

Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 4.5- Ratio and Proportion

BOOK SOLUTIONS
CLASS 9
MATHS

CHAPTER 4.5
Ratio and Proportion



Maharashtra Board Solutions→

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Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 4.5- Ratio and Proportion

Class 9: Maths Chapter 4.5 solutions. Complete Class 9 Maths Chapter 4.5 Notes.

Maharashtra Board Solutions Class 9-Maths (Part 1): Chapter 4.5- Ratio and Proportion

Maharashtra Board 9th Maths Chapter 4.5, Class 9 Maths Chapter 4.5 solutions

Question 1.

Which number should be subtracted from 12, 16 and 21 so that resultant numbers are in continued proportion?

Solution:

Let the number to be subtracted be x .

$\therefore (12 - x), (16 - x)$ and $(21 - x)$ are in continued proportion.

$$\therefore \frac{12-x}{16-x} = \frac{16-x}{21-x}$$

$$\therefore \frac{(12-x)-(16-x)}{16-x} = \frac{(16-x)-(21-x)}{21-x}$$

...[By dividendo]

$$\therefore \frac{12-x-16+x}{16-x} = \frac{16-x-21+x}{21-x}$$

$$\therefore \frac{-4}{16-x} = \frac{-5}{21-x}$$

$$\therefore \frac{4}{16-x} = \frac{5}{21-x}$$

$$\therefore 4(21-x) = 5(16-x)$$

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$$\therefore 84 - 4x = 80 - 5x$$

$$\therefore 5x - 4x = 80 - 84$$

$$\therefore x = -4$$

$\therefore -4$ should be subtracted from 12, 16 and 21 so that the resultant numbers are in continued proportion.

Question 2.

If $(28 - x)$ is the mean proportional of $(23 - x)$ and $(19 - x)$, then find the value of x .

Solution:

$(28 - x)$ is the mean proportional of $(23 - x)$ and $(19 - x)$[Given]

$$\therefore \frac{23 - x}{28 - x} = \frac{28 - x}{19 - x}$$

$$\therefore \frac{(23 - x) - (28 - x)}{28 - x} = \frac{(28 - x) - (19 - x)}{19 - x}$$

...[By dividendo]

$$\therefore \frac{23 - x - 28 + x}{28 - x} = \frac{28 - x - 19 + x}{19 - x}$$

$$\therefore \frac{-5}{28 - x} = \frac{9}{19 - x}$$

$$\therefore -5(19 - x) = 9(28 - x)$$

$$\therefore -95 + 5x = 252 - 9x$$

$$\therefore 5x + 9x = 252 + 95$$

$$\therefore 14x = 347$$

$$\therefore x = \frac{347}{14}$$

Question 3.

Three numbers are in continued proportion, whose mean proportional is 12 and the sum of the remaining two numbers is 26, then find these numbers.

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Solution:

Let the first number be x .

$$\therefore \text{Third number} = 26 - x$$

12 is the mean proportional of x and $(26 - x)$.

$$\therefore x \cdot 12 = 12 \cdot 26 - x$$

$$\therefore x(26 - x) = 12 \times 12$$

$$\therefore 26x - x^2 = 144$$

$$\therefore x^2 - 26x + 144 = 0$$

$$\therefore x^2 - 18x - 8x + 144 = 0$$

$$\therefore x(x - 18) - 8(x - 18) = 0$$

$$\therefore (x - 18)(x - 8) = 0$$

$$\therefore x = 18 \text{ or } x = 8$$

$$\therefore \text{Third number} = 26 - x = 26 - 18 = 8 \text{ or } 26 - x = 26 - 8 = 18$$

$\therefore$ The numbers are 18, 12, 8 or 8, 12, 18.

Question 4.

If $(a + b + c)(a - b + c) = a^2 + b^2 + c^2$, show that a, b, c are in continued proportion.

Solution:

$$(a + b + c)(a - b + c) = a^2 + b^2 + c^2 \dots [\text{Given}]$$

$$\therefore a(a - b + c) + b(a - b + c) + c(a - b + c) = a^2 + b^2 + c^2$$

$$\therefore a^2 - ab + ac + ab - b^2 + bc + ac - bc + c^2 = a^2 + b^2 + c^2$$

$$\therefore a^2 + 2ac - b^2 + c^2 = a^2 + b^2 + c^2$$

$$\therefore 2ac - b^2 = b^2$$

$$\therefore 2ac = 2b^2$$

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$$\therefore ac = b^2$$

$$\therefore b^2 = ac$$

$\therefore a, b, c$ are in continued proportion.

Question 5.

If $ab = bc$ and $a, b, c > 0$, then show that,

i. $(a + b + c)(b - c) = ab - c^2$

ii. $(a^2 + b^2)(b^2 + c^2) = (ab + bc)^2$

iii. $a^2 + b^2 + c^2 = a^2 + b^2 + c^2$

Solution:

Let $ab = bc = k$

$$\therefore b = ck$$

$$\therefore a = bk = (ck)k$$

$$\therefore a = ck^2 \dots (ii)$$

i. $(a + b + c)(b - c) = ab - c^2$

$$\text{L.H.S} = (a + b + c)(b - c)$$

$$= [ck^2 + ck + c][ck - c] \dots [\text{From (i) and (ii)}]$$

$$= c(k^2 + k + 1)c(k - 1)$$

$$= c^2(k^2 + k + 1)(k - 1)$$

$$\text{R.H.S} = ab - c^2$$

$$= (ck^2)(ck) - c^2 \dots [\text{From (i) and (ii)}]$$

$$= c^2k^3 - c^2$$

$$= c^2(k^3 - 1)$$

$$= c^2(k - 1)(k^2 + k + 1) \dots [a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

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$$\therefore \text{L.H.S} = \text{R.H.S}$$

$$\therefore (a + b + c) (b - c) = ab - c^2$$

$$\text{ii. } (a^2 + b^2)(b^2 + c^2) = (ab + bc)^2$$

$$b = ck; a = ck^2$$

$$\text{L.H.S} = (a^2 + b^2) (b^2 + c^2)$$

$$= [(ck^2) + (ck)^2] [(ck)^2 + c^2] \dots [\text{From (i) and (ii)}]$$

$$= [c^2k^4 + c^2k^2] [c^2k^2 + c^2]$$

$$= c^2k^2 (k^2 + 1) c^2 (k^2 + 1)$$

$$= c^4k^2 (k^2 + 1)^2$$

$$\text{R.H.S} = (ab + bc)^2$$

$$= [(ck^2) (ck) + (ck)c]^2 \dots [\text{From (i) and (ii)}]$$

$$= [c^2k^3 + c^2k]^2$$

$$= [c^2k (k^2 + 1)]^2 = c^4(k^2 + 1)^2$$

$$\therefore \text{L.H.S} = \text{R.H.S}$$

$$\therefore (a^2 + b^2) (b^2 + c^2) = (ab + bc)^2$$

$$\text{iii. } a^2 + b^2 + 2ab = a + cb$$

$$b = ck; a = ck^2$$

$$\begin{aligned} \text{L.H.S} &= \frac{a^2 + b^2}{ab} \\ &= \frac{(ck^2)^2 + (ck)^2}{(ck^2)(ck)} \quad \dots[\text{From (i) and (ii)}] \end{aligned}$$

$$= \frac{c^2k^4 + c^2k^2}{c^2k^3}$$

$$= \frac{c^2k^2(k^2 + 1)}{c^2k^3}$$

$$= \frac{k^2 + 1}{k}$$

$$\begin{aligned} \text{R.H.S} &= \frac{a + c}{b} \\ &= \frac{ck^2 + c}{ck} \quad \dots[\text{From (i) and (ii)}] \end{aligned}$$

$$= \frac{c(k^2 + 1)}{ck}$$

$$= \frac{k^2 + 1}{k}$$

$$\therefore \text{L.H.S} = \text{R.H.S}$$

$$\therefore \frac{a^2 + b^2}{ab} = \frac{a + c}{b}$$

Question 6. Find mean proportional of $x+y$ and $x-y$.

Solution:

Let a be the mean proportional of $x+y$ and $x-y$

$$\begin{aligned}\therefore a^2 &= \frac{x+y}{x-y} \times \frac{x^2-y^2}{x^2y^2} \\ &= \frac{x+y}{x-y} \times \frac{(x+y)(x-y)}{x^2y^2} \\ &\dots[\because a^2 - b^2 = (a+b)(a-b)]\end{aligned}$$

$$\therefore a^2 = \frac{(x+y)^2}{x^2y^2}$$

$$\therefore a = \frac{x+y}{xy}$$

...[Taking square root of both sides]

$$\begin{aligned}\therefore \text{Mean proportional of } \frac{x+y}{x-y}, \frac{x^2-y^2}{x^2y^2} \text{ is} \\ \frac{x+y}{xy}.\end{aligned}$$



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- Chapter 1.2- Sets
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- Chapter 1.4- Sets
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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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FAQs

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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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