times 2}{10 \times \cancel{3}} \\
 &= \frac{1 \times 2}{5 \times 1} = \frac{2}{5}
 \end{aligned}$$

∴ Answer : (A)

Value Based Questions

Simplify :

$$\begin{aligned}
 (a) \quad \frac{-49}{9} \div \frac{-7}{9} &= \frac{-49}{9} \times \frac{9}{-7} \\
 &= \frac{\cancel{49} \times 9}{9 \times \cancel{7}} \\
 &= \frac{7 \times 1}{1 \times 1} = 7
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \left(\frac{3}{5} - \frac{1}{3}\right) + \left(\frac{8}{7} \times \frac{1}{4}\right) \\
 &= \left(\frac{9-5}{15}\right) + \frac{32+7}{28} \left(\frac{\cancel{8} \times 1}{7 \times \cancel{4}}\right) \\
 &= \frac{4}{15} + \left(\frac{2 \times 1}{7 \times 1}\right) \\
 &= \frac{4}{15} + \frac{2}{7} = \frac{28+30}{105} \\
 &= \frac{58}{105}
 \end{aligned}$$

$$\begin{aligned}
 \text{c)} \quad \frac{-7}{9} \div \frac{21}{26} &= \frac{-7}{9} \times \frac{26}{21} \\
 &= \frac{-1 \times 26}{9 \times 3} \\
 &= \frac{-1 \times 26}{9 \times 3} = \frac{-26}{27}
 \end{aligned}$$

$$\begin{aligned}
 \text{d)} \quad \left(\frac{3}{7} \times \frac{5}{-9} \right) \div \left(\frac{-12}{49} \times \frac{5}{12} \right) \\
 &= \left(\frac{3 \times 5}{7 \times 9 \times (-1)} \right) \div \left(\frac{(-1) \times 12 \times 5}{49 \times 12} \right) \\
 &= \left(\frac{1 \times 5}{7 \times 3 \times (-1)} \right) \div \left(\frac{(-1) \times 1 \times 5}{49 \times 1} \right) \\
 &= \frac{5}{-21} \div \frac{-5}{49} \\
 &= \frac{5}{-21} \times \frac{49}{-5} \\
 &= \frac{1 \times 7}{-3 \times 1 \times -1} \\
 &= \frac{7}{3}
 \end{aligned}$$

Questions:

(a) yes

(b) $\frac{-26}{27}$ and

(c) He has no interest in studies.

(d) He is serious about his studies.

MENTAL MATHS

Write T for true and F for false statements.

1) All fractions are rational numbers.

∴ Answer: T

$$(2) \quad \frac{-\sqrt{2}}{-8} = \frac{(-1) \times \sqrt{2}}{(-1) \times 8} = \frac{\sqrt{2}}{8}$$

∴ $\frac{-\sqrt{2}}{-8}$ is not a negative rational number.

∴ Answer: F

3) All rational numbers can be represented on the number line.

∴ Answer: T

4) There is no smallest rational number. ∴ Answer: F

5) Additive inverse of $\frac{a}{b} = -\frac{a}{b}$
= A negative number

∴ Answer: F

6) Reciprocal of 1 = $\frac{1}{1} = 1 \neq -1$

∴ Answer: F

7) There are so many rational numbers between 0 and $-\sqrt{2}$

∴ Answer: F

8) Standard form of $-\frac{51}{56} = -\frac{51}{56}$

∴ Answer: T

9) ~~Rec~~ Reciprocal of 0 = $\frac{1}{0}$, which is not defined.

∴ 0 has no reciprocal

∴ Answer: T

10)

$$\begin{aligned}\frac{\sqrt{2}}{8} \div \frac{10}{3} &= \frac{\sqrt{2}}{8} \times \frac{3}{10} \\ &= \frac{\cancel{\sqrt{2}} \times 3}{8 \times 10 \cdot 2} \\ &= \frac{1 \times 3}{8 \times 2} \\ &= \frac{3}{16} \neq \frac{50}{24}\end{aligned}$$

∴ Answer: F

