CDS-AFCAT 1 2025

SSBCrack EXAMS

LIVE

MATHS

RATIO & PROPORTION

CLASS 1

NAVJYOTI SIR

11 Oct 2024 Live Classes Schedule

8:00AM	11 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	11 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

1:00PM	BIOLOGY - MCQ - CLASS 4	SHIVANGI MA'AM
4:00PM	MATHS - TRIGONOMETRY - CLASS 4	NAVJYOTI SIR

CDS 1 2025 LIVE CLASSES

1:00PM	BIOLOGY - MCQ - CLASS 4	SHIVANGI MA'AM
7:00PM	MATHS - RATIO & PROPORTION - CLASS 1	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - UNIVERSE & SOLAR SYSTEMS	DIVYANSHU SIR
7:00PM	MATHS - RATIO & PROPORTION - CLASS 1	NAVJYOTI SIR

RATIO

- **Ratio is strictly a mathematical term to compare two similar quantities expressed in the same units.**

- **The ratio of two terms 'x' and 'y' is denoted by $x : y$.**

$$\text{Ratio of } x \text{ to } y = \frac{x}{y} = x : y$$

RATIO

- **The numerator of the ratio is called the antecedent (x) and the denominator is called the consequent (y) of the ratio.**

$$a : b = \frac{a}{b}$$

a — antecedent

b — consequent

PROPERTIES OF RATIOS

- The two quantities must be of the same kind and in same units.

- The ratios is a pure number, i.e., without any unit of measurement.

PROPERTIES OF RATIOS

- **The ratio would stay unaltered even if both the numerator and the denominator are multiplied or divided by the same non-zero number.**

Example: $\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{2}{3} = \frac{4}{6}$

$4 : 8 : 12$ ——— X

$= 1 : 2 : 3$ (ratio) — ✓

PROPERTIES OF RATIOS

- **If the sum of two numbers is A and their difference is a, then the ratio of numbers is given by $A + a : A - a$.**

$x + y = A$ — (1)

$x - y = a$ — (2)

(1) + (2), $2x = A + a$

$x = \left(\frac{A+a}{2}\right)$

(1) − (2), $2y = A - a \Rightarrow y = \left(\frac{A-a}{2}\right)$

$$\frac{x}{y} = \frac{\left(\frac{A+a}{2}\right)}{\left(\frac{A-a}{2}\right)} = \frac{A+a}{A-a} = A+a : A-a$$

Sum + diff : Sum − diff.

COMPARISON OF RATIO

- **Find which is largest among these $\frac{2}{5}, \frac{4}{3}$ and $\frac{4}{15}$.** $(2:5,\ 4:3,\ 4:15)$

$\frac{2}{5} = \frac{6}{15}$

$\frac{4}{3} = \frac{20}{15}$ ✓

$\frac{4}{15}$

$\frac{4}{3} \rightarrow 4:3$ is the largest ratio.

(Two or more ratios may be compared by reducing the equivalent fractions to a common denominator and then comparing the magnitudes of their numerator)

TYPES OF RATIOS

- **Compound Ratio** – Ratios are compounded by multiplying together the numerators for a new numerator and the denominators for a new denominator.

  The compound ratio of $a: b$ and $c: d$ is $\frac{a \times c}{b \times d}$ i.e., $ac: bd$.

  $\frac{a}{c} \quad \frac{b}{d} \rightarrow \frac{a \times b}{c \times d} = ab : cd$

- **Duplicate Ratio –** Duplicate ratio of $(x: y)$ is $x^2: y^2$ (square)
- **Triplicate Ratio –** Triplicate ratio of $(x: y)$ is $x^3: y^3$ (cube)
- **Sub – Duplicate Ratio –** Sub - duplicate ratio of $(x: y)$ is $\sqrt{x}: \sqrt{y}$ (square root)

TYPES OF RATIOS

- **Sub – Triplicate Ratio –** Sub - triplicate ratio of $(x: y)$ is $\sqrt[3]{x}: \sqrt[3]{y}$ (cube root)
- **Reciprocal Ratio –** Reciprocal ratio of $(x: y)$ is $\frac{1}{x}: \frac{1}{y}$
- **Inverse Ratio –** Inverse ratio of $(x: y)$ is $y: x$.

PROPERTIES OF RATIOS

- **Invertendo – If $\frac{a}{b} = \frac{c}{d}$ then $\frac{b}{a} = \frac{d}{c}$, i.e., the inverse ratios of two equal ratios are equal. This property is called Invertendo.**

- **Alternendo – If $\frac{a}{b} = \frac{c}{d}$ then $\frac{a}{c} = \frac{b}{d}$, i.e., the ratio of antecedents and consequents of two equal ratios are equal. This property is called Alternendo.**

PROPERTIES OF RATIOS

- **Componendo** – If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a+b}{b} = \frac{c+d}{d}$. This property is called Componendo.
- **Dividendo** – If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a-b}{b} = \frac{c-d}{d}$. This property is called Dividendo.
- **Componendo - Dividendo** – If $\frac{a}{b} = \frac{c}{d}$, then $\frac{a+b}{a-b} = \frac{c+d}{c-d}$. This property is called Componendo - Dividendo.

WAY TO SOLVE RATIO

Suppose any given quantity a, is to be divided in the ratio $m : n$.

Step 1: Make $m + n = a$, so $1 = \frac{a}{m+n}$

Step 2: To find value of m, we multiply as $m \times \frac{a}{m+n}$ and similarly, to find value of n, we multiply as $n \times \frac{a}{m+n}$

Step 3: Finally, a gives two values in the ratio of $m : n$.

QUESTION

Divide 70 in the ratio 3 : 7.

$\frac{3}{10} \times 70 = 21$

$\frac{7}{10} \times 70 = 49$

$(21 + 49 = 70)$

QUESTION

If $A:B = 2:3$ and $B:C = 6:9$. Find $A:B:C$.

$A:B = 2:3 \times 2 = 4:6$

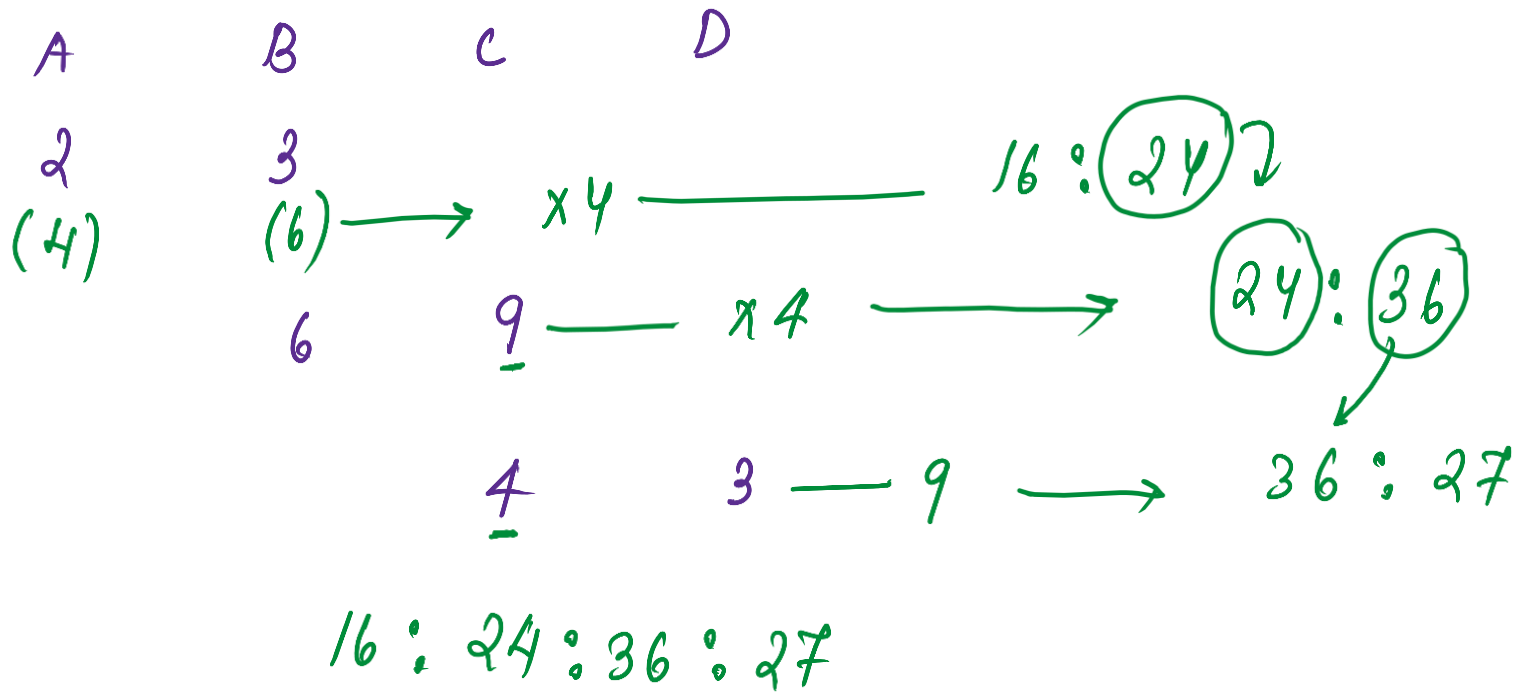
$B:C = 6:9 = 6:9$

$4:6:9$ ✓

common to be made equal,

QUESTION

If $A:B = 2:3, B:C = 6:9$, and $C:D = 4:3$. Find $A:B:C:D$.



QUESTION

If $Rs\ 950$ is divided among A, B, C in the ratio of $\frac{1}{2} : \frac{1}{4} : \frac{1}{5}$. What share did A get?

$\frac{1}{2} \times 20 : \frac{1}{4} \times 20 : \frac{1}{5} \times 20$

(10 : 5 : 4)

Ratio — Integers + no-common factor

$A \rightarrow \frac{10}{10+5+4} \times 950$

$\frac{10}{19} \times \overset{50}{\cancel{950}} = 500$

QUESTION

The ratio between two numbers is 3 : 4. If each number be increased by 2, the ratio becomes 7 : 9. Find the numbers.

$3 : 4$

numbers $\longrightarrow$ $3k$ & $4k$

3×4 $\quad$ 4×4

12 $\quad$ 16

$$\frac{3k+2}{4k+2} = \frac{7}{9}$$

$$27k + 18 = 28k + 14$$

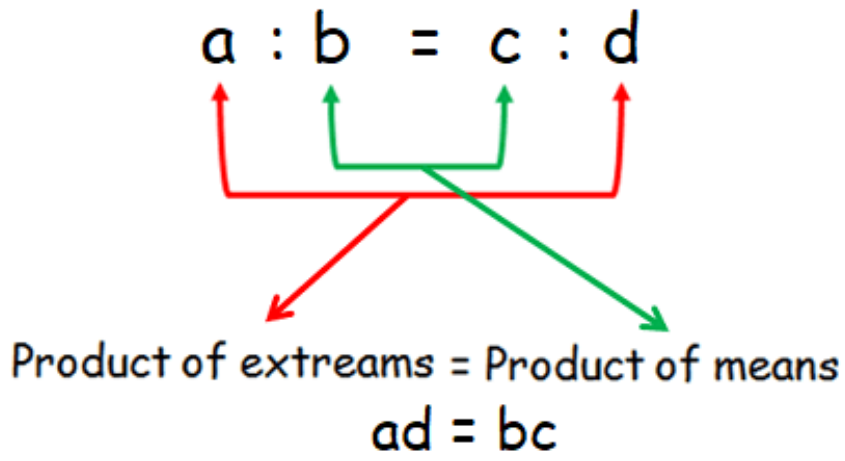
$$4 = k$$

PROPORTION

- When two ratios are equal, then the four quantities composing them are said to be in proportion.
- If $\frac{a}{b} = \frac{c}{d}$, then a, b, c, d are said to in proportion.
- This is expressed by saying that ‘a’ is to ‘b’ as ‘c’ is to ‘d’ and then proportion is written as $a : b :: c : d$ or $a : b = c : d$
- The terms ‘a’ and ‘d’ are called the extreme terms while ‘b’ and ‘c’ are called the mean terms.

OPERATIONS OF PROPORTION

- **Mean Proportional –** Mean proportional between 'a' and 'b' is $\sqrt{a \times b}$.
- **Third Proportional –** If $a : b = b : c$, then c is called the third proportional to a and b.
- **Fourth Proportional -** If $a : b = c : d$, then d is called the Fourth proportional to a, b and c.



$a : b :: c : d$

$\frac{a}{b} = \frac{c}{d}$

$a \times d = c \times b$

QUESTION

Find:

a) mean proportional between 3 and 75.

b) Fourth proportional of 23, 46 & 53.

a) $\sqrt{3 \times 75} = \sqrt{225} = 15$ $\left(\sqrt{3 \times 3 \times 25} = 3 \times 5 = 15 \right)$

b) $\frac{23}{46} = \frac{53}{x} \Rightarrow x = 53 \times 2 = 106$

QUESTION

Find two numbers such that their mean proportional is 18 and third proportional to them is 144.

$a \quad b$

$\sqrt{ab} = 18 \Rightarrow ab = 18^2 = 324$

$\frac{a}{b} = \frac{b}{144} \Rightarrow b^2 = 144a$

$b^2 = \frac{144 \times 324}{b}$

$b^3 = 144 \times 324$

$= 12^2 \times 18^2$

$= 2 \times 2 \times 3 \times 2 \times 2 \times 3 \times 3 \times 3 \times 2 \times 2 \times 3 \times 3$

$b = 2 \times 3 \times 2 \times 3 = 36$

$a = 9 \quad b = 36$

QUESTION

In a class of 45 students, the ratio of boys and girls is 2: 3. How many more boys are to be added to make the ratio 2: 1?

$B : G = 2 : 3$

no. of boys $= \frac{2}{5} \times 45 = 18$

no. of girls $= \frac{3}{5} \times 45 = 27$

$$\frac{18 + x}{27} = \frac{2}{1}$$

$$18 + x = 54$$

$$x = 36$$

QUESTION

What must be added to each of the four numbers $10, 18, 22, 38$ so that they become in proportion ?

$$\frac{10+x}{18+x} = \frac{22+x}{38+x}$$

$$x^2 + 48x + 380 = x^2 + 40x + 396$$

$$8x = 16$$

$$x = 2$$

QUESTION

Divide $Rs\ 581$ among A, B and C such that four-time $A's$ share is equal to 5 times $B's$ share which is equal to seven times $C's$ share. Find A's share.

A B C

$4A = 5B = 7C$

$A + B + C = 581$

$A + \frac{4A}{5} + \frac{4}{7}A = 581$

$35A + 28A + 20A = 581 \times 35$

$83A = 581 \times 35$

$A = \frac{581 \times 35}{83} = 245$

A's Share

₹ 245

PARTNERSHIP

- A partnership is an association of two or more persons who invest their money in order to carry on a certain business. A partner who manages the business is called the **working partner/active partner** and the one who simply invests the money is called the **sleeping partner.**

  profit + salary,

  profits

  Partnership is of two kinds :

  (i) Simple

  (ii) Compound

PARTNERSHIP

- **Simple partnership -** If the capitals of the partners are invested for the same period, the partnership is called simple.
- **Compound partnership -** If the capitals of the partners are invested for different lengths of time, the partnership is called compound
- Ratio of profit/Loss is dependent over investment and time given by participant.

Suppose, A and B are partner in business, then their profit/loss is as follows:

$$\frac{Investment\ of\ A \times Period\ of\ investment\ of\ A}{Investment\ of\ B \times Period\ of\ investment\ of\ B} = \frac{Profit\ of\ A}{Profit\ of\ B}\ or\ \frac{Loss\ of\ A}{Loss\ of\ B}$$

$$(\text{Investment})_A \times (\text{Time till money is kept invested})_A :$$

$$(\quad " \quad \hat{} \quad)_B \times (\qquad\qquad)_B :$$

$$(\qquad\qquad)_C \times (\qquad\qquad)_C = \underline{\underset{(A)}{\text{profit}}} : \underline{\underset{(B)}{\text{profit}}} : \underline{\underset{(C)}{\text{profit}}}$$

QUESTION

Three partner Rahul, Puneet and Chandan invest $Rs\ 1600$, $Rs\ 1800$ and $Rs\ 2300$ respectively in a business for 1 year. Find the ratio of profit.

$1600 \times 1 : 1800 \times 1 : 2300 \times 1$

$16 : 18 : 23$

QUESTION

Three partners A,B and C invested $Rs\ 1600$, $Rs\ 1800$, and $Rs\ 2200$ where each given time of 1 year. How should they divide a profit of $Rs\ 56$?

A → ₹ 16

B → ₹ 18

C → ₹ 22

QUESTION

A and B started a business where A invested $Rs\ 500$ for 6 months and B invested Rs 1200 for 1 year. In what ratio profit will be divided?

QUESTION

A and B invested in the ratio $3:2$ in a business. If 5% of the total profit goes to charity and A's share is $Rs\ 855$, find the total profit.

QUESTION

A started a business with a capital of $Rs54{,}000$ and admitted B and C after 4 months and 6 months, respectively. At the end of the year, the profit was divided in the $1:4:5$. What is the difference between the capitals invested by B and C ?

CDS-AFCAT 1 2025

SSBCrack EXAMS

LIVE

MATHS

RATIO & PROPORTION

CLASS 3

NAVJYOTI SIR