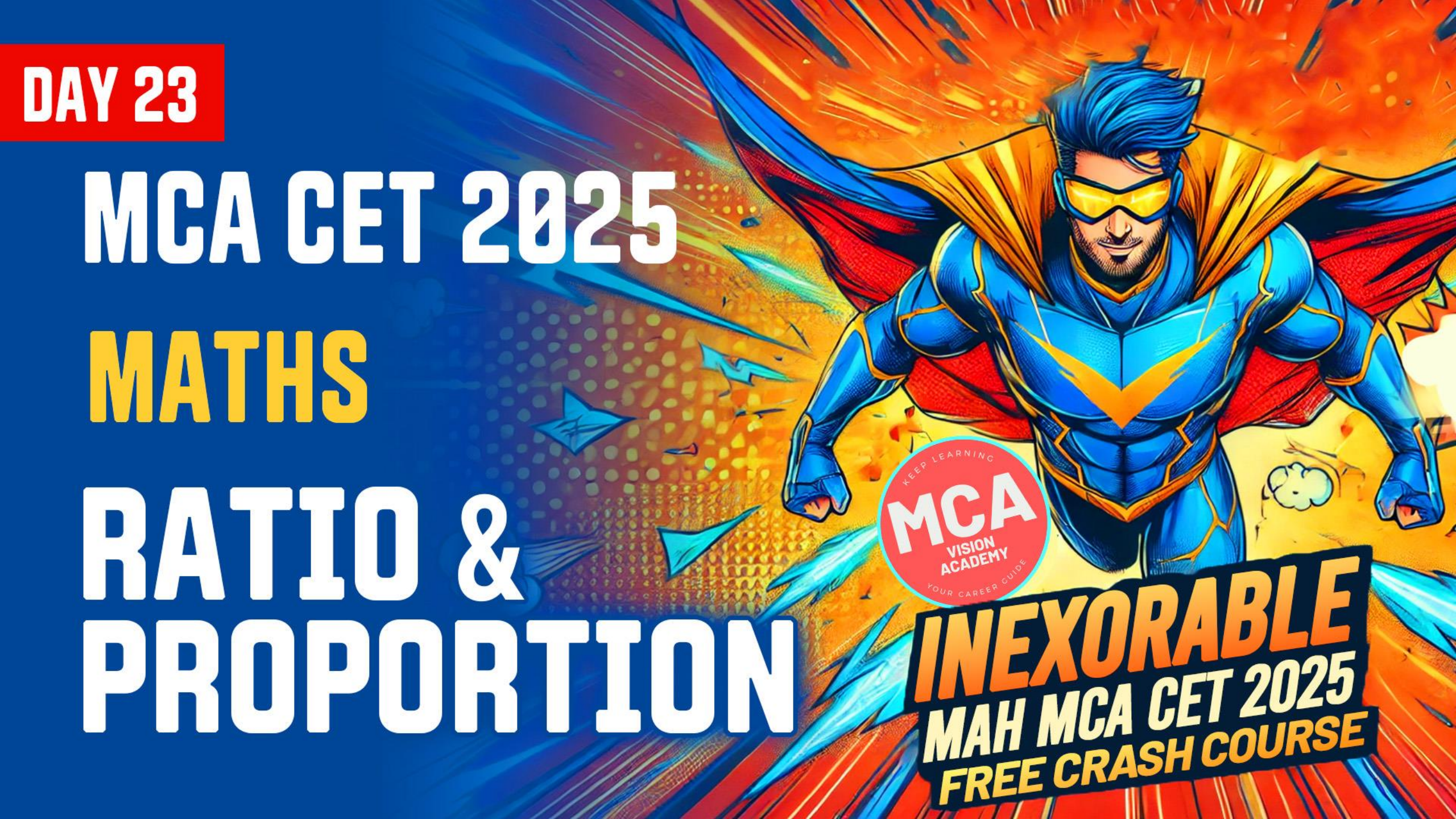
DAY 23

MCA CET 2025

MATHS

RATIO & PROPORTION



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Ratio

The ratio between x and y can be represented as x: y, where x is called antecedent and y is called consequent.

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

Comparison of Ratios

If $\frac{a}{b}$ ~~~ $\frac{c}{d}$

$ad > cb \quad \therefore \frac{a}{b} > \frac{c}{d}$

$ad < cb \quad \therefore \frac{a}{b} < \frac{c}{d}$

$ad = cb \quad \therefore \frac{a}{b} = \frac{c}{d}$

Proportion

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

- An equality of two ratios is called the proportion.
- a : b :: c : d, where symbol :: represents proportion and it is read as 'a is to b' as 'c is to d'.
- a and d are extremes and b and c are means.

Continued Proportion

If a : b :: b : c then c is the 3rd Proportional

$$\frac{a}{b} = \frac{b}{c} \Rightarrow \boxed{c = \frac{b^2}{a}}$$

Continued Proportion

If a : b :: c : d then d is the 4th Proportional

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

Mean Proportional

- Mean proportional between a and b is $\sqrt{ab}$

Tip

a:b = 3:4

b:c = 2:5

Find a:b:c ?

$\frac{a}{b} = \frac{3}{4}$

$\frac{b}{c} = \frac{2 \times 2}{5 \times 2} = \frac{4}{10}$

$\therefore a:b:c = 3:4:10$

Equal the value of 'b'

a:b:c = 3 x 2 : 4 x 2 : 5 x 4

= 6 : 8 : 20

= 3 : 4 : 10

Tip

a:b = 1:2

b:c = 3:2

c:d = 1:3

Find a:b:c:d ?

a : b : c : d

1 : 2 → 2 → 2

3 ← 3 : 2 → 2

1 ← 1 ← 1 : 3

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a : b : c : d = 5 : 6 : 5 : 7

Tip : For a number divided in ratio

- If x is divided in a : b, then

$$1st\ part = \frac{ax}{a+b}$$

$$2nd\ part = \frac{bx}{a+b}$$

100

3 : 5

$1^{st} = \frac{3 \times 100}{8}$

$2^{nd} = \frac{5 \times 100}{8}$

Tip : For a number divided in ratio

- If x is divided in a : b : c, then

$$1st\ part = \frac{ax}{a+b+c}$$

$$2nd\ part = \frac{bx}{a+b+c}$$

$$3rd\ part = \frac{cx}{a+b+c}$$

Income Expenditure Ratio

The incomes of two persons are in ratio of a : b and their expenditures are in the ratio of c : d. If each of them saves Rs. X,

then their incomes are

$$\frac{X(d-c)}{ad-bc} \times a \text{ and } \frac{X(d-c)}{ad-bc} \times b$$

Their expenditures are

$$\frac{X(b-a)}{ad-bc} \times c \text{ and } \frac{X(b-a)}{ad-bc} \times d$$

a b $\sqrt{ab}$

If x is subtracted from each of 23, 39, 32 and 56, the numbers so obtained in this order are in proportion. What is the mean proportional between (x + 4) and (3x + 1)?

(a) 15 (b) 10 (c) 12 (d) 14

8 (9) (16)

$$\frac{23-x}{39-x} = \frac{32-x}{56-x}$$

$$\frac{23-x+39-x}{23-x-39+x} = \frac{32-x+56-x}{32-x-56+x}$$

$$\frac{62-2x}{-16} = \frac{88-2x}{-24} \Rightarrow \frac{31-x}{8} = \frac{44-x}{12}$$

Componend-Dividendo

$$\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$372 - 12x = 352 - 8x$$

$$20 = 4x \Rightarrow \boxed{x = 5}$$

$$\sqrt{9 \times 16} = 3 \times 4$$

$$= (12)$$

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What is the ratio of the mean proportional between 4.8 and 10.8 and the third proportional to 0.4 and 2.4?

(a) 2 : 1 (b) 3 : 2 (c) 1 : 2 (d) 2 : 3

$\sqrt{4.8 \times 10.8} = \sqrt{51.84}$

7.2

51 84 → 2. → 8.

7 → 49

8 → 64

$\frac{7.2}{2.4 \times 6} = \frac{1}{2}$

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

$c = \frac{b^2}{a}$ a b

$c = \frac{2.4 \times 2.4}{0.4}$ 1

$c = 2.4 \times 6.$

If (5a - 3b) : (4a - 2b) = 2:3, then a:b is equal to

(a)3:4 (b)2:3 (c)5:8 (d)5:7

$$\frac{5a-3b}{4a-2b} = \frac{2}{3}$$

$$\Rightarrow 15a - 9b = 8a - 4b$$

$$7a = 5b$$

$$\frac{a}{b} = \frac{5}{7}$$

If a : b = 2 : 5 , c : b = 3 : 4 , then a : b : c is equal to :

(a) 6 : 15 : 20 (b) 8 : 20 : 15

(c) 2 : 5 : 4 (d) 2 : 5 : 3

$a : b = 2 : 5 = 8 : 20$

$b : c = 4 : 3 = 20 : 15$

$\Rightarrow 8 : 20 : 15$

Two numbers are in the ratio 3:4. On increasing each of them by 30, the ratio becomes 9:10. The numbers are :

(a) 30,40

(b) 15,20

(c) 12,16

(d) 18,24

$\frac{x}{y} = \frac{3}{4}$

$\Rightarrow x = \frac{3y}{4}$

$\frac{x+30}{y+30} = \frac{9}{10}$

$\frac{\frac{3y}{4}+30}{(y+30)} = \frac{9}{10}$

$\frac{3y+120}{4y+120} = \frac{9}{10}$

$30y + 1200 = 36y + 1080$

$120 = 6y$

$\frac{120}{6} = y$

$y = 20$

a b c

What is the ratio between the fourth proportional of 3, 4, 9 and the mean proportional between 2 and 98?

(a) 7:8 (b) 7:6 (c) 8:7 (d) 6:7

$\frac{a}{b} = \frac{c}{d} \Rightarrow d = \frac{b \times c}{a} = \frac{4 \times 9^3}{3} \Rightarrow 12$

$\frac{12}{14} = \frac{6}{7}$

$\sqrt{2 \times 98} = \sqrt{2 \times 2 \times 49} = 2 \times 7 = 14$

In an office of 1200 employees, the ratio of urban to rural members of staff is 8: 7. After joining some new employees, out of which 20 are rural, the ratio becomes 5: 4. The number of new urban employees is:

(a) 100

(b) 85

(c) 76

(d) 108

$$\frac{U}{R} = \frac{8}{7} = \frac{640}{560}$$

$$\frac{640+x}{560} = \frac{5}{4}$$

$$2560 + 4x = 2900$$

$$4x = 340$$

$$x = \frac{340}{4}$$

$$= 85$$

12x

The ratio of the income of A to that of B is 5:7. A and B save Rs. 4000 and Rs. 5000 respectively. If the expenditure of A is equal to 66 2/3 % of the expenditure of B, then the total income of A and B is :

(a) Rs. 25,200 (b) Rs. 24,000

(c) Rs. 26,400 (d) Rs. 28,800

$\frac{A}{B} = \frac{5}{7}$ 'x'

Income: A = 5x B = 7x

savings: 4000 5000

Exp. : 5x-4000 7x-5000

$5x-4000 = 66\frac{2}{3}\%$ of $(7x-5000)$

$= \frac{200}{300} \times (7x-5000)$

$5x-4000 = \frac{14x}{3} - \frac{10000}{3}$

$5x - \frac{14x}{3} = -\frac{10000}{3} + 4000 \Rightarrow \frac{x}{3} = \frac{2000}{3} \Rightarrow x = 2000$

$12x = 12 \times 2000$

$= 24000$

If $x : y : z = 3:4:5$ and $x + y + z = 96$, then what is the value of z ?

(a) 42

(b) 36

(c) 32

(d) 40

'm'

$x = 3m$

$y = 4m$

$z = 5m$

$12m = 96$

$m = 8$

$= 5 \times 8 = 40$

There are 150 students in a school. If the ratio between the number of boys and girls is 4:1 then find the mean proportional between the number of boys and girls.

(a) 50 (b) 40 (c) 30 (d) 60

Boys = $\frac{4 \times 150}{5} = 120$

Girls = 30

$\sqrt{120 \times 30} = \sqrt{3600} = 60$

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