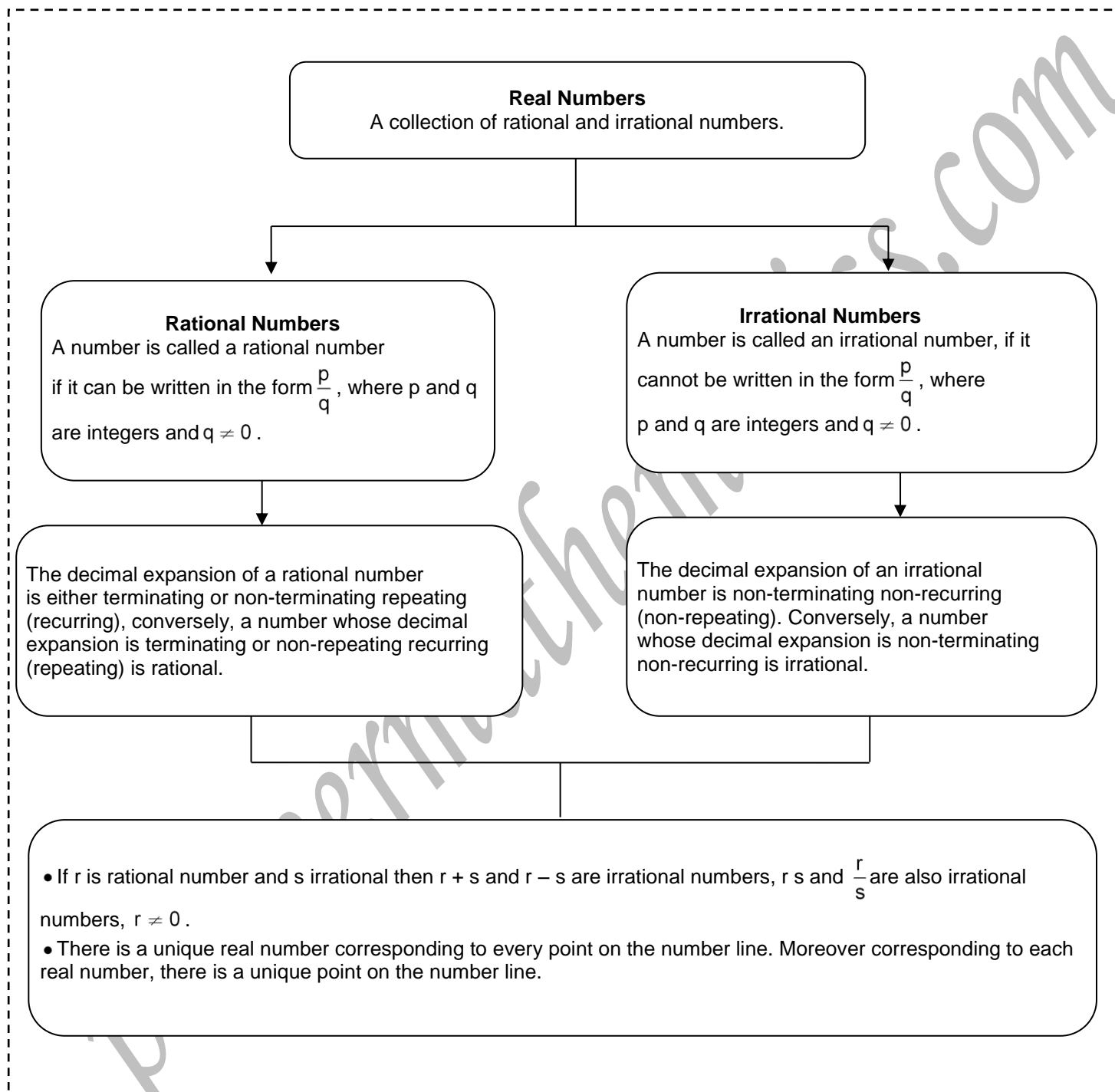


Number System

Chapter Flowchart

The Chapter Flowcharts give you the gist of the chapter flow in a single glance.



Let $a > 0$ be a real number and n be a positive integer. Then $\sqrt[n]{a} = b$, if $b^n = a$ and $b > 0$. The symbol ' $\sqrt{\quad}$ ' used in $\sqrt[n]{a}$, is called the radical sign.

Laws of Exponents

If a, b are positive real numbers and m, n are rational numbers. Then, we have

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

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

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

$$(iv) a^{-m} = \frac{1}{a^m}$$

$$(v) a^m b^m = (ab)^m$$

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

$$(vii) (a^m)^{\frac{1}{n}} = (a^{\frac{1}{n}})^m = a^{\frac{m}{n}}$$

$$\text{i.e., } \sqrt[n]{a^m} = (\sqrt[n]{a})^m = a^{\frac{m}{n}}$$

If a and b are positive integers, then

$$(i) \text{Rationalising factor of } \frac{1}{\sqrt{a}} \text{ is } \sqrt{a}$$

$$(ii) \text{Rationalising factor of } \frac{1}{a \pm \sqrt{b}} \text{ is } a \mp \sqrt{b}$$

$$(iii) \text{Rationalising factor of } \frac{1}{\sqrt{a} \pm \sqrt{b}} \text{ is } \sqrt{a} \mp \sqrt{b}$$

Revision Question Bank

1. Prove that: $9^{3/2} - 3 \times 5^0 - \left(\frac{1}{81}\right)^{-1/2} = 15$
2. Express $0.\overline{1416}$ in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
3. Find the value of $\frac{1}{\sqrt{10}}$, when $\sqrt{10} = 3.162$.
4. Write the rational number $\frac{329}{400}$ in decimal form. Also, find the kind of decimal expansion.
5. Find the value of $\left(\frac{64}{125}\right)^{-213} + \frac{1}{\left(\frac{256}{625}\right)^{1/4}} + \frac{\sqrt{25}}{\sqrt[3]{64}}$.
6. If $x = 3 + 2\sqrt{2}$, then find whether $x + \frac{1}{x}$ is rational or irrational.
7. Represent $\sqrt{7.3}$ on the number line.
8. Express with rational denominator $\frac{1}{\sqrt{2} + \sqrt{3} + \sqrt{5}}$.
9. If $a = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ and $b = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}$, then find the value of $a^2 + b^2 - 5ab$.
10. Simplify $\frac{1}{2 + \sqrt{5}} + \frac{1}{\sqrt{5} + \sqrt{6}} + \frac{1}{\sqrt{6} + \sqrt{7}} + \frac{1}{\sqrt{7} + \sqrt{8}}$.

Answers

2. $\frac{472}{333}$

3. 0.03162.

4. 0.8225, terminating.

5. 65/16.

6. 6, rational.

8. $\frac{2\sqrt{3} + 3\sqrt{2} - \sqrt{30}}{12}$

9. -33

10. $2(\sqrt{2} - 1)$

Previous Years Question Bank

1. Simplify: $13\sqrt[5]{32} - 7\sqrt[4]{625} + \sqrt[3]{729}$. [CBSE Schools 2016-17]
2. Insert eight rational numbers between 2 and 3. [CBSE Schools 2016-17]
3. Represent $\sqrt{10.5}$ on the number line. [CBSE Schools 2016-17]
4. Find the value of a and b, if $\frac{7+\sqrt{3}}{7-\sqrt{3}} - \frac{7-\sqrt{3}}{7+\sqrt{3}} = a + \sqrt{3}b$. [CBSE Schools 2016-17]
5. If $x = 9 - 4\sqrt{5}$, find $x^2 + \frac{1}{x^2}$. [CBSE Schools 2016-17]
6. Simplify $\sqrt{x^3}^{\frac{2}{3}}$ [CBSE Schools 2016-17]
7. Express the rational number $0.\bar{9}$ in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$. [CBSE Schools 2016-17]
8. If $x = \frac{\sqrt{2}+1}{\sqrt{2}-1}$ and $y = \frac{\sqrt{2}-1}{\sqrt{2}+1}$, find the value of $x^2 + y^2 + xy$. [CBSE Schools 2016-17]
9. Simplify: $\left(\frac{81}{16}\right)^{-3/4} \times \left[\left(\frac{25}{9}\right)^{-3/2} \div \left(\frac{5}{2}\right)^{-3}\right]$ [CBSE Schools 2016-17]
10. Find the value of $\frac{3\sqrt{12}}{6\sqrt{27}}$ [CBSE Schools 2016-17]
11. Find four rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$. [CBSE Schools 2016-17]
12. Let a and b be rational and irrational numbers respectively. Is $a + b$ an irrational number? Justify your answer. [CBSE Schools 2016-17]
13. If $x = \frac{\sqrt{2}-1}{\sqrt{2}+1}$ and $y = \frac{\sqrt{2}+1}{\sqrt{2}-1}$; then find the value of $x^2 + 5xy - y^2$. [CBSE Schools 2016-17]
14. Find the value of $8\sqrt{6} \times 2\sqrt{3}$. [CBSE Schools 2016-17]
15. Represent $1.\bar{27}$ in the form $\frac{p}{q}$ where p and q are integers, $q \neq 0$. [CBSE Schools 2016-17]
16. Represent $5\sqrt{2}$ on a number line. [CBSE Schools 2016-17]
17. If $x = \frac{1}{\sqrt{a}-\sqrt{b}}$, then prove that $(a-b)^2x^2 + (a-b)x - (a+b) = \sqrt{a} + \sqrt{b} + 2\sqrt{a}\sqrt{b}$. [CBSE Schools 2016-17]
18. Simplify $\frac{16 \times 2^{n+1} - 4 \times 2^n}{16 \times 2^{n+2} - 2 \times 2^{n+2}}$ [CBSE Schools 2016-17]
19. Write $\frac{3}{13}$ in decimal form and state what kind of decimal expansion does it have? [CBSE Schools 2016-17]
20. Rationalise the denominator of $\frac{4}{2+\sqrt{3}+\sqrt{7}}$ [CBSE Schools 2016-17]
21. If $x + \frac{1}{x} = 3$, find $x^4 + \frac{1}{x^4}$. [CBSE Schools 2016-17]

22. If $x = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ and $y = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$, then show that $x^2 + xy + y^2 = 99$. [CBSE Schools 2016-17]
23. Find the decimal representation of $\frac{-16}{15}$. [CBSE Schools 2015-16]
24. Express $18.\overline{48}$ in the form of p/q , where p and q are integers, $q \neq 0$ [CBSE Schools 2015-16]
25. Express $0.\overline{125}$ in form $\frac{p}{q}$, where p and q are integers, $q \neq 0$ [CBSE Schools 2015-16]
26. Show that $0.2\overline{35}$ can be expressed in the form of p/q where 'p' and 'q' are integers and $q \neq 0$. [CBSE Schools 2015-16]
27. Give an example of two irrational numbers whose:
 (i) difference is a rational number. (ii) sum is a rational number.
 (iii) product is a rational number. (iv) division is a rational number. Justify also. [CBSE Schools 2015-16]
28. Represent $\sqrt{5.3}$ on number line. Write steps of construction also. [CBSE Schools 2015-16]
29. If $a = \frac{1}{3-\sqrt{11}}$ and $b = \frac{1}{a}$, then find. $a^2 - b^2$ [CBSE Schools 2015,16]
30. If $a = \frac{1-\sqrt{7}}{1+\sqrt{7}}$ and $b = \frac{1+\sqrt{7}}{1-\sqrt{7}}$, then find the value of $\frac{a^2+ab+b^2}{a^2-ab+b^2}$. [CBSE Schools 2015-16]
31. If 'a' and 'b' are rational numbers and $\frac{\sqrt{11}-\sqrt{7}}{\sqrt{11}+\sqrt{7}} = a - b\sqrt{77}$, then find the values of 'a' and 'b'. [CBSE Schools 2015-16]
32. Find the value of $(81)^{0.16} \times (81)^{0.09}$ [CBSE Schools 2014-15]
33. Express $0.\overline{61}$ in $\frac{p}{q}$ form. [CBSE Schools 2014-15]
34. Find two rational numbers between 2 and 5. [CBSE Schools 2014-15]
35. Locate $\sqrt{5}$ on the number line. [CBSE Schools 2015,17]
36. If $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}} = a + b\sqrt{15}$. Find the values of a and b . [CBSE Schools 2014-15]
37. Simplify: $3 \cdot 3^{\frac{1}{3}} - \sqrt[3]{3}$ [CBSE Schools 2014-15]
38. Express $0.2\overline{35}$ in the $\frac{p}{q}$ form, where p and q are integers and $q \neq 0$. [CBSE Schools 2014-15]
39. If $2^x \left[\left(\frac{256}{81} \right)^x \right]^{1/4} = \frac{64}{9}$, find the value of x . [CBSE Schools 2014-15]
40. Find the value of: $\sqrt[12]{512^4}^{1/3}$. [CBSE Schools 2014-15]
41. Find two rational numbers between $3\frac{2}{3}$ and $3\frac{2}{4}$. [CBSE Schools 2014-15]
42. Simplify the expression: $\sqrt{3} + 1 \left(1 - \sqrt{12} + \frac{9}{\sqrt{3} + \sqrt{12}} \right)$ [CBSE Schools 2014-15]

Chapter Test

Maximum Marks: 30

Maximum Time: 1 hour

1. Find the value of x, if $2^4 \times 2^5 = 2^{3x}$. [1]
2. Find two rational numbers between $\frac{3}{5}$ and $\frac{4}{5}$. [1]
3. Express $1.\overline{27}$ as a vulgar fraction. [2]
4. Find two irrational numbers between 0.12 & 0.13. [2]
5. Simplify : $\sqrt[4]{\sqrt[3]{x^2}}$. [2]
6. Is the product of rational and irrational numbers is always irrational? Justify. [2]
7. $\frac{\sqrt{5} + \sqrt{3}}{\sqrt{5} - \sqrt{3}} = a - \sqrt{5}b$, then find the value of a and b. [3]
8. Simplify : $\left(\frac{5^{-1} \times 7^2}{5^2 \times 7^{-4}}\right)^{\frac{7}{2}} \times \left(\frac{5^{-2} \times 7^3}{5^3 \times 7^{-5}}\right)^{\frac{5}{2}}$. [3]
9. Represents $1 + \sqrt{3}$ on the number line. [3]
10. If $\sqrt{3} = 1.73205$, then what is the value of $\sqrt{2} \times \sqrt{\frac{\sqrt{3}-1}{\sqrt{3}+1}}$? [3]
11. Simplify: $\frac{7\sqrt{3}}{\sqrt{10} + \sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6} + \sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15} + 3\sqrt{2}}$. [4]
12. Express in a rational denominator $\frac{3}{\sqrt{3} - \sqrt{2} + \sqrt{5}}$. [4]

Answers

1. 3

2. $\frac{19}{30}, \frac{2}{3}$

3. 14/11

4. 0.12010010001.....,

0.12101001000.....

5. $x^{1/6}$ 6. No, for example, $0 \times \sqrt{2} = 0$, which is rational

7. a=4, b=-1

8. 175

10. 0.73205

11. 1

12. $\frac{\sqrt{30} + 2\sqrt{3} - 3\sqrt{2}}{4}$ For Solutions: www.pioneermathematics.com/latestupdates