

Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 2.3- Real Numbers

BOOK SOLUTIONS
CLASS 9
MATHS

CHAPTER 2.3
Real Numbers



Maharashtra Board Solutions→

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Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 2.3- Real Numbers

Class 9: Maths Chapter 2.3 solutions. Complete Class 9 Maths Chapter 2.3 Notes.

Maharashtra Board Solutions Class 9-Maths (Part 1): Chapter 2.3- Real Numbers

Maharashtra Board 9th Maths Chapter 2.3, Class 9 Maths Chapter 2.3 solutions

Question 1.

State the order of the surds given below.

i. $\sqrt[3]{7}$

ii. $5\sqrt{12}$

iii. $\sqrt[4]{10}$

iv. $\sqrt{39}$

v. $\sqrt[3]{18}$

Answer:

i. 3, ii. 2, iii. 4, iv. 2, v. 3

Question 2.

State which of the following are surds Justify. [2 Marks each]

i. $\sqrt[3]{51}$

ii. $\sqrt[4]{16}$

iii. $\sqrt[3]{81}$

iv. $\sqrt{256}$

v. $\sqrt[3]{64}$

vi. $\sqrt{\frac{22}{7}}$

Answer:

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i. $51-\sqrt{3}$ is a surd because 51 is a positive rational number, 3 is a positive integer greater than 1 and $51-\sqrt{3}$ is irrational.

ii. $16-\sqrt{4}$ is not a surd because

$$\begin{aligned}\sqrt[4]{16} &= (16)^{\frac{1}{4}} \\ &= (2^4)^{\frac{1}{4}}\end{aligned}$$

= 2, which is not an irrational number.

iii. $81-\sqrt{5}$ is a surd because 81 is a positive rational number, 5 is a positive integer greater than 1 and $81-\sqrt{5}$ is irrational.

iv. $256-\sqrt{\quad}$ is not a surd because

$$\begin{aligned}\sqrt{256} &= (256)^{\frac{1}{2}} \\ &= (16^2)^{\frac{1}{2}}\end{aligned}$$

= 16, which is not an irrational number.

v. $64-\sqrt{3}$ is not a surd because

$$\begin{aligned}\sqrt[3]{64} &= (64)^{\frac{1}{3}} \\ &= (4^3)^{\frac{1}{3}}\end{aligned}$$

= 4, which is not an irrational number.

vi. $227-\sqrt{\quad}$ is a surd because 227 is a positive rational number, 2 is a positive integer greater than 1 and $227-\sqrt{\quad}$ is irrational.

Question 3.

Classify the given pair of surds into like surds and unlike surds. [2 Marks each]

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i. $\sqrt{52}, 5\sqrt{13}$

ii. $\sqrt{68}, 5\sqrt{3}$

iii. $4\sqrt{18}, 7\sqrt{2}$

iv. $19\sqrt{12}, 6\sqrt{3}$

v. $5\sqrt{22}, 7\sqrt{33}$

vi. $5\sqrt{5}, \sqrt{75}$

Solution:

If the order of the surds and the radicands are same, then the surds are like surds.

$$\sqrt{52}, 5\sqrt{13}$$

$$\sqrt{52} = \sqrt{4 \times 13}$$

$$= \sqrt{4} \times \sqrt{13}$$

$$= 2\sqrt{13}$$

Here, the order of $2\sqrt{13}$ and $5\sqrt{13}$ is same and their radicands are also same.

$\therefore 2\sqrt{13}$ and $5\sqrt{13}$ are like surds.

ii. $\sqrt{68}, 5\sqrt{3}$

$$\sqrt{68} = \sqrt{4 \times 17}$$

$$= \sqrt{4} \times \sqrt{17}$$

$$= 2\sqrt{17}$$

Here, the order of $2\sqrt{17}$ and $5\sqrt{3}$ is same but their radicands are not.

$\therefore 2\sqrt{17}$ and $5\sqrt{3}$ are unlike surds.

iii. $4\sqrt{18}, 7\sqrt{2}$

$$4\sqrt{18} = 4 \times \sqrt{9 \times 2}$$

$$= 4 \times \sqrt{9} \times \sqrt{2}$$

$$= 4 \times 3\sqrt{2}$$

$$= 12\sqrt{2}$$

Here, the order of $12\sqrt{2}$ and $7\sqrt{2}$ is same and their radicands are also same.

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$\therefore 418\sqrt{}$ and $72\sqrt{}$ are like surds.

iv. $19\sqrt{12}, 6\sqrt{3}$

$$\begin{aligned}19\sqrt{12} &= 19 \times \sqrt{4 \times 3} \\&= 19 \times \sqrt{4} \times \sqrt{3} \\&= 19 \times 2\sqrt{3} \\&= 38\sqrt{3}\end{aligned}$$

Here, the order of $383\sqrt{}$ and $63\sqrt{}$ is same and their radicands are also same.

$\therefore 1912\sqrt{}$ and $63\sqrt{}$ are like surds.

v. $522\sqrt{}, 733\sqrt{}$

Here, the order of $522\sqrt{}$ and $733\sqrt{}$ is same but their radicands are not.

$\therefore 522\sqrt{}$ and $733\sqrt{}$ are unlike surds.

vi. $5\sqrt{5}, \sqrt{75}$

$$\begin{aligned}\sqrt{75} &= \sqrt{25 \times 3} \\&= \sqrt{25} \times \sqrt{3} \\&= 5\sqrt{3}\end{aligned}$$

Here, the order of $5\sqrt{5}$ and $5\sqrt{3}$ is same but their radicands are not.

$\therefore 5\sqrt{5}$ and $\sqrt{75}$ are unlike surds.

Question 4.

Simplify the following surds.

i. $\sqrt{27}$ ii. $\sqrt{50}$ iii. $\sqrt{250}$

iv. $\sqrt{112}$ v. $\sqrt{168}$

Solution:

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$$\begin{aligned}\text{i. } \sqrt{27} &= \sqrt{9 \times 3} \\ &= \sqrt{9} \times \sqrt{3} \\ &= 3\sqrt{3}\end{aligned}$$

$$\begin{aligned}\text{ii. } \sqrt{50} &= \sqrt{25 \times 2} \\ &= \sqrt{25} \times \sqrt{2} \\ &= 5\sqrt{2}\end{aligned}$$

$$\begin{aligned}\text{iii. } \sqrt{250} &= \sqrt{25 \times 10} \\ &= \sqrt{25} \times \sqrt{10} \\ &= 5\sqrt{10}\end{aligned}$$

$$\begin{aligned}\text{iv. } \sqrt{112} &= \sqrt{16 \times 7} \\ &= \sqrt{16} \times \sqrt{7} \\ &= 4\sqrt{7}\end{aligned}$$

$$\begin{aligned}\text{v. } \sqrt{168} &= \sqrt{4 \times 42} \\ &= \sqrt{4} \times \sqrt{42} \\ &= 2\sqrt{42}\end{aligned}$$

Question 5.

Compare the following pair of surds.

$$\text{i. } 7\sqrt{2}, 5\sqrt{3}$$

$$\text{ii. } \sqrt{247}, \sqrt{274}$$

$$\text{iii. } 2\sqrt{7}, \sqrt{28}$$

$$\text{iv. } 5\sqrt{5}, 7\sqrt{2}$$

$$\text{v. } 4\sqrt{42}, 9\sqrt{2}$$

$$\text{vi. } 5\sqrt{3}, 9$$

$$\text{vii. } 7, 2\sqrt{5}$$

Solution:

i. $7\sqrt{2} = \sqrt{49} \times \sqrt{2} = \sqrt{98}$

$$5\sqrt{3} = \sqrt{25} \times \sqrt{3} = \sqrt{75}$$

Since, $98 > 75$

$$\therefore \sqrt{98} > \sqrt{75}$$

$$\therefore 7\sqrt{2} > 5\sqrt{3}$$

ii. Since, $247 < 274$

$$\therefore \sqrt{247} < \sqrt{274}$$

iii. $2\sqrt{7} = \sqrt{4} \times \sqrt{7} = \sqrt{28}$

Since, $28 = 28$

$$\therefore \sqrt{28} = \sqrt{28}$$

$$\therefore 2\sqrt{7} = \sqrt{28}$$

iv. $5\sqrt{5} = \sqrt{25} \times \sqrt{5} = \sqrt{125}$

$$7\sqrt{2} = \sqrt{49} \times \sqrt{2} = \sqrt{98}$$

Since, $125 > 98$

$$\therefore \sqrt{125} > \sqrt{98}$$

$$\therefore 5\sqrt{5} > 7\sqrt{2}$$

$$\begin{aligned}\text{v.} \quad 4\sqrt{42} &= \sqrt{16} \times \sqrt{42} = \sqrt{672} \\ 9\sqrt{2} &= \sqrt{81} \times \sqrt{2} = \sqrt{162}\end{aligned}$$

Since, $672 > 162$

$$\therefore \sqrt{672} > \sqrt{162}$$

$$\therefore 4\sqrt{42} > 9\sqrt{2}$$

$$\begin{aligned}\text{vi.} \quad 5\sqrt{3} &= \sqrt{25} \times \sqrt{3} = \sqrt{75} \\ 9 &= \sqrt{81}\end{aligned}$$

Since, $75 < 81$

$$\therefore \sqrt{75} < \sqrt{81}$$

$$\therefore 5\sqrt{3} < 9$$

$$\begin{aligned}\text{vii.} \quad 7 &= \sqrt{49} \\ 2\sqrt{5} &= \sqrt{4} \times \sqrt{5} = \sqrt{20}\end{aligned}$$

Since, $49 > 20$

$$\therefore \sqrt{49} > \sqrt{20}$$

$$\therefore 7 > 2\sqrt{5}$$

Question 6.

Simplify.

$$\text{i.} \quad 5\sqrt{3} + 8\sqrt{3}$$

$$\text{ii.} \quad 9\sqrt{5} - 4\sqrt{5} + \sqrt{125}$$

$$\text{iii.} \quad 7\sqrt{48} - \sqrt{27} - \sqrt{3}$$

$$\text{iv.} \quad \sqrt{7} - \frac{3}{5}\sqrt{7} + 2\sqrt{7}$$

Solution:

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i. $5\sqrt{3} + 8\sqrt{3} = (5+8)\sqrt{3} = 13\sqrt{3}$

$\therefore 5\sqrt{3} + 8\sqrt{3} = 13\sqrt{3}$

ii. $9\sqrt{5} - 4\sqrt{5} + \sqrt{125}$

$$= 9\sqrt{5} - 4\sqrt{5} + \sqrt{25 \times 5}$$

$$= 9\sqrt{5} - 4\sqrt{5} + \sqrt{25} \times \sqrt{5}$$

$$= 9\sqrt{5} - 4\sqrt{5} + 5\sqrt{5}$$

$$= (9 - 4 + 5)\sqrt{5}$$

$$= 10\sqrt{5}$$

$\therefore 9\sqrt{5} - 4\sqrt{5} + \sqrt{125} = 10\sqrt{5}$

iii. $7\sqrt{48} - \sqrt{27} - \sqrt{3}$

$$= 7\sqrt{16 \times 3} - \sqrt{9 \times 3} - \sqrt{3}$$

$$= 7 \times \sqrt{16} \times \sqrt{3} - \sqrt{9} \times \sqrt{3} - \sqrt{3}$$

$$= 7 \times 4\sqrt{3} - 3\sqrt{3} - \sqrt{3}$$

$$= 28\sqrt{3} - 3\sqrt{3} - \sqrt{3}$$

$$= (28 - 3 - 1)\sqrt{3}$$

$$= 24\sqrt{3}$$

$\therefore 7\sqrt{48} - \sqrt{27} - \sqrt{3} = 24\sqrt{3}$

iv. $\sqrt{7} - \frac{3}{5}\sqrt{7} + 2\sqrt{7}$

$$= \left(1 - \frac{3}{5} + 2\right)\sqrt{7}$$

$$= \left(3 - \frac{3}{5}\right)\sqrt{7}$$

$$= \left(\frac{15-3}{5}\right)\sqrt{7}$$

$$= \frac{12\sqrt{7}}{5}$$

$\therefore \sqrt{7} - \frac{3}{5}\sqrt{7} + 2\sqrt{7} = \frac{12\sqrt{7}}{5}$

Question 7.

Multiply and write the answer in the simplest form.

i. $3\sqrt{12} \times \sqrt{18}$

ii. $3\sqrt{12} \times 7\sqrt{15}$

iii. $3\sqrt{8} \times \sqrt{5}$

iv. $5\sqrt{8} \times 2\sqrt{8}$

Solution:

$$\begin{aligned}\text{i. } 3\sqrt{12} \times \sqrt{18} &= 3 \times \sqrt{4 \times 3} \times \sqrt{9 \times 2} \\ &= 3 \times 2\sqrt{3} \times 3\sqrt{2} \\ &= 3 \times 2 \times 3 \times \sqrt{3} \times \sqrt{2} \\ &= 18\sqrt{6}\end{aligned}$$

$$\therefore 3\sqrt{12} \times \sqrt{18} = 18\sqrt{6}$$

$$\begin{aligned}\text{ii. } 3\sqrt{12} \times 7\sqrt{15} &= 3 \times \sqrt{4 \times 3} \times 7 \times \sqrt{5 \times 3} \\ &= 3 \times 2\sqrt{3} \times 7\sqrt{5} \times \sqrt{3} \\ &= 3 \times 2 \times 7 \times \sqrt{3} \times \sqrt{3} \times \sqrt{5} \\ &= 42 \times 3 \times \sqrt{5} \\ &= 126\sqrt{5}\end{aligned}$$

$$\therefore 3\sqrt{12} \times 7\sqrt{15} = 126\sqrt{5}$$

$$\begin{aligned}\text{iii. } 3\sqrt{8} \times \sqrt{5} &= 3 \times \sqrt{4 \times 2} \times \sqrt{5} \\ &= 3 \times 2\sqrt{2} \times \sqrt{5} \\ &= 6\sqrt{10}\end{aligned}$$

$$\therefore 3\sqrt{8} \times \sqrt{5} = 6\sqrt{10}$$

$$\begin{aligned}\text{iv. } 5\sqrt{8} \times 2\sqrt{8} &= 5 \times 2 \times \sqrt{8} \times \sqrt{8} \\ &= 5 \times 2 \times 8\end{aligned}$$

$$\therefore 5\sqrt{8} \times 2\sqrt{8} = 80$$

Question 8.

Divide and write form.

$$\text{i. } \sqrt{98} \div \sqrt{2}$$

$$\text{ii. } \sqrt{125} \div \sqrt{50}$$

$$\text{iii. } \sqrt{54} \div \sqrt{27}$$

$$\text{iv. } \sqrt{310} \div \sqrt{5}$$

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Solution:

$$\text{i. } \frac{\sqrt{98}}{\sqrt{2}} = \sqrt{\frac{98}{2}} = \sqrt{49} = 7$$

$$\text{ii. } \frac{\sqrt{125}}{\sqrt{50}} = \sqrt{\frac{125}{50}} = \sqrt{\frac{25 \times 5}{25 \times 2}} = \sqrt{\frac{5}{2}}$$

$$\text{iii. } \frac{\sqrt{54}}{\sqrt{27}} = \sqrt{\frac{54}{27}} = \sqrt{2}$$

$$\text{iv. } \frac{\sqrt{310}}{\sqrt{5}} = \sqrt{\frac{310}{5}} = \sqrt{\frac{5 \times 62}{5}} = \sqrt{62}$$

Question 9.

Rationalize the denominator.

$$\text{i. } \frac{3}{\sqrt{5}} \quad \text{ii. } \frac{1}{\sqrt{14}} \quad \text{iii. } \frac{5}{\sqrt{7}}$$

$$\text{iv. } \frac{6}{9\sqrt{3}} \quad \text{v. } \frac{11}{\sqrt{3}}$$

Solution:

$$\text{i. } \frac{3}{\sqrt{5}} = \frac{3}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$$

...[Multiplying the numerator and denominator by $\sqrt{5}$]

$$= \frac{3 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{3\sqrt{5}}{5}$$

$$\therefore \frac{3}{\sqrt{5}} = \frac{3\sqrt{5}}{5}$$

$$\text{ii. } \frac{1}{\sqrt{14}} = \frac{1}{\sqrt{14}} \times \frac{\sqrt{14}}{\sqrt{14}}$$

...[Multiplying the numerator and denominator by $\sqrt{14}$]

$$= \frac{1 \times \sqrt{14}}{\sqrt{14} \times \sqrt{14}} = \frac{\sqrt{14}}{14}$$

$$\therefore \frac{1}{\sqrt{14}} = \frac{\sqrt{14}}{14}$$

$$\text{iii. } \frac{5}{\sqrt{7}} = \frac{5}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$$

...[Multiplying the numerator and denominator by $\sqrt{7}$]

$$= \frac{5 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{5\sqrt{7}}{7}$$

$$\therefore \frac{5}{\sqrt{7}} = \frac{5\sqrt{7}}{7}$$

$$\text{iv. } \frac{6}{9\sqrt{3}} = \frac{6}{9\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

...[Multiplying the numerator and denominator by $\sqrt{3}$]

$$= \frac{6 \times \sqrt{3}}{9\sqrt{3} \times \sqrt{3}}$$

$$= \frac{6\sqrt{3}}{9 \times 3} = \frac{2\sqrt{3}}{9}$$

$$\therefore \frac{6}{9\sqrt{3}} = \frac{2\sqrt{3}}{9}$$

$$\text{v. } \frac{11}{\sqrt{3}} = \frac{11}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

...[Multiplying the numerator and denominator by $\sqrt{3}$]

$$= \frac{11 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{11\sqrt{3}}{3}$$

$$\therefore \frac{11}{\sqrt{3}} = \frac{11\sqrt{3}}{3}$$

Question 1.

$9+16$ ----- $\sqrt{}$? + 9 --- $\sqrt{}$ + 16 --- $\sqrt{}$ (Textbookpg. no. 28)

Solution:

$$\sqrt{9+16} = \sqrt{25} = 5$$

$$\sqrt{9} + \sqrt{16} = 3 + 4 = 7$$

$$\therefore \sqrt{9+16} \neq \sqrt{9} + \sqrt{16}$$

Question 2.

$100+36$ ----- $\sqrt{}$? 100 --- $\sqrt{}$ + 36 --- $\sqrt{}$ (Textbook pg. no. 28)

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Solution:

$$\sqrt{100+36} = \sqrt{136} = 2\sqrt{34}$$

$$\sqrt{100} + \sqrt{36} = 10 + 6 = 16$$

$$\therefore \sqrt{100+36} \neq \sqrt{100} + \sqrt{36}$$

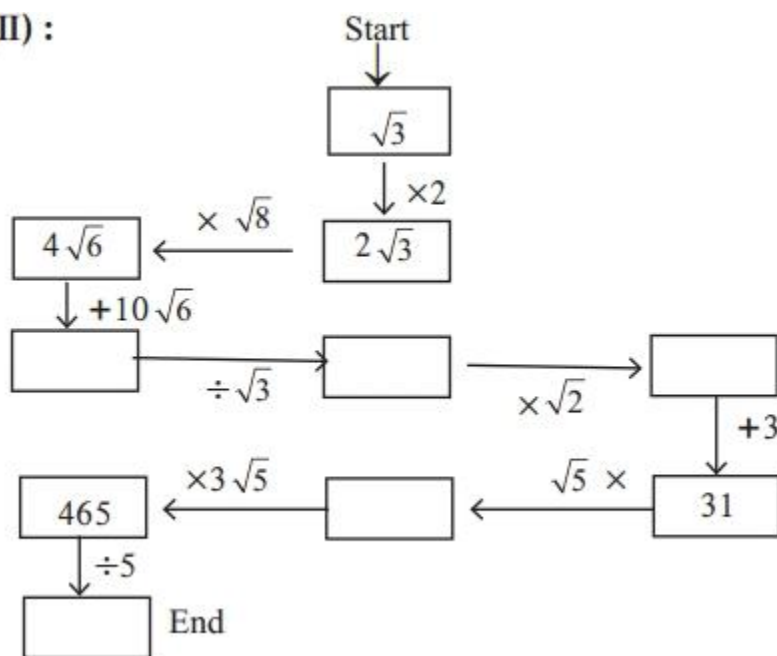
From the above examples,

$$\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}$$

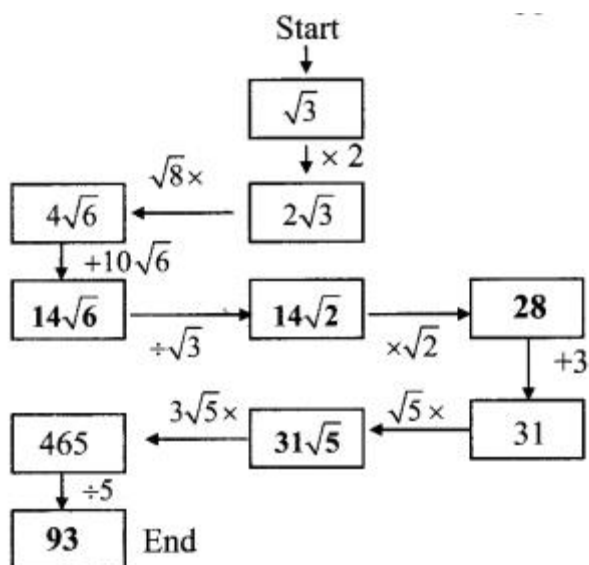
Question 3.

Follow the arrows and complete the chart by doing the operations given. (Textbook pg. no. 34)

(II) :

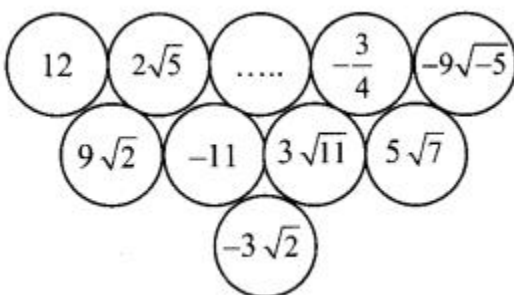


Solution:



Question 4.

There are some real numbers written on a card sheet. Use these numbers and construct two examples each of addition, subtraction, multiplication and division. Solve these examples. (Textbook pg. no. 34)



Solution:

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i. $9\sqrt{2} + (-3\sqrt{2}) = 9\sqrt{2} - 3\sqrt{2} = 6\sqrt{2}$

ii. $12 - 2\sqrt{5} = 2(6 - \sqrt{5})$

iii. $2\sqrt{5} \times 3\sqrt{11} = 6\sqrt{55}$

iv. $\frac{2\sqrt{5}}{9\sqrt{2}} = \frac{2\sqrt{5}}{9\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{10}}{9 \times 2} = \frac{\sqrt{10}}{9}$



Maharashtra Board Solutions

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- Chapter 7.5- Statistics

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The Maharashtra State Board of Secondary and Higher Secondary Education or MSBSHSE (Marathi: महाराष्ट्र राज्य माध्यमिक आणि उच्च माध्यमिक शिक्षण मंडळ), is an **autonomous and statutory body established in 1965**. The board was amended in the year 1977 under the provisions of the Maharashtra Act No. 41 of 1965.

The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the

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concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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As of now, the MSCERT and Balbharti are responsible for the syllabus and textbooks of Classes 1 to 8, while Classes 9 and 10 are under the Maharashtra State Board of Secondary and Higher Secondary Education (MSBSHSE).

How many state boards are there in Maharashtra?

The Maharashtra State Board of Secondary & Higher Secondary Education, conducts the HSC and SSC Examinations in the state of Maharashtra through its nine Divisional Boards located at Pune, Mumbai, Aurangabad, Nasik, Kolhapur, Amravati, Latur, Nagpur and Ratnagiri.

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