



Learn the Basics of Ratios and Proportions for WBP Constable Exam

Dive into the world of mathematics and elevate your preparation for the **WBP Constable Exam** by delving into the Basics of **Ratios and Proportions**. This comprehensive course is meticulously crafted to equip you with a solid understanding of these fundamental mathematical concepts. From understanding the essence of ratios to mastering proportions, this course aims to simplify complex topics through clear explanations and practical examples.

Whether you are a novice or seeking to reinforce your existing knowledge, this learning journey will empower you with the skills needed to confidently approach ratio and proportion problems. Gear up for success as you navigate through this educational adventure tailored for WBP Constable Exam aspirants.

Ratio and Proportion

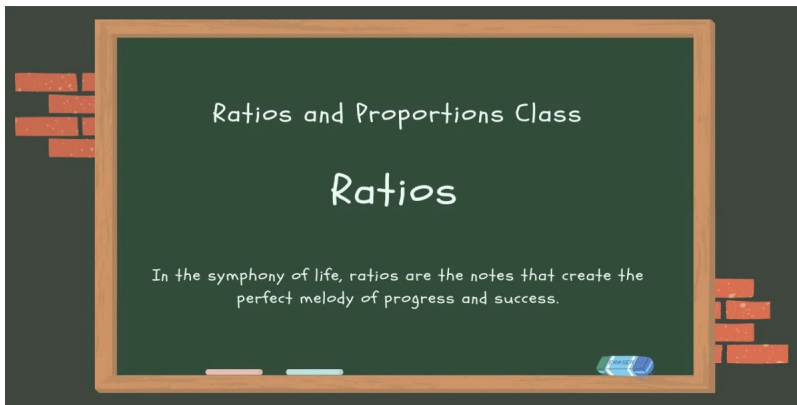
Let's first understand what are **Ratios and Proportions**,

When two or more similar quantities are compared, then to represent this comparison, ratios are used. The ratio between x and y can be represented as $x : y$, where x is called antecedent, and y is called the consequent.

$x : y$ or x/y

A proportion is an expression which states that two ratios are equal e.g. $3/12 = 1/4$.

$\Rightarrow 3 : 12 = 1 : 4$



Let's understand the Ratios in detail.

Ratio

As in ratios, two quantities are compared so quantities should be in the same unit and the ratio has no unit.

TIP: In ratios $a : b$ is different from $b : a$.



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Dividing a number in a Ratio:

Let 'A' be a given number. The given ratio is $a_1 : a_2$, so 'A' has to be divided in the ratio of $a_1 : a_2$,

$$\text{First part} = \frac{a_1}{a_1 + a_2} \times A$$

$$\text{Second part} = \frac{a_2}{a_1 + a_2} \times A$$

Since, 'A' has to be divided in the ratio, so, (first part + second part) = A

E.g. Dividing 3200 among P, Q, and R in the ratio of 5 : 2 : 9, find the amount received by R.

Sol: Amount received by R = $\frac{9}{5 + 2 + 9} \times 3200 = \frac{9}{16} \times 3200 = 1800$ (Ans.)

E.g. In a 40 liters mixture acetic acid and sodium acetate are in the ratio 3 : 1; find the amount of sodium acetate solution to be added to make the ratio 2 : 3.

Sol: Sodium acetate in the solution = $\frac{1}{1 + 3} \times 40 = 10$

$$\text{Rest} = 40 - 10 = 30$$

Let 'x' amount be added of sodium acetate in the solution to make ratio 2 : 3.

$$\Rightarrow \frac{30}{10 + x} = \frac{2}{3}$$

$$\Rightarrow 90 = 20 + 2x$$

$$\Rightarrow 2x = 70$$

$$\Rightarrow x = 35$$
 (Ans.)

We will discuss these types of problems in the Mixtures and Alligations chapter.

Comparison of Ratio

We will understand this topic examples.

E.g. Which is greater, $\frac{5}{8}$, or $\frac{3}{8}$?

Sol: We can easily compare both sides as the denominator is the same for both;

$$\Rightarrow 5 > 3 \text{ so, } \frac{5}{8} > \frac{3}{8}$$
 (Ans.)

E.g. Which is greater, $\frac{4}{7}$ or $\frac{5}{9}$?

Sol: As denominator of both fractions are different so we simply can't compare, let's simplify them,



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As $4/7 = 0.5714$ and $5/9 = 0.5555$

As $0.57 > 0.55 \Rightarrow 4/7 > 5/9$ (Ans.)

- For comparing two fractions we can simply convert both ratios in such a way that both ratios have the same denominator, then compare their numerator, the fraction with greater numerator will be greater.
- For comparing two fractions we can simply convert both ratios in such a way that both ratios have the same numerator, then compare their denominator, the fraction with greater denominator will be lesser.

E.g. Which is greater, $4/7$, or $5/9$?

Sol: Let's try to make the numerator equal

$$\Rightarrow (4 \times 5)/(7 \times 5) = 20/35; (5 \times 4) / (9 \times 4) = 20/36$$

As $35 < 36$ so $4/7 > 5/9$ (Ans.)

For solving questions related to ratios we need to compare two quantities, let's discuss some properties of comparison;

1. $a : b > c : d$ if $ad > bc$
2. $a : b < c : d$ if $ad < bc$
3. $a : b = c : d$ if $ad = bc$

E.g. Which is greater, $4/7$, or $5/9$?

Sol: Let $a/b = 4/7$ and $c/d = 5/9$

$$\Rightarrow ad = 4 \times 9, bc = 7 \times 5$$

$$\Rightarrow ad = 36, bc = 35$$

$$\Rightarrow ad > bc, 4/7 > 5/9$$
 (Ans.)

Without any cumbersome calculation, we arrived at our solution. So now, let's understand the basics of proportion.

Proportion

An equality or two ratios is called a proportion and we say that the four numbers are in proportion.

If $a/b = c/d$ or $a : b :: c : d$

Here, a and d are called **extremes (extreme terms)** and b, c are called **Means (middle terms)**.

$$\text{Or, } a \times d = b \times c.$$

If $a : b :: b : c$, then these numbers a, b, c are said to be in **Continued Proportion**.



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$$\Rightarrow a : b :: b : c$$

$$\Rightarrow a : b = b : c$$

$$\Rightarrow a \times c = b \times b$$

$$\Rightarrow ac = b^2$$

$$\Rightarrow c = b^2/a$$

Where b is called **Mean Proportional** and c is called **Third Proportional**.

E.g. Mean proportional to 'a' and 'b'.

Sol: Let it be 'x'

$$\Rightarrow a : x :: x : b$$

$$\Rightarrow a \times b = x \times x$$

$$\Rightarrow ab = x^2$$

$$\Rightarrow x = \sqrt{ab} \text{ (Ans.)}$$

E.g. The ratio of incomes of Raman and Gagan is 4 : 3 and the ratio of their expenditures is 3 : 2. If each person saves Rs 2500, then find their incomes and expenditures.

Sol: Let the income of Raman be 4x and income of Gagan is 3x.

$$\Rightarrow \text{Expenditures of Raman} = 4x - 2500$$

$$\Rightarrow \text{Expenditures of Gagan} = 3x - 2500$$

According to question, $(4x - 2500)/(3x - 2500) = 3/2$

$$\Rightarrow 8x - 5000 = 9x - 7500$$

$$\Rightarrow x = 2500$$

$$\text{Income of Gagan, } 3x = 3 \times 2500 = 7500$$

$$\text{Income of Raman, } 4x = 4 \times 2500 = 10000$$

$$\text{Expenditures of Gagan, } 3x - 2500 = 7500 - 2500 = 5000$$

Expenditures of Raman,

$$\Rightarrow 4x - 2500 = 10000 - 2500 = 7500 \text{ (Ans.)}$$

This is a very common question in the quant section and it took a very long time to solve too, so let's find a better alternative for this.



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TRICK: The incomes of two persons are in the ratio of $a : b$ and their expenditures are in the ratio of $c : d$. If each of them saves X , then their **incomes** are given by,

$$[X(d - c) / (ad - bc)] \times a \text{ and } [X(d - c) / (ad - bc)] \times b, \text{ respectively.}$$

Their **expenditures** are given by,

$$[X(b - a) / (ad - bc)] \times c \text{ and } [X(b - a) / (ad - bc)] \times d, \text{ respectively.}$$

Let's try to solve the previous question by this method.

$$\Rightarrow \text{Income of Raman} = [X(d - c) / (ad - bc)] \times a = [2500(2 - 3) / (8 - 9)] \times 4 = 10000$$

$$\Rightarrow \text{Income of Gagan} = [X(d - c) / (ad - bc)] \times b = [2500(2 - 3) / (8 - 9)] \times 3 = 7500 \text{ (Ans.)}$$

Yes, we got the solution and it's fast if we remember the formula correctly.

Let us look at few examples and if you are now confident about this section, just try these questions by yourself before looking at my solution. Some of these questions were asked in the **WBP Constable** Exam. So, please take this section very seriously.

Examples on Ratios and Proportions for Better Understanding

E.g. In a bag with 1 rupee, 50 paise, and 25 paise, if the ratio of the number of coins is $2 : 3 : 5$, what would be the ratio of their values? **[WBP Constable 2018]**

Sol: Given,

$$\Rightarrow 1 \text{ rupee coins} : 50 \text{ paise coins} : 25 \text{ paise coins} = 2 : 3 : 4$$

We know that, 1 rupee = 100 paise

$$\Rightarrow 100 \text{ paise coins} : 50 \text{ paise coins} : 25 \text{ paise coins} = 2 : 3 : 4$$

The ratio of their values will be:

$$\Rightarrow 2 \times 100 : 3 \times 50 : 4 \times 25 = 200 : 150 : 100 = 4 : 3 : 2 \text{ (Ans.)}$$

E.g. The sides of a triangle are in the ratio of $7 : 9 : 12$. The difference between the length of largest and the smallest sides is 15 cm. The length of largest side is **[WBP Constable 2016]**

Sol: Let the three sides of triangle be $7x$, $9x$ and $12x$. Given,

$$\Rightarrow 12x - 7x = 5x = 15$$



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$$\Rightarrow x = 3$$

So, the length of largest side = $12x = 12 \times 3 = 36$ cm (Ans.)

E.g. In a class of girls and boys, 10% boys are equal to $1/4$ th number of girls. What is the ratio between the number of boys and girls of the class? [WBP Constable 2013]

Sol: Let, the number of boys in the class is b and the number of girls is g . Given,

$$\Rightarrow b/10 = g/4$$

$$\Rightarrow 4b = 10g$$

$$\Rightarrow b/g = 10/4 = 5 : 2$$

So, the ratio between the number of boys and girls of the class is $5 : 2$. (Ans.)

As we conclude this insightful journey into the Basics of Ratios and Proportions, you now possess a robust foundation in fundamental mathematical concepts crucial for the WBP Constable Exam. The mastery you've gained over ratios and proportions will undoubtedly enhance your problem-solving skills, empowering you to tackle mathematical challenges with confidence. Remember, these foundational principles are not just confined to exams but form an integral part of real-life applications. So, take pride in the knowledge you've acquired, and let it guide you towards success.

So, this is all for today. If you like this blog, do check out our latest blog on [Averages](#). In our next blog, we will discuss the [Age Based Problems on Ratios](#) for **WBP Constable Exam**. Till then, stay tuned!