NUMBER SYSTEMS

1. Irrational numbers
2. Real numbers and their Decimal Expansions
3. Representing Real Numbers on the number Line
4. Operations on real numbers
5. Laws of Exponents for Real Numbers

Definition of Irrational number

A number which can not be written in the form of $\frac{p}{q}$, where p and q are integers and q ≠ 0 is called irrational number.

OR

A number which is non-terminating and non recurring decimal is called irrational number

Find the rational numbers between two given numbers

HOME WORK (Date :- 03/04/20)

1. Find 6 rational numbers between 3 and 4
2. Find five rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$
3. Find 3 rational numbers between $\frac{1}{2}$ and $\frac{3}{4}$
4. Find 5 rational numbers between $-\frac{3}{4}$ and $-\frac{1}{2}$
5. Find 24 rational numbers between 0 and 0.1

Express the following rational numbers as decimals and check its terminating or non terminating

HOME WORK (03/04/20)

1) $\frac{33}{8}$ 2) $\frac{17}{4}$ 3) $-\frac{329}{400}$ 4) $\frac{893}{16}$ 5) $\frac{1}{3}$ 6) $\frac{11}{17}$ 7) $2\frac{5}{12}$ 8) $\frac{15}{4}$

9) $\frac{-17}{8}$ 10) $\frac{327}{500}$ 11) $\frac{13}{80}$ 12) $\frac{-2}{3}$ 13) $\frac{6}{7}$

14) $\frac{11}{24}$ 15) $\frac{22}{7}$

EXPRESS EACH OF THE FOLLOWING DECIMAL IN THE FROM OF $\frac{P}{Q}$

1. 0.41
2. 2.35
3. 8.010
4. 2.002

Express each of the following as a fraction in simplest from

Home Work (04/04/20)

1) $0.\overline{6}$ 2) $0.\overline{35}$ 3) $5.\overline{2}$ 4) $23.\overline{43}$ 5) $0.\overline{47}$

6) $0.\overline{001}$ 7) $0.12\overline{3}$ 8) $0.003\overline{52}$ 9) $15.7\overline{12}$

10) $0.\overline{621}$ 11) $125.\overline{3}$ 12) $0.\overline{95}$ 13) $2.66\overline{31}$

14) $0.7\overline{43}$

Express $0.7\overline{43}$ in $\frac{p}{q}$ form.

Let x = $0.7\overline{43}$

i.e x = 0.743434343……----------(1)

Multiplying both side by 100

100x = 100 X 0.743434343……

100x = 74.343434343……----------(2)

Subtracting (1) from (2)

100x = 74.34343434……

x = 0.74343434……

99x = 73.60000000……

∴ 99x = 73.6

$$x = \frac{73.6}{99}$$

$$x = \frac{736}{990}$$

Hence $0.7\overline{43} = \frac{368}{495}$

Finding irrational between two given rational numbers

1) Find two irrational numbers between $\frac{1}{7}$ and $\frac{5}{7}$

Sol.:- $\frac{1}{7} = 0.\overline{142857}$ and $\frac{5}{7} = 0.\overline{714285}$

To find the irrational numbers between two given numbers, we generate numbers which are non terminating and non-recurring lying between them.

i.e 0.150200200020002……..

And

0.213021130021113000211113……

HOME WORK (06/04/20)

1) Find two irrational numbers between the following rational numbers
   a) $\frac{5}{7}$ and $\frac{9}{11}$
   b) 0.6161161116…… and 0.683542935
   c) $\sqrt{3}$ and $\sqrt{5}$
   d) 2.3012212221222221…… and 2.3306

Locating $\sqrt{n}$ on real number line for a positive integer n.

Video

Home work (06/04/20)

Locate the following on number line

1) $\sqrt{2}$ 2) $\sqrt{3}$ 4) $\sqrt{4}$ 3) $\sqrt{5}$

4) $\sqrt{6}$ 5) $\sqrt{7}$ 6) $\sqrt{8}$ 8) $\sqrt{9}$

7) $\sqrt{10}$ 8) $\sqrt{11}$ 9) $\sqrt{13}$ 10) $\sqrt{17}$

Decimal Representation of real numbers on number line

Video -6

Home work (07/04/20)

Visualize the following on the number line, using successive magnification

1) 3.765
2) $4.\overline{26}$
3) $6.2\overline{7}$
4) 3.448
5) 3.755
6) $2.\overline{26}$
7) $4.2\overline{7}$

Operations on real numbers

This topic I will take in school during regular class

Representation of $\sqrt{9.3}$ on the number line

- Video

REPRESENTATION OF THE FOLLOWING NUMBER ON NUMBER LINE

1) $\sqrt{5.6}$ 2) $\sqrt{9.2}$ 3) $\sqrt{3.2}$

4) $\sqrt{6.3}$ 5) $\sqrt{1.7}$

LAW'S OF EXPONENTS

1) $a^m \times a^n = a^{m+n}$

2) $\frac{a^m}{a^n} = a^{m-n}$

3) $(a^m)^n = a^{mn}$

4) $(ab)^m = a^m \times b^m$

5) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

6) $a^{-n} = \frac{1}{a^n}$

7) $a^0 = 1$

Find the following

a) $(16)^{\frac{1}{2}}$ b) $(125)^{\frac{1}{3}}$ c) $(625)^{\frac{1}{4}}$ d) $(9)^{\frac{1}{2}}$

e) $(64)^{\frac{1}{2}}$ f) $(125)^{\frac{-1}{3}}$ g) $(243)^{\frac{-1}{5}}$

Sol: $(125)^{\frac{-1}{3}}$

5	125
5	25
5	5
	1

$(5^3)^{\frac{-1}{3}}$

5^{-1}

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

Find the following

a) $2^{\frac{1}{3}} \cdot 2^{\frac{3}{4}}$

b) $2^{\frac{2}{3}} \cdot 2^{\frac{1}{3}}$

c) $11^{\frac{1}{2}} \cdot 11^{\frac{1}{4}}$

d) $\dfrac{2^{\frac{1}{8}}}{4^{\frac{1}{6}}}$

e) $\dfrac{11^{\frac{1}{6}}}{11^{\frac{2}{6}}}$

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

g) $\left(4^{\frac{5}{2}}\right)^{\frac{4}{5}}$

Home work (08/04/20)

3. Find the following

(i) $4^{2/3} \cdot 8^{2/3}$ (ii) $3^3 (27)^3$ (iii) $2^8 \cdot (16)^4$ (iv) $2^8 \cdot 3^8$ (v) $3^{10} \cdot 4^5$ (vi) $\frac{4^5}{16^5}$

(vii) $13^{1/5} \cdot 17^{1/5}$ (viii) $\frac{7^{1/5}}{7^{1/3}}$ (ix) π^0 (x) $8^{1/2} \cdot 16^{1/4}$ (ix) $7^{1/4}$

4. Evaluate : (i) $\left[\left(\frac{25}{9}\right)^{\frac{5}{2}}\right]^{\frac{3}{5}}$ (ii) $\left(\frac{25}{9}\right)^{\frac{5}{2}\times\frac{3}{5}}$ and show that their values are equal.

5. Verify that $\left(\frac{8}{125}\right)^{\frac{2}{3}} \times \left(\frac{64}{27}\right)^{\frac{2}{3}} = \left(\frac{8}{125} \times \frac{64}{27}\right)^{\frac{2}{3}}$

6. Evaluate :

(i) $\left(\frac{16}{81}\right)^{\frac{5}{4}}$ (ii) $\left(\frac{125}{27}\right)^{\frac{4}{3}}$

7. Evaluate :

(i) $8^{-\frac{2}{3}}$ (ii) $343^{-\frac{1}{3}}$ (iii) $\left(\frac{25}{81}\right)^{-\frac{3}{2}}$ (iv) $\left(\frac{32}{243}\right)^{-\frac{4}{5}}$

8. Simplify :

(i) $\left(\frac{81}{625}\right)^{\frac{3}{4}} \times \left(\frac{81}{625}\right)^{\frac{1}{4}}$ (ii) $\left(\frac{27}{125}\right) \times \left(\frac{27}{125}\right)^{-\frac{4}{3}}$

9. Evaluate :

(i) $\left(\frac{81}{625}\right)^{\frac{3}{4}} \div \left(\frac{81}{625}\right)^{\frac{1}{4}}$ (ii) $\left(\frac{81}{625}\right)^{\frac{3}{4}-\frac{1}{4}}$

10. Simplify :

(i) $15^{\frac{3}{2}} \div \left(\frac{1}{5}\right)^{\frac{1}{2}}$ (ii) $64^{-\frac{2}{3}} \times 27^{-\frac{2}{3}}$

11. Simplify each of the following :

(i) $(64)^{1/3} \times (64)^{2/3} \times (64)^{-4/3}$ (ii) $\left(\frac{27}{125}\right)^{-2/3} \times \left(\frac{27}{125}\right)^{-4/3}$ (ii) $\left(\frac{27}{125}\right)^{-2/3} + \left(\frac{27}{125}\right)^{-4/3}$

(iv) $(0.125)^{2/3}$ (v) $\left(13^2 - 5^2\right)^{3/2}$ (vi) $\left(1^3 + 2^3 + 3^3 + 4^3\right)^{-3/2}$

Additional Home work (08/04/20)

12. Simplify the expression and eliminate any negative exponents. Assume that all letters denote positive numbers.

(*i*) $(2x^4y^{-4/5})^3(8y^2)^{2/3}$ (*ii*) $\left(\frac{-2x^{1/3}}{y^{1/2}z^{1/6}}\right)^4$ (*iii*) $\frac{(y^{10}z^{-5})^{1/5}}{(y^{-2}z^3)^{1/3}}$

(*iv*) $\frac{(9st)^{3/2}}{(27s^3t^{-4})^{2/3}}$ (*v*) $\left(\frac{a^2b^{-3}}{x^{-1}y^2}\right)^3\left(\frac{x^{-2}b^{-1}}{a^{3/2}y^{1/3}}\right)$ (*vi*) $\left(\frac{xy^{-2}z^{-3}}{x^2y^3z^{-4}}\right)^{-3}$

13. Prove that

(*i*) $\left(\frac{64}{125}\right)^{-2/3}+\frac{1}{\left(\frac{256}{625}\right)^{1/4}}+\frac{\sqrt{25}}{\sqrt{64}}=\frac{65}{16}$ (*ii*) $\sqrt{3\times5^{-3}}+\sqrt[3]{3^{-1}}\cdot\sqrt{5}\times\sqrt[6]{3\times5^4}=\frac{3}{5}$

14. If $2^{5x}+2^x=\sqrt[5]{2^{20}}$, find x.

15. Find x if $\left(\frac{2}{3}\right)^x\left(\frac{3}{2}\right)^{2x}=\frac{81}{16}$

16. Find x if $5.9^x=3^{2x+2}-324$

17. Find x if

(*i*) $2^{3x-6}\cdot3^{2x-3}=216$ (*ii*) $\left(\frac{3}{5}\right)^x\left(\frac{5}{3}\right)^{2x}=\frac{125}{27}$ (*iii*) $5^{x-3}\cdot3^{2x-8}=225$

18. Show that :

(*i*) $\frac{(x^{a+b})^2(x^{b+c})^2(x^{c+a})^2}{(x^ax^bx^c)^4}=1$ (*ii*) $\left(\frac{x^{a^2+b^2}}{x^{-ab}}\right)^{a-b}\cdot\left(\frac{x^{b^2+c^2}}{x^{-bc}}\right)^{b-c}\cdot\left(\frac{x^{c^2+a^2}}{x^{-ca}}\right)^{c-a}=1$

19. Prove that :

(*i*) $\frac{a^{-1}}{a^{-1}+b^{-1}}+\frac{a^{-1}}{a^{-1}-b^{-1}}=\frac{2b^2}{b^2-a^2}$ (*ii*) $\frac{1}{1+a^{x-y}}+\frac{1}{1+a^{y-x}}=1$

20. If $xyz=1$, show that

$$\frac{1}{1+x+y^{-1}}+\frac{1}{1+y+z^{-1}}+\frac{1}{1+z+x^{-1}}=1$$

21. Show that $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=0$, if it is given that $2^x=3^y=6^{-z}$.