પુ॰ના International School
Shree Swaminarayan Gurukul, Zundal

Grade – 8 MATHS Specimen copy Year 22-23

INDEX

CHAPTER – 01
RATIONAL NUMBERS

CHAPTER NO: 1

CHAPTER NAME : RATIONAL NUMBERS

KEY POINTS TO REMEMBER:

(1) Natural Numbers:-Counting numbers starting from 1 are known as Natural numbers , and denoted by N. i.e. N = {1,2,3,4,5,……}

(2)Whole Numbers: All natural numbers together with 0 are called whole Numbers and denoted by W.

i.e. W = { 0 , 1, 2, 3, 4, 5,.....}

(3)Integers :All natural numbers and negative of natural numbers including 0 are called Integers.

i.e. …….−5,−4,−3,−2, −1 , 0, 1,2,3,4,5,..... etc. are all integers.

(4) Rational Numbers:The numbers of the form $\frac{a}{b}$, where a and b are integers and b≠0 , are called rational numbers.

(5) Properties of Rational numbers:

(i) Closure

(ii) Commutativity

(iii) Associativity

(iv) Distributivity of multiplication over addition

(v) The role of zero

(vi) The role of 1

(vii) Reciprocal

(viii) Representation of Rational numbers on the Number line.

- **Properties on Rational Numbers**

(i) Closure Property

Rational numbers are closed under:

- **Addition**

$$eg.\ \frac{3}{5}+\frac{(-4)}{9}=\frac{27-20}{45}=\frac{7}{45}$$

which is a rational number.

- **Subtraction**

$$\frac{5}{8}-\frac{3}{7}=\frac{35-24}{56}=\frac{11}{56}$$

$$\frac{2}{5}-\frac{3}{4}=\frac{8-15}{20}=\frac{-7}{20}$$

are rational numbers.

- **Multiplication:**

$$\frac{-5}{7}\times\frac{2}{9}=\frac{-10}{63}$$

$$\frac{2}{3}\times\frac{5}{11}=\frac{10}{33}$$

are rational numbers.

Rational numbers are closed under addition subtraction and multiplication.

- **Division**: $\frac{-3}{5}\div\frac{2}{3}=\frac{-9}{10}$ which is also a rational number. For any rational number a,

  a ÷ 0 is not defined. So, rational number are not closed under division.

However, if we exclude zero then the rational numbers are closed under division.

(ii) Commutativity:

Addition: Two rational numbers can be added in any order, i.e., commutativity holds for

rational numbers under addition, i.e., for any two rational number a and b, a + b = b + a.

$$\frac{-3}{4}+\frac{5}{11}=\frac{-13}{44}$$

$$\frac{5}{11}+\left(\frac{-3}{4}\right)=-\frac{13}{44}$$

- Subtraction:

$$\frac{2}{5}-\frac{5}{6}=\frac{12-25}{30}=\frac{-13}{30}$$

$$\frac{5}{6}-\frac{2}{5}=\frac{25-12}{20}=\frac{13}{30}$$

Hence, subtraction is not associative for rational numbers.

- **(iii) Multiplication**: **Multiplication is commutative for rational numbers.**

  In general, a × b = b × a, for any two rational numbers a and b.

$$\frac{-3}{4}\times\frac{5}{6}=\frac{5}{6}\times\left(\frac{-3}{4}\right)=\frac{-15}{24}$$

Division:

$$\frac{-3}{7}\div\frac{2}{5}=\frac{-3}{7}\times\frac{5}{2}=\frac{-15}{14}$$

$$\frac{2}{5}\div\left(\frac{-3}{7}\right)=\frac{2}{5}\times\frac{7}{-3}=\frac{14}{-15}$$

$$\frac{-3}{7}\div\frac{2}{5}\neq\frac{2}{5}\div\left(\frac{-3}{7}\right)$$

Hence, division is not commutative for rational numbers.

iii) Associativity:

Addition:

$$eg.\ \frac{-2}{5}+\left[\frac{3}{4}+\left(\frac{-7}{8}\right)\right]=\frac{-2}{5}+\left(\frac{-1}{8}\right)=\frac{-21}{40}=\left[\frac{-2}{5}+\frac{3}{4}\right]+\left(\frac{-7}{8}\right)=\frac{7}{20}-\frac{7}{8}=\frac{-21}{40}$$

So, addition is associative for rational numbers, i.e., for any three rational numbers a, b and c, a + (b + c) = (a + b) + c.

Subtraction:

eg. $\frac{-3}{4}-\left[-\frac{5}{6}-\frac{2}{3}\right]=\frac{-3}{4}-\left(\frac{-9}{6}\right)=\left(-\frac{9}{6}\right)=\frac{9}{12}=\frac{3}{4}$

and $\left[\frac{-3}{4}-\left(\frac{-5}{6}\right)\right]-\frac{2}{3}=\frac{1}{12}-\frac{2}{3}=\frac{-7}{12}$

i.e., $\frac{3}{4}\neq\frac{-7}{12}$.

Hence, subtraction is not associative for rational numbers.

Multiplication:

So, **multiplication is associative for rational number, i.e., for any three rational numbers a, b and c, a × (b × c) = (a × b) × c.**

eg. $\frac{-2}{3}\times\left(\frac{2}{5}\times\frac{6}{7}\right)=\frac{-2}{3}\times\frac{12}{35}=\frac{-24}{105}=\frac{-8}{35}$

and $\left(\frac{-2}{3}\times\frac{2}{5}\right)\times\frac{6}{7}=\frac{-4}{15}\times\frac{6}{7}=\frac{-24}{105}=\frac{-8}{35}$

Division:

eg. $\frac{2}{3}\div\left[\frac{-1}{2}\div\frac{2}{5}\right]=\left[\frac{2}{3}\div\left(\frac{-1}{2}\right)\right]\div\frac{2}{5}$

We have, LHS $\frac{2}{3}\div\left[-\frac{1}{2}\div\frac{2}{5}\right]=\left[\frac{2}{3}\div\frac{1}{2}\times\frac{5}{2}\right]$

$=\frac{2}{3}\div\left(\frac{-5}{4}\right)=\frac{2}{3}\times\frac{4}{-5}=\frac{8}{-15}$

RHS $\left[\frac{2}{3}\div\left(\frac{-1}{2}\right)\right]\div\frac{2}{5}=\left[\frac{2}{3}\times\left(\frac{-2}{1}\right)\right]\div\frac{2}{5}=\left(\frac{-4}{3}\right)\div\frac{2}{5}$

$=\frac{-4}{3}\times\frac{5}{2}=\frac{-20}{6}=\frac{-10}{3}$

But LHS ≠ RHS

Hence, the division is not associative for rational numbers.

Distributivity of multiplication over addition for rational number:

For all rational numbers a, b and c, **a (b + c) = ab + ac**

eg. Let $\frac{-2}{5}, \frac{3}{8}$ and $\frac{-3}{4}$ are any three rational numbers, then

$$\frac{-2}{5}\times\left\{\frac{3}{8}+\left(\frac{-3}{4}\right)\right\} = \frac{-2}{5}\times\left\{\frac{3+(-6)}{8}\right\}$$

$$= \frac{-2}{5}\times\left(\frac{-3}{8}\right) = \frac{6}{40} = \frac{3}{20}$$

Also, $$\frac{-2}{5}\times\frac{3}{8} = \frac{-6}{40} = \frac{-3}{20}$$

and $$\frac{-2}{5}\times\frac{-3}{4} = \frac{6}{20}$$

Therefore, $$\left(\frac{-2}{5}\times\frac{3}{8}\right)+\left(\frac{-2}{5}\times\frac{-3}{4}\right) = \frac{-3}{20}+\frac{6}{20} = \frac{3}{20}$$

Thus, $$\frac{2}{5}\times\left\{\frac{3}{8}+\left(\frac{-3}{4}\right)\right\} = \left(\frac{-2}{5}\times\frac{3}{8}\right)+\left\{\frac{-2}{5}\times\left(\frac{-3}{4}\right)\right\}$$

Distributivity of multiplication over subtraction for rational number:

For any three rational numbers a, b and c, **a (b – c) = ab – ac**

eg. Let $\frac{1}{2}, \frac{-2}{5}$ and $\frac{-3}{10}$ are any three rational numbers, then

$$\frac{1}{2}\times\left\{\frac{-2}{5}-\left(\frac{-3}{10}\right)\right\} = \frac{1}{2}\times\left\{\frac{-4-(-3)}{10}\right\} = \frac{1}{2}\times\left(\frac{-4+3}{10}\right)$$

$$= \frac{1}{2}\times\left(\frac{-1}{10}\right) = \frac{-1}{20}$$

Also, $$\frac{1}{2}\times\left(\frac{-2}{5}\right) = \frac{-2}{10} = -\frac{1}{5}$$

and $$\frac{1}{2}\times\left(\frac{-3}{10}\right) = \frac{-3}{10}$$

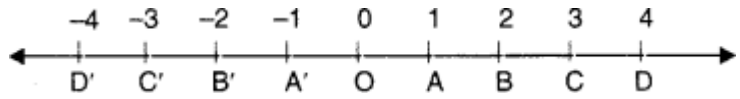
Therefore, $$\left(\frac{1}{2}\times\frac{-2}{5}\right)-\left(\frac{1}{2}\times\frac{-3}{10}\right) = \frac{-1}{5}-\left(\frac{-3}{20}\right)$$

$$= \frac{-1}{5}+\frac{3}{20}$$

$$= \frac{-4+3}{20} = \frac{-1}{20}$$

Thus, $$\frac{1}{2}\times\left\{\frac{-2}{5}-\left(\frac{-3}{10}\right)\right\} = \left(\frac{1}{2}\times\frac{-2}{5}\right)-\left(\frac{1}{2}\times\frac{-3}{10}\right)$$

Representation of Rational Numbers on the Number Line



- We draw a line.
- We mark a point O on it and name it 0. Mark a point to the right of 0. Name it 1. The distance between these two points is called unit distance.
- Mark a point to the right of 1 at unit distance and name it 2.
- Proceeding in this manner, we can mark points 3, 4, 5,
- Similarly we can mark – 1, – 2, – 3, – 4, – 5, …… to the left of 0. This line is called the number line.
- This line extends indefinitely on both sides.

The positive rational numbers are represented by points on the number line to the right of O whereas the negative rational numbers are represented by points on the number line to the left of O.

CHAPTER 1

CHAPTER NAME : RATIONAL NUMBERS

EXERCISE 1.1

Using appropriate properties find:

$(i)\ -\frac{2}{3}\times\frac{3}{5}+\frac{5}{2}-\frac{3}{5}\times\frac{1}{6}$

$(ii)\ \frac{2}{5}\times\left(\frac{-3}{7}\right)-\frac{1}{6}\times\frac{3}{2}+\frac{1}{14}\times\frac{2}{5}$

Solution:

$= -\frac{2}{3}\times\frac{3}{5}+\frac{5}{2}-\frac{3}{5}\times\frac{1}{6}$

$= -\frac{2}{3}\times\frac{3}{5}-\frac{3}{5}\times\frac{1}{6}+\frac{5}{2}$ (By regrouping)

$= \frac{3}{5}\times\left(-\frac{2}{3}-\frac{1}{6}\right)$

(using distributive property)

$= \frac{3}{5}\times\left(\frac{-2\times2}{3\times2}-\frac{1\times1}{6\times1}\right)+\frac{5}{2}$

$= \frac{3}{5}\times\left(-\frac{4}{6}-\frac{1}{6}\right)+\frac{5}{2}$

$= \frac{3}{5}\times\left(\frac{-4-1}{6}\right)+\frac{5}{2}$

$= \frac{3}{5}\times\left(\frac{-5}{6}\right)+\frac{5}{2}$

$= \cancel{\frac{3}{5}}\times\left(\cancel{\frac{-5}{6}}\right)+\frac{5}{2}$

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

$-\frac{1}{2}+\frac{5}{2}$

$= \frac{-1+5}{2} = \frac{4}{2} = 2$

Using appropriate properties find:

Q.1.(b) $\frac{2}{5} \times \left(-\frac{3}{7}\right) - \frac{1}{6} \times \frac{3}{2} + \frac{1}{14} \times \frac{2}{5}$

$= \frac{2}{5} \times \left(-\frac{3}{7}\right) + \frac{1}{14} \times \frac{2}{5} - \frac{1}{6} \times \frac{3}{2}$ (By regrouping)

(by associativity)

$= \left[\frac{2}{5} \times \left(-\frac{3}{7}\right) + \frac{1}{14} \times \frac{2}{5}\right] - \frac{1}{6} \times \frac{3}{2}$

$= \frac{2}{5} \times \left[-\frac{3}{7} + \frac{1}{14}\right] - \frac{1}{6} \times \frac{3}{2}$ [by distributivity]

$= \frac{2}{5} \times \left[-\frac{3\times2}{7\times2} + \frac{1}{14}\right] - \frac{1}{4}$

$= \frac{2}{5} \times \left[-\frac{6}{14} + \frac{1}{14}\right] - \frac{1}{4}$

$= \frac{2}{5} \times \left[\frac{-6+1}{14}\right] - \frac{1}{4}$

$= \frac{2}{5} \times \left[-\frac{5}{14}\right] - \frac{1}{4}$

$= -\frac{2}{14} - \frac{1}{4}$

$= -\frac{1}{7} - \frac{1}{4}$

L.C.M. of 4 and 7 = 2×2×7=28

2	4	7
2	2	7
7	1	7
	1	1

$= \frac{-4-7}{28}$

$= \frac{-11}{28}$

Write the additive inverse of each of the following:

(a) $\frac{2}{8}$

The additive inverse of a rational number $\frac{a}{b}$ is $(\frac{-a}{b})$

(i) The additive inverse of $\frac{2}{8}$ is $\frac{-2}{8}$ because $\frac{2}{8} + (\frac{-2}{8}) = 0$

(ii) The additive inverse of $\frac{-5}{9} = \frac{5}{9}$

(iii) The additive inverse of $\frac{-6}{-5} = \frac{-6}{5}$

(iv) The additive inverse of $\frac{2}{-9}$ is $\frac{2}{9}$

(v) The additive inverse of $\frac{19}{-6} = \frac{19}{6}$

Verify that –(−x) = x for

(i) x= $\frac{11}{15}$

$-(-x) = -(-\frac{11}{15}) = \frac{11}{15}$

$-(-x) = -(-(-\frac{13}{17})) = -(\frac{13}{17}) = \frac{-13}{17}$

Find the multiplicative inverse of the following :

(a) The multiplicative inverse of −13 is $-\frac{1}{13}$

(b) The multiplicative inverse of $\frac{-13}{19} = \frac{1}{\frac{-13}{19}} = \frac{-19}{13} = -\frac{19}{13}$

(c) The multiplicative inverse of $\frac{1}{5}$ is 5.

(d) The multiplicative inverse of $\frac{-5}{8} \times \frac{-3}{7}$

$\frac{(-5)\times(-3)}{8\times7} = \frac{15}{56}$

Multiplicative inverse of $\frac{15}{56} = \frac{1}{\frac{15}{56}} = \frac{56}{15}$

(e) The multiplicative inverse of $-1 \times \frac{-2}{5}$ = ??

First of all $-1 \times \frac{-2}{5} = \frac{2}{5}$

Now Multiplicative inverse is $\frac{1}{\frac{2}{5}} = \frac{5}{2}$

(f) The multiplicative inverse of -1 is $\frac{1}{-1} = -1$

Name the property under multiplication used in each of the following

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

Multiplicative identity of 1. Or 1 is the multiplicative identity for rationals.

(ii) $-\frac{13}{17} \times \frac{-2}{7} = \frac{-2}{7} \times \frac{-13}{17}$

Commutativity

(iii) $\frac{-19}{29} \times \frac{29}{-19} = 1$

Multiplicative inverse.

Multiply $\frac{6}{13}$ by the reciprocal of $\frac{-7}{16}$

Reciprocal of $\frac{-7}{16} = \frac{-16}{7}$

$\frac{6}{13} \times$ [Reciprocal of $\frac{-7}{16}$] = $\frac{6}{13} \times [\frac{-16}{7}] = \frac{6 \times (-16)}{13 \times 7} = \frac{-96}{91}$

Tell what property allows you to compute $\frac{1}{3} \times (6 \times \frac{4}{3})$ as $(\frac{1}{3} \times 6) \times \frac{4}{3}$

By using associativity

a × (b × c) = (a × b) × c

Is $\frac{8}{9}$ the multiplicative inverse of $-1\frac{1}{8}$? Why or why not?

No; $\frac{8}{9}$ is not the multiplicative inverse of $-1\frac{1}{8}$

Because $-1\frac{1}{8} = \frac{-9}{8}$ and $\frac{8}{9} \times \frac{-9}{8} = -1$ [which is not equal to 1]

∴ $\frac{8}{9}$ is not the multiplicative inverse of $\frac{-9}{8}$

∵ The product of $\frac{-9}{8}$ and its multiplicative inverse must be equal to 1.

Is 0.3 the multiplicative inverse of $3\frac{1}{3}$? Why or why not ?

0.3 × $3\frac{1}{3} = \frac{3}{10} \times \frac{10}{3} = 1$

Yes, 0.3 is multiplicative inverse of $\frac{1}{3}$

Write:

(i) The rational number that does not have a reciprocal

Ans 0 (zero) is a rational number that does not have a reciprocal

(ii) The rational number that are equal to their reciprocals.

Ans. 1 and -1 are rational number that are equal to their reciprocals.

(iii) The rational number that is equal to its negative.

Ans. 0 is the rational number equal to its negative.

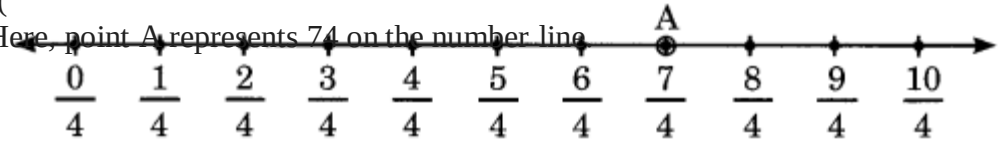
Textual Exercise 1.2 (Txtbkpg 20)

Represent these numbers on the number line. (i)$\frac{7}{4}$ (ii) $\frac{-5}{6}$

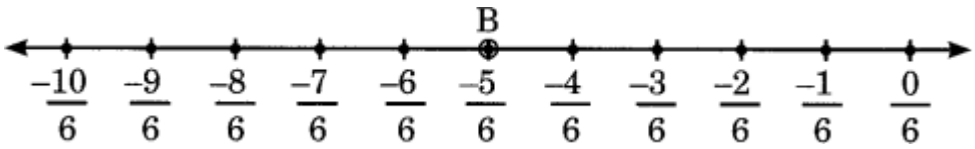
(i) $\frac{7}{4}$

((

Here, point A represents 74 on the number line



(ii) $(-5)/6$

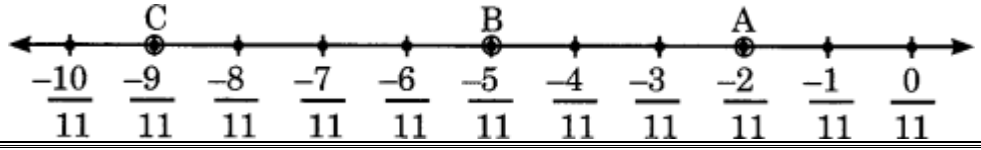


Here, point B represents $(-5)/6$ on the number line.

Represent $\frac{-2}{11}$, $\frac{-5}{11}$, $\frac{-9}{11}$ on a number line.

Solution:

We have $\frac{-2}{11}$, $\frac{-5}{11}$ and $\frac{-9}{11}$



Here, point A represents $\frac{-2}{11}$, point B represents $\frac{-5}{11}$, point C represents $\frac{-9}{11}$

Write five rational numbers which are smaller than 2.

Solution:

Required five rational numbers smaller than 2 are

1, 0, $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$

Or

$-1, -\frac{1}{2}, 0, \frac{1}{2}, 1$

Find ten rational numbers between $\frac{-2}{5}$ and $\frac{1}{2}$

Solution :

First of all given 2 rational numbers have different denominators.

So to convert them into rationals having same denominator find L.C.M.

L.C.M. of 2 and 5 = 10

$$-\frac{2}{5} = -\frac{2}{5} \times \frac{2}{2} = -\frac{4}{10}$$

$$\frac{1}{2} = \frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$$

Again , $-\frac{4}{10} = -\frac{4}{10} \times \frac{2}{2} = -\frac{8}{20}$

$$\frac{5}{10} = \frac{5}{10} \times \frac{2}{2} = \frac{10}{20}$$

∴ Ten rational numbers between $-\frac{2}{5}$ and $\frac{1}{2}$ are :

$$-\frac{7}{20}, -\frac{6}{20}, -\frac{5}{20}, -\frac{4}{20}, -\frac{3}{20}, -\frac{2}{20}, -\frac{1}{20}, \frac{0}{20}, \frac{1}{20}, \frac{2}{20}$$

Find five rationals between

(i) $\frac{2}{3}$ and $\frac{4}{5}$

Solution :Converting $\frac{2}{3}$ and $\frac{4}{5}$ into same denominators such that the difference between the numerators is more than 5.

L.C.M OF 3 AND 5 is 15 (15×4=60)

1	3	5
	3	5

$\frac{2}{3} = \frac{2\times20}{3\times20} = \frac{40}{60}$

$\frac{4}{5} = \frac{4\times12}{5\times12} = \frac{48}{60}$

Now five rationals between $\frac{40}{60}(=\frac{2}{3})$ and $\frac{48}{60}(=\frac{4}{5})$ are

$\frac{41}{60}; \frac{42}{60}; \frac{43}{60}; \frac{44}{60}; \frac{45}{60}; \frac{46}{60}$

Q5(ii) $-\frac{3}{2}$ and $\frac{5}{3}$

Solution :Converting $-\frac{3}{2}$ and $\frac{5}{3}$ with the same denominators we have

L.C.M. of 2 and 3 = 6

1	2	3
	2	3

$-\frac{3}{2} = -\frac{3\times3}{2\times3} = -\frac{9}{6}$

$\frac{5}{3} = \frac{5\times2}{3\times2} = \frac{10}{6}$

Now ; five rationalsbetween $-\frac{9}{6}(=-\frac{3}{2})$and $\frac{10}{6}(=5/3)$are

$-\frac{2}{2}; -\frac{1}{2}; \frac{0}{2}; \frac{1}{2}; \frac{2}{2}; \frac{3}{2}$

Q.5.(iii) $\frac{1}{4}$ and $\frac{1}{2}$

Solution : Converting with same denominators we get

L.C.M of 2 and 4 = 4

2	2	4
2	1	2
	1	1

$\frac{1}{4}=\frac{1}{4}$; $\frac{1}{2}=\frac{1\times2}{2\times2}=\frac{2}{4}$

$\frac{1}{4}=\frac{1\times8}{4\times8}=\frac{8}{32}$; $\frac{1}{2}=\frac{2}{4}=\frac{2\times8}{4\times8}=\frac{16}{32}$

So , now five rationals between $\frac{1}{4}$ and $\frac{1}{2}$ are

$\frac{9}{32},\frac{10}{32},\frac{11}{32},\frac{12}{32},\frac{13}{32}$

Write five rationals numbers greater than −2.

Solution : greater $>(-2)$ means $>(\frac{-4}{2})$

So $>\frac{-4}{2}$ are $-\frac{3}{2}$, $-\frac{2}{2}$, $-\frac{1}{2}$, $\frac{0}{2}$, $\frac{1}{2}$

Find ten rational numbers between $\frac{-3}{5}$ and $\frac{3}{4}$

Solution: Converting given rationals $\frac{3}{5}$ and $\frac{3}{4}$ into rationals with same denominator

And their numerators with difference of more than 10

$\frac{3}{5}=\frac{3\times20}{5\times20}=\frac{60}{100}$ and $\frac{3}{4}=\frac{3\times25}{4\times25}=\frac{75}{100}$

∴ Ten rational numbers between $\frac{3}{5}$ and $\frac{3}{4}$ are as follows:

$\frac{61}{100}$; $\frac{62}{100}$; $\frac{63}{100}$; $\frac{64}{100}$; $\frac{65}{100}$; $\frac{66}{100}$; $\frac{67}{100}$; $\frac{68}{100}$; $\frac{69}{100}$; $\frac{70}{100}$.

Q. Fill in the blanks:

(1) $(\frac{-3}{17})+(\frac{-12}{5})=(\frac{-12}{5})+$ (… … …)

(2) $(\frac{-8}{13}+\frac{3}{7})+(\frac{-13}{4})=$ **(…..)** $+[\frac{3}{7}+(\frac{-13}{4})]$

(3) $\frac{-16}{7}+$**……=……**$+\frac{-16}{7}=\frac{-16}{7}$

(4) Zero has_____reciprocal.

(5) The numbers_____and_____are their own reciprocals.

(6) The reciprocal of −5 is_____.

(7) Reciprocal of $\frac{1}{x}$, where $x \neq 0$ is _____.

(8) The product of two rational numbers is always a_____.

(9) The reciprocal of a positive rational number is_____.

Solution:

(1) $\left(\frac{-3}{17}\right)$

(2) $\left(-\frac{8}{13}\right)$

(3) 0 , 0

(4) no

(5) 1 , −1

(6) $-\frac{1}{5}$

(7) x

(8) rational number

(9) positive

Q. Multiple choice questions:

1. An integer can be:

a) Only Positive

b) Only Negative

c) Both positive and negative

d) None of the above

Answer: (c)

Explanation: An integer can be both positive and negative as well as zero.

2. A rational number can be represented in the form of:

a) p/q

b) pq

c) p+q

d) p-q

Answer: (a)

Explanation: A rational number can be represented in the form p/q where p and q are integers and q is not equal to zero.

3. *The value of ½ x ⅗ is equal to*:

a) ½

b) 3/10

c) ⅗

d) ⅖

Answer: *(b)*

Explanation: ½ x ⅗ $= \frac{1 \times 3}{2 \times 5} = \frac{3}{10}$

3. The value of $\frac{1}{2} \times \frac{3}{5}$ is equal to:

a) $\frac{1}{2}$

b) $\frac{3}{10}$

c) $\frac{3}{5}$

d)

Higher Order Thinking Skills (HOTS)

Rajni had a certain amount of money in her purse. She spent ₹ $10\frac{1}{4}$ in the school canteen, bought a gift worth ₹ $25\frac{3}{4}$ and gave ₹ □□ □/□ to her friend. How much she have to begin with?

Solution:

Amount given to school canteen = ₹ $10\frac{1}{4}$

Amount given to buy gift = ₹ $25\frac{3}{4}$

Amount given to her friend = ₹ $16\frac{1}{2}$

To begin with Rajni had

$$= ₹10\frac{1}{4} + ₹25\frac{3}{4} + ₹16\frac{1}{2}$$

$$= ₹\left(\frac{41}{4} + \frac{103}{4} + \frac{33}{2}\right)$$

$$= ₹\left(\frac{41+103+66}{4}\right) = ₹\frac{210}{4}$$

$$= ₹52\frac{2}{4} = ₹52\frac{1}{2}$$

One-third of a group of people are men. If the number of women is 200 more thanthe men, find the total number of people.

Solution:

Number of men in the group = $\frac{1}{3}$ of the group

Number of women = $1 - \frac{1}{3} = \frac{2}{3}$

Difference between the number of men and women = $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

If difference is $\frac{1}{3}$, then total number of people = 1

If difference is 200, then total number of people

$= 200 \div \frac{1}{3} = 200 \times 3 = 600$

Hence, the total number of people = 600

CLASS-8
SUB-MATHS

SAMPLE COPY
LESSON-2 (LINEAR EQUATION IN ONE VARIABLE)

- **SUMMARY**
- **INTRODUCTION**
- **ADDING AND SUBTRACTING METHOD**
- **TRANSPOSING**
- **REDUCING EQUATION IN SIMPLER FORM**

Class –VIII Mathematics (Ex. 2.1)

Solve the following questions.

1. $x-2=7$

Ans. $x-2=7$

$\Rightarrow x-2+2 = 7+2$

[Adding 2 both sides]

$\Rightarrow x = 9$

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2. $y+3=10$

Ans.

2. $y+3=10$

Ans. $y+3=10$

$\Rightarrow y+3-3 = 10-3$

[Subtracting 3 both sides]

$\Rightarrow y = 7$

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3. $6=z+2$

Ans. $6 = z + 2$

$\Rightarrow 6 - 2 = z + 2 - 2$

[Subtracting 2 both sides]

$\Rightarrow 4 = z \quad \Rightarrow z = 4$

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4. $\frac{3}{7} + x = \frac{17}{7}$

Ans. $\frac{3}{7} + x = \frac{17}{7}$

$\Rightarrow x + \frac{3}{7} - \frac{3}{7} = \frac{17}{7} - \frac{3}{7}$

[Subtracting $\frac{3}{7}$ both sides]

$\Rightarrow x = \frac{17 - 3}{7}$

$\Rightarrow x = \frac{14}{7}$

$\Rightarrow x = 2$

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5. $6x = 12$

Ans. $6x = 12$

$\Rightarrow \frac{x}{6} = \frac{12}{6}$

[Dividing both sides by 6]

$\Rightarrow x = 2$

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6. $\frac{t}{5}=10$

Ans. $\frac{t}{5}=10$

$\Rightarrow \frac{t}{5}\times 5 = 10\times 5$

[Multiplying both sides by 5]

$\Rightarrow t = 50$

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7. $\frac{2x}{3}=18$

Ans. $\frac{2x}{3}=18$

$\Rightarrow \frac{2x}{3}\times 3 = 18\times 3$

[Multiplying both sides by 3]

$\Rightarrow 2x = 18\times 3$

$\Rightarrow \frac{2x}{2}=\frac{18\times 3}{2}$

[Dividing both sides by 2]

$\Rightarrow x = 27$

8.

8. $1.6=\frac{y}{1.5}$

Ans. $1.6=\frac{y}{1.5}$

$\Rightarrow 1.6\times 1.5 = \frac{y}{1.5}\times 1.5$

[Multiplying both sides by 1.5]

$\Rightarrow 2.40 = y \Rightarrow y = 2.40$

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9. $7x - 9 = 16$

Ans. $7x - 9 = 16$

$\Rightarrow 7x - 9 + 9 = 16 + 9$

[Adding 9 both sides]

$\Rightarrow 7x = 25 \Rightarrow \frac{7x}{7} = \frac{25}{7}$

[Dividing both sides by 7]

$\Rightarrow x = \frac{25}{7}$

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10. $14y - 8 = 13$

Ans. $14y - 8 = 13$

$\Rightarrow 14y - 8 + 8 = 13 + 8$

[Adding 8 both sides]

$\Rightarrow 14y = 21 \Rightarrow \frac{14y}{14} = \frac{21}{14}$

[Dividing both sides by 14]

$\Rightarrow y = \frac{3}{2}$

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11. $17 + 6p = 9$

Ans. $17 + 6p = 9$

$\Rightarrow 17 + 6p - 17 = 9 - 17$

[Subtracting 17 from both sides]

$$\Rightarrow 6p = -8 \Rightarrow \frac{6p}{6} = \frac{-8}{6}$$

[Dividing both sides by 6]

$$\Rightarrow p = \frac{-4}{3}$$

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12. $\frac{x}{3} + 1 = \frac{7}{15}$

Ans. $\frac{x}{3} + 1 = \frac{7}{15}$

$$\Rightarrow \frac{x}{3} + 1 - 1 = \frac{7}{15} - 1$$

[Subtracting 1 from both sides]

$$\Rightarrow \frac{x}{3} = \frac{7-15}{15} \Rightarrow \frac{x}{3} = \frac{-8}{15}$$

$$\Rightarrow \frac{x}{3} \times 3 = \frac{-8}{15} \times 3$$

[Multiplying both sides by 3]

$$\Rightarrow x = \frac{-8}{5}$$

EXERCISE-2.2

1 If you subtract $\frac{1}{2}$ from a number and multiply the result by $\frac{1}{2}$, you get $\frac{1}{8}$. What is the number?

Ans. Let the number be x.

According to the question,

$$\frac{1}{2}\left(x - \frac{1}{2}\right) = \frac{1}{8}$$

$$\Rightarrow 2 \times \frac{1}{2}\left(x - \frac{1}{2}\right) = \frac{1}{8} \times 2$$

⇒ [Multiplying both sides by 2]

⇒ ⇒ $x-\frac{1}{2}=\frac{1}{4}$

⇒ ⇒ $x-\frac{1}{2}+\frac{1}{2}=\frac{1}{4}+\frac{1}{2}$

⇒ [Adding both sides $\frac{1}{2}$]

⇒ ⇒ $x=\frac{1+2}{4}$

⇒ ⇒ $x=\frac{3}{4}$

⇒ Hence, the required number is $\frac{3}{4}$.

⇒ ---

⇒ **2. The perimeter of a rectangular swimming pool is 154 m. Its length is 2 m more than twice its breadth. What are the length and breadth?**

⇒ **Ans.** Let the breadth of the pool be x m.

⇒ Then, the length of the pool = $(2x+2)$ m

⇒ Perimeter = $2(l+b)$

⇒ ⇒ 154 = $2(2x+2+x)$

⇒ ⇒ $\frac{154}{2}=\frac{2(2x+2+x)}{2}$

⇒ [Dividing both sides by 2]

⇒ ⇒ $77=3x+2$

⇒ ⇒ $77-2=3x+2-2$

⇒ [Subtracting 2 from both sides]

⇒ ⇒ $75=3x$

⇒ ⇒ $\frac{75}{3}=\frac{3x}{3}$

⇒ [Dividing both sides by 3]

⇒ ⇒ $25=x$

⇒ ⇒ $x=25$ m

⇒ Hence, length of the pool = $2x+2$

⇒ $2\times25+2$ = 50 + 2 = 52 m

⇒ And, breadth of the pool = 25 m.

⇒ ---

⇒ **3. The base of an isosceles triangle is $\frac{4}{3}$ cm. The perimeter of the triangle is $4\frac{2}{15}$ cm. What is the length of either of the remaining equal sides?**

⇒ **Ans.** Let each of equal sides of an isosceles triangle be x cm.

⇒ Perimeter of a triangle = Sum of all three sides

$\Rightarrow \Rightarrow 4\frac{2}{15} = \frac{4}{3} + x + x$

$\Rightarrow \Rightarrow \frac{62}{15} = \frac{4}{3} + 2x$

$\Rightarrow \Rightarrow \frac{62}{15} - \frac{4}{3} = \frac{4}{3} - \frac{4}{3} + 2x$

$\Rightarrow$ [Subtracting $\frac{4}{3}$ from both the sides]

$\Rightarrow \Rightarrow \frac{62-20}{15} = 2x$

$\Rightarrow \Rightarrow \frac{42}{15} = 2x$

$\Rightarrow \Rightarrow \frac{42}{15 \times 2} = \frac{2x}{2}$

$\Rightarrow$ [Dividing both sides by 2]

$\Rightarrow \Rightarrow \frac{7}{5} = x$

$\Rightarrow \Rightarrow x = 1\frac{2}{5}$ cm

$\Rightarrow$ Hence, each equal side of an isosceles triangle is $1\frac{2}{5}$ cm.

$\Rightarrow$

$\Rightarrow$ **4. Sum of two numbers is 95. If one exceeds the other by 15, find the numbers.**

$\Rightarrow$ **Ans.** Sum of two number = 95

$\Rightarrow$ Let the first number be x, then another number be $x+15$.

$\Rightarrow$ According to the question, $x + x + 15 = 95$

$\Rightarrow \Rightarrow 2x + 15 = 95$

$\Rightarrow \Rightarrow 2x + 15 - 15 = 95 - 15$

$\Rightarrow$ [Subtracting 15 from both sides]

$\Rightarrow \Rightarrow 2x = 80$

$\Rightarrow \Rightarrow \frac{2x}{2} = \frac{80}{2}$

$\Rightarrow$ [Dividing both sides by 2]

$\Rightarrow \Rightarrow x = 40$

$\Rightarrow$ Hence, the first number = 40

$\Rightarrow$ And another number = 40 + 15 = 55.

$\Rightarrow$

$\Rightarrow$ **5. Two numbers are in the ratio 5 : 3. If they differ by 18, what are the numbers?**

$\Rightarrow$ **Ans.** Let the two numbers be $5x$ and $3x$.

$\Rightarrow$ According to question, $5x - 3x = 18$

$\Rightarrow$ [Multiplying both sides by 2]

$\Rightarrow \Rightarrow x - \frac{1}{2} = \frac{1}{4}$

$\Rightarrow \Rightarrow x-\frac{1}{2}+\frac{1}{2}=\frac{1}{4}+\frac{1}{2}$

$\Rightarrow$ [Adding both sides $\frac{1}{2}$]

$\Rightarrow \Rightarrow x=\frac{1+2}{4}$

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

$\Rightarrow$ Hence, the required number is $\frac{3}{4}$.

6. Three consecutive integers add up to 51. What are these integers?

Ans. Let the three consecutive integers be $x, x+1$ and $x+2$.

According to the question, $x+x+1+x+2=51$

$\Rightarrow 3x+3=51$

$\Rightarrow 3x+3-3=51-3$

[Subtracting 3 from both sides]

$\Rightarrow 3x=48$

$\Rightarrow \frac{3x}{3}=\frac{48}{3}$

[Dividing both sides by 3]

$\Rightarrow x=16$

Hence, first integer = 16,

second integer = 16 + 1 = 17 and

third integer = 16 + 2 = 18.

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7. The sum of three consecutive multiples of 8 is 888. Find the multiples.

Ans. Let the three consecutive multiples of 8 be $x, x+8$ and $x+16$.

According to question, $x+x+8+x+16=888$

$\Rightarrow 3x+24=888$

$\Rightarrow 3x+24-24=888-24$

[Subtracting 24 from both sides]

$\Rightarrow 3x = 864$

$\Rightarrow \frac{3x}{3} = \frac{864}{3}$

[Dividing both sides by 3]

$\Rightarrow x = 288$

Hence, first multiple of 8 = 288,

second multiple of 8 = 288 + 8 = 296 and third multiple of 8 = 288 + 16 = 304.

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8. Three consecutive integers are such that when they are taken in increasing order and multiplied by 2, 3 and 4 respectively, they add up to 74. Find these numbers.

Ans. Let the three consecutive integers be $x, x+1$ and $x+2$.

According to the question, $2x + 3(x+1) + 4(x+2) = 74$

$\Rightarrow 2x + 3x + 3 + 4x + 8 = 74$

$\Rightarrow 9x + 11 = 74$

$\Rightarrow 9x + 11 - 11 = 74 - 11$

[Subtracting 11 from both sides]

$\Rightarrow 9x = 63$

$\Rightarrow \frac{9x}{9} = \frac{63}{9}$

[Dividing both sides by 9]

$\Rightarrow x = 7$

Hence first integer = 7, second integer

= 7 + 1 = 8 and third integer = 7 + 2 = 9.

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9. The ages of Rahul and Haroon are in the ratio 5 : 7. Four years later the sum of their ages will be 56 years. What are their present ages?

Ans. Let the present ages of Rahul and Haroon be $5x$ years and $7x$ years respectively.

According to condition, $(5x+4)+(7x+4)=56$

$\Rightarrow 12x+8=56$

$\Rightarrow 12x+8-8=56-8$

[Subtracting 8 from both sides]

$\Rightarrow 12x=48$

$\Rightarrow \frac{12x}{12}=\frac{48}{12}$

[Dividing both sides by 12]

$\Rightarrow x=4$

Hence, present age of Rahul = 5×4 = 20 years and present age of Haroon

= 7×4 = 28 years.

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10. The number of boys and girls in a class are in the ratio 7 : 5. The number of boys is 8 more than the number of girls. What is the total class strength?

Ans. Let the number of girls be $x.$

Then, the number of boys = $x+8.$

According to the question, $\frac{x+8}{x}=\frac{7}{5}$

$\Rightarrow 5(x+8)=7x$

$\Rightarrow 5x+40=7x$

$\Rightarrow 5x-7x=-40$

[Transposing $7x$ to L.H.S. and 40 to R.H.S.]

$\Rightarrow -2x=-40 \Rightarrow \frac{-2x}{-2}=\frac{-40}{-2}$

[Dividing both sides by -2]

$\Rightarrow \; x = 20$

Hence the number of girls = 20 and number of boys = 20 + 8 = 28.

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11. Baichung's father is 26 years younger than Baichung's grandfather and 29 years older than Baichung. The sum of the ages of all the three is 135 years. What is the age of each one of them?

Ans. Let Baichung's age be x years, then Baichung's father's age = $(x+29)$ years and Baichung's granddaughter's age = $(x+29+26)=(x+55)$ years.
According to condition, $x+x+29+x+55=135$

$\Rightarrow \; 3x+84=135 \;\Rightarrow\; 3x+84-84=135-84$

[Subtracting 84 from both sides]
$\Rightarrow \; 3x=51 \;\Rightarrow\; \frac{3x}{3}=\frac{51}{3}$

[Dividing both sides by 3]
$\Rightarrow \; x=17$ years

Hence, Baichung's age = 17 years, Baichung's father's age = 17 + 29

= 46 years

And Baichung's granddaughter's age

= 17 + 29 + 26 = 72 years.

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12. Fifteen years from now Ravi's age will be four times his present age. What is Ravi's present age?

Ans. Let Ravi's present age be x years.
After fifteen years, Ravi's age = $4x$ years.

Fifteen years from now, Ravi's age = $(x+15)$ years.

According to question, $4x=x+15$

$\Rightarrow \; 4x-x=15$

[Transposing x to L.H.S.]

$\Rightarrow 3x = 15$

$\Rightarrow \frac{3x}{3} = \frac{15}{3}$

[Dividing both sides by 3]

$\Rightarrow x = 5$ years

Hence, Ravi's present age be 5 years.

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13. A rational number is such that when you multiply it by $\frac{5}{2}$ and add $\frac{2}{3}$ to the product, you get $\frac{-7}{12}$. What is the number?

Ans. Let the rational number be x.

According to the question, $\frac{5}{2}x + \frac{2}{3} = \frac{-7}{12}$

$\Rightarrow \frac{5}{2}x + \frac{2}{3} - \frac{2}{3} = \frac{-7}{12} - \frac{2}{3}$

[Subtracting $\frac{2}{3}$ from both sides]

$\Rightarrow \frac{5x}{2} = \frac{-7-8}{12}$

$\Rightarrow \frac{5x}{2} = \frac{-15}{12}$

$\Rightarrow 5x \times 12 = -15 \times 2$

$\Rightarrow 60x = -30$

$\Rightarrow \frac{60x}{60} = \frac{-30}{60}$

[Dividing both sides by 60]

$\Rightarrow x = \frac{-1}{2}$

Hence, the rational number is $\frac{-1}{2}$.

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14. Lakshmi is a cashier in a bank. She has currency notes of denominations ` 100, `50 an`10 respectively. The ratio of the number of these notes is 2 : 3 : 5. The total cash with Lakshmi is `4,00,000. How many notes of each denomination does she have?

Ans. Let number of notes be $2x, 3x$ and $5x$.

According to question, $100\times 2x+50\times 3x+10\times 5x=4,00,000$

$\Rightarrow 200x+150x+50x=4,00,000$

$\Rightarrow 400x=4,00,000$

$\Rightarrow \frac{400x}{400}=\frac{4,00,000}{400}$

[Dividing both sides by 400]

$\Rightarrow x=1000$

Hence, number of denominations of ` 100 notes = 2×1000 = 2000

Number of denominations of ` 50 notes = 3×1000 = 3000

Number of denominations of ` 10 notes = 5×1000 = 5000

Therefore, required denominations of notes of ` 100, ` 50 and ` 10 are 2000, 3000 and 5000 respectively.

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15. I have a total of `300 in coins of denomination `1, `2 and `5. The number of `2 coins is 3 times the number of `5 coins. The total number of coins is 160. How many coins of each denomination are with me?

Ans. Total sum of money = ` 300

Let the number of ` 5 coins be $x,$ number of ` 2 coins be $3x$ and number of ` 1 coins be $160-(x+3x)=160-4x.$

According to question, $5\times x+2\times(3x)+1\times(160-4x)=300$

$\Rightarrow 5x+6x+160-4x=300$

$\Rightarrow 7x+160=300$

$\Rightarrow 7x+160-160=300-160$

[Subtracting 160 from both sides]
$\Rightarrow 7x=140$

$\Rightarrow \frac{7x}{7}=\frac{140}{7}$

[Dividing both sides by 7]
$\Rightarrow x=20$

Hence, the number of coins of ` 5 denomination = 20

Number of coins of ` 2 denomination = 3×20 = 60

Number of coins of ` 1 denomination = $160-4\times 20$ = 160 – 80 = 80

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16. The organizers of an essay competition decide that a winner in the competition gets a prize of `100 and a participant who does not win, gets a prize of `25. The total prize money distributed is `3,000. Find the number of participants is 63.
Ans. Total sum of money = ` 3000
Let the number of winners of ` 100 be x.

And those who are not winners = $63-x$

According to the question, $100\times x+25\times(63-x)=3000$

$\Rightarrow 100x+1575-25x=3000$

$\Rightarrow 75x+1575=3000$

$\Rightarrow 7x+1575-1575=3000-1575$

[Subtracting 1575 from both sides]
$\Rightarrow 7x=1425$

$\Rightarrow \frac{7x}{7}=\frac{1425}{7}$

[Dividing both sides by 7]

$\Rightarrow \ x = 19$

Hence the number of winner is 19.

EXERCISE-2.3

Class –VIII Mathematics (Ex. 2.3)
NCERT SOLUTION

Solve the following equations and check your results.

1. $3x = 2x + 18$

Ans. $3x = 2x + 18$

$\Rightarrow \ 3x - 2x = 18$

$\Rightarrow \ x = 18$

To check:

$3x = 2x + 18$

$\Rightarrow \ 3 \times 18 = 2 \times 18 + 18$

$\Rightarrow \ 54 = 36 + 18$

$\Rightarrow$ 54 = 54

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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2. $5t - 3 = 3t - 5$

Ans. $5t - 3 = 3t - 5$

$\Rightarrow \ 5t - 3t = -5 + 3$

$\Rightarrow \ 2t = -2$

$\Rightarrow t = \frac{-2}{2} = -1$

To check:

$5t - 3 = 3t - 5$

$\Rightarrow 5\times(-1) - 3 = 3\times(-1) - 5$

$\Rightarrow -5 - 3 = -3 - 5$

$\Rightarrow -8 = -8$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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3. $5x + 9 = 5 + 3x$

Ans. $5x + 9 = 5 + 3x$

$\Rightarrow 5x - 3x = 5 - 9$

$\Rightarrow 2x = -4$

$\Rightarrow x = \frac{-4}{2} = -2$

To check:

$5x + 9 = 5 + 3x$

$\Rightarrow 5\times(-2) + 9 = 5 + 3\times(-2)$

$\Rightarrow -10 + 9 = 5 - 6$

$\Rightarrow -1 = -1$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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4. $4z+3=6+2z$

Ans. $4z+3=6+2z$

$\Rightarrow 4z-2z=6-3$

$\Rightarrow 2z=3$

$\Rightarrow z=\frac{3}{2}$

To check:

$4z+3=6+2z$

$\Rightarrow 4\times\frac{3}{2}+3=6+2\times\frac{3}{2}$

$\Rightarrow 2\times3+3=6+3$

$\Rightarrow 6+3=9$

$\Rightarrow 9=9$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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5. $2x-1=14-x$

Ans. $2x-1=14-x$

$\Rightarrow 2x+x=14+1$

$\Rightarrow 3x=15$

$\Rightarrow x=\frac{15}{3}=5$

To check:

$2x-1=14-x$

$\Rightarrow 2\times5-1=14-5$

$\Rightarrow$ 10 – 1 = 9

$\Rightarrow$ 9 = 9

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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6. $8x+4=3(x-1)+7$

Ans. $8x+4=3(x-1)+7$

$\Rightarrow 8x+4=3x-3+7$

$\Rightarrow 8x-3x=-3+7-4$

$\Rightarrow 5x=0$

$\Rightarrow x=\frac{0}{5}=0$

To check:

$8x+4=3(x-1)+7$

$\Rightarrow 8\times 0+4=3(0-1)+7$

$\Rightarrow 0+4=3\times(-1)+7$

$\Rightarrow 4=-3+7$

$\Rightarrow 4=4$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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7. $x=\frac{4}{5}(x+10)$

Ans. $x=\frac{4}{5}(x+10)$

$\Rightarrow 5x = 4(x+10)$

$\Rightarrow 5x = 4x + 40$

$\Rightarrow 5x - 4x = 40$

$\Rightarrow x = 40$

To check:

$x = \frac{4}{5}(x+10)$

$\Rightarrow 40 = \frac{4}{5}(40+10)$

$\Rightarrow 40 = \frac{4}{5} \times 50$

$\Rightarrow 40 = 4 \times 10$

$\Rightarrow$ 40 = 40

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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8. $\frac{2x}{3} + 1 = \frac{7x}{15} + 3$

Ans. $\frac{2x}{3} + 1 = \frac{7x}{15} + 3$

$\Rightarrow \frac{2x}{3} - \frac{7x}{15} = 3 - 1$

$\Rightarrow \frac{10x - 7x}{15} = 2$

$\Rightarrow 3x = 30$

$\Rightarrow x = \frac{30}{3} = 10$

To check:

$$\frac{2x}{3}+1=\frac{7x}{15}+3$$

$$\Rightarrow \frac{2\times10}{3}+1=\frac{7\times10}{15}+3$$

$$\Rightarrow \frac{20}{3}+1=\frac{14}{3}+3$$

$$\Rightarrow \frac{20+3}{3}=\frac{14+9}{3}$$

$$\Rightarrow \frac{23}{3}=\frac{23}{3}$$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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9. $2y+\frac{5}{3}=\frac{26}{3}-y$

Ans. $2y+\frac{5}{3}=\frac{26}{3}-y$

$$\Rightarrow 2y+y=\frac{26}{3}-\frac{5}{3}$$

$$\Rightarrow 3y=\frac{26-5}{3}$$

$$\Rightarrow 3y=\frac{21}{3}$$

$$\Rightarrow y=\frac{21}{3\times3}=\frac{7}{3}$$

To check:

$$2y+\frac{5}{3}=\frac{26}{3}-y$$

$\Rightarrow 2\times\frac{7}{3}+\frac{5}{3}=\frac{26}{3}-\frac{7}{3}$

$\Rightarrow \frac{14}{3}+\frac{5}{3}=\frac{26}{3}-\frac{7}{3}$

$\Rightarrow \frac{14+5}{3}=\frac{26-7}{3}$

$\Rightarrow \frac{19}{3}=\frac{19}{3}$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

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10. $3m=5m-\frac{8}{5}$

Ans. $3m=5m-\frac{8}{5}$

$\Rightarrow 3m-5m=\frac{-8}{5}$

$\Rightarrow -2m=\frac{-8}{5}$

$\Rightarrow m=\frac{-8}{5\times(-2)}$

$\Rightarrow m=\frac{4}{5}$

To check:

$3m=5m-\frac{8}{5}$

$\Rightarrow 3\times\frac{4}{5}=5\times\frac{4}{5}-\frac{8}{5}$

$\Rightarrow \frac{12}{5} = 4 - \frac{8}{5}$

$\Rightarrow \frac{12}{5} = \frac{20-8}{5}$

$\Rightarrow \frac{12}{5} = \frac{12}{5}$

$\Rightarrow$ L.H.S. = R.H.S.

Hence, it is correct.

EXERCISE-2.4

1. Amina thinks of a number and subtracts $\frac{5}{2}$ from it. She multiplies the result by 8. The result now obtained is 3 times the same number she thought of. What is the number?

Ans. Let Amina think a number x.

According to the question, $8\left(x - \frac{5}{2}\right) = 3x$

$\Rightarrow 8x - \frac{8\times 5}{2} = 3x$

$\Rightarrow 8x - 4\times 5 = 3x$

$\Rightarrow 8x - 20 = 3x$

$\Rightarrow 8x - 3x = 20$

$\Rightarrow 5x = 20$

$\Rightarrow x = \frac{20}{5} = 4$

Hence, the number is 4.

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2. A positive number is 5 times another number. If 21 is added to both the numbers, then one of the new numbers becomes twice the other new number. What are the numbers?

Ans. Let another number be x.

Then positive number = $5x$

According to the question, $5x+21=2(x+21)$

$\Rightarrow 5x+21=2x+42$

$\Rightarrow 5x-2x=42-21$

$\Rightarrow 3x=21$

$\Rightarrow x=\frac{21}{3}=7$

Hence another number = 7 and positive number = 7×5 =35

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3. Sum of the digits of a two-digit number is 9. When we interchange the digits, it is found that the resulting new number is greater than the original number by 27. What is the two-digit number?

Ans. Let the unit place digit of a two-digit number be x.

Therefore, the tens place digit = $9-x$

$\because$ 2-digit number = 10 x tens place digit + unit place digit

$\therefore$ Original number = $10(9-x)+x$

According to the question, New number

= Original number + 27

$\Rightarrow 10x+(9-x)=10(9-x)+x+27$

$\Rightarrow 10+9-x=90-10x+x+27$

$\Rightarrow 9x+9=117-9x$

$\Rightarrow 9x+9x=117-9$

$\Rightarrow 18x=108$

$\Rightarrow x = \frac{108}{18} = 6$

Hence, the 2-digit number = $10(9-x)+x$ = 10 (9 – 6) + 6 = $10\times 3+6$ = 30 + 6 = 36

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4. One of the two digits of a two-digit number is three times the other digit. If you interchange the digits of this two-digit number and add the resulting number to the original number, you get 88. What is the original number?

Ans. Let the unit place digit of a two-digit number be x.

Therefore, the tens place digit = $3x$

$\because$ 2-digit number = 10 x tens place digit + unit place digit

$\therefore$ Original number = $10\times 3x + x = 30x + x$ = $31x$

According to the question, New number + Original number = 88

$\Rightarrow 10x + 3x + 31x = 88$

$\Rightarrow 44x = 88$

$\Rightarrow x = \frac{88}{44} = 2$

Hence, the 2-digit number = $31x = 31\times 2 = 62$

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5. Shobo's mother's present age is six times Shobo's present age. Shobo's age five years from now will be one third of his mother's present age. What are their present age?

Ans. Let Shobo's present age be x years.

And Shobo's mother's present age = $6x$ years

According to the question, $x+5 = \frac{1}{3}\times 6x$

$\Rightarrow\ x+5=2x$

$\Rightarrow\ 2x=x+5$

$\Rightarrow\ 2x-x=5$

$\Rightarrow\ x=5$ years.

Hence, Shobo's present age = 5 years

And Shobo's mother's present age = 6×5 = 30 years.

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6. There is a narrow rectangular plot, reserved for a school, in Mahuli village. The length and breadth of the plot are in the ratio 11 : 4. At the rate `100 per meter it will cost the village panchayat`75,000 to fence the plot. What are the dimensions of the plot?

Ans. Let the length and breadth of the rectangular plot be $11x$ and $4x$ respectively.

$\therefore$ Perimeter of the plot = $\frac{\text{Total Cost}}{\text{Cost of 1 meter}} = \frac{75000}{100}$ = 750 m

We know that Perimeter of rectangle = 2 (length + breadth)

Therefore, according to the question,

$750=2(11x+4x)$

$\Rightarrow\ 750=2\times15x$

$\Rightarrow\ 750=30x$

$\Rightarrow\ 30x=750$

$\Rightarrow\ x=\frac{750}{30}=25$

Hence, length of rectangular plot = 11×25 = 275 m

And breadth of rectangular plot = 4×25 = 100 m

---

7. Hasan buys two kinds of cloth materials for school uniforms, shirt material that costs him `50 per meter and trouser material that costs him `90 per meter.

Ans. Let ratio between shirt material and trouser material be $3x : 2x$.

The cost of shirt material = $50 \times 3x = 150x$

The selling price at 12% gain = $\frac{100 + P\%}{100} \times$ C.P.

$= \frac{100+12}{100} \times 150x$

$= \frac{112}{100} \times 150x = 168x$

The cost of trouser material = $90 \times 2x = 180x$

The selling price at 12% gain = $\frac{100 + P\%}{100} \times$ C.P.

$= \frac{100+10}{100} \times 180x$

$= \frac{110}{100} \times 180x = 198x$

According to the question,

$168x + 198x = 36,600$

$\Rightarrow 366x = 36600$

$\Rightarrow x = \frac{36600}{366}$ = 100 meters

Now, trouser material = $2x = 2 \times 100$

= 200 meters

Hence, Hasan bought 200 meters of the trouser material.

For every 2 meters of the trouser material he buys 3 meters of the shirt material. He sells the materials at 12% and 10% respectively. His total sale is `36,000. How much trouser material did he buy?

8. Half of a herd of deer are grazing in the field and three fourths of the remaining are playing nearby. The rest 9 are drinking water from the pond. Find the number of deer in the herd.

Ans. Let the total number of deer in the herd be x.

According to question, $x=\frac{x}{2}+\frac{3}{4}\times\left(x-\frac{x}{2}\right)+9$

$\Rightarrow x=\frac{x}{2}+\frac{3}{4}\left(\frac{2x-x}{2}\right)+9$

$\Rightarrow x=\frac{x}{2}+\frac{3}{4}\times\frac{x}{2}+9$

$\Rightarrow x=\frac{x}{2}+\frac{3}{8}x+9$

$\Rightarrow x-\frac{x}{2}-\frac{3x}{8}=9$

$\Rightarrow \frac{8x-4x-3x}{8}=9$

$\Rightarrow \frac{x}{8}=9$

$\Rightarrow x=9\times8=72$

Hence, the total number of deer in the herd is 72.

---

9. A grandfather is ten times older than his granddaughter. He is also 54 years older than her. Find their present ages.

Ans. Let present age of granddaughter be x years.

Therefore, Grandfather's age = $10x$ years

According to question, $10x=x+54$

$\Rightarrow 10x-x=54$

$\Rightarrow\ 9x = 54$

$\Rightarrow\ x = \frac{54}{9} = 6$ years

Hence, granddaughter's age = 6 years and grandfather's age = 10×6 = 60 years.

---

10. Aman's age is three times his son's age. Ten years ago he was five times his son's age. Find their present ages.
Ans. Let the present age of Amon's son be x years.
Therefore, Aman's age = $3x$ years

According to question,

$3x - 10 = 5(x - 10)$

$\Rightarrow\ 3x - 10 = 5x - 50$

$\Rightarrow\ 3x - 5x = -50 + 10$

$\Rightarrow\ -2x = -40$

$\Rightarrow\ x = \frac{-40}{-2}$ = 20 years

Hence, Aman's son's age = 20 years

And Aman's age = 3×2 = 60 years

EXERCISE-2.5

Solve the following linear equations.

1. $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

Ans. $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

$$\Rightarrow \frac{x}{2}-\frac{x}{3}=\frac{1}{4}+\frac{1}{5}$$

$$\Rightarrow \frac{3x-2x}{6}=\frac{5+4}{20}$$

$$\Rightarrow \frac{x}{6}=\frac{9}{20}$$

$$\Rightarrow x=\frac{9\times 6}{20}=\frac{27}{10}$$

To check:

$$\frac{x}{2}-\frac{1}{5}=\frac{x}{3}+\frac{1}{4}$$

$$\Rightarrow \frac{27}{10\times 2}-\frac{1}{5}=\frac{27}{10\times 3}+\frac{1}{4}$$

$$\Rightarrow \frac{27}{20}-\frac{1}{5}=\frac{9}{10}+\frac{1}{4}$$

$$\Rightarrow \frac{27-4}{20}=\frac{18+5}{20}$$

$$\Rightarrow \frac{23}{20}=\frac{23}{20}$$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

2. $\frac{n}{2}-\frac{3n}{4}+\frac{5n}{6}=21$

Ans. $\frac{n}{2}-\frac{3n}{4}+\frac{5n}{6}=21$

$$\Rightarrow \frac{6n-9n+10n}{12}=21$$

$$\Rightarrow \frac{7n}{12} = 21$$

$$\Rightarrow n = \frac{21 \times 12}{7}$$

$$\Rightarrow n = 36$$

To check:

$$\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$$

$$\Rightarrow \frac{36}{2} - \frac{3 \times 36}{4} + \frac{5 \times 36}{6} = 21$$

$$\Rightarrow 18 - 27 + 30 = 21$$

$\Rightarrow$ 21 = 21

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

3. $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

Ans. $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$

$$\Rightarrow \frac{x}{1} - \frac{8x}{3} + \frac{5x}{2} = \frac{17}{6} - \frac{7}{1}$$

$$\Rightarrow \frac{6x - 16x + 15x}{6} = \frac{17 - 42}{6}$$

$$\Rightarrow \frac{5x}{6} = \frac{-25}{6}$$

$$\Rightarrow x = \frac{-25 \times 6}{6 \times 5}$$

$$\Rightarrow x = -5$$

To check:

$$x+7-\frac{8x}{3}=\frac{17}{6}-\frac{5x}{2}$$

$$\Rightarrow -5+7-\frac{8\times(-5)}{3}=\frac{17}{6}-\frac{5\times(-5)}{2}$$

$$\Rightarrow 2+\frac{40}{3}=\frac{17}{6}+\frac{25}{2}$$

$$\Rightarrow \frac{6+40}{3}=\frac{17+75}{6}$$

$$\Rightarrow \frac{46}{3}=\frac{92}{6}$$

$$\Rightarrow \frac{46}{3}=\frac{46}{3}$$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

4. $\frac{x-5}{3}=\frac{x-3}{5}$

Ans. $\frac{x-5}{3}=\frac{x-3}{5}$

$$\Rightarrow 5\times(x-5)=3(x-3)$$

$$\Rightarrow 5x-25=3x-9$$

$$\Rightarrow 5x-3x=-9+25$$

$$\Rightarrow 2x=16$$

$$\Rightarrow x=\frac{16}{2}=8$$

To check:

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

$$\Rightarrow \frac{8-5}{3}=\frac{8-3}{5}$$

$$\Rightarrow \frac{3}{3}=\frac{5}{5}$$

$$\Rightarrow 1=1$$

$$\Rightarrow \text{L.H.S.} = \text{R. H. S.}$$

Therefore, it is correct.

---

5. $\frac{3t-2}{4}-\frac{2t+3}{3}=\frac{2}{3}-t$

Ans. $\frac{3t-2}{4}-\frac{2t+3}{3}=\frac{2}{3}-t$

$$\Rightarrow \frac{3t-2}{4}-\frac{2t+3}{3}+t=\frac{2}{3}$$

$$\Rightarrow \frac{3(3t-2)-4(2t+3)+12t}{12}=\frac{2}{3}$$

$$\Rightarrow \frac{9t-6-8t-12+12t}{12}=\frac{2}{3}$$

$$\Rightarrow \frac{13t-18}{12}=\frac{2}{3}$$

$$\Rightarrow 3\times(13t-18)=2\times12$$

$$\Rightarrow 39t-54=24$$

$$\Rightarrow 39t=24+54$$

$$\Rightarrow 39t=78$$

$$\Rightarrow t=\frac{78}{39}=2$$

To check:

$$\frac{3t-2}{4}-\frac{2t+3}{3}=\frac{2}{3}-t$$

$$\Rightarrow \frac{3\times 2-2}{4}-\frac{2\times 2+3}{3}=\frac{2}{3}-2$$

$$\Rightarrow \frac{6-2}{4}-\frac{4+3}{3}=\frac{2-6}{3}$$

$$\Rightarrow \frac{4}{4}-\frac{7}{3}=\frac{-4}{3}$$

$$\Rightarrow \frac{1}{1}-\frac{7}{3}=\frac{-4}{3}$$

$$\Rightarrow \frac{3-7}{3}=\frac{-4}{3}$$

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

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

6. $m-\frac{m-1}{2}=1-\frac{m-2}{3}$

Ans. $m-\frac{m-1}{2}=1-\frac{m-2}{3}$

$$\Rightarrow \frac{m}{1}-\frac{m-1}{2}+\frac{m-2}{3}=1$$

$$\Rightarrow \frac{6m-3(m-1)+2(m-2)}{6}=1$$

$$\Rightarrow \frac{6m-3m+3+2m-4}{6}=1$$

$$\Rightarrow \frac{5m-1}{6}=1$$

$$\Rightarrow 5m-1=6$$

$$\Rightarrow 5m=6+1$$

$$\Rightarrow 5m=7$$

$$\Rightarrow m=\frac{7}{5}$$

To check:

$$m-\frac{m-1}{2}=1-\frac{m-2}{3}$$

$$\Rightarrow \frac{7}{5}-\frac{\frac{7}{5}-1}{2}=1-\frac{\frac{7}{5}-2}{3}$$

$$\Rightarrow \frac{7}{5}-\frac{\frac{7-5}{5}}{2}=1-\frac{\frac{7-10}{5}}{3}$$

$$\Rightarrow \frac{7}{5}-\frac{2}{5\times 2}=1-\frac{-3}{5\times 3}$$

$$\Rightarrow \frac{7}{5}-\frac{1}{5}=1+\frac{1}{5}$$

$$\Rightarrow \frac{7-1}{5}=\frac{5+1}{5}$$

$$\Rightarrow \frac{6}{5}=\frac{6}{5}$$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

Simplify and solve the following linear equation.

7. $3(t-3)=5(2t+1)$

Ans. $3(t-3)=5(2t+1)$

$\Rightarrow 3t-9=10t+5$

$\Rightarrow 3t-10t=5+9$

$\Rightarrow -7t=14$

$\Rightarrow t=\frac{14}{-7}$

$\Rightarrow t=-2$

To check:

$3(t-3)=5(2t+1)$

$\Rightarrow 3(-2-3)=5\{2\times(-2)+1\}$

$\Rightarrow 3\times-5=5(-4+1)$

$\Rightarrow -15=5\times(-3)$

$\Rightarrow -15=-15$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

8. $15(y-4)-2(y-9)+5(y+6)=0$

Ans. $15(y-4)-2(y-9)+5(y+6)=0$

$\Rightarrow 15y-60-2y+18+5y+30=0$

$\Rightarrow 18y-12=0$

$\Rightarrow 18y=12$

$\Rightarrow y=\frac{12}{18}$

$\Rightarrow y = \frac{2}{3}$

To check:

$15(y-4)-2(y-9)+5(y+6)=0$

$\Rightarrow 15\left(\frac{2}{3}-4\right)-2\left(\frac{2}{3}-9\right)+5\left(\frac{2}{3}+6\right)=0$

$\Rightarrow 15\left(\frac{2-12}{3}\right)-2\left(\frac{2-27}{3}\right)+5\left(\frac{2+18}{3}\right)=0$

$\Rightarrow 15\times\frac{-10}{3}-2\times\frac{-25}{3}+5\times\frac{20}{3}=0$

$\Rightarrow -50+\frac{50}{3}+\frac{100}{3}=0$

$\Rightarrow -50+\frac{50+100}{3}=0$

$\Rightarrow -50+\frac{150}{3}=0$

$\Rightarrow -50+50=0$

$\Rightarrow 0 = 0$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

9. $3(5z-7)-2(9z-11)=4(8z-13)-17$

Ans. $3(5z-7)-2(9z-11)=4(8z-13)-17$

$\Rightarrow 15z-21-18z+22=32z-52-17$

$\Rightarrow -3z+1=32z-69$

$\Rightarrow -3z-32z=-69-1$

$\Rightarrow -35z = -70$

$\Rightarrow z = \frac{-70}{-35} = 2$

To check:

$3(5z-7)-2(9z-11) = 4(8z-13)-17$

$\Rightarrow 3(5\times 2-7)-2(9\times 2-11) = 4(8\times 2-13)-17$

$\Rightarrow 3(10-7)-2(18-11) = 4(16-13)-17$

$\Rightarrow 3\times 3-2\times 7 = 4\times 3-17$

$\Rightarrow 9-14 = 12-17$

$\Rightarrow -5 = -5$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

---

10. $0.25(4f-3) = 0.05(10f-9)$

Ans. $0.25(4f-3) = 0.05(10f-9)$

$\Rightarrow 1.00f-0.75 = 0.50f-0.45$

$\Rightarrow 1.00f-0.50f = -0.45+0.75$

$\Rightarrow 0.50f = 0.3$

$\Rightarrow f = \frac{0.3}{0.50}$

$\Rightarrow f = 0.6$

To check:

$0.25(4f-3) = 0.05(10f-9)$

$\Rightarrow 0.25(4\times0.6-3)=0.05(10\times0.6-9)$

$\Rightarrow 0.25(2.4-3)=0.05(6.0-9)$

$\Rightarrow 0.25\times(-0.6)=0.05\times(-3)$

$\Rightarrow -0.150=-0.150$

$\Rightarrow$ L.H.S. = R. H. S.

Therefore, it is correct.

EXERCISE-2.6

Solve the following equations.

1. $\frac{8x-3}{3x}=2$

Ans. $\frac{8x-3}{3x}=2$

$\Rightarrow 8x-3=2\times3x$

$\Rightarrow 8x-3=6x$

$\Rightarrow 8x-6x=3$

$\Rightarrow 2x=3$

$\Rightarrow x=\frac{3}{2}$

---

2. $\frac{9x}{7-6x}=15$

Ans. $\frac{9x}{7-6x}=15$

$\Rightarrow 9x=15(7-6x)$

$\Rightarrow 9x=105-90x$

$\Rightarrow 9x+90x=105$

$\Rightarrow 99x=105$

$\Rightarrow x=\frac{105}{99}$

$\Rightarrow x=\frac{35}{33}$

---

3. $\frac{x}{x+15}=\frac{4}{9}$

Ans. $\frac{z}{z+15}=\frac{4}{9}$

$\Rightarrow z\times 9=4(z+15)$

$\Rightarrow 9z=4z+60$

$\Rightarrow 9z-4z=60$

$\Rightarrow 5z=60$

$\Rightarrow z=\frac{60}{5}$

$\Rightarrow z=12$

---

4. $\frac{3y+4}{2-6y}=\frac{-2}{5}$

Ans. $\frac{3y+4}{2-6y}=\frac{-2}{5}$

$\Rightarrow 5(3y+4)=-2(2-6y)$

$\Rightarrow 15y+20=-4+12y$

$\Rightarrow 15y-12y=-4-20$

$\Rightarrow 3y=-24$

$\Rightarrow y=\frac{-24}{3}$

$\Rightarrow y=-8$

---

5. $\frac{7y+4}{y+2}=\frac{-4}{3}$

Ans. $\frac{7y+4}{y+2}=\frac{-4}{3}$

$\Rightarrow 3(7y+4)=-4(y+2)$

$\Rightarrow 21y+12=-4y-8$

$\Rightarrow 21y+4y=-8-12$

$\Rightarrow 25y=-20$

$\Rightarrow y=\frac{-20}{25}$

$\Rightarrow y=\frac{-4}{5}$

---

6. The ages of Hari and Harry are in the ratio 5 : 7. Four years from now the ratio of their ages will be 3 : 4. Find their present ages.

Ans. Let the Ages of Hari and Harry be $5x$ years and $7x$ years.

According to question, $\frac{5x+4}{7x+4}=\frac{3}{4}$

$\Rightarrow 4(5x+4)=3(7x+4)$

$\Rightarrow 20x+16=21x+12$

$\Rightarrow 20x-21x=12-16$

$\Rightarrow -x=-4$

$\Rightarrow x=4$

Hence, the age of Hari = $5x = 4\times5$

= 20 years

And the age of Harry = $7x = 7\times4$

= 28 years.

---

7. The denominator of a rational number is greater than its numerator by 8. If the numerator is increased by 17 and the denominator is decreased by 1, the number obtained is $\frac{3}{2}$. Find the rational number.

Ans. Let the numerator of a rational number be x, then the denominator is $x+8$.

Therefore, Rational number = $\frac{x}{x+8}$

According to the question,

$\frac{x+17}{x+8-1}=\frac{3}{2}$

$\Rightarrow \frac{x+17}{x+7}=\frac{3}{2}$

$\Rightarrow 2(x+17)=3(x+7)$

$\Rightarrow 2x+34=3x+21$

$\Rightarrow 2x-3x=21-34$

$\Rightarrow -x=-13$

$\Rightarrow x=13$

Hence, the required rational number

$= \frac{x}{x+8}=\frac{13}{13+8}=\frac{13}{21}.$