

class: VII

Rational numbers

Mathematics

Ex 9.1.

2) write four more rational numbers in each of the following patterns:

i) $-\frac{3}{5}, -\frac{6}{10}, -\frac{9}{15}, -\frac{12}{20}, \dots$

Sol: $-\frac{3}{5} = -\frac{3 \times 1}{5 \times 1}, -\frac{6}{10} = -\frac{3 \times 2}{5 \times 2}, -\frac{9}{15} = -\frac{3 \times 3}{5 \times 3}; -\frac{12}{20} = -\frac{3 \times 4}{5 \times 4}$

After observing the pattern

Four more rational nos. would be

$-\frac{3 \times 5}{5 \times 5} = -\frac{15}{25}, -\frac{3 \times 6}{5 \times 6} = -\frac{18}{30}, -\frac{3 \times 7}{5 \times 7} = -\frac{21}{35} \Delta -\frac{3 \times 8}{5 \times 8} = -\frac{24}{40}$

ii) H.W. iii) iv) C.W.

Q3) Give four rational numbers equivalent to:

i) $-\frac{2}{7}$ ii) $\frac{5}{3}$ iii) $\frac{4}{9}$

i) Four rational numbers equivalent to $-\frac{2}{7}$ are

$-\frac{2 \times 2}{7 \times 2} = -\frac{4}{14}, -\frac{2 \times 3}{7 \times 3} = -\frac{6}{21}, -\frac{2 \times 4}{7 \times 4} = -\frac{8}{28}$ and $-\frac{2 \times 5}{7 \times 5} = -\frac{10}{35}$

ii) & iii) H.W.

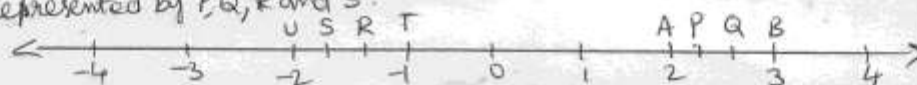
Q4) Draw the number line and represent the following rational numbers on it:

i) $\frac{3}{4}$



ii) to iv) H.W.

Q5) The points P, Q, R, S, T, U, A and B on the number line are such that, $TR = RS = SU$ and $AP = PQ = QB$. Name the rational numbers represented by P, Q, R and S.



Ans:	
Prepresents I	
A	" $\frac{8}{3}$
R	" $-\frac{4}{3}$
S	" $-\frac{5}{2}$

Q6) Which of the following pairs represent the same number?

i) $-\frac{7}{21}$ and $\frac{3}{9}$

Sol: i) $-\frac{7}{21}$ is a negative rational number and $\frac{3}{9}$ is a positive rational number.

\therefore The given pair does not represent the same rational number.

ii) $-\frac{16}{20} = \frac{-16 \times -1}{20 \times -1} = \frac{16}{-20} = \frac{16 \div 4}{-20 \div 4} = \frac{4}{-5}$

$$\frac{20}{-25} = \frac{20 \div 5}{-25 \div 5} = \frac{4}{-5}$$

\therefore The given pair represents the same rational number.

iii) to vi) H.W.

vii) $-\frac{5}{-9}$ and $\frac{5}{-9}$

$$\frac{-5}{-9} = \frac{-5 \times -1}{-1 \times -1} = \frac{5}{9}$$

$\therefore \frac{5}{9}$ is a positive rational number and $\frac{5}{-9}$ is a negative rational number.

\therefore The given pair does not represent the same rational number.

Q7) Rewrite the following rational numbers in the simplest form:

i) $-\frac{8}{6}$

Sol: The HCF of 8 and 6 is 2.

$$\text{Simplest form} = \frac{-8 \div 2}{6 \div 2} = \frac{-4}{3}$$

ii), iii) H.W.

iv) $-\frac{8}{10}$

Sol: The HCF of 8 and 10 is 2.

$$\therefore \text{The simplest form} = \frac{-8 \div 2}{10 \div 2} = \frac{-4}{5}$$

Q8) Fill in the boxes with the correct symbol out of $>$, $<$ and $=$.

i) $-\frac{5}{7} \square \frac{2}{3}$

Sol: $-\frac{5}{7}$ is a negative rational number whereas $\frac{2}{3}$ is a positive rational number.

$\therefore -\frac{5}{7} \square \frac{2}{3}$

ii) to vi) H.W.

Q9) which is greater in each of the following:

i), $\frac{2}{3}, \frac{5}{2}$

Sol: $\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}$ (\because LCM (3, 2) = 6); $\frac{5}{2} = \frac{5 \times 3}{2 \times 3} = \frac{15}{6}$

ii), $-\frac{5}{6}, -\frac{4}{3}$ $\therefore \frac{15}{6} > \frac{4}{6}$; $\therefore \frac{5}{2} > \frac{2}{3}$

$-\frac{5}{6} = -\frac{5}{6}$; $-\frac{4}{3} = \frac{-4 \times 2}{3 \times 2} = \frac{-8}{6}$ (\because LCM (6, 3) = 6)

$\therefore -\frac{5}{6} > \frac{-8}{6}$

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

iii), to v, H.W.

Q10) Write the following rational numbers in ascending order:

i), $-\frac{3}{5}, -\frac{2}{5}, -\frac{1}{5}$

Sol: The given rational nos. in ascending order are $-\frac{3}{5}, -\frac{2}{5}, -\frac{1}{5}$.

ii), H.W.

iii), $-\frac{3}{7}, -\frac{3}{2}, -\frac{3}{4}$

$-\frac{3}{7} = \frac{-3 \times 4}{7 \times 4} = \frac{-12}{28}$ (\because LCM (7, 2, 4) = 28)

$-\frac{3}{2} = \frac{-3 \times 14}{2 \times 14} = \frac{-42}{28}$

$-\frac{3}{4} = \frac{-3 \times 7}{4 \times 7} = \frac{-21}{28}$

$\therefore \frac{-42}{28} < \frac{-21}{28} < \frac{-12}{28}$

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

* Operations on rational numbers:

Addition:

Q, Addition of two rational numbers with same denominators:

Two rational numbers with the same denominators can be added by adding their numerators, keeping the denominator same.

Try these

Pg 185

Q 1) Find i) $-\frac{13}{7} + \frac{6}{7}$ ii) $\frac{19}{5} + \frac{-7}{5}$ Sol: i) $-\frac{13}{7} + \frac{6}{7} = \frac{-13+6}{7} = \frac{-7}{7} = -1$.

ii) H.W.

b) Addition of two rational numbers with different denominators:

As in the case of fractions, first find the LCM of the two denominators. Then we find the rational numbers equal to the given rational numbers with this LCM as the denominator. Now, we add the two rational numbers as in a).

Ex: Let us add $-\frac{7}{5}$ and $\frac{-2}{3}$.

Sol: L.C.M. of 5 and 3 is 15.

$$-\frac{7}{5} = \frac{-21}{15} \quad \text{and} \quad \frac{-2}{3} = \frac{-10}{15}$$

$$\therefore -\frac{7}{5} + \frac{-2}{3} = \frac{-21}{15} + \frac{-10}{15} = \frac{-31}{15}$$

Try these

Pg 185 H.W.

* Additive Inverse: The additive inverse of the rational number

$$\frac{p}{q} \text{ is } \frac{-p}{q}$$

Try these

Pg 186

Q) what will be the additive inverse of $-\frac{3}{9}$?, $-\frac{9}{11}$?, $-\frac{5}{7}$?Sol: The additive inverse of $-\frac{3}{9}$ will be $\frac{3}{9}$. The additive of $-\frac{9}{11}$ will be $\frac{9}{11}$.The additive inverse of $\frac{5}{7}$ will be $-\frac{5}{7}$.

+ Subtraction: while subtracting two rational numbers, we add the additive inverse of the rational number to be subtracted to the other rational number.

Review Exercise: Pg 187.Q1) Try to find $\frac{7}{8} - \frac{5}{9}$ in both ways. Did you get the same answer?

$$\text{Sol: i) } \frac{7}{8} - \frac{5}{9} = \frac{63-40}{72} = \frac{23}{72}$$

$$\text{ii) } \frac{7}{8} - \frac{5}{9} = \frac{7}{8} + \frac{(-5)}{9} = \frac{63}{72} + \frac{(-40)}{72} = \frac{63+(-40)}{72} = \frac{23}{72}; \text{ yes; In both ways we got the same answer.}$$

Q2) H.W.

Try these:
Pg 187 Q, Find: i) $7\frac{2}{9} - \frac{2}{5}$ ii) $2\frac{1}{5} - (-1)$.

Sol: i) $7\frac{2}{9} - \frac{2}{5} = 7\frac{2}{9} + (-\frac{2}{5}) = \frac{35}{9} + (-\frac{2}{5}) = \frac{35 \times 5}{45} + \frac{(-2 \times 9)}{45} = \frac{35 \times 5 - 18}{45} = \frac{17}{45}$.

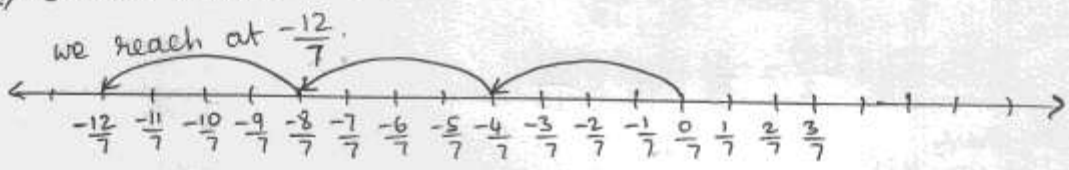
ii) H.W.

* Multiplication of a rational number by a positive integer: while multiplying a rational number by a positive integer, we multiply the numerator by that integer, keeping the denominator unchanged.

Review Ex: Pg: 187.

a1) Find $-\frac{4}{7} \times 3$, using both ways. What do you observe?

Sol: i) On the number line, it will mean three jumps of $\frac{4}{7}$ to the left.



ii) $-\frac{4}{7} \times 3 = \frac{-4 \times 3}{7} = -\frac{12}{7}$

Observation: we arrive at the same rational number.

a2) H.W.

* b) Multiplication of rational number by a negative integer:

while multiplying a rational number by a negative integer, we multiply the numerator by that integer, keeping the denominator unchanged.

Ex: $-\frac{2}{9} \times -5$

Sol: $-\frac{2}{9} \times -5 = \frac{-2 \times -5}{9} = \frac{10}{9}$

-5 can be written as $-\frac{5}{1}$.
 $-\frac{2}{9} \times -\frac{5}{1} = \frac{10}{9} = \frac{-2 \times (-5)}{9 \times 1} = \frac{10}{9}$

Try these pg 188 (H.W.)

c) Multiplication of two rational numbers (none of which is an integer):

Ex: $-\frac{3}{8} \times \frac{5}{7} = \frac{-3 \times 5}{8 \times 7} = -\frac{15}{56}$

- Step 1: multiply the numerators of the two rational nos.
- Step 2: multiply the denominators of the two rational nos.
- Step 3: write the product as $\frac{\text{Result of Step 1}}{\text{Result of Step 2}}$.

Try these:

Pg 188.

Q1) What will be i) $-\frac{3}{5} \times 7$? ii) $-\frac{6}{5} \times (-2)$?

Sol: i) $-\frac{3}{5} \times 7 = \frac{-3 \times 7}{5 \times 1} = \frac{-21}{5} = -4\frac{1}{5}$

ii) $-\frac{6}{5} \times (-2) = \frac{-6 \times -2}{5 \times 1} = \frac{12}{5} = 2\frac{2}{5}$

Q2) H.W.

* Division: The reciprocal of the rational number $\frac{p}{q}$ is $\frac{q}{p}$.

To divide one rational number by other rational number, we multiply the rational number by the reciprocal of the other.

Try these Pg: 189

Q1) What will be the reciprocal of $-\frac{6}{11}$? and $-\frac{8}{5}$?Sol: The reciprocal of $-\frac{6}{11}$ will be $-\frac{11}{6}$.The reciprocal of $-\frac{8}{5}$ will be $-\frac{5}{8}$.

Q2) Try some more examples and confirm this observation.

Sol: i) $\frac{3}{5} \times$ reciprocal of $(\frac{3}{5}) = \frac{3}{5} \times \frac{5}{3} = 1$

ii) $-\frac{7}{9} \times$ reciprocal of $(-\frac{7}{9}) = -\frac{7}{9} \times -\frac{9}{7} = 1$.

Try these Pg 190

Q1) Find i) $\frac{2}{3} \times -\frac{7}{8}$ ii) $-\frac{6}{7} \times \frac{5}{7}$.

Sol: i) $\frac{2}{3} \times -\frac{7}{8} = \frac{2 \times -7}{3 \times 8} = \frac{-14}{24} = \frac{-14 \div 2}{24 \div 2} = \frac{-7}{12}$. ii) H.W.

Q2) Find the sum:

i) $\frac{5}{4} + (-\frac{11}{4})$; iv) $-\frac{3}{11} + \frac{5}{9}$.

Sol: $\frac{5}{4} + (-\frac{11}{4}) = \frac{5 + (-11)}{4} = \frac{-6}{4} = \frac{-6 \div 2}{4 \div 2} = \frac{-3}{2}$.

iv) LCM of 11 and 9 is 99.

$$-\frac{3}{11} = \frac{-3}{11} \times \frac{9}{9} = \frac{-27}{99}, \quad \frac{5}{9} = \frac{55}{99}$$

$$\therefore \frac{-3}{11} + \frac{5}{9} = \frac{-27}{99} + \frac{55}{99} = \frac{-27 + 55}{99} = \frac{28}{99}$$

vi) $-\frac{2}{3} + 0 = -\frac{2}{3}$; ii), iii), v), H.W.

Ex 9.2.

Q2) Find: i) $\frac{7}{24} - \frac{17}{36}$

Sol: $\frac{7}{24} - \frac{17}{36} = \frac{7}{24} + \frac{(-17)}{36} = \frac{21 + (-34)}{72} = \frac{-13}{72}$

[∵ i) 24, 36
2, 3
∴ LCM = 12 × 2 × 3 = 72]

$$\therefore \frac{7}{24} - \frac{17}{36} = \frac{-13}{72} - 6 = \frac{-13}{72} - \frac{6 \times 72}{72} = \frac{-13 - 54}{72} = \frac{-67}{72}$$

ii), iii), iv), H.W.

Q3) Find the product:

$$i) \frac{9}{2} \times \left(-\frac{7}{4}\right) = \frac{9 \times -7}{2 \times 4} = \frac{-63}{8} = -7\frac{2}{8}$$

$$ii) \frac{3}{10} \times (-9) = \frac{3 \times (-9)}{10} = \frac{-27}{10} = -2\frac{7}{10}$$

$$v) \frac{3}{11} \times \frac{2}{5} = \frac{3 \times 2}{11 \times 5} = \frac{6}{55}$$

$$vi) \frac{3 \times (-5)}{-5 \times 3} = \frac{-15}{-15} = 1$$

iii, iv, H.W.

Q4) Find the value of:

$$i) -4 \div \frac{2}{3}$$

$$sol: -4 \div \frac{2}{3} = \frac{-4}{1} \div \frac{2}{3} = \frac{-4}{1} \times \frac{3}{2} = \frac{-4 \times 3}{1 \times 2} = -6$$

$$ii) -\frac{3}{5} \div 2 = \frac{-3}{5} \div \frac{2}{1} = \frac{-3}{5} \times \frac{1}{2} = \frac{-3 \times 1}{5 \times 2} = \frac{-3}{10}$$

$$iii) -\frac{4}{5} \div -3 = \frac{-4}{5} \div \frac{-3}{1} = \frac{-4}{5} \times \frac{1}{-3} = \frac{-4 \times 1}{5 \times (-3)} = \frac{4}{15}$$

$$vi) \frac{-7}{12} \div \left(-\frac{2}{13}\right) = \frac{-7}{12} \times \left(-\frac{13}{2}\right) = \frac{-7 \times -13}{12 \times 2} = \frac{91}{24} = 3\frac{19}{24}$$

iv, v, vii, H.W.

Note: According to the given instructions all the sums and important points should be done in the classwork and home work (where H.W. Indicated).
If Already done, no need to repeat.