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GMAT RATIO AND PROPORTIONS FORMULAS PDF

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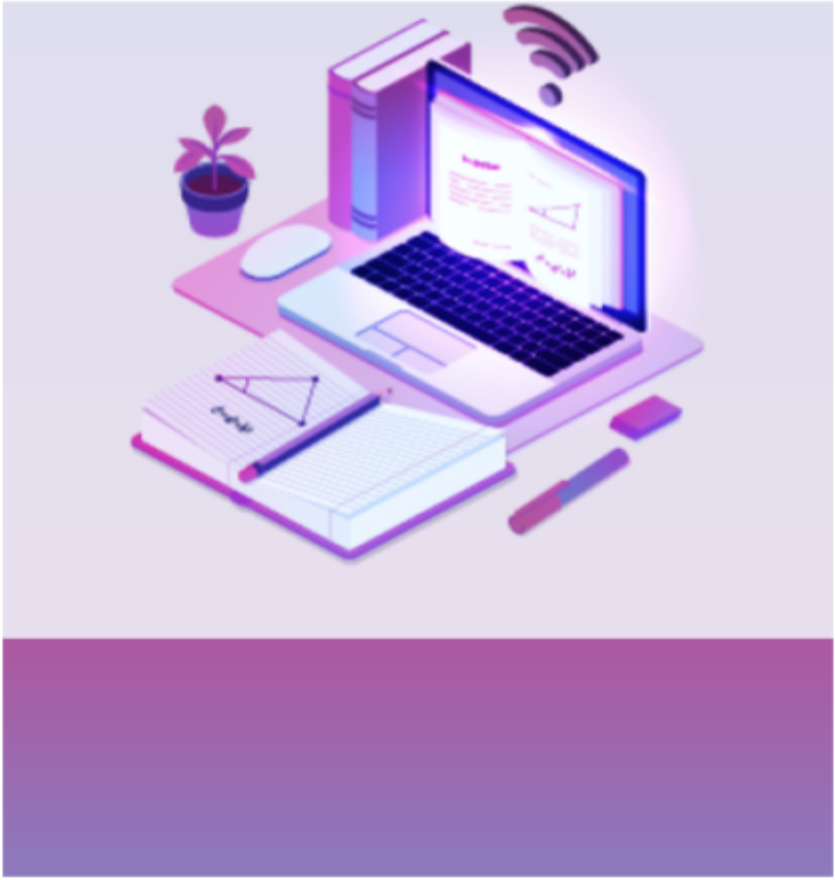

Ratio and Proportion Tips Formulae and shortcuts

- **Ratio and Proportion**
- One of the most basic GMAT topics is ratio and proportions. It's merely a continuation of high school math.
- The fundamentals of this notion are significant not only in their own right, but also in answering questions about other concepts.
- All ratio and proportion problems need the use of the ratio proportion formula. We may simplify our work and save a lot of time by using the ratio

proportion formula. So, here are the formulas for proportional ratios.

- A ratio can only compare two numbers with the same unit, and the sign we use to denote a ratio is ":" In a faction, we use "/" and "to" to represent a ratio.
- The Ratio of the number a to the number b ($b \neq 0$) is $\frac{a}{b}$
- Example: A ratio, for example, can be expressed or represented in a variety of ways. For instance, the ratio of 2 to 3 can be expressed as 2:3 or $\frac{2}{3}$

- The order in which the terms of a ratio are written is important. The ratio of the number of months having precisely 30 days to the number of months with exactly 31 days, for example is $\frac{4}{7}$,not$\frac{7}{4}$
- It is not necessary for a ratio to be positive. When dealing with quantities of objects, however, the ratios will be positive. Only positive ratios will be considered in this notion.
- A ratio remains the same if both antecedent and consequent are multiplied or divided by the same non-zero number, i.e.,

$$\frac{a}{b}=\frac{pa}{pb}=\frac{qa}{qb}, \text{ p,q}\neq 0$$

$$\frac{a}{b}=\frac{a/p}{b/p}=\frac{a/q}{b/q}, \text{ p,q}\neq 0$$

- Two ratios in fraction notation can be compared in the same way that actual numbers can.

$$\frac{a}{b}=\frac{p}{q}\Leftrightarrow aq = bp$$

$$\frac{a}{b}> \frac{p}{q}\Leftrightarrow aq > bp$$

$$\frac{a}{b}< \frac{p}{q}\Leftrightarrow aq < bp$$

- **If a, b, x are positive, then**

If a > b, then $\frac{a+x}{b+x} < \frac{a}{b}$

If a < b, then $\frac{a+x}{b+x} > \frac{a}{b}$

If a > b, then $\frac{a-x}{b-x} > \frac{a}{b}$

If a < b, then $\frac{a-x}{b-x} < \frac{a}{b}$

If $\frac{a}{p} = \frac{b}{q} = \frac{c}{r} = \frac{d}{s} = \ldots$,

then a:b:c:d:... = p:q:r:s:...

- **If two ratios $\frac{a}{b}$ and $\frac{c}{d}$ are equal**
  - $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{b}{a} = \frac{d}{c}$ (Invertendo)
  - $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{c}{a} = \frac{b}{d}$ (Alternendo)
  - $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{b} = \frac{c+d}{d}$ (Componendo)
  - $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a-b}{b} = \frac{c-d}{d}$ (Dividendo)
  - $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{a-b} =$ (Componendo-Dividendo)
  - a/b = c/d $\Rightarrow$ pa+qb/ra+sb = pc+qd/ rc+sd, for all real p, q, r, s such that pa+qb$\neq$0 and rc+sd$\neq$0

- **If a, b, c, d, e, f, p, q, r are constants and are not equal to zero**

➔ $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \ldots$ then each of these ratios is equal to $\frac{a+c+e\ldots}{b+d+f\ldots}$

➔ $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \ldots$ then each of these ratios is equal to $\frac{pa+qc+re\ldots}{pb+qd+rf\ldots}$

➔ Duplicate Ratio of a : b is $a^2 : b^2$

➔ Sub-duplicate ratio of a : b is $\sqrt{a} : \sqrt{b}$

➔ Triplicate Ratio of a : b is $a^3 : b^3$

➔ Sub-triplicate ratio of a : b is $a^{1/3} : b^{1/3}$

Proportions :

- A proportion is defined as an equalisation of ratios.
- As a result, if a:b = c:d is a ratio, the first and final terms are referred to as extremes, whereas the middle two phrases are referred to as means.
- When four terms a, b, c, and d are considered to be proportionate, a:b = c:d is the result. When three terms a, b, and c are considered to be proportionate, a:b = b:c is the result.
- A proportion is a statement that two ratios are equal; for example $\frac{2}{3}=\frac{8}{12}$ is a proportion.
- One way to solve a proportion involving an unknown is to cross multiply, obtaining a new equality.
- For example, to solve for n in the proportion $\frac{2}{3}=\frac{n}{12}$, cross multiply, obtaining 24=3n, then divide both sides by 3, to get n=8

Properties of proportions :

- If a:b = c:d is a proportion, then Product of extremes = product of means i.e., ad = bc
- Denominator addition/subtraction: a:a+b = c:c+d and a:a-b = c:c-d
- a, b, c, d,.... are in continued proportion means, a:b = b:c = c:d = ...
- a:b = b:c then b is called mean proportional and b^2 = ac
- The third proportional of two numbers, a and b, is c, such that, a:b = b:c. d is fourth proportional to numbers a, b, c if a:b = c:d

Variations :

- If x varies directly to y, then x is said to be in directly proportional with y and is written as $x \propto y$
  - ➔ x = ky (where k is direct proportionality constant)
  - ➔ x = ky + C (If x depends upon some other fixed constant C)
- If x varies inversely to y, then x is said to be in inversely proportional with y and is written as $x \propto \frac{1}{y}$
  - ➔ $x = k\frac{1}{y}$ (where k is indirect proportionality constant)
  - ➔ $x = k\frac{1}{y}$ + C (If x depends upon some other fixed constant C)
- If $x \propto y$ and $y \propto z$ then $x \propto z$
- If $x \propto y$ and $x \propto z$ then $x \propto (y \pm z)$
- If $a \propto b$ and $x \propto y$ then $ax \propto by$
