Rational Numbers
Exercise 4A

Q1

Answer :

The numbers that are in the form of $\frac{p}{q}$, where p and q are integers and q ≠0, are called rational numbers.

For example:

Five positive rational numbers:

$\frac{5}{7}, \frac{-3}{-4}, \frac{7}{8}, \frac{-14}{-15}, \frac{5}{9}$

Five negative rational numbers:

$\frac{-3}{7}, \frac{-3}{8}, \frac{8}{-9}, \frac{-19}{25}, \frac{8}{-25}$

Yes, there is a rational number that is neither positive nor negative, i.e. zero (0).

Q3

Answer :

(i) $\frac{8}{19}$
Numerator = 8
Denominator =19

(ii) $\frac{5}{-8}$
Numerator = 5
Denominator = −8

(iii) $\frac{-13}{5}$

Numerator = −13
Denominator =15

(iv) $\frac{-8}{-11}$

Numerator = −8
Denominator = −11

(v) 9
i.e $\frac{9}{1}$
Numerator = 9
Denominator = 1

Q4

Answer :

(i) 5
The rational number will be $\frac{5}{1}$.
Numerator = 5
Denominator = 1

(ii) -3
The rational number will be $\frac{-3}{1}$.
Numerator = -3
Denominator = 1

(iii)1
The rational number will be $\frac{1}{1}$.
Numerator = 1
Denominator = 1

(iv) 0
The rational number will be $\frac{0}{1}$.
Numerator =0
Denominator = 1

(v) -23
The rational number will be $\frac{-23}{1}$.
Numerator = -23
Denominator = 1

Q5

Answer :

Positive rational numbers:
(iii) $\frac{-5}{-8}$

(iv) $\frac{37}{53}$
(vi) 8 because 8 can be written as $\frac{8}{1}$, **where** $1 \neq 0$.

0 is neither positive nor negative.

Q6

Answer :

Negative rational numbers:

(iii) $\frac{-5}{7}$

(iv) $\frac{4}{-9}$

(v) -6

(vi) $\frac{1}{-2}$

Q7

Answer :

(i) Following are the four rational numbers that are equivalent to $\frac{6}{11}$.

$\frac{6\times2}{11\times2}, \frac{6\times3}{11\times3}, \frac{6\times4}{11\times4}$ and $\frac{6\times5}{11\times5}$

i.e. $\frac{12}{22}, \frac{18}{33}, \frac{24}{44}$ and $\frac{30}{55}$

(ii) Following are the four rational numbers that are equivalent to $\frac{-3}{8}$.

$\frac{-3\times2}{8\times2}, \frac{-3\times3}{8\times3}, \frac{-3\times4}{8\times4}$ and $\frac{-3\times5}{8\times5}$

i.e. $\frac{-6}{16}, \frac{-9}{24}, \frac{-12}{32}$ and $\frac{-15}{40}$

(iii) Following are the four rational numbers that are equivalent to $\frac{7}{-15}$.

$\frac{7\times2}{-15\times2}, \frac{7\times3}{-15\times3}, \frac{7\times4}{-15\times4}$ and $\frac{7\times5}{-15\times5}$

(iv) Following are the four rational numbers that are equivalent to 8, i.e. $\frac{8}{1}$.

$\frac{8\times2}{1\times2}, \frac{8\times3}{1\times3}, \frac{8\times4}{1\times4}$ and $\frac{8\times5}{1\times5}$

i.e. $\frac{16}{2}, \frac{24}{3}, \frac{32}{4}$ and $\frac{40}{5}$

(v) Following are the four rational numbers that are equivalent to -1, i.e. $\frac{1}{1}$.

$\frac{1\times2}{1\times2}, \frac{1\times3}{1\times3}, \frac{1\times4}{1\times4}$ and $\frac{1\times5}{1\times5}$

i.e. $\frac{2}{2}, \frac{3}{3}, \frac{4}{4}$ and $\frac{5}{5}$

(vi) Following are the four rational numbers that are equivalent to -1, i.e. $\frac{-1}{1}$.

$\frac{-1\times2}{1\times2}, \frac{-1\times3}{1\times3}, \frac{-1\times4}{1\times4}$ and $\frac{-1\times5}{1\times5}$

i.e. $\frac{-2}{2}, \frac{-3}{3}, \frac{-4}{4}$ and $\frac{-5}{5}$

Q8

Answer :

(i) $\frac{12\times(-1)}{(-17)\times(-1)} = \frac{-12}{17}$

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

(iii) $\frac{-8}{-19} = \frac{-8\times(-1)}{(-19)\times(-1)} = \frac{8}{19}$

(iv) $\frac{11\times(-1)}{-6\times(-1)} = \frac{-11}{6}$

Q9

Answer :

(i) Numerator of $\frac{5}{8}$ is 5.

5 should be multiplied by 3 to get 15.

Multiplying both the numerator and the denominator by 3:

$\frac{5\times3}{8\times3} = \frac{15}{24}$

$\frac{5}{8} = \frac{15}{24}$

(ii) Numerator of $\frac{5}{8}$ is 5.

5 should be multiplied by −2 to get −10.

Multiplying both the numerator and the denominator by −2:

$\frac{5\times(-2)}{8\times(-2)} = \frac{-10}{-16}$

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

Q10

Answer :

(i) Denominator of $\frac{4}{7}$ is 7.

7 should be multiplied by 3 to get 21.

Multiplying both the numerator and the denominator by 3:

$$\frac{4\times3}{7\times3}=\frac{12}{21}$$

$$\frac{4\times3}{7\times3}=\frac{4}{7}$$

(ii)

Denominator of $\frac{4}{7}$ is 7.

7 should be multiplied by -5 to get -35.

Multiplying both the numerator and the denominator by -5:

$$\frac{4\times(-5)}{7\times(-5)}=\frac{-20}{-35}$$

$$\frac{4}{7}=\frac{-20}{-35}$$

Q11

Answer :

(i) Numerator of $\frac{-12}{13}$ is -12.

-12 should be multiplied by 4 to get 48.

Multiplying both the numerator and the denominator by 4:

$$\frac{-12\times4}{13\times4}=\frac{-48}{52}$$

$$\frac{-12}{13}=\frac{-48}{52}$$

(ii) Numerator of $\frac{-12}{13}$ is -12.

-12 should be multiplied by -5 to get 60

Multiplying its numerator and denominator by -5:

$$\frac{-12\times(-5)}{13\times(-5)}=\frac{60}{-65}$$

$$\frac{-12}{13}=\frac{60}{-65}$$

Q12

Answer :

(i) Denominator of $\frac{-8}{11}$ is 11.

Clearly, $11\times2=22$

Multiplying both the numerator and the denominator by 2:

$$\frac{-8\times2}{11\times2}=\frac{-16}{22}$$

$$\frac{-8}{11}=\frac{-16}{22}$$

(ii) Denominator of $\frac{-8}{11}$ is 11.

Clearly, $11\times5=55$

Multiplying both the numerator and the denominator by 5:

$$\frac{-8\times5}{11\times5}=\frac{-40}{55}$$

$$\frac{-8}{11}=\frac{-40}{55}$$

Q13

Answer :

(i) Numerator of $\frac{14}{-5}$ is 14.

Clearly, 14×4=56

Multiplying both the numerator and the denominator by 4:

$\frac{14\times4}{-5\times4}=\frac{56}{-20}$

$\frac{14}{-5}=\frac{56}{-20}$

(ii) −70

Numerator of $\frac{14}{-5}$ is 14.

Clearly, 14×(−5)=−70

Multiplying both the numerator and the denominator by -5:

$\frac{14\times(-5)}{(-5)\times(-5)}=\frac{-70}{25}$

$\frac{14}{-5}=\frac{-70}{25}$

Q14

Answer :

(i) Denominator of $\frac{13}{-8}$ is −8.

Clearly, (−8)×5= −40

Multiplying both the numerator and the denominator by 5:

$\frac{13\times5}{-8\times5}=\frac{65}{-40}$

$\frac{13}{-8}=\frac{65}{-40}$

(ii) Denominator of $\frac{13}{-8}$ is −8.

Clearly, (−8)×(−4)= 32

Multiplying both the numerator and the denominator by −4:

$\frac{13\times(-4)}{-8\times(-4)}=\frac{-52}{32}$

$\frac{13}{-8}=\frac{-52}{32}$

Q15

Answer :

(i) Numerator of $\frac{-36}{24}$ is -36.

Clearly, (−36) ÷ 4= (−9)

Dividing both the numerator and the denominator by 4:

$\frac{-36\div4}{24\div4}=\frac{-9}{6}$

(ii) Numerator of $\frac{-36}{24}$ is −36.

Clearly, (−36) ÷ (−6) = 6

Dividing both the numerator and the denominator by -6:

$\frac{-36\div(-6)}{24\div(-6)}=\frac{6}{-4}$

$\frac{-36}{24}=\frac{6}{-4}$

Q16

Answer :

(i) Denominator of $\frac{84}{-147}$ is −147.

$\therefore -147 \div (-21) = 7$

Dividing both the numerator and the denominator by -21:

$$\frac{84 \div (-21)}{-147 \div (-21)} = \frac{-4}{7}$$

$$\frac{84}{-147} = \frac{-4}{7}$$

(ii)Denominator of $\frac{84}{-147}$ is −147.

$-147 \div 3 = -49$

Dividing both the numerator and the denominator by 3:

$$\frac{84 \div 3}{-147 \div 3} = \frac{28}{-49}$$

$$\frac{84}{-147} = \frac{28}{-49}$$

Q17

Answer :

(i) $\frac{35}{49}$

H.C.F. of 35 and 49 is 7.

$$\begin{array}{r|l} 35 & 49 \\ -35 & 1 \\ \hline 14 & 35 \\ -28 & 2 \\ \hline 7 & 14 \\ -14 & 2 \\ \hline \times & \end{array}$$

Dividing the numerator and the denominator by 7:

$$\frac{35 \div 7}{49 \div 7} = \frac{5}{7}$$

So, $\frac{35}{49}$ **is equal to** $\frac{5}{7}$ in the standard form.

(ii) $\frac{8}{-36}$

Denominator is -36, which is negative.

Multiplying both the numerator and the denominator by -1:

$$\frac{8 \times (-1)}{-36 \times (-1)} = \frac{-8}{36}$$

$$\begin{array}{r|l} 8 & 36 \\ -32 & 4 \\ \hline 4 & 8 \\ -8 & 2 \\ \hline \times & \end{array}$$

H.C.F. of 8 and 36 is 4.

Dividing its numerator and denominator by 4:

$$\frac{-8 \div 4}{36 \div 4} = \frac{-2}{9}$$

So, $\frac{8}{-36}$ **is equal to** $\frac{-2}{9}$ in the standard form.

(iii) $\frac{-27}{45}$

```
27)45(1
  -27
   18)27(1
     -18
       9)18(2
        -18
          ×
```

H.C.F. of 27 and 45 is 9.

Dividing its numerator and denominator by 9:

$\frac{-27 \div 9}{45 \div 9} = \frac{-3}{5}$

Hence, $\frac{-27}{45}$ is equal to $\frac{-3}{5}$ in the standard form.

(iv) $\frac{-14}{-49}$

The denominator is negative.

Multiplying its numerator and denominator by -1:

$\frac{-14 \times (-1)}{-49 \times (-1)} = \frac{14}{49}$

```
14)49(3
  -42
    7)14(2
     -14
       ×
```

H.C.F. of 14 and 49 is 7.

Dividing both the numerator and the denominator by 7.

$\frac{14 \div 7}{49 \div 7} = \frac{2}{7}$

Hence, $\frac{-14}{-49}$ is equal to $\frac{2}{7}$ in the standard form.

(v) $\frac{91}{-78}$

The denominator is negative.

Multiplying its denominator and denominator by -1:

$\frac{91 \times (-1)}{-78 \times (-1)} = \frac{-91}{78}$

```
78)91(1
  -78
   13)78(6
     -78
       ×
```

H.C.F. of 91 and 78 is 13.

Dividing both the numerator and the denominator by 13:

$\frac{-91 \div 13}{78 \div 13} = \frac{-7}{6}$

Hence, $\frac{91}{-78}$ is equal to $\frac{-7}{6}$ in the standard form.

(vi) $\frac{-68}{119}$

```
68)119(1
   -68
    51)68(1
      -51
       17)51(3
         -51
           ×
```

H.C.F. of 68 and 119 is 17.

Dividing both the numerator and the denominator by 17:

$\frac{-68 \div 17}{119 \div 17} = \frac{-4}{7}$

Hence, $\frac{-68}{119}$ is equal to $\frac{-4}{7}$ in the standard form.

(vii) $\frac{-87}{116}$

$$\begin{array}{r} 87\overline{)116}(1 \\ -87 \\ \hline 29\overline{)87}(3 \\ -87 \\ \hline \times \end{array}$$

H.C.F. of 87 and 116 is 29.

Dividing both the numerator and the denominator by 29:

$\frac{-87\div 29}{116\div 29}=\frac{-3}{4}$

Hence, $\frac{-87}{116}$ is equal to $\frac{-3}{4}$ in the standard form.

1

$(viii)$ $\frac{299}{-161}$

The denominator is negative.

Multiplying both the numerator and denominator by -1:

$$\frac{299\times(-1)}{-161\times(-1)}=\frac{-299}{161}$$

$$\begin{array}{r} 161\overline{)299}(1 \\ -161 \\ \hline 138\overline{)161}(1 \\ -138 \\ \hline 23\overline{)138}(6 \\ -138 \\ \hline \times \end{array}$$

H.C.F. of 299 and 161 is 23.

Dividing both the numerator and the denominator by 23:

$\frac{-299\div 23}{161\div 23}=\frac{-13}{7}$

Hence, $\frac{299}{-161}$ is equal to $\frac{-13}{7}$ in the standard form.

Q18

Answer :

(i)

$$\frac{-9\times 4}{5\times 4}=\frac{-36}{20}$$

$$\frac{-9\times(-3)}{5\times(-3)}=\frac{27}{-15}$$

$$\frac{-9\times 5}{5\times 5}=\frac{-45}{25}$$

$$\therefore \frac{-9}{5}=\frac{-36}{20}=\frac{27}{-15}=\frac{-45}{25}$$

(ii)

$$\frac{-6\times 3}{11\times 3}=\frac{-18}{33}$$

$$\frac{-6\times 4}{11\times 4}=\frac{-24}{44}$$

$$\therefore \frac{-6}{11}=\frac{-18}{33}=\frac{-24}{44}$$

Q19

Answer :

(i) $\frac{-13}{7}, \frac{39}{-21}$

We have:

$(-13)\times(-21) = 273$

And $7\times39=273$

$(-13) \times (-21) = 7 \times 39$

or $\frac{-13}{7} = \frac{39}{-21}$

Hence, $\frac{-13}{7}$ and $\frac{39}{21}$ are equivalent rational numbers.

(ii) $\frac{3}{-8}, \frac{-6}{16}$

We have:

$3\times16=48$

And $(-8)\times(-6) = 48$

$\therefore 3\times16 = (-8)\times(-6)$

$\frac{3}{-8} = \frac{-6}{16}$

(iii) $\frac{9}{4}, \frac{-36}{-16}$

We have:

$9\times(-16) = -144$

And $4\times(-36) = -144$

$9\times(-16) = 4\times(-36)$

$\frac{9}{4} = \frac{-36}{-16}$

Therefore, they are equivalent rational numbers.

(iv) $\frac{7}{15}, \frac{-28}{60}$

We have:

$7\times60 = 420$

And $15\times(-28) = -420$

$\therefore 7\times60 \neq 15\times(-28)$

Therefore, the rational numbers are not equivalent.

(v) $\frac{3}{12}, \frac{-1}{4}$

We have:
$3 \times 4 = 12$
And $12 \times (-1) = -12$
$12 \neq -12$
Therefore, the rational numbers are not equivalent.

(vi) $\frac{2}{3}, \frac{3}{2}$

We have:

$2 \times 2 = 4$

And $3 \times 3 = 9$

$2 \times 2 \neq 3 \times 3$

Therefore, the rational numbers are not equivalent.

Q20

Answer :

(i) $\frac{-1}{5} = \frac{8}{x}$

$\Rightarrow -x = 5 \times 8$
$\Rightarrow x = -40$

(ii) $\frac{7}{-3} = \frac{x}{6}$
$\Rightarrow (-3)x = 7 \times 6$

$\Rightarrow x = \frac{(7 \times 6)}{(-3)}$
$\Rightarrow x = -14$

(iii) $\frac{3}{5} = \frac{x}{-25}$
$\Rightarrow 5x = 3 \times (-25)$

$\Rightarrow x = \frac{3 \times (-25)}{5}$
$\Rightarrow x = (-15)$

(iv) $\frac{13}{6} = \frac{-65}{x}$

$\Rightarrow 13x = 6 \times (-65)$

$\Rightarrow x = \frac{6 \times (-65)}{13}$

$\Rightarrow x = 6 \times (-5)$

$\Rightarrow x = -30$

(v) $\frac{16}{x} = -4$
$\Rightarrow \mathbf{x} = \frac{16}{(-4)}$
$\Rightarrow x = (-4)$

vi) $\frac{-48}{x} = 2$
$\Rightarrow \frac{-48}{2} = \frac{x}{1}$
$\Rightarrow 2x = (-48) \times 1$
$\Rightarrow x = \frac{-48}{2}$
$x = (-24)$

Q21

Answer :

(i) $\frac{8}{-12}$ and $\frac{-10}{15}$

$8\times15 = 120$
And $(-10)\times(-12) = 120$

$8\times15 = (-10)\times(-12)$

$\therefore \frac{8}{-12} = \frac{-10}{15}$

Therefore, the rational numbers are equal.

ii) $\frac{-3}{9}, \frac{7}{-21}$

$(-3)\times(-21) = 63$
And $7\times 9 = 63$

$\therefore (-3)\times(-21) = 7\times9$

$\frac{-3}{9} = \frac{7}{-21}$

Therefore, the rational numbers are equal.

(iii) $\frac{-8}{-14}, \frac{15}{21}$

$(-8)\times 21 = -168$
And $15\times(-14) = -210$

$(-8)\times 21 \neq 15\times 14$

Therefore, the rational numbers are not equal.

Q22

Answer :

(i) False
For example, −1 is smaller than zero and is a rational number.
(ii)True
All integers can be written with the denominator 1.
(iii) False
Though 0 is an integer, when the denominator is 0, it is not a rational number.
For example, $\frac{1}{0}$ is not a rational number.
(iv)True
(v) False
−1 is a rational number but not a fraction.