

## Class 9 Number System study Material

Q. Define rational number and irrational Number?

Q. Prove that (i)  $\sqrt{3} - \sqrt{2}$  (ii)  $2/\sqrt{3}$  are irrational numbers

Q. Represent on each number on number line:

(i)  $3/7$  (ii)  $13/7$  (iii)  $4/9$  (iv)  $2.5$  (v)  $\sqrt{2}$  (vi)  $\sqrt{5}$  (vii)  $\sqrt{4.9}$  (viii)  $(2 + \sqrt{3})$

Q. Visualize the representation of  $5.3\bar{7}$  on the number line upto 5 decimal place. i.e. 5.37777.

Q. Find the three rational numbers between

(i)  $\sqrt{2}$  and  $\sqrt{3}$  (ii)  $1/3$  and  $1/2$  (iii)  $0.2323323332.....$  and  $0.25255255525552.....$

Q. Find two irrational numbers between (i) 2 and 2.5. (ii) 0.12 and 0.13. (iii)  $0.3030030003...and$   
 $0.3010010001.....$

Q. Prove that: (i) Sum and difference of a rational and an irrational number is always an irrational number.

(ii) Sum and difference of two irrational numbers is either rational or irrational number.

(iii) Product of a non-zero rational number with an irrational number is either rational or irrationals

(iv) Product of an irrational with a irrational is not always irrational.

Q. Examine whether the following numbers are rational or irrational:

(i)  $(2 - \sqrt{3})^2$  (ii)  $(\sqrt{2} + \sqrt{3})^2$  (iii)  $(3 + \sqrt{2})(3 - \sqrt{2})$  (iv)  $\sqrt[3]{3}$

Q. What is surd? [SURDS: Any irrational number of the form  $\sqrt[n]{a}$  is given a special name surd. Where 'a' is called Radicand, it should always be a rational number. Also the symbol  $\sqrt[n]{\quad}$  is called the radical sign and the index n is called order of the surd.

Q. Express the following in the form of p/q. (i)  $0.\bar{3}$  (ii)  $0.\overline{37}$  (iii)  $2.2\overline{35}$  (iv)  $0.\overline{621}$

Q. Which is greater is each of the following: (i)  $\sqrt[3]{16}$  and  $\sqrt[5]{8}$  (ii)  $\sqrt{\frac{1}{2}}$  and  $\sqrt[3]{\frac{1}{3}}$

Q. Q. Arrange  $\sqrt{2}$ ,  $\sqrt[3]{3}$  and  $\sqrt[4]{5}$  in ascending order

Q. If  $x = 1/(2+\sqrt{3})$  then find the value of  $x^3 - x^2 - 11x + 3$

Q. if  $x = 3 + \sqrt{8}$  and  $y = 3 - \sqrt{8}$  then find value of  $\frac{1}{x^2} + \frac{1}{y^2}$

Q. Simplify:

(i)  $\sqrt{6} - \sqrt{216} + \sqrt{96} = 15\sqrt{6} - \sqrt{6^2} \times 6 + \sqrt{16 \times 6}$  Ans.  $13\sqrt{6}$

(ii)  $5\sqrt[3]{250} + 7\sqrt[3]{16} - 14\sqrt[3]{54}$  Ans.  $-3\sqrt[3]{2}$

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(iii)  $4\sqrt{3} + 3\sqrt{48} - \frac{5}{2}\sqrt{\frac{1}{3}}$  Ans.  $\frac{91}{6}\sqrt{3}$

Q. Find value of a and b if  $(3 + 2\sqrt{2})/(3 - \sqrt{2}) = a + b\sqrt{2}$

Q. (i) if  $x = 3 - \sqrt{8}$  then show that  $x^3 + \frac{1}{x^3} = 198$  (ii) If  $x = 0.125$ , find the value of  $(\frac{1}{x})^{\frac{1}{3}}$

Q. If  $x = 1 + 2^{1/3} + 2^{2/3}$  then show that  $x^3 - 3x^2 - 3x - 1 = 0$  (ii) 25. If  $x = 9 - 4\sqrt{5}$ , find  $\sqrt{x} - 1/\sqrt{x}$

Q. If  $x = 1 + \sqrt{2} + \sqrt{3}$  then show that  $x^4 - 4x^3 - 4x^2 + 16x - 8 = 0$

Q. Simplify: (i)  $\frac{16 \times 2^{n+1} - 4 \times 2^n}{16 \times 2^{n+2} - 2 \times 2^{n+2}}$  (ii)  $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}}$

Q. Rationalise the denominator of each of the following (i)  $\frac{1}{1+\sqrt{2}-\sqrt{3}}$  (ii)  $\frac{1}{\sqrt{3}+\sqrt{2}-\sqrt{5}}$  (iii)  $\frac{3}{\sqrt[3]{9}}$  (iv)  $\frac{5}{\sqrt[4]{125}}$

Q. If  $a = 9 - 4\sqrt{5}$ , Show that  $(a - \frac{1}{a})^2 = 320$  (ii) If  $x = 1 - \sqrt{2}$ , Show that  $(x - \frac{1}{x})^3 = 8$

Q. Find the value x, (i) if  $5^{x-3} \times 3^{2x-8} = 225$  {ans=5} (ii) if  $3^x = (\frac{1}{27^x})$

Q. If  $x = (\sqrt{2} + 1) \div (\sqrt{2} - 1)$  and  $y = (\sqrt{2} - 1) \div (\sqrt{2} + 1)$  find the value of  $x^2 + y^2 + xy$  {Ans: 35}

Q. if  $x = 7 + 4\sqrt{3}$  and  $xy = 1$ . Find  $\frac{1}{x^2} + \frac{1}{y^2}$  {Ans: 194}

Q. If  $9^{x+2} = 240 + 9^x$ , then find value of x {ans: 1/2}

Q. if  $x = \frac{\sqrt{p+2q} + \sqrt{p-2q}}{\sqrt{p+2q} - \sqrt{p-2q}}$  then show that  $qx^2 - px + q = 0$

Q. (i) Show that  $\frac{1}{1+a^{x-y}} + \frac{1}{1+a^{y-x}} = 1$  (ii) Show that  $\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} = 5$

Q. (i) if  $x^2 + \frac{1}{x^2} = 14$  then find the value of x (ii) Find the product  $\sqrt[3]{2} \times \sqrt[4]{2} \times \sqrt[12]{32}$

Q. Find the value of x if  $\sqrt{15 - x\sqrt{14}} = \sqrt{8} - \sqrt{7}$  {ans = 4}

Q. if  $\frac{1+\sqrt{2}}{1-\sqrt{2}} + \frac{1-\sqrt{2}}{1+\sqrt{2}} = a + b\sqrt{2}$ , then find a and b

Q. Prove that:  $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \dots + \frac{1}{\sqrt{8}+3} = 2$