

Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 4.2- Ratio and Proportion

BOOK SOLUTIONS
CLASS 9
MATHS

CHAPTER 4.2
Ratio and Proportion



Maharashtra Board Solutions→

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Maharashtra Board Solutions Class 9-Maths

(Part 1): Chapter 4.2- Ratio and Proportion

Class 9: Maths Chapter 4.2 solutions. Complete Class 9 Maths Chapter 4.2 Notes.

Maharashtra Board Solutions Class 9-Maths (Part 1): Chapter 4.2- Ratio and Proportion

Maharashtra Board 9th Maths Chapter 4.2, Class 9 Maths Chapter 4.2 solutions

Question 1.

Using the property $ab = akbk$, fill in the blanks by substituting proper numbers in the following.

i. $\frac{5}{7} = \frac{\dots}{28} = \frac{35}{\dots} = \frac{\dots}{3.5}$

ii. $\frac{9}{14} = \frac{4.5}{\dots} = \frac{\dots}{42} = \frac{\dots}{3.5}$

Solution:

i. $\frac{5}{7} = \frac{\dots}{28} = \frac{5 \times 4}{7 \times 4} = \frac{20}{28}$

$$\frac{5}{7} = \frac{35}{\dots} = \frac{5 \times 7}{7 \times 7} = \frac{35}{49}$$

$$\frac{5}{7} = \frac{\dots}{3.5} = \frac{5 \times 0.5}{7 \times 0.5} = \frac{2.5}{3.5}$$

$$\therefore \frac{5}{7} = \frac{20}{28} = \frac{35}{49} = \frac{2.5}{3.5}$$

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$$\begin{aligned}\text{ii. } \frac{9}{14} &= \frac{4.5}{\dots} = \frac{9 \times 0.5}{14 \times 0.5} = \frac{4.5}{7} \\ \frac{9}{14} &= \frac{\dots}{42} = \frac{9 \times 3}{14 \times 3} = \frac{27}{42} \\ \frac{9}{14} &= \frac{\dots}{3.5} = \frac{9 \times 0.25}{14 \times 0.25} = \frac{2.25}{3.5} \\ \therefore \frac{9}{14} &= \frac{4.5}{7} = \frac{27}{42} = \frac{2.25}{3.5}\end{aligned}$$

Question 2.

Find the following ratios.

- The ratio of radius to circumference of the circle.
- The ratio of circumference of circle with radius r to its area.
- The ratio of diagonal of a square to its side, if the length of side is 7 cm.
- The lengths of sides of a rectangle are 5 cm and 3.5 cm. Find the ratio of numbers denoting its perimeter to area.

Solution:

- Let the radius of circle be r .

then, its circumference = $2\pi r$

Ratio of radius to circumference of the circle

$$\begin{aligned}&= \frac{\text{radius}}{\text{circumference}} \\ &= \frac{r}{2\pi r} \\ &= \frac{1}{2\pi} \\ &= 1 : 2\pi\end{aligned}$$

The ratio of radius to circumference of the circle is $1 : 2\pi$.

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ii. Let the radius of the circle is r .

$$\therefore \text{circumference} = 2\pi r \text{ and area} = \pi r^2$$

Ratio of circumference to the area of circle

$$\begin{aligned} &= \frac{\text{circumference}}{\text{area}} \\ &= \frac{2\pi r}{\pi r^2} \\ &= \frac{2}{r} \\ &= 2 : r \end{aligned}$$

$\therefore$ The ratio of circumference of circle with radius r to its area is $2 : r$.

iii. Length of side of square = 7 cm

$$\therefore \text{Diagonal of square} = \sqrt{2} \times \text{side}$$

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

$$= 7\sqrt{2} \text{ cm}$$

Ratio of diagonal of a square to its side

$$\begin{aligned} &= \frac{\text{diagonal}}{\text{side}} \\ &= \frac{7\sqrt{2}}{7} \\ &= \frac{\sqrt{2}}{1} \\ &= \sqrt{2} : 1 \end{aligned}$$

$\therefore$ The ratio of diagonal of a square to its side is $\sqrt{2} : 1$.

iv. Length of rectangle = (l) = 5 cm,

Breadth of rectangle = (b) = 3.5 cm

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Perimeter of the rectangle = $2(l + b)$

$$= 2(5 + 3.5)$$

$$= 2 \times 8.5$$

$$= 17 \text{ cm}$$

Area of the rectangle = $l \times b$

$$= 5 \times 3.5$$

$$= 17.5 \text{ cm}^2$$

Ratio of numbers denoting perimeter to the area of rectangle

$$= \frac{\text{perimeter}}{\text{area}}$$

$$= \frac{17}{17.5}$$

$$= \frac{17 \times 10}{17.5 \times 10}$$

$$= \frac{170}{175}$$

$$= \frac{5 \times 34}{5 \times 35}$$

$$= \frac{34}{35}$$

$$= 34 : 35$$

$\therefore$ Ratio of numbers denoting perimeter to the area of rectangle is 34 : 35.

Question 3.

Compare the following

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i. $\frac{\sqrt{5}}{3}, \frac{3}{\sqrt{7}}$

ii. $\frac{3\sqrt{5}}{5\sqrt{7}}, \frac{\sqrt{63}}{\sqrt{125}}$

iii. $\frac{5}{18}, \frac{17}{121}$

iv. $\frac{\sqrt{80}}{\sqrt{48}}, \frac{\sqrt{45}}{\sqrt{27}}$

v. $\frac{9.2}{5.1}, \frac{3.4}{7.1}$

Solution:

i. $\frac{\sqrt{5}}{3}, \frac{3}{\sqrt{7}}$

$$\sqrt{5} \times \sqrt{7} = \sqrt{35}$$

$$3 \times 3 = 9 = \sqrt{9^2} = \sqrt{81}$$

Here, $35 < 81$

$$\therefore \sqrt{35} < \sqrt{81}$$

$$\therefore \frac{\sqrt{5}}{3} < \frac{3}{\sqrt{7}}$$

ii. $\frac{3\sqrt{5}}{5\sqrt{7}}, \frac{\sqrt{63}}{\sqrt{125}}$

$$\begin{aligned} 3\sqrt{5} \times \sqrt{125} &= 3 \times \sqrt{5 \times 125} \\ &= 3 \times \sqrt{5 \times 25 \times 5} \\ &= 3 \times 5 \times 5 \\ &= 3 \times 25 = 75 \end{aligned}$$

$$\begin{aligned} 5\sqrt{7} \times \sqrt{63} &= 5 \times \sqrt{7 \times 63} \\ &= 5 \times \sqrt{7 \times 9 \times 7} \\ &= 5 \times 3 \times 7 = 105 \end{aligned}$$

Here, $75 < 105$

$$\therefore \frac{3\sqrt{5}}{5\sqrt{7}} < \frac{\sqrt{63}}{\sqrt{125}}$$

iii. $\frac{5}{18}, \frac{17}{121}$

$$5 \times 121 = 605$$

$$18 \times 17 = 306$$

Here, $605 > 306$

$$\therefore \frac{5}{18} > \frac{17}{121}$$

iv. $\frac{\sqrt{80}}{\sqrt{48}}, \frac{\sqrt{45}}{\sqrt{27}}$

$$\sqrt{80} \times \sqrt{27} = \sqrt{2160}$$

$$\sqrt{48} \times \sqrt{45} = \sqrt{2160}$$

Here, $2160 = 2160$

$$\therefore \sqrt{2160} = \sqrt{2160}$$

$$\therefore \frac{\sqrt{80}}{\sqrt{48}} = \frac{\sqrt{45}}{\sqrt{27}}$$

Alternate method:

$$\frac{\sqrt{80}}{\sqrt{48}}, \frac{\sqrt{45}}{\sqrt{27}}$$

$$\text{Consider, } \frac{\sqrt{80}}{\sqrt{48}} = \frac{\sqrt{16 \times 5}}{\sqrt{16 \times 3}} = \frac{4\sqrt{5}}{4\sqrt{3}} = \frac{\sqrt{5}}{\sqrt{3}}$$

$$\frac{\sqrt{45}}{\sqrt{27}} = \frac{\sqrt{9 \times 5}}{\sqrt{9 \times 3}} = \frac{3\sqrt{5}}{3\sqrt{3}} = \frac{\sqrt{5}}{\sqrt{3}}$$

$$\text{Here, } \frac{\sqrt{5}}{\sqrt{3}} = \frac{\sqrt{5}}{\sqrt{3}}$$

$$\therefore \frac{\sqrt{80}}{\sqrt{48}} = \frac{\sqrt{45}}{\sqrt{27}}$$

v. $\frac{9.2}{5.1}, \frac{3.4}{7.1}$

$$9.2 \times 7.1 = 65.32$$

$$5.1 \times 3.4 = 17.34$$

Here, $65.32 > 17.34$

$$\therefore \frac{9.2}{5.1} > \frac{3.4}{7.1}$$

Question 4.

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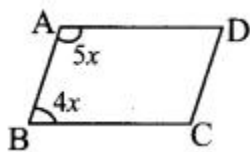
Solve.

ABCD is a parallelogram. The ratio of $\angle A$ and $\angle B$ of this parallelogram is 5 : 4. Find the measure of $\angle B$. [2 Marks]

Solution:

Ratio of $\angle A$ and $\angle B$ for given parallelogram is 5 : 4

Let the common multiple be x.



$$m\angle A = 5x^\circ \text{ and } m\angle B = 4x^\circ$$

Now, $m\angle A + m\angle B = 180^\circ$...[Adjacent angles of a parallelogram are supplementary]

$$\therefore 5x^\circ + 4x^\circ = 180^\circ$$

$$\therefore 9x^\circ = 180^\circ$$

$$\therefore x^\circ = 20^\circ$$

$$\therefore m\angle B = 4x^\circ = 4 \times 20^\circ = 80^\circ$$

$\therefore$ The measure of $\angle B$ is 80.

ii. The ratio of present ages of Albert and Salim is 5 : 9. Five years hence ratio of their ages will be 3 : 5. Find their present ages.

Solution:

The ratio of present ages of Albert and Salim is 5 : 9

Let the common multiple be x.

$\therefore$ Present age of Albert = 5x years and

Present age of Salim = 9x years

After 5 years,

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Albert's age = $(5x + 5)$ years and

Salim's age = $(9x + 5)$ years

According to the given condition,

Five years hence ratio of their ages will be 3 : 5

$$5x + 5 \quad 9x + 5 = 35$$

$$\therefore 5(5x + 5) = 3(9x + 5)$$

$$\therefore 25x + 25 = 27x + 15$$

$$\therefore 25 - 15 = 27x - 25x$$

$$\therefore 10 = 2x$$

$$\therefore x = 5$$

$$\therefore \text{Present age of Albert} = 5x = 5 \times 5 = 25 \text{ years}$$

$$\text{Present age of Salim} = 9x = 9 \times 5 = 45 \text{ years}$$

$\therefore$ The present ages of Albert and Salim are 25 years and 45 years respectively.

iii. The ratio of length and breadth of a rectangle is 3 : 1, and its perimeter is 36 cm. Find the length and breadth of the rectangle.

Solution:

The ratio of length and breadth of a rectangle is 3 : 1

Let the common multiple be x .

Length of the rectangle (l) = $3x$ cm

and Breadth of the rectangle (b) = x cm

Given, perimeter of the rectangle = 36 cm

Since, Perimeter of the rectangle = $2(l + b)$

$$\therefore 36 = 2(3x + x)$$

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$$\therefore 36 = 2(4x)$$

$$\therefore 36 = 8x$$

$$\therefore x = 36 \div 8 = 4.5$$

Length of the rectangle = $3x = 3 \times 4.5 = 13.5$ cm

$\therefore$ The length of the rectangle is 13.5 cm and its breadth is 4.5 cm.

iv. The ratio of two numbers is 31 : 23 and their sum is 216. Find these numbers.

Solution:

The ratio of two numbers is 31 : 23

Let the common multiple be x .

$\therefore$ First number = $31x$ and

Second number = $23x$

According to the given condition,

Sum of the numbers is 216

$$\therefore 31x + 23x = 216$$

$$\therefore 54x = 216$$

$$\therefore x = 4$$

$$\therefore \text{First number} = 31x = 31 \times 4 = 124$$

$$\text{Second number} = 23x = 23 \times 4 = 92$$

$\therefore$ The two numbers are 124 and 92.

v. If the product of two numbers is 360 and their ratio is 10 : 9, then find the numbers.

Solution:

Ratio of two numbers is 10 : 9

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Let the common multiple be x .

$\therefore$ First number = $10x$ and

Second number = $9x$

According to the given condition,

Product of two numbers is 360

$$\therefore (10x)(9x) = 360$$

$$\therefore 90x^2 = 360$$

$$\therefore x^2 = 4$$

$$\therefore x = 2 \dots \text{[Taking positive square root on both sides]}$$

$$\therefore \text{First number} = 10x = 10 \times 2 = 20$$

$$\text{Second number} = 9x = 9 \times 2 = 18$$

$\therefore$ The two numbers are 20 and 18.

Question 5.

If $a : b = 3 : 1$ and $b : c = 5 : 1$, then find the value of [3 Marks each]

i. $\left(\frac{a^3}{15b^2c} \right)^3$

ii. $\frac{a^2}{7bc}$

Solution:

Given, $a : b = 3 : 1$

$$\therefore ab = 3^1$$

$$\therefore a = 3b \dots (i)$$

and $b : c = 5 : 1$

$$\therefore bc = 5^1$$

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$$b = 5c \dots (ii)$$

Substituting (ii) in (i),

we get $a = 3(5c)$

$$\therefore a = 15c \dots (iii)$$

$$\begin{aligned} i. \quad \left(\frac{a^3}{15b^2c} \right)^3 &= \left[\frac{(15c)^3}{15(5c)^2c} \right]^3 \dots [\text{From (ii) and (iii)}] \\ &= \left[\frac{15c \times 15c \times 15c}{15 \times 5c \times 5c \times c} \right]^3 \\ &= (3 \times 3)^3 \\ &= (9)^3 \end{aligned}$$

$$\therefore \left(\frac{a^3}{15b^2c} \right)^3 = 729$$

$$\begin{aligned} ii. \quad \frac{a^2}{7bc} &= \frac{(15c)^2}{7 \times 5c \times c} \dots [\text{From (ii) and (iii)}] \\ &= \frac{15c \times 15c}{7 \times 5c \times c} \end{aligned}$$

$$\therefore \frac{a^2}{7bc} = \frac{45}{7}$$

Question 6. If $0.04 \times 0.4 \times a \dots \dots \dots \sqrt{} = 0.4 \times 0.04 \times b \sqrt{}$, then find the ratio $a:b$.

Solution:

$$0.04 \times 0.4 \times a \dots \dots \dots \sqrt{} = 0.4 \times 0.04 \times b \sqrt{} \dots [\text{Given}]$$

$$\therefore 0.04 \times 0.4 \times a = (0.4)^2 \times (0.04)^2 \times b \dots [\text{Squaring both sides}]$$

$$\begin{aligned}\therefore \frac{a}{b} &= \frac{(0.04)^2 \times (0.4)^2}{0.04 \times 0.4} \\ &= 0.04 \times 0.4 = 0.016 \\ &= \frac{16}{1000} \\ &= \frac{8 \times 2}{8 \times 125} \\ \therefore \frac{a}{b} &= \frac{2}{125}\end{aligned}$$

Question 7. $(x + 3) : (x + 11) = (x - 2) : (x + 1)$, then find the value of x .

Solution:

$$(x + 3) : (x + 11) = (x - 2) : (x + 1)$$

$$x+3x+11=x-2x+1$$

$$\therefore (x + 3)(x + 1) = (x - 2)(x + 11)$$

$$\therefore x(x + 1) + 3(x + 1) = x(x + 11) - 2(x + 11)$$

$$\therefore x^2 + x + 3x + 3 = x^2 + 11x - 2x - 22$$

$$\therefore x^2 + 4x + 3 = x^2 + 9x - 22$$

$$\therefore 4x + 3 = 9x - 22$$

$$\therefore 3 + 22 = 9x - 4x$$

$$\therefore 25 = 5x$$

$$\therefore x = 5$$



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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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