19/04/20

## Exercise → 1

There are various different types of numbers system. The different types are as follow -

(i) Natural Numbers - these numbers are used for counting and always ~~stra~~ start with one to infinitely.
Example - 1, 2, 3, 4 . . . . .

(ii) Whole Numbers - this is the set of all natural numbers including 0 to infinitely.
Example 0, 1, 2, 3, 4 . . . . . ∞

(iii) Integers - the set of all whole numbers and their respective negative number is called intergers

(iv) Rational number - Such numbers which and thier respective negative numbers is called the integers can be express in the form of $\frac{p}{q}$ where p and q both are integers and $q \neq 0$, are called Rational number.

(v) Irrational number - An irrational number is real no. that cannot be expressed as a ration of two integers.

Ex "π" or "Pi" (3,14,15,9)

(vi) Terminating decimal → A terminating decimal is usually defined as a decimal number that Contains a finite number of digit after the decimal point.

Example → $\frac{1}{4}$ = $4\overline{)10}$ (.25) = 0.25.

-8
20
-20
0

(vii) Non - terminating decimal - A non - terminating, non - repeating decimal is a decimal number that continues endlessly, with no group of digits repeating endlessly Decimals of this type cannot be represented as fractions, and as a result are irrational numbers.

Example - $\frac{6}{7}$ = 0.857142

Definations -

Natural no. → These no. starts from 1 to infinitely

Whole no. → These no. strats from 0 to infinitely

Intergs. → It iclude natural no. and their inverse.

Rational no. → The no. can be expressed in the form of p/q.

Irrational no. → These no. cannot be expressed in the form of p/q.

Real no → ~~A~~ It contain all rational and irrational no. That can be represented on a no. line.

Prime no. → These no. are greater than 1 only factors and 1 and itself

composite no. → These no. having factors more than factor two.

Ex. 1.1

Q:1 Is zero a rational no? can you write in the form $\frac{p}{q}$. there p and q are integers and $q \neq 0$?

Ans→ yes, zero is rational number
Ex. → $\frac{0}{1}, \frac{0}{2}, \frac{0}{3}, \frac{0}{40}$.

Q:2 Find six rational number between 3 and 4
Ans→ There were infinite rational number between 3 and 4.

$\frac{3}{1} \times \frac{7}{7} = \frac{21}{7}$

$\frac{4}{1} \times \frac{7}{7} = \frac{28}{7}$

$\left[\frac{22}{7}, \frac{23}{7}, \frac{24}{7}, \frac{25}{7}, \frac{26}{7}, \frac{27}{7}\right]$

Q:3 Find the five rational no. between $\frac{3}{5}$ and $\frac{4}{5}$.
Ans→ There were infinite rational no. are present between $\frac{3}{5}$ and $\frac{4}{5}$.

$\frac{3}{5} \times \frac{6}{6} = \frac{18}{30}$

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

$\left[\frac{19}{30}, \frac{20}{30}, \frac{21}{30}, \frac{22}{30}, \frac{23}{30}\right]$

Q:4 State wheather the following statements are true or false.

(i) Every natural no. is a whole no.
Ans → True.
Natural no. → 1, 2, 3 ..........
whole no. → 0, 1, 2, 3 .........

(ii) Every integer is a whole no.
Ans → False
Integers → ...... -2, -1, 0, 1 2 ...... They some integers are negative.
Whole no. → 0, 1, 2, 3, ........ They all are positive

(iii) Every rational no. is a whole no.
Ans → False
Ex. → $\frac{p}{q}$ = ·333 which is not a whole no.

Exercise - 1.2

Q. State wheather the following statements are true or false
Justify your answer.

(i) Each irrational no is a real no.
Ans → Every no. which we can show on line is real no. and irration no. can be express on no. line. So, it is True.

(ii) Every point on the number line is of the form $\sqrt{m}$, where m is a natural number
Ans → False because natural no. are never negative.

(iii) Every real number is an irrational no.
False.

Q.2 Are the square roots of all positive integers irrational? If not, give an ex. of the square root of a no. that is a rational

Ans → No, The square roots of all positive integers is not irrational.

Ex. → $\sqrt{4}$, $\sqrt{9}$, $\sqrt{36}$, $\sqrt{49}$

$= \sqrt{2 \times 2}$ $\quad \sqrt{3 \times 3}$ $\quad \sqrt{6 \times 6}$ $\quad \sqrt{7 \times 7}$

$= 2 = \frac{2}{1}$ $\quad \Rightarrow 3$ $\quad = 6$ $\quad = 7.$

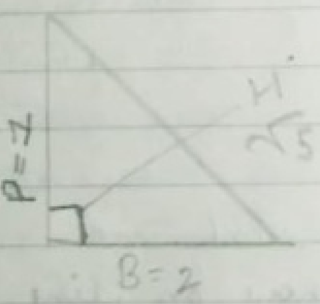
Q 3 Show how $\sqrt{5}$ can be represented on the number line.

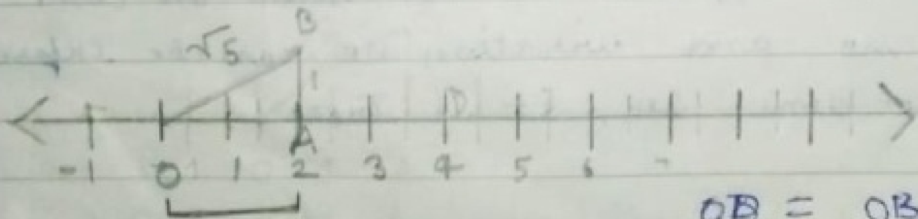
By Pythagoras Th.

$H = \sqrt{P^2 + B^2}$

$H = \sqrt{1^2 + 2^2}$

$H = \sqrt{1 + 4} = \sqrt{5}$

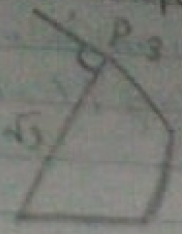



OB = OB = $\sqrt{5}$

B = 2
P = 1

Q4 Classroom activity (construct the square root spiral)




$OP = \sqrt{4}$
$OP^3 = \sqrt{5}$
$OP^4 = \sqrt{6}$
$OP^5 = \sqrt{7}$
$OP^6 = \sqrt{7}$
$OP = \sqrt{3}$

## Ex 1.3

Terminating Decimal Expansion - In this our remainder becomes zero after some times. $\frac{42}{100}$

Non-Terminating Recurring - In this remainder repeats after some time. $\frac{1}{3}$

Non-Terminating Non-Recurring. - In this remainder neither zero not repeat.

Q1 Write the following in decimal form and say what kind of decimal expansion each has:

(i) $\frac{36}{100}$

$100 \overline{)360} \; 0.36$ - Terminating Decimal.

$$\begin{array}{r} 300 \\ \hline 0600 \\ 600 \\ \hline 0 \end{array}$$

vi) $\frac{329}{400}$ =

$$\begin{array}{r|l} 400 & 3290 \;\; 0.8 \\ & -3200 \\ \hline & 00900 \\ & -800 \\ \hline & 1000 \\ & -800 \\ \hline & 2000 \\ & 2000 \\ \hline & 0 \end{array}$$

Terminating decimal

Q. 2 you know that $\frac{1}{7} = 0.\overline{142857}$. Can you predict

What the decimal expansion of $\frac{2}{7}, \frac{3}{7}, \frac{4}{7}, \frac{5}{7}, \frac{6}{7}$ are, without doing the long ~~dufu~~ division, if so, how?

$\frac{1}{7} = \overline{0.142857}$

$\frac{2}{7} = 2 \times \frac{1}{7} = 2 \times 0.142857 = 0.\overline{285714}$

$\frac{3}{7} = 3 \times \frac{1}{7} = 2 \times 0.142857 = \overline{0.428571}$

$\frac{4}{7} = 4 \times \frac{1}{7} = 4 \times 0.142857 = 0.\overline{571428}$

$\frac{5}{7} = 5 \times \frac{1}{7} = 5 \times 0.142857 = 0.\overline{714285}$

$\frac{6}{7} = 6 \times \frac{1}{7} = 6 \times 0.142857 = \overline{0.857142}$

Q:3 Express the following in the form of $\frac{p}{q}$, where p and q are integers and q ≠ 0.

(i) 0.6

Ans → Let $x = 0.666$

Multiply by 10 both side (I)

$10x = 10 \times 0.666$

$10x = 6.666$ (II)

Sub eq (I) from (II)

$10x = 6.666$

$x = 0.666$

$9x = 6.0$

$9x = 6$

$x = \frac{6}{9} = \frac{2}{3}$

$0.\overline{6} = \frac{2}{3}$ Ans.

(ii) $0.4\overline{7}$

$0.4\overline{7} = 0.4777$

Let $x = 0.4777$ (I)

Multiply by, both side.

$10x = 4.777$ (II)

sub both eq. (I) from (II)

$10x = 4.777$

$$10x = 4.777$$
$$x = 0.4777$$
$$9x = 4.30.$$

$$9x = 4.3$$
$$9x = \frac{43}{10}$$
$$x = \frac{43}{10 \times 9}$$
$$x = \frac{43}{90}$$

$$0.\overline{47} = \frac{43}{90}$$

(iii) $0.\overline{001}$

Ans → $0.\overline{001} = 0.001001 \ldots$

Let $x = 0.001\,001 \ldots$ (I)

Multiply by 1000 both.

$1000x = 1.001001.$

Sub (I) from (II)

$$1000x = 1.001001 \ldots$$
$$x = 0.001001 \ldots$$
$$999x = 1.0$$

$$999x = 1$$

$$x = \frac{1}{999}$$

$0.\overline{001} = \frac{1}{999}$ Ans.

Q:4 Express 0.99909 in the form of p/q. Are you surprised by your answer? With your teacher and classmates discuss why the answer make sense.

Ans: $0.\overline{9} = 0.999\ldots$

Let $x = 0.999\ldots \rightarrow$ (I)

Multiply by 10 both sides.

$10x = 9.999\ldots \rightarrow$ (II)

Subtract eq. (I) from (II)

$$\begin{array}{rl} 10x &= 9.999 \\ x &= 0.999 \\ \hline 9x &= 9.0 \end{array}$$

$9x = 9$

$x = \frac{9}{9} = 1$ Answer.

Q.5 What can the maximum no. of digits be in the repeating block of digits in decimal expansion of $\frac{1}{17}$? Perform the division to check your answer?

Ans: $17\overline{)100}(0.\overline{0588235294117647}$

$$\begin{array}{r} 100 \\ -85 \\ \hline 150 \\ -136 \\ \hline 140 \\ -136 \\ \hline 40 \\ -34 \\ \hline 60 \end{array}$$

$$
\begin{array}{r}
-51 \\ \hline
90 \\
-85 \\ \hline
50 \\
-34 \\ \hline
160 \\
-153 \\ \hline
70 \\
-68 \\ \hline
20 \\
-17 \\ \hline
30 \\
-17 \\ \hline
130 \\
-119 \\ \hline
110 \\
-102 \\ \hline
80 \\
-68 \\ \hline
120 \\
-119 \\ \hline
1
\end{array}
$$

Ans. = $0.\overline{0588235294117647}$ = 16 Block.

Q:6 Look at the several ex. of rational no. in the form of p/q (q ≠ 0), where p and q are intergers with no common factors other than 1 and having terminating decimal represtation (expansion). Can you guess what property q must satisfy?

Ans → Example = $\frac{2}{5}$ = 0.4.

$\frac{5}{2} = 2.5$

$\frac{3}{5} = 0.6$

Q must satisfy the - factors of 2 and 5.

$\frac{5}{3} = 1.6666 \ldots$

Q:7 Write 3 no. whose decimal expansion are non Terminating Non-Recurring.

Ans: $\pi = 3.14159 \ldots$

$\sqrt{2} = 1.414 \ldots$

$\sqrt{3} = 1.7$

$0.101001000$

Q:8 Find 3 different irrational no. between the rational no. $\frac{5}{7}$ and $\frac{9}{11}$.

Ans: $\frac{5}{7} = 0.\overline{714285}$

$\frac{9}{11} = 0.81$

$= 0.715889 \ldots$

$= 0.73429 \ldots$ Irrational no.

$= 0.7592, 0.77912 \ldots$

Q:9 Classify the following no. as rational or irrational

(i) $\sqrt{23}$

Ans: $\sqrt{23} = 4.795831$

It is an irrational no.

(ii) $\sqrt{225} = \pm 15.15$.

Ans: Therefore $\sqrt{225}$ is a rational no.

(iii - iv - v) are at Pg no. -

Ex. - 1.3. (Remaining q.-- iii, iv, v)

(iii) 0.3796.

Ans → It is a terminating decimal. Therefore, it is rational no

(iv) 7.478478 .....

Ans → The given no 7.478478 ... is non terminating recurring decimal, which can be converted into $\frac{p}{q}$ form

While converting 7.478478 into $\frac{p}{q}$ form, we get

$x = 7.478478 \ldots$ (a)

$1000x = 7478.478478 \ldots$ (b)

While subtracting a from b, we get

$1000x = 7478.478478 \ldots$

$-x = 7.478478$

$999x = 7471$ $\quad 999x = 7471$ $\quad x = \frac{7471}{999}$

Therefore, 7.478478 is a rational no.

(v) 1.101001000100001 .....

Ans → We can observe that the no 1.101001000100001 ... is a non terminating non-recurring decimal

Thus, non-terminating or non-recurring decimal cannot be converted into $\frac{p}{q}$ form

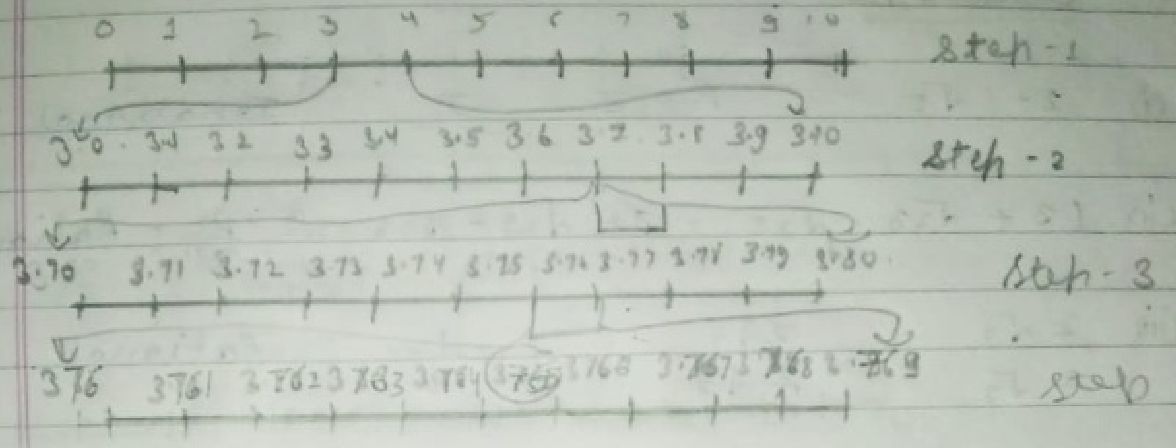
Therefore, we conclude that 1.1010010001000 is an irrational no.

18/4/20.

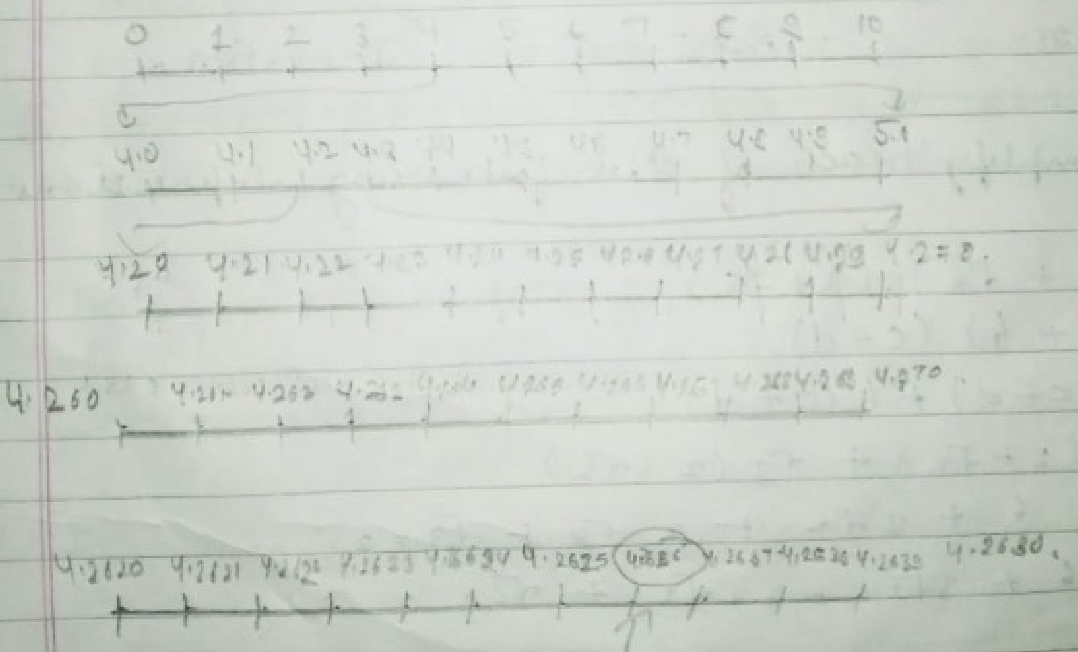
# Ex. - 1.4.

Q:1 Visualise 3.765 on the no. line using successive mangnification.

ans ÷




Q:2 Visualize $4.\overline{26}$ on the no line, upto 4 decim places.



## Ex - 1.5

Q:1 Classify the following no. as rational or irrational.

(i) $2 - \sqrt{5}$ = $R - I = I$ = Irrational

(ii) $(3 + \sqrt{23} - \sqrt{23}$ = $3 + \sqrt{23} - \sqrt{23} = \frac{3}{1}$ $\frac{p}{q}$ = Rational

(iii) $\frac{2\sqrt{7}}{2\sqrt{7}}$ = $\frac{\cancel{2}\cancel{\sqrt{7}}}{\cancel{2}\cancel{\sqrt{7}}}$ = $\frac{1}{1}$ $\frac{1}{q}$ = Rational

(iv) $\frac{1}{\sqrt{2}}$ = $\frac{R}{I}$ = $I$ = Irrational

(v) $2\pi$ = $R \times I = I$ = Irrational

Q.2; Simplify each of the following expressions-

(i) $(3 + \sqrt{3})(2 + \sqrt{2})$

Ans = $(a + b)(c + d)$

$a(c + d) + b(c + d)$

$3(2 + \sqrt{2}) + \sqrt{3}(2 + \sqrt{2})$

$6 + 3\sqrt{2} + 2\sqrt{3} + \sqrt{3} \times 2$

$6 + 3\sqrt{2} + 2\sqrt{3} + \sqrt{6}$.

(ii) $(3 + \sqrt{3}(3 - \sqrt{3})$

Ans = $(a + b)(a - b) = a^2 - b^2$

$3^2 - (\sqrt{3})^3$

$9 - 3 = 6$.

(iii) $(\sqrt{5} + \sqrt{2})^2$

Ans - $(a+b)^2 = a^2 + 2ab + b^2$

$= (\sqrt{5})^2 + 2 \times \sqrt{5} \times \sqrt{2} + (\sqrt{2})^2$

$= 5 + 2 \times \sqrt{5 \times 2} + 2$

$= 5 + 2 + 2\sqrt{10}$

$= 7 + 2\sqrt{10}$

(iv) $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$

Ans - $(a-b)(a+b) = a^2 - b^2$

$= (\sqrt{5})^2 - (\sqrt{2})^2$

$= 5 - 2 \quad 3.$

Q. 3. Recall, $\pi$ is defined as the ratio of all the circumference (say c) of a circle to its diameter (say d) That is $\pi = \frac{c}{d}$. This seems to contradict the fact that $\pi$ is irrational How will you re solve this contradiction.

solve - 1 : $\pi = \frac{c}{d}$ c and d are Rational

But if we calculate $\frac{c}{d}$, it gives $\pi$

$\pi$ is irrational

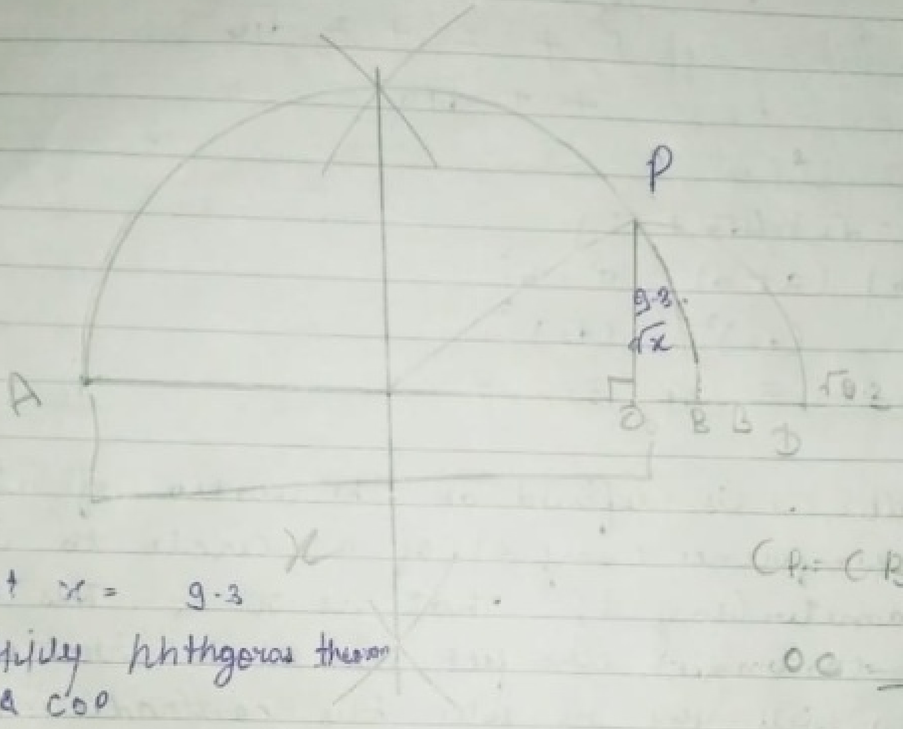
It means either c or d or both are irration

$\frac{I}{R} = R \qquad \frac{R}{I} = I \qquad \frac{I}{I} = I.$

Q: 4 Represent $\sqrt{9.3}$ on the no. line.

Ans > construct

Proof.




let $x = 9.3$

Apply phthgoras theorem

a COP

$H^2 = B^2 + P^2$

$CP^2 - OC^2 \quad OP^2$

$OP^2 = CP^2 - OC^2$

$CP = CB = \frac{x+1}{2}$

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

$OP^2 = \left(\frac{x+1}{2}\right)^2 - \left(\frac{x-1}{2}\right)^2$

$OP^2 = \left[\frac{x^2+2x+1}{4}\right] - \left[\frac{x^2-2x+1}{4}\right]$

Q.5.

$OP^2 = \sqrt{\frac{\cancel{x^2} + 2x + \cancel{1} - \cancel{x^2} + 2x - \cancel{1}}{4}}$

$OP = \sqrt{\frac{4x}{4}}$

$OP = \sqrt{x}$

Q.5 Rationalize the denominators of the following-

(i) $\frac{1}{\sqrt{7}}$

Ans. $\frac{1}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{\sqrt{7}}{\sqrt{7} \times 7} = \frac{\sqrt{7}}{7}$ Ans.

(ii) $\frac{1}{\sqrt{7} - \sqrt{6}}$

Ans. $\frac{1}{\sqrt{7} - \sqrt{6}} \times \frac{\sqrt{7} + \sqrt{6}}{\sqrt{7} + \sqrt{6}} = \frac{\sqrt{7} + \sqrt{6}}{(\sqrt{7})^2 - (\sqrt{6})^2}$

$(a+b) = a^2 - b^2$

$= \frac{\sqrt{7} + \sqrt{6}}{7 - 6} = \frac{\sqrt{7} + \sqrt{6}}{1}$

$\sqrt{7} + \sqrt{6}$ Ans.

(iii) $\frac{1}{\sqrt{5} + \sqrt{2}}$

Ans. $\frac{1}{\sqrt{5} + \sqrt{2}} \times \frac{\sqrt{5} - \sqrt{2}}{\sqrt{5} - \sqrt{2}}$

$(a + b) \quad (a - b) = a^2 - b^2$

$= \frac{\sqrt{5} - \sqrt{2}}{(\sqrt{5})^2 - (\sqrt{2})^2}$

$\frac{\sqrt{5} - \sqrt{2}}{5 - 2} = \frac{\sqrt{5} - \sqrt{2}}{3}$ Ans

(iv) $\frac{1}{\sqrt{7} - 2}$

Ans : $\frac{1}{\sqrt{7}-2} \times \frac{\sqrt{7}+2}{\sqrt{7}+2}$

$\frac{\sqrt{7}+2}{(\sqrt{7})^2 - 2^2}$

$= \frac{\sqrt{7}+2}{\sqrt{7}-4} = \frac{\sqrt{7}+1}{3} =$ Ans.

## Ex. - 1.6.

Q.1 Find :

(i) $64^{\frac{1}{2}}$.

Ans : $64^{\frac{1}{2}}$

$= (2 \times 2 \times 2 \times 2 \times 2 \times 2)^{\frac{1}{2}}$

$= (\underset{3}{2^6})^{\frac{1}{2}}$

$= 2^{6 \times \frac{1}{2}}$

$= 2^3 = 2 \times 2 \times 2 = 8 =$ Ans.

(ii) $32^{\frac{1}{5}}$

Ans : $32^{\frac{1}{5}}$

$= (2^5)^{\frac{1}{5}}$

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

$= 2^1 = 2 =$ Ans.

(iii) $125^{\frac{1}{3}}$

Ans : $125^{\frac{1}{3}}$

$= \frac{1}{5}^{1} =$ Ans.

Q:3 Simplify

(i) $2^{\frac{2}{3}} \quad 2^{\frac{1}{5}}$

$= 2^{\frac{2}{3}} \times 2^{\frac{1}{5}}$

$= 2^{\left(\frac{2}{3}+\frac{1}{5}\right)}$

$= 2^{\left(\frac{2\times5+1\times3}{15}\right)}$

$= 2^{\left(\frac{10+3}{15}\right)}$

$= 2^{\left(\frac{13}{15}\right)} =$ Ans.

(ii) $\left(\frac{1}{3^3}\right)^7$

$= \left(\frac{1}{3^3}\right)^7$

$\frac{1^7}{3^{3\times7}} = \frac{1}{3^{21}} =$ Ans.

(iii) $\frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$

$= \frac{11^{\frac{1}{2}}}{11^{\frac{1}{4}}}$

$11^{\left(\frac{1}{2}-\frac{1}{4}\right)}$

$= 11^{\left(\frac{1\times2-1\times1}{4}\right)}$

$= 11^{\left(\frac{2-1}{4}\right)}$

$= 11^{\left(\frac{1}{4}\right)} =$ Ans