

Maharashtra Board Solutions Class 9-Maths (Part 1): Chapter 4.4- Ratio and Proportion

BOOK SOLUTIONS
CLASS 9
MATHS

CHAPTER 4.4
Ratio and Proportion



Maharashtra Board Solutions→

For any clarifications or questions you can write to info@indcareer.com

Postal Address

IndCareer.com, 52, Shilpa Nagar, Somalwada Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888, **Website:** <https://www.indcareer.com>

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>



Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 4.4- Ratio and Proportion

Class 9: Maths Chapter 4.4 solutions. Complete Class 9 Maths Chapter 4.4 Notes.

Maharashtra Board Solutions Class 9-Maths (Part 1): Chapter 4.4- Ratio and Proportion

Maharashtra Board 9th Maths Chapter 4.4, Class 9 Maths Chapter 4.4 solutions

Question 1.

Fill in the blanks of the following.

i. $\frac{x}{7} = \frac{y}{3} = \frac{3x+5y}{\dots\dots\dots} = \frac{7x-9y}{\dots\dots\dots}$

ii. $\frac{a}{3} = \frac{b}{4} = \frac{c}{7} = \frac{a-2b+3c}{\dots\dots\dots} = \frac{\dots\dots\dots}{6-8+14}$

Solution:

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

$$\begin{aligned} \text{i. } \frac{x}{7} &= \frac{y}{3} = \frac{3x+5y}{\dots\dots\dots} = \frac{7x-9y}{\dots\dots\dots} \\ \frac{x}{7} &= \frac{y}{3} = \frac{3x+5y}{3 \times 7 + 5 \times 3} \\ &\dots[\text{Theorem on equal ratios}] \\ &= \frac{3x+5y}{21+15} = \frac{3x+5y}{36} \end{aligned}$$

$$\begin{aligned} \frac{x}{7} &= \frac{y}{3} = \frac{7x-9y}{7 \times 7 - 9 \times 3} \\ &\dots[\text{Theorem on equal ratios}] \\ &= \frac{7x-9y}{49-27} = \frac{7x-9y}{22} \end{aligned}$$

$$\therefore \frac{x}{7} = \frac{y}{3} = \frac{3x+5y}{36} = \frac{7x-9y}{22}$$

$$\begin{aligned} \text{ii. } \frac{a}{3} &= \frac{b}{4} = \frac{c}{7} = \frac{a-2b+3c}{\dots\dots\dots} = \frac{\dots\dots\dots}{6-8+14} \\ \frac{a}{3} &= \frac{b}{4} = \frac{c}{7} = \frac{a-2b+3c}{3-2 \times 4 + 3 \times 7} \\ &\dots[\text{Theorem on equal ratios}] \\ &= \frac{a-2b+3c}{3-8+21} = \frac{a-2b+3c}{16} \end{aligned}$$

$$\begin{aligned} \frac{a}{3} &= \frac{b}{4} = \frac{c}{7} = \frac{2a-2b+2c}{2 \times 3 - 2 \times 4 + 2 \times 7} \\ &\dots[\text{Theorem on equal ratios}] \\ &= \frac{2a-2b+2c}{6-8+14} \end{aligned}$$

$$\therefore \frac{a}{3} = \frac{b}{4} = \frac{c}{7} = \frac{a-2b+3c}{16} = \frac{2a-2b+2c}{6-8+14}$$

Question 2.

$5m - n = 3m + 4n$, then find the values of the following expressions.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

i. $\frac{m^2 + n^2}{m^2 - n^2}$

ii. $\frac{3m + 4n}{3m - 4n}$

Solution:

$$5m - n = 3m + 4n \dots [\text{Given}]$$

$$\therefore 5m - 3m = 4n + n$$

$$\therefore 2m = 5n$$

i. $\frac{m^2}{n^2} = \frac{25}{4} \dots [\text{Squaring both sides}]$

$$\therefore \frac{m^2 + n^2}{m^2 - n^2} = \frac{25 + 4}{25 - 4}$$

$\dots [\text{By componendo - dividendo}]$

$$\therefore \frac{m^2 + n^2}{m^2 - n^2} = \frac{29}{21}$$

$$\therefore \frac{m^2 + n^2}{m^2 - n^2} = 29 : 21$$

$$\text{ii. } \frac{m}{n} = \frac{5}{2}$$

$$\therefore \frac{m}{n} \times \frac{3}{4} = \frac{5}{2} \times \frac{3}{4}$$

... $\left[\text{Multiplying both sides by } \frac{3}{4} \right]$

$$\therefore \frac{3m}{4n} = \frac{15}{8}$$

$$\therefore \frac{3m+4n}{3m-4n} = \frac{15+8}{15-8}$$

...[By componendo - dividendo]

$$\therefore \frac{3m+4n}{3m-4n} = \frac{23}{7}$$

$$\therefore \frac{3m+4n}{3m-4n} = 23 : 7$$

Question 3.

Solve:

i. If $a(y+z) = b(z+x) = c(x+y)$ and out of a, b, c no two of them are equal, then show that,
 $y - za(b-c) = z - xb(c-a) = x - yc(a-b)$.

Solution:

Here, no two of a, b and c are equal.

$\therefore$ values of $(b-c), (c-a)$ and $(a-b)$ are not zero.

$a(y+z) = b(z+x) = c(x+y) \dots$ [Given]

$$\therefore \frac{a(y+z)}{abc} = \frac{b(z+x)}{abc} = \frac{c(x+y)}{abc}$$

...[Dividing each term by abc]

$$\therefore \frac{y+z}{bc} = \frac{z+x}{ac} = \frac{x+y}{ab}$$

$$\text{Let } \frac{y+z}{bc} = \frac{z+x}{ac} = \frac{x+y}{ab} = k \quad \dots(i)$$

$$k = \frac{x+y}{ab} = \frac{z+x}{ac} \quad \dots[\text{From (i)}]$$

$$\therefore k = \frac{(x+y)-(z+x)}{ab-ac}$$

...[Theorem on equal ratios]

$$= \frac{x+y-z-x}{a(b-c)}$$

$$\therefore k = \frac{y-z}{a(b-c)} \quad \dots(ii)$$

$$k = \frac{y+z}{bc} = \frac{x+y}{ab} \quad \dots[\text{From (i)}]$$

$$k = \frac{(y+z)-(x+y)}{bc-ab}$$

...[Theorem on equal ratios]

$$= \frac{y+z-x-y}{b(c-a)}$$

$$\therefore k = \frac{z-x}{b(c-a)} \quad \dots(iii)$$

$$k = \frac{z+x}{ac} = \frac{y+z}{bc} \quad \dots[\text{From (i)}]$$

$$\therefore k = \frac{(z+x)-(y+z)}{ac-bc}$$

...[Theorem on equal ratios]

$$= \frac{z+x-y-z}{c(a-b)}$$

$$\therefore k = \frac{x-y}{c(a-b)} \quad \dots(iv)$$

$$\therefore \frac{y-z}{a(b-c)} = \frac{z-x}{b(c-a)} = \frac{x-y}{c(a-b)}$$

...[From (ii), (iii) and (iv)]

ii. If $\frac{x}{3x-y-z} = \frac{y}{3y-z-x} = \frac{z}{3z-x-y}$ and $x + y + z \neq 0$, then show that the value of each ratio is equal to 1.

Solution:

$$\text{Let } \frac{x}{3x-y-z} = \frac{y}{3y-z-x} = \frac{z}{3z-x-y} = k$$

$$\therefore k = \frac{x+y+z}{(3x-y-z)+(3y-z-x)+(3z-x-y)}$$

...[Theorem on equal ratios]

$$\begin{aligned}\therefore k &= \frac{x+y+z}{3x-x-x+3y-y-y+3z-z-z} \\ &= \frac{x+y+z}{x+y+z}\end{aligned}$$

$$\therefore k = 1 \quad \dots[\because x+y+z \neq 0]$$

$$\therefore \text{Each ratio} = 1$$

iii. $\frac{x}{3x-y-z} = \frac{y}{3y-z-x} = \frac{z}{3z-x-y}$ and $x + y + z \neq 0$, then show that $a+b=2$.

Solution:

$$\text{Let } \frac{ax+by}{x+y} = \frac{bx+az}{x+z} = \frac{ay+bz}{y+z} = k$$

$$\begin{aligned}\therefore k &= \frac{(ax+by) + (bx+az) + (ay+bz)}{(x+y) + (x+z) + (y+z)} \\ &\quad \dots [\text{Theorem on equal ratios}] \\ &= \frac{ax+bx+ay+by+az+bz}{2x+2y+2z} \\ &= \frac{x(a+b) + y(a+b) + z(a+b)}{2(x+y+z)} \\ &= \frac{(a+b)(x+y+z)}{2(x+y+z)}\end{aligned}$$

$$\therefore k = \frac{a+b}{2} \quad \dots [\because x+y+z \neq 0]$$

$$\therefore \text{Each ratio} = \frac{a+b}{2}$$

iv. If $y+za=z+xb=x+yc$, then show that $xb+c-a=yc+a-b=za+b-c$.

Solution:

$$\text{Let } \frac{y+z}{a} = \frac{z+x}{b} = \frac{x+y}{c} = k \dots(i)$$

$$\therefore k = \frac{z+x}{b} = \frac{x+y}{c} = \frac{y+z}{a}$$

$$\therefore k = \frac{(z+x) + (x+y) - (y+z)}{b+c-a}$$

...[Theorem on equal ratios]

$$= \frac{z+x+x+y-y-z}{b+c-a}$$

$$\therefore k = \frac{2x}{b+c-a} \dots(ii)$$

$$k = \frac{x+y}{c} = \frac{y+z}{a} = \frac{z+x}{b} \dots[\text{From (i)}]$$

$$\therefore k = \frac{(x+y) + (y+z) - (z+x)}{c+a-b}$$

...[Theorem on equal ratios]

$$= \frac{x+y+y+z-z-x}{c+a-b}$$

$$\therefore k = \frac{2y}{c+a-b} \dots(iii)$$

$$k = \frac{y+z}{a} = \frac{z+x}{b} = \frac{x+y}{c} \dots[\text{From (i)}]$$

$$\therefore k = \frac{(y+z)+(z+x)-(x+y)}{a+b-c}$$

...[Theorem on equal ratios]

$$= \frac{y+z+z+x-x-y}{a+b-c}$$

$$\therefore k = \frac{2z}{a+b-c} \quad \dots(\text{iv})$$

$$\therefore \frac{2x}{b+c-a} = \frac{2y}{c+a-b} = \frac{2z}{a+b-c}$$

...[From (ii), (iii) and (iv)]

$$\therefore \frac{x}{b+c-a} = \frac{y}{c+a-b} = \frac{z}{a+b-c}$$

...[Multiplying each ratio by $\frac{1}{2}$]

v. If $3x-5y, 5z+3y, x+5z, y-5x, y-z, x-z$, then show that every ratio = $\frac{x}{y}$.

Solution:

$$\text{Let } \frac{3x-5y}{5z+3y} = \frac{x+5z}{y-5x} = \frac{y-z}{x-z} = k$$

$$\therefore k = \frac{3x-5y}{5z+3y} = \frac{x+5z}{y-5x} = \frac{5y-5z}{5x-5z}$$

...[Multiplying numerator and denominator of third ratio by 5]

$$\therefore k = \frac{(3x-5y)+(x+5z)+(5y-5z)}{(5z+3y)+(y-5x)+(5x-5z)}$$

...[Theorem on equal ratios]

$$= \frac{4x}{4y}$$

$$= \frac{x}{y}$$

$$\therefore \text{Each ratio} = \frac{x}{y}$$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

Question 4.**Solve:**

i. $\frac{16x^2 - 20x + 9}{8x^2 + 12x + 21} = \frac{4x - 5}{2x + 3}$

ii. $\frac{5y^2 + 40y - 12}{5y + 10y^2 - 4} = \frac{y + 8}{1 + 2y}$

Solution:

i. $\frac{16x^2 - 20x + 9}{8x^2 + 12x + 21} = \frac{4x - 5}{2x + 3}$

If $x = 0$ then

$$\begin{aligned}\text{L.H.S} &= \frac{16x^2 - 20x + 9}{8x^2 + 12x + 21} = \frac{16(0)^2 - 20(0) + 9}{8(0)^2 + 12(0) + 21} \\ &= \frac{9}{21} = \frac{3}{7}\end{aligned}$$

$$\begin{aligned}\text{R.H.S.} &= \frac{4x-5}{2x+3} = \frac{4(0)-5}{2(0)+3} \\ &= \frac{-5}{3}\end{aligned}$$

$$\frac{3}{7} = \frac{-5}{3}, \text{ which is a contradiction.}$$

$$\therefore x \neq 0.$$

$$\text{Let } \frac{16x^2 - 20x + 9}{8x^2 + 12x + 21} = \frac{4x-5}{2x+3} = k \quad \dots(i)$$

$$\therefore k = \frac{16x^2 - 20x + 9}{8x^2 + 12x + 21} = \frac{4x(4x-5)}{4x(2x+3)}$$

...[Multiplying numerator and denominator of second ratio by $4x$ as $x \neq 0$]

$$\begin{aligned}\therefore k &= \frac{16x^2 - 20x + 9}{8x^2 + 12x + 21} = \frac{16x^2 - 20x}{8x^2 + 12x} \\ &= \frac{(16x^2 - 20x + 9) - (16x^2 - 20x)}{(8x^2 + 12x + 21) - (8x^2 + 12x)}\end{aligned}$$

...[Theorem on equal ratios]

$$= \frac{16x^2 - 20x + 9 - 16x^2 + 20x}{8x^2 + 12x + 21 - 8x^2 - 12x}$$

$$= \frac{9}{21} = \frac{3 \times 3}{3 \times 7}$$

$$\therefore k = \frac{3}{7}$$

$$\frac{4x-5}{2x+3} = k \quad \dots[\text{From (i)}]$$

$$\therefore \frac{4x-5}{2x+3} = \frac{3}{7}$$

$$\therefore 7(4x-5) = 3(2x+3)$$

$$\therefore 28x - 35 = 6x + 9$$

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

$$\therefore 28x - 6x = 9 + 35$$

$$\therefore 22x = 44$$

$$\therefore x = 2$$

$\therefore x = 2$ is the solution of the given equation.

ii. $5y^2 + 40y - 125y + 10y^2 - 4 = y + 81 + 2y$

If $y = 0$ then

$$\begin{aligned}\text{L.H.S.} &= \frac{5y^2 + 40y - 12}{5y + 10y^2 - 4} = \frac{5(0)^2 + 40(0) - 12}{5(0) + 10(0)^2 - 4} \\ &= \frac{-12}{-4} = \frac{3}{1}\end{aligned}$$

$$\text{R.H.S.} = \frac{y + 8}{1 + 2y} = \frac{0 + 8}{1 + 2(0)} = \frac{8}{1}$$

$$\therefore \frac{3}{1} = \frac{8}{1}, \text{ which is a contradiction}$$

$$\therefore y \neq 0$$

$$\text{Let } \frac{5y^2 + 40y - 12}{5y + 10y^2 - 4} = \frac{y + 8}{1 + 2y} = k \quad \dots(i)$$

$$\therefore k = \frac{5y^2 + 40y - 12}{5y + 10y^2 - 4} = \frac{5y(y + 8)}{5y(1 + 2y)}$$

...[Multiplying numerator and denominator of second ratio by $5y$ as $y \neq 0$]

$$\therefore k = \frac{5y^2 + 40y - 12}{5y + 10y^2 - 4} = \frac{5y^2 + 40y}{5y + 10y^2}$$

$$\therefore k = \frac{(5y^2 + 40y - 12) - (5y^2 + 40y)}{(5y + 10y^2 - 4) - (5y + 10y^2)}$$

...[Theorem on equal ratios]

$$= \frac{5y^2 + 40y - 12 - 5y^2 - 40y}{5y + 10y^2 - 4 - 5y - 10y^2}$$

$$= \frac{-12}{-4}$$

$$\therefore k = 3$$

$$\frac{y + 8}{1 + 2y} = k$$

...[From (i)]

$$\therefore \frac{y + 8}{1 + 2y} = 3$$

$$\therefore y + 8 = 3(1 + 2y)$$

$$\therefore y + 8 = 3 + 6y$$

$$\therefore 8 - 3 = 6y - y$$

$$\therefore 5 = 5y$$

$$\therefore y = 1$$

$\therefore y = 1$ is the solution of the given equation.



Maharashtra Board Solutions

Class 9 Maths

Part 1

- Chapter 1.1- Sets
- Chapter 1.2- Sets
- Chapter 1.3- Sets
- Chapter 1.4- Sets
- Chapter 2.1- Real Numbers
- Chapter 2.2- Real Numbers
- Chapter 2.3- Real Numbers
- Chapter 2.4- Real Numbers
- Chapter 2.5- Real Numbers
- Chapter 3.1- Polynomials
- Chapter 3.2- Polynomials
- Chapter 3.3- Polynomials
- Chapter 3.4- Polynomials
- Chapter 3.5- Polynomials
- Chapter 3.6- Polynomials
- Chapter 4.1- Ratio and Proportion
- Chapter 4.2- Ratio and Proportion
- Chapter 4.3- Ratio and Proportion
- Chapter 4.4- Ratio and Proportion
- Chapter 4.5- Ratio and Proportion
- Chapter 5.1- Linear Equations in Two Variables
- Chapter 5.2- Linear Equations in Two Variables
- Chapter 6.1- Financial Planning
- Chapter 6.2- Financial Planning
- Chapter 7.1- Statistics
- Chapter 7.2- Statistics
- Chapter 7.3- Statistics
- Chapter 7.4- Statistics

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

- Chapter 7.5- Statistics

About About Maharashtra State Board (MSBSHSE)

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

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

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.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>

FAQs

Where do I get the Maharashtra State Board Books PDF For free download?

You can download the Maharashtra State Board Books from the eBalbharti official website, i.e. cart.ebalbharati.in or from this article.

Add image

How to Download Maharashtra State Board Books?

Students can get the Maharashtra Books for primary, secondary, and senior secondary classes from here. You can view or download the Maharashtra State Board Books from this page or from the official website for free of cost. Students can follow the detailed steps below to visit the official website and download the e-books for all subjects or a specific subject in different mediums.

Step 1: Visit the official website ebalbharati.in

Step 2: On the top of the screen, select "Download PDF textbooks"

Step 3: From the "Classes" section, select your class.

Step 4: From "Medium", select the medium suitable to you.

Step 5: All Maharashtra board books for class 11th will now be displayed on the right side.

Step 6: Click on the "Download" option to download the PDF book.

Who developed the Maharashtra State board books?

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.

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-ratio-and-proportion/>

About IndCareer

IndCareer.com is a leading developer of online career guidance resources for the Indian marketplace. Established in 2007, IndCareer.com is currently used by over thousands of institutions across India, including schools, employment agencies, libraries, colleges and universities.

IndCareer.com is designed to assist you in making the right career decision - a decision that meets your unique interests and personality.

For any clarifications or questions you can write to **info@indcareer.com**

Postal Address

IndCareer.com
52, Shilpa Nagar,
Somalwada
Nagpur - 440015
Maharashtra, India

WhatsApp: +91 9561 204 888

Website: <https://www.indcareer.com>

<https://www.indcareer.com/schools/maharashtra-board-solutions-class-9-maths-part-1-chapter-4-4-ratio-and-proportion/>