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## Ratio and Proportion

### IMPORTANT CONCEPTS

**I. Ratio:** The ratio of two quantities  $a$  and  $b$  in the same units, is the fraction  $\frac{a}{b}$  and we write it as  $a : b$ .

In the ratio  $a : b$ , we call  $a$  as the **first term** or **antecedent** and  $b$ , the **second term** or **consequent**.

**Ex.** The ratio  $5 : 9$  represents  $\frac{5}{9}$  with antecedent = 5, consequent = 9.

**Rule:** The multiplication or division of each term of a ratio by the same non-zero number does not affect the ratio.

**Ex.**  $4 : 5 = 8 : 10 = 12 : 15$  etc. Also,  $4 : 6 = 2 : 3$ .

**II. Proportion:** The equality of two ratios is called proportion.

If  $a : b = c : d$ , we write,  $a : b :: c : d$  and we say that  $a, b, c, d$  are in proportion.

Here  $a$  and  $d$  are called **extremes**, while  $b$  and  $c$  are called **mean terms**.

**Product of means = Product of extremes.**

Thus,  $a : b :: c : d \Leftrightarrow (b \times c) = (a \times d)$ .

**III. (i) Fourth Proportional:** If  $a : b = c : d$ , then  $d$  is called the fourth proportional to  $a, b, c$ .

(ii) **Third Proportional:** If  $a : b = b : c$ , then  $c$  is called the third proportional to  $a$  and  $b$ .

(iii) **Mean Proportional:** Mean proportional between  $a$  and  $b$  is  $\sqrt{ab}$ .

**IV. (i) Comparison of Ratios:** We say that  $(a : b) > (c : d) \Leftrightarrow \frac{a}{b} > \frac{c}{d}$ .

(ii) **Compounded Ratio:**

The compounded ratio of the ratios  $(a : b), (c : d), (e : f)$  is  $(ace : bdf)$ .

**V. (i) Duplicate ratio** of  $(a : b)$  is  $(a^2 : b^2)$ .

(ii) **Sub-duplicate ratio** of  $(a : b)$  is  $(\sqrt{a} : \sqrt{b})$ .

(iii) **Triplicate ratio** of  $(a : b)$  is  $(a^3 : b^3)$ .

(iv) **Sub-triplicate ratio** of  $(a : b)$  is  $\left(\frac{1}{a^3} : \frac{1}{b^3}\right)$ .

(v) If  $\frac{a}{b} = \frac{c}{d}$ , then  $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ . (componendo and dividendo)

**VI. Variation:**

(i) We say that  $x$  is directly proportional to  $y$ , if  $x = ky$  for some constant  $k$  and we write,  $x \propto y$ .

(ii) We say that  $x$  is inversely proportional to  $y$ , if  $xy = k$  for some constant  $k$  and we write,  $x \propto \frac{1}{y}$ .

**VII.** Suppose a container contains  $x$  units of liquid from which  $y$  units are taken out and replaced by water. After

$n$  operations, the quantity of pure liquid in the final mixture =  $\left[ x \left( 1 - \frac{y}{x} \right)^n \right]$  units.

## SOLVED EXAMPLES

**Ex. 1.** If 10% of  $x$  is equal to 20% of  $y$ , then find  $x : y$ .

**Sol.** 10% of  $x = 20\%$  of  $y \Rightarrow \frac{10}{100}x = \frac{20}{100}y \Rightarrow \frac{x}{10} = \frac{y}{5} \Rightarrow \frac{x}{y} = \frac{10}{5} = \frac{2}{1}$ .

Hence,  $x : y = 2 : 1$ .

**Ex. 2.** A man spends ₹ 500 in buying 12 tables and chairs. The cost of one table is ₹ 50 and that of one chair is ₹ 40. What is the ratio of the numbers of the chairs and tables purchased?

**Sol.** Let the number of tables purchased be  $x$ .

Then, number of chairs purchased =  $(12 - x)$ .

$$\therefore 50x + 40(12 - x) = 500$$

$$\Leftrightarrow 50x - 40x = 500 - 480$$

$$\Leftrightarrow 10x = 20$$

$$\Leftrightarrow x = 2.$$

So, number of tables = 2 and number of chairs = 10.

Hence, required ratio =  $10 : 2 = 5 : 1$ .

**Ex. 3.** If  $7 : x = 17.5 : 22.5$ , then find the value of  $x$ .

(Bank P.O., 2007)

**Sol.**  $7 : x = 17.5 : 22.5$

$$\Leftrightarrow 17.5x = 7 \times 22.5$$

$$\Leftrightarrow x = \frac{7 \times 22.5}{17.5} = 9.$$

Hence,  $x = 9$ .

**Ex. 4.** If  $20\%$  of  $(P + Q) = 50\%$  of  $(P - Q)$ , then find  $P : Q$ .

**Sol.**  $20\%$  of  $(P + Q) = 50\%$  of  $(P - Q)$

$$\Rightarrow \frac{20}{100}(P + Q) = \frac{50}{100}(P - Q) \Rightarrow \frac{P + Q}{5} = \frac{P - Q}{2}$$

$$\Rightarrow 2(P + Q) = 5(P - Q) \Rightarrow 3P = 7Q \Rightarrow \frac{P}{Q} = \frac{7}{3} \Rightarrow P : Q = 7 : 3.$$

**Ex. 5.** If  $30\%$  of  $A = 0.25$  of  $B = \frac{1}{5}$  of  $C$ , then find  $A : B : C$ .

**Sol.**  $30\%$  of  $A = 0.25$  of  $B = \frac{1}{5}$  of  $C$

$$\Rightarrow \frac{30}{100}A = \frac{25}{100}B = \frac{1}{5}C \Rightarrow \frac{3A}{10} = \frac{B}{4} = \frac{C}{5} = k \text{ (say)}$$

$$\Rightarrow A = \frac{10k}{3}, B = 4k, C = 5k$$

$$\Rightarrow A : B : C = \frac{10k}{3} : 4k : 5k = \frac{10}{3} : 4 : 5 = 10 : 12 : 15.$$

**Ex. 6.** If  $2x^2 - 7xy + 3y^2 = 0$ , then find the value of  $x : y$ .

**Sol.**  $2x^2 - 7xy + 3y^2 = 0 \Leftrightarrow 2x^2 - 6xy - xy + 3y^2 = 0$

$$\Leftrightarrow 2x(x - 3y) - y(x - 3y) = 0$$

$$\Leftrightarrow (x - 3y)(2x - y) = 0 \Leftrightarrow x = 3y \text{ or } 2x = y$$

$$\Leftrightarrow \frac{x}{y} = 3 \text{ or } \frac{x}{y} = \frac{1}{2}.$$

$\therefore x : y = 3 : 1 \text{ or } 1 : 2.$

**Ex. 7.** If  $A, B, C, D$  are quantities of the same kind such that  $A : B = 3 : 4$ ,  $B : C = 5 : 7$  and  $C : D = 8 : 9$ , find

(a)  $A : C$

(b)  $B : D$

(c)  $A : D$

(d)  $A : B : C : D$

**Sol.** (a)  $A : C = \frac{A}{C} = \frac{A}{B} \times \frac{B}{C} = \frac{3}{4} \times \frac{5}{7} = \frac{15}{28} = 15 : 28.$

(b)  $B : D = \frac{B}{D} = \frac{B}{C} \times \frac{C}{D} = \frac{5}{7} \times \frac{8}{9} = \frac{40}{63} = 40 : 63.$

(c)  $A : D = \frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} = \frac{3}{4} \times \frac{5}{7} \times \frac{8}{9} = \frac{10}{21} = 10 : 21.$

(d)  $A : B = 3 : 4; B : C = 5 : 7 = \left(5 \times \frac{4}{5}\right) : \left(7 \times \frac{4}{5}\right) = 4 : \frac{28}{5};$

$C : D = 8 : 9 = \left(8 \times \frac{7}{10}\right) : \left(9 \times \frac{7}{10}\right) = \frac{28}{5} : \frac{63}{10}.$

$\therefore A : B : C : D = 3 : 4 : \frac{28}{5} : \frac{63}{10} = 30 : 40 : 56 : 63.$

**Ex. 8.** If  $a : b = \frac{2}{9} : \frac{1}{3}, b : c = \frac{2}{7} : \frac{5}{14}$  and  $d : c = \frac{7}{10} : \frac{3}{5}$ , then find  $a : b : c : d$ .

**Sol.**  $a : b = \frac{2}{9} : \frac{1}{3} = 2 : 3, b : c = \frac{2}{7} : \frac{5}{14} = 4 : 5 = \left(4 \times \frac{3}{4}\right) : \left(5 \times \frac{3}{4}\right) = 3 : \frac{15}{4},$

$c : d = \frac{3}{5} : \frac{7}{10} = 6 : 7 = \left(6 \times \frac{5}{8}\right) : \left(7 \times \frac{5}{8}\right) = \frac{15}{4} : \frac{35}{8}.$

$\therefore a : b : c : d = 2 : 3 : \frac{15}{4} : \frac{35}{8} = 16 : 24 : 30 : 35.$

**Ex. 9.** If  $m : n = 3 : 2$ , then find the ratio  $(4m + 5n) : (4m - 5n)$ .

(S.S.C., 2007, 2008)

**Sol.**  $\frac{m}{n} = \frac{3}{2} \Rightarrow \frac{4m + 5n}{4m - 5n} = \frac{4\left(\frac{m}{n}\right) + 5}{4\left(\frac{m}{n}\right) - 5} = \frac{4 \times \frac{3}{2} + 5}{4 \times \frac{3}{2} - 5} = \frac{11}{1}.$

$\therefore (4m + 5n) : (4m - 5n) = 11 : 1.$

**Ex. 10.** If  $(2x + 3y) : (3x + 5y) = 18 : 29$ , what is the value of  $x : y$ ?

(B.Ed Entrance, 2010)

**Sol.**  $\frac{2x + 3y}{3x + 5y} = \frac{18}{29} \Rightarrow 29(2x + 3y) = 18(3x + 5y)$

$\Rightarrow 58x + 87y = 54x + 90y$

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

Hence,  $x : y = 3 : 4.$

**Ex. 11.** If  $(x + y) : (x - y) = 7 : 3$ , then find the ratio  $(x^3 + y^3) : (x^3 - y^3)$ .

**Sol.**  $\frac{(x + y)}{(x - y)} = \frac{7}{3} \Rightarrow 3x + 3y = 7x - 7y$

$\Rightarrow 4x = 10y \Rightarrow \frac{x}{y} = \frac{10}{4} = \frac{5}{2}$

$\Rightarrow \frac{x^3 + y^3}{x^3 - y^3} = \frac{\left(\frac{x^3}{y^3}\right) + 1}{\left(\frac{x^3}{y^3}\right) - 1} = \frac{\left(\frac{x}{y}\right)^3 + 1}{\left(\frac{x}{y}\right)^3 - 1} = \frac{\frac{125}{8} + 1}{\frac{125}{8} - 1} = \frac{133}{8} \times \frac{8}{117} = \frac{133}{117}.$

Hence,  $(x^3 + y^3) : (x^3 - y^3) = \frac{133}{117}.$

**Ex. 12.** If  $a : 5 = b : 7 = c : 8$ , then  $\frac{a+b+c}{a} = ?$

**Sol.** Let  $\frac{a}{5} = \frac{b}{7} = \frac{c}{8} = k$ . Then,  $a = 5k$ ,  $b = 7k$ ,  $c = 8k$ .

$$\therefore \frac{a+b+c}{a} = \frac{5k+7k+8k}{5k} = \frac{20k}{5k} = 4.$$

**Ex. 13.** If  $p : q = r : s = t : u = 2 : 3$ , then find  $(mp + nr + ot) : (mq + ns + ou)$ .

**Sol.**  $\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3} \Rightarrow p = \frac{2q}{3}, r = \frac{2s}{3}, t = \frac{2u}{3}$ .

$$\therefore \frac{mp + nr + ot}{mq + ns + ou} = \frac{m \times \frac{2q}{3} + n \times \frac{2s}{3} + o \times \frac{2u}{3}}{mq + ns + ou} = \frac{\frac{2}{3}(mq + ns + ou)}{(mq + ns + ou)} = \frac{2}{3}.$$

**Ex. 14.** Find :  
 (i) the fourth proportional to 4, 9, 12 ;  
 (ii) the third proportional to 16 and 36 ;  
 (iii) the mean proportional between 0.08 and 0.18 ;  
 (iv) the mean proportional between  $6 + 3\sqrt{3}$  and  $8 - 4\sqrt{3}$ .

**Sol.** (i) Let the fourth proportional to 4, 9, 12 be  $x$ .

$$\text{Then, } 4 : 9 :: 12 : x \Leftrightarrow 4 \times x = 9 \times 12 \Leftrightarrow x = \frac{9 \times 12}{4} = 27.$$

$\therefore$  Fourth proportional to 4, 9, 12 is 27.

(ii) Let the third proportional to 16 and 36 be  $x$ .

$$\text{Then, } 16 : 36 :: 36 : x \Leftrightarrow 16 \times x = 36 \times 36 \Leftrightarrow x = \frac{36 \times 36}{16} = 81.$$

$\therefore$  Third proportional to 16 and 36 is 81.

(iii) Mean proportional between 0.08 and 0.18

$$= \sqrt{0.08 \times 0.18} = \sqrt{\frac{8}{100} \times \frac{18}{100}} = \sqrt{\frac{144}{100 \times 100}} = \frac{12}{100} = 0.12.$$

(iv) Mean proportional between  $6 + 3\sqrt{3}$  and  $8 - 4\sqrt{3}$

$$= \sqrt{(6 + 3\sqrt{3})(8 - 4\sqrt{3})} = \sqrt{48 - 36} = \sqrt{12} = 2\sqrt{3}.$$

**Ex. 15.** Find two numbers such that their mean proportional is 6 and third proportional 20.25.

**Sol.** Let the two numbers be  $x$  and  $y$ .

$$\text{Then, } \sqrt{xy} = 6 \text{ and } x : y :: y : 20.25$$

$$\Rightarrow xy = (6)^2 = 36 \text{ and } y^2 = 20.25x$$

$$\Rightarrow x = \frac{36}{y} \text{ and } y^2 = 20.25 \times \frac{36}{y} = \frac{729}{y}$$

$$\Rightarrow y^3 = 729 = 9^3 \Rightarrow y = 9 \Rightarrow x = \frac{36}{9} = 4.$$

Hence, the required numbers are 4 and 9.

**Ex. 16.** When 20% of a number is added to another number the number increases by 50%. What is the respective ratio between the first and the second numbers?

**Sol.** Let the two numbers be  $x$  and  $y$ .

$$\text{Then, } y + 20\% \text{ of } x = 150\% \text{ of } y \Rightarrow y + \frac{20}{100}x = \frac{150}{100}y \Rightarrow y + \frac{x}{5} = \frac{3}{2}y \Rightarrow \frac{y}{2} = \frac{x}{5} \Rightarrow \frac{x}{y} = \frac{5}{2} \Rightarrow x : y = 5 : 2.$$

Hence, required ratio = 5 : 2.

**Ex. 17.** In a class the ratio of female students to male students is 16 : 9. What percentage of the class is female?

(M.B.A., 2006)

**Sol.** Out of every (16 + 9) i.e., 25 students, 16 are female.

$$\therefore \text{Required percentage} = \left( \frac{16}{25} \times 100 \right) \% = 64\%.$$

**Ex. 18.** If A exceeds B by 40%, B is less than C by 20%, then find A : C.

**Sol.**  $B = 80\% \text{ of } C = \frac{4}{5}C$ ;

$$A = 140\% \text{ of } \frac{4}{5}C = \left( \frac{140}{100} \times \frac{4}{5}C \right) = \frac{28}{25}C.$$

$$\therefore A : C = \frac{28}{25}C : C = \frac{28}{25} : 1 = 28 : 25.$$

**Ex. 19.** Divide the number 455 in the ratio 4 : 3.

(L.I.C.A.D.O., 2008)

**Sol.** First part =  $\left( 455 \times \frac{4}{7} \right) = 260$ ;

$$\text{Second part} = \left( 455 \times \frac{3}{7} \right) = 195.$$

**Ex. 20.** A sum of ₹ 427 is to be divided among A, B and C in such a way that 3 times A's share, 4 times B's share and 7 times C's share are all equal. Find the share of each.

**Sol.**  $3A = 4B = 7C = k$  (say)

$$\Rightarrow A = \frac{k}{3}, B = \frac{k}{4}, C = \frac{k}{7} \Rightarrow A : B : C = \frac{k}{3} : \frac{k}{4} : \frac{k}{7} = \frac{1}{3} : \frac{1}{4} : \frac{1}{7} = 28 : 21 : 12.$$

Sum of ratio terms = (28 + 21 + 12) = 61.

$$\therefore A's \text{ share} = ₹ \left( 427 \times \frac{28}{61} \right) = ₹ 196;$$

$$B's \text{ share} = ₹ \left( 427 \times \frac{21}{61} \right) = ₹ 147;$$

$$C's \text{ share} = ₹ \left( 427 \times \frac{12}{61} \right) = ₹ 84.$$

**Ex. 21.** Divide ₹ 6450 among A, B, C and D such that when A gets ₹ 9, B gets ₹ 8; when B gets ₹ 6, C gets ₹ 5 and when C gets ₹ 4, D gets ₹ 3.

**Sol.**  $A : B = 9 : 8, B : C = 6 : 5 = \left( 6 \times \frac{4}{3} \right) : \left( 5 \times \frac{4}{3} \right) = 8 : \frac{20}{3},$

$$C : D = 4 : 3 = \left( 4 \times \frac{5}{3} \right) : \left( 3 \times \frac{5}{3} \right) = \frac{20}{3} : 5.$$

$$\therefore A : B : C : D = 9 : 8 : \frac{20}{3} : 5 = 27 : 24 : 20 : 15.$$

Sum of ratio terms = (27 + 24 + 20 + 15) = 86.

$$A's \text{ share} = ₹ \left( 6450 \times \frac{27}{86} \right) = ₹ 2025; B's \text{ share} = ₹ \left( 6450 \times \frac{24}{86} \right) = ₹ 1800;$$

$$C's \text{ share} = ₹ \left( 6450 \times \frac{20}{86} \right) = ₹ 1500; D's \text{ share} = ₹ \left( 6450 \times \frac{15}{86} \right) = ₹ 1125.$$

**Ex. 22.** A sum of ₹ 1290 is divided between A, B and C such that A's share is  $1\frac{1}{2}$  times that of B and B's share is

$1\frac{3}{4}$  times that of C. What is C's share?

**Sol.** Let C's share = ₹  $x$ .

$$\text{Then, B's share} = ₹ \left( 1\frac{3}{4}x \right) = ₹ \left( \frac{7x}{4} \right);$$

$$\text{A's share} = ₹ \left( \frac{3}{2} \times \frac{7x}{4} \right) = ₹ \left( \frac{21x}{8} \right).$$

$$A : B : C = \frac{21x}{8} : \frac{7x}{4} : x = \frac{21}{8} : \frac{7}{4} : 1 = 21 : 14 : 8.$$

$$\text{Sum of ratio terms} = (21 + 14 + 8) = 43.$$

$$\therefore \text{C's share} = ₹ \left( 1290 \times \frac{8}{43} \right) = ₹ 240.$$

**Ex. 23.** Divide ₹ 1050 among A, B and C such that A receives  $\frac{2}{5}$  as much as B and C together and B receives  $\frac{3}{7}$  as much as A and C together.

**Sol.**  $A = \frac{2}{5}(B + C), B = \frac{3}{7}(A + C)$

$$\Rightarrow A = \frac{2}{5} \left( \frac{3}{7}A + \frac{3}{7}C + C \right) = \frac{2}{5} \left( \frac{3}{7}A + \frac{10}{7}C \right) = \frac{6}{35}A + \frac{4}{7}C$$

$$\Rightarrow \frac{29}{35}A = \frac{4}{7}C \Rightarrow A = \left( \frac{4}{7} \times \frac{35}{29} \right) C = \frac{20}{29}C.$$

$$\therefore B = \frac{3}{7} \left( \frac{20}{29}C + C \right) = \frac{3}{7} \times \frac{49}{29}C = \frac{21}{29}C.$$

$$A : B : C = \frac{20}{29}C : \frac{21}{29}C : C = 20 : 21 : 29.$$

$$\text{Sum of ratio terms} = (20 + 21 + 29) = 70.$$

$$\text{A's share} = ₹ \left( 1050 \times \frac{20}{70} \right) = ₹ 300; \text{ B's share} = ₹ \left( 1050 \times \frac{21}{70} \right) = ₹ 315;$$

$$\text{C's share} = ₹ \left( 1050 \times \frac{29}{70} \right) = ₹ 435.$$

**Ex. 24.** The cost of an article depends on three items – material, labour and other expenses. The cost on these items is in the ratio 3 : 4 : 1 respectively. If the cost of material is ₹ 22.50, find the cost of the article. (R.R.B., 2006)

**Sol.** Let the cost of material, labour and other expenses be ₹  $3x$ ,  $4x$  and  $x$  respectively.

$$\text{Then, } 3x = 22.50 \text{ or } x = 7.50.$$

$$\therefore \text{Cost of the article} = 3x + 4x + x = 8x = ₹ (8 \times 7.50) = ₹ 60.$$

**Ex. 25.** Three numbers are in the ratio  $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$ . The difference between the greatest and the smallest numbers is 36. Find the numbers.

**Sol.** Ratio of numbers =  $\frac{1}{2} : \frac{2}{3} : \frac{3}{4} = 6 : 8 : 9$ .

Let the numbers be  $6x$ ,  $8x$  and  $9x$ .

$$\text{Then, } 9x - 6x = 36 \text{ or } 3x = 36 \text{ or } x = 12.$$

$$\therefore \text{The numbers are } (6 \times 12), (8 \times 12) \text{ and } (9 \times 12) \text{ i.e., } 72, 96 \text{ and } 108.$$

**Ex. 26.** Find three numbers in the ratio of 3 : 2 : 5 such that the sum of their squares is equal to 1862.

**Sol.** Let the numbers be  $3x$ ,  $2x$  and  $5x$ .

$$\text{Then, } (3x)^2 + (2x)^2 + (5x)^2 = 1862 \Rightarrow 9x^2 + 4x^2 + 25x^2 = 1862 \Rightarrow 38x^2 = 1862 \Rightarrow x^2 = 49 \Rightarrow x = 7.$$

$$\text{Hence, the numbers are } 21, 14 \text{ and } 35.$$

**Ex. 27.** The ratio of incomes of A and B is 3 : 4. The ratio of their expenditures is 4 : 5. Find the ratio of their savings if the savings of A is one-fourth of his income. (Campus Recruitment, 2008)

**Sol.** Let the incomes of A and B be  $3x$  and  $4x$  and their expenditures be  $4y$  and  $5y$  respectively.

Then, A's savings =  $3x - 4y$ .

$$\therefore 3x - 4y = \frac{1}{4} \text{ of } 3x \Rightarrow 12x - 16y = 3x \Rightarrow 9x = 16y \Rightarrow y = \frac{9}{16}x.$$

$$\begin{aligned} \text{So, ratio of savings} &= \frac{A's \text{ savings}}{B's \text{ savings}} = \frac{3x - 4y}{4x - 5y} = \frac{3x - 4 \times \frac{9}{16}x}{4x - 5 \times \frac{9}{16}x} \\ &= \frac{3x - \frac{9}{4}x}{4x - \frac{45}{16}x} = \left( \frac{3}{4}x \times \frac{16}{19x} \right) = 12 : 19. \end{aligned}$$

**Ex. 28.** Weekly incomes of two persons are in the ratio of 7 : 3 and their weekly expenses are in the ratio of 5 : 2. If each of them saves ₹ 300 per week, find their weekly incomes. (SNAP, 2010)

**Sol.** Let the incomes of the two persons be ₹  $7x$  and ₹  $3x$  and their expenses be ₹  $5y$  and ₹  $2y$  respectively. Then,

$$7x - 5y = 3x - 2y \Rightarrow 4x = 3y \Rightarrow y = \frac{4}{3}x.$$

$$\text{Now, } 7x - 5y = 300 \Rightarrow 7x - 5 \times \frac{4}{3}x = 300$$

$$\Rightarrow 7x - \frac{20x}{3} = 300 \Rightarrow x = 900.$$

$\therefore$  Weekly income of first person = ₹  $(7 \times 900)$  = ₹ 6300.

Weekly income of second person = ₹  $(3 \times 900)$  = ₹ 2700.

**Ex. 29.** The salary of A, B and C together amounts to ₹ 33300. If they spend 80%, 85% and 75% of their respective incomes, their savings are as 7 : 6 : 9. Find the salary of B.

**Sol.** Since A, B and C spend 80%, 85% and 75% of their incomes, they save 20%, 15% and 25% of their incomes. Let the salary of A, B and C be  $x$ ,  $y$  and  $z$  respectively.

$$\text{Then, } 20\% \text{ of } x : 15\% \text{ of } y : 25\% \text{ of } z = 7 : 6 : 9 \Rightarrow \frac{x}{5} : \frac{3y}{20} : \frac{z}{4} = 7 : 6 : 9.$$

$$\frac{x}{5} : \frac{3y}{20} :: 7 : 6 \Rightarrow \frac{x}{5} \times 6 = \frac{3y}{20} \times 7 \Rightarrow \frac{x}{y} = \frac{3}{20} \times \frac{7}{6} \times 5 = \frac{7}{8}.$$

$$\frac{3y}{20} : \frac{z}{4} :: 6 : 9 \Rightarrow \frac{3y}{20} \times 9 = \frac{z}{4} \times 6 \Rightarrow \frac{y}{z} = \frac{1}{4} \times \frac{6}{9} \times \frac{20}{3} = \frac{10}{9}.$$

$$\text{So, } x : y = 7 : 8 \text{ and } y : z = 10 : 9 = \left( 10 \times \frac{4}{5} \right) : \left( 9 \times \frac{4}{5} \right) = 8 : \frac{36}{5}.$$

$$x : y : z = 7 : 8 : \frac{36}{5} = 35 : 40 : 36.$$

Let  $x = 35k$ ,  $y = 40k$  and  $z = 36k$ .

$$\therefore 35k + 40k + 36k = 33300 \Rightarrow 111k = 33300 \Rightarrow k = 300.$$

Hence, B's salary = ₹  $(40 \times 300)$  = ₹ 12000.

**Ex. 30.** What must be added to each term of the ratio 7 : 11 so as to make it equal to 3 : 4? (S.S.C., 2010)

**Sol.** Let the number to be added be  $x$ .

$$\text{Then, } \frac{7+x}{11+x} = \frac{3}{4} \Rightarrow 4(7+x) = 3(11+x) \Rightarrow 28 + 4x = 33 + 3x \Rightarrow x = 5.$$

Hence, required number = 5.

**Ex. 31.** What should be subtracted from 15, 28, 20 and 38 so that the remaining numbers may be proportional?

(M.A.T., 2009)

**Sol.** Let the required number be  $x$ .

$$\text{Then, } \frac{15-x}{28-x} = \frac{20-x}{38-x}$$

$$\Leftrightarrow (15-x)(38-x) = (20-x)(28-x)$$

$$\Leftrightarrow 570 - 53x + x^2 = 560 - 48x + x^2$$

$$\Leftrightarrow 5x = 10 \Leftrightarrow x = 2.$$

Hence, required number = 2.

**Ex. 32.** The ratio of milk and water in 64 litres of a mixture is 5 : 3. What amount of water is added to make the ratio 3 : 5? (P.C.S., 2006)

**Sol.** Quantity of milk =  $\left(64 \times \frac{5}{8}\right)$  litres = 40 litres.

Quantity of water =  $\left(64 \times \frac{3}{8}\right)$  litres = 24 litres.

Let  $x$  litres of water be added.

$$\text{Then, } \frac{40}{24+x} = \frac{3}{5} \Rightarrow 200 = 72 + 3x$$

$$\Rightarrow 3x = 128$$

$$\Rightarrow x = \frac{128}{3} = 42\frac{2}{3}.$$

Hence, required quantity =  $42\frac{2}{3}$  litres.

**Ex. 33.** The dimensions of a rectangular room when increased by 4 metres, are in the ratio of 4 : 3 and when decreased by 4 metres, are in the ratio of 2 : 1. Find the dimensions of the room.

**Sol.** Let the length and breadth of the room be  $x$  metres and  $y$  metres respectively.

$$\text{Then, } \frac{x+4}{y+4} = \frac{4}{3} \Rightarrow 3x + 12 = 4y + 16$$

$$\Rightarrow 3x - 4y = 4$$

...(i)

$$\text{And, } \frac{x-4}{y-4} = \frac{2}{1} \Rightarrow x - 4 = 2y - 8$$

$$\Rightarrow x - 2y = -4$$

...(ii)

Multiplying (ii) by 3 and subtracting from (i), we get :  $y = 8$ .

Putting  $y = 8$  in (i), we get :  $x = 12$ .

Hence, the dimensions of the room are 12 m and 8 m.

**Ex. 34.** The ages of Chinmay and Maulik are in the ratio of 5 : 2 respectively. After 7 years, the ratio of their ages will be 4 : 3. What is the age of Chinmay? (M.A.T., 2007)

**Sol.** Let the present ages of Chinmay and Maulik be  $5x$  and  $2x$  years respectively.

Chinmay's age 7 years hence =  $(5x + 7)$  years.

Maulik's age 7 years hence =  $(2x + 7)$  years.

$$\therefore \frac{5x+7}{2x+7} = \frac{4}{3} \Leftrightarrow 3(5x+7) = 4(2x+7) \Leftrightarrow 15x+21 = 8x+28 \Leftrightarrow 7x = 7$$

$$\Leftrightarrow x = 1.$$

Hence, Chinmay's age = 5 years.

**Ex. 35.** A bag contains one-rupee, 50-paise and 25-paise coins in the ratio 5 : 6 : 8. If the total amount of money in the bag is ₹ 210, find the number of coins of each kind.

**Sol.** Let the number of one-rupee, 50-paise and 25-paise coins be  $5x$ ,  $6x$  and  $8x$  respectively.

$$\text{Then, sum of their values} = ₹ \left( 5x + \frac{50 \times 6x}{100} + \frac{25 \times 8x}{100} \right) = ₹ (5x + 3x + 2x) = ₹ 10x.$$



$$\therefore 10x = 210 \Rightarrow x = 21.$$

So, number of one-rupee coins =  $5 \times 21 = 105$ ;

number of 50-paise coins =  $6 \times 21 = 126$ ;

number of 25-paise coins =  $8 \times 21 = 168$ .

**Ex. 36.** If  $m$  is proportional to  $n$  and  $m = 5$  when  $n = 4$ , then what is the value of  $m$  when  $n = 18$ ?

**Sol.**  $m \propto n \Rightarrow m = kn$  for some constant  $k$ .

$$\text{When } m = 5 \text{ and } n = 4, m = kn \Rightarrow 5 = 4k \Rightarrow k = \frac{5}{4}.$$

$$\text{When } n = 18, \text{ we have : } m = \frac{5}{4}n = \frac{5}{4} \times 18 = \frac{45}{2} = 22.5.$$

**Ex. 37.**  $x^2$  varies directly as  $y^3$  and when  $x = 6$ ,  $y = 3$ . Deduce the relation between  $x$  and  $y$ .

**Sol.**  $x^2 \propto y^3 \Rightarrow x^2 = ky^3$  for some constant  $k$ .

When  $x = 6$  and  $y = 3$ , we have :

$$x^2 = ky^3 \Rightarrow 6^2 = k \times 3^3 \Rightarrow 36 = 27k \Rightarrow k = \frac{36}{27} = \frac{4}{3}.$$

$$\therefore x^2 = \frac{4}{3}y^3 \Rightarrow 3x^2 = 4y^3.$$

**Ex. 38.** The time of oscillation of a pendulum varies as the square root of its length. If a pendulum of length 40 cm oscillates once in a second, find the length of the pendulum oscillating once in 2.5 seconds.

**Sol.**  $T \propto \sqrt{l} \Rightarrow T = k\sqrt{l}$  for some constant  $k$ .

$$\text{When } l = 40 \text{ cm, } T = 1 \text{ sec, } T = k\sqrt{l} \Rightarrow 1 = k\sqrt{40} \Rightarrow k = \frac{1}{\sqrt{40}}.$$

Let the required length be  $x$  cm.

$$\text{Then, } 2.5 = \frac{1}{\sqrt{40}} \cdot \sqrt{x} \Rightarrow \sqrt{x} = 2.5 \times \sqrt{40} \Rightarrow x = (2.5 \times \sqrt{40})^2 = 6.25 \times 40 = 250.$$

Hence, required length = 250 cm.

**Ex. 39.** The ratio of the number of students studying in schools A, B and C is 6:8:7 respectively. If the number of students studying in each of the schools is increased by 20%, 15% and 20% respectively, what will be the new ratio of the number of students in schools A, B and C? (NABARD, 2008)

**Sol.** Let the number of students studying in schools A, B and C be  $6x$ ,  $8x$  and  $7x$  respectively.

$$\text{Then, new strength of school A} = 120\% \text{ of } 6x = \frac{36x}{5};$$

$$\text{new strength of school B} = 115\% \text{ of } 8x = \frac{46x}{5};$$

$$\text{new strength of school C} = 120\% \text{ of } 7x = \frac{42x}{5}.$$

$$\therefore \text{Required ratio} = \frac{36x}{5} : \frac{46x}{5} : \frac{42x}{5} = 18 : 23 : 21.$$

**Ex. 40.** The cost of manufacturing a car is made up of three items : cost of materials, labour and overheads. In a year, the cost of these items were in the ratio 4 : 3 : 2. Next year the cost of materials rose by 10%, cost of labour increased by 8% but the overheads reduced by 5%. Find the increase percent in the price of the car.

**Sol.** Let the cost of materials, labour and overheads in the first year be ₹  $4x$ , ₹  $3x$  and ₹  $2x$  respectively.

$$\text{Then, cost of materials in second year} = 110\% \text{ of ₹ } 4x = ₹ \left( \frac{110}{100} \times 4x \right) = ₹ \frac{440x}{100}.$$

$$\text{Cost of labour in second year} = 108\% \text{ of ₹ } 3x = ₹ \left( \frac{108}{100} \times 3x \right) = ₹ \frac{324x}{100}.$$

$$\text{Overheads in second year} = 95\% \text{ of } ₹ 2x = ₹ \left( \frac{95}{100} \times 2x \right) = ₹ \left( \frac{190x}{100} \right).$$

$$\text{Price of the car in first year} = ₹ (4x + 3x + 2x) = ₹ 9x.$$

$$\text{Price of the car in second year} = ₹ \left( \frac{440x}{100} + \frac{324x}{100} + \frac{190x}{100} \right) = ₹ \left( \frac{954x}{100} \right).$$

$$\text{Increase in price} = ₹ \left( \frac{954x}{100} - 9x \right) = ₹ \frac{54x}{100}.$$

$$\therefore \text{Increase \%} = \left( \frac{54x}{100} \times \frac{1}{9x} \times 100 \right) \% = 6\%.$$

**Ex. 41.** Cost of a diamond varies directly as the square of its weight. A diamond broke into four pieces with their weights in the ratio 1 : 2 : 3 : 4. If the loss in the total value of the diamond was ₹ 70000, find the price of the original diamond. (A.A.O. Exam, 2010)

**Sol.** Let the weights of the four pieces be  $x$ ,  $2x$ ,  $3x$  and  $4x$ .

$$\text{Then, original weight of the diamond} = (x + 2x + 3x + 4x) = 10x.$$

$$\text{Original price of the diamond} = k \times (10x)^2 = 100kx^2, \text{ where } k \text{ is a constant.}$$

$$\text{Prices of the smaller pieces will be } kx^2, 4kx^2, 9kx^2 \text{ and } 16kx^2.$$

$$\text{Total price of the four pieces} = (kx^2 + 4kx^2 + 9kx^2 + 16kx^2) = 30kx^2.$$

$$\text{Loss in value} = (100kx^2 - 30kx^2) = 70kx^2.$$

$$\therefore 70kx^2 = 70000 \text{ or } kx^2 = 1000.$$

$$\text{Hence, price of original diamond} = ₹ (100 \times 1000) = ₹ 100000.$$

**Ex.42.** In a mixture of three varieties of tea, the ratio of their weights is 4 : 5 : 8. If 5 kg tea of the first variety, 10 kg tea of the second variety and some quantity of tea of the third variety are added to the mixture, the ratio of the weights of three varieties of tea becomes 5 : 7 : 9. Find the quantity of the third variety of tea in the final mixture. (P.C.S., 2006)

**Sol.** Let the weights of 1st, 2nd and 3rd varieties of tea in the original mixture be  $4x$ ,  $5x$  and  $8x$  kg respectively.

$$\text{Then, } \frac{4x+5}{5x+10} = \frac{5}{7} \Leftrightarrow 7(4x+5) = 5(5x+10)$$

$$\Leftrightarrow 28x + 35 = 25x + 50$$

$$\Leftrightarrow 3x = 15 \Leftrightarrow x = 5.$$

So, the weights of 1st, 2nd and 3rd varieties in the original mixture are 20 kg, 25 kg and 40 kg respectively.

Let  $y$  kg of third variety be added.

$$\text{Then, } \frac{25+10}{40+y} = \frac{7}{9} \Leftrightarrow 7(40+y) = 9 \times 35 \Leftrightarrow 40+y = \frac{9 \times 35}{7} = 45 \Leftrightarrow y = 5.$$

$$\text{Hence, quantity of third variety in the final mixture} = (40 + 5) \text{ kg} = 45 \text{ kg.}$$

**Ex. 43.** A shopkeeper mixes two varieties of tea – one costing ₹ 75 per kg and the other costing ₹ 50 per kg in the ratio 3 : 2. If he sells the mixed variety at ₹ 62.40 per kg, find his gain or loss percent. (S.S.C., 2008)

**Sol.** Suppose the shopkeeper mixes  $3x$  kg of first variety and  $2x$  kg of second variety.

$$\text{Then, C.P. of } (5x) \text{ kg of mixture} = ₹ (3x \times 75 + 2x \times 50) = ₹ (325x).$$

$$\text{S.P. of } (5x) \text{ kg of mixture} = ₹ (5x \times 62.40) = ₹ (312x).$$

$$\text{Loss} = ₹ (325x - 312x) = ₹ (13x).$$

$$\therefore \text{Loss \%} = \left( \frac{13x}{325x} \times 100 \right) \% = 4\%.$$

**Ex. 44.** Initially two cups of same volume are filled with milk upto  $\frac{3}{5}$ th and  $\frac{4}{5}$ th of their volumes. Water is then filled. Then two mixtures are mixed and poured into a jug. Find the ratio of water to milk in the mixture. (Campus Recruitment, 2008)

**Sol.** Let the volume of each of the two cups be  $x$ .

Then, volume of milk in the first cup =  $\frac{3}{5}x$ .

Volume of water in the first cup =  $\frac{2}{5}x$ .

Volume of milk in the second cup =  $\frac{4}{5}x$ .

Volume of water in the second cup =  $\frac{x}{5}$ .

$\therefore$  Ratio of water to milk in the jug =  $\left(\frac{2}{5}x + \frac{x}{5}\right) : \left(\frac{3}{5}x + \frac{4}{5}x\right) = \frac{3}{5}x : \frac{7}{5}x = 3 : 7$ .

**Ex. 45.** Three equal jugs are filled with a mixture of milk and water. The proportion of milk and water in each glass is in the ratio 1 : 2, 2 : 3 and 3 : 4. The contents of the three jugs are emptied into a single vessel. What is the proportion of milk and water in it? (M.A.T., 2008)

**Sol.** Let the volume of each jug be  $x$  litres. Then,

milk in 1st glass =  $\frac{x}{3}$  litres; water in 1st glass =  $\frac{2x}{3}$  litres;

milk in 2nd glass =  $\frac{2x}{5}$  litres; water in 2nd glass =  $\frac{3x}{5}$  litres;

milk in 3rd glass =  $\frac{3x}{7}$  litres; water in 3rd glass =  $\frac{4x}{7}$  litres.

Total milk in final mixture =  $\left(\frac{x}{3} + \frac{2x}{5} + \frac{3x}{7}\right)$  litres =  $\frac{122}{105}$  litres.

Total water in final mixture =  $\left(\frac{2x}{3} + \frac{3x}{5} + \frac{4x}{7}\right)$  litres =  $\frac{193}{105}$  litres.

$\therefore$  Required ratio of milk and water =  $\frac{122}{105} : \frac{193}{105} = 122 : 193$ .

**Ex. 46.** The resistance of a wire is directly proportional to its length and inversely proportional to the square of its radius. Two wires of the same material have the same resistance and their radii are in the ratio of 9 : 8. If the length of the first wire is 162 cm, find the length of the other wire.

**Sol.** Clearly, we have :  $R \propto l$  and  $R \propto \frac{1}{r^2} \Rightarrow R \propto \frac{l}{r^2} \Rightarrow R = \frac{kl}{r^2}$ , where  $k$  is a constant.

Let the radii of the two wires be  $9x$  and  $8x$  and their lengths be  $l_1$  and  $l_2$  respectively.

Then,  $\frac{kl_1}{(9x)^2} = \frac{kl_2}{(8x)^2} \Rightarrow \frac{l_1}{81x^2} = \frac{l_2}{64x^2} \Rightarrow \frac{l_2}{64} = \frac{162}{81} = 2$

$\Rightarrow l_2 = (64 \times 2)$  cm = 128 cm

Hence, length of the other wire = 128 cm.

**Ex. 47.** Visitors to a show were charged ₹ 12 each on the first day, ₹ 9.50 on the second, ₹ 4 on the third day and the total attendance on three days were in the ratio 3 : 6 : 11 respectively. Find the average charge per person for the whole show.

**Sol.** Let the attendance on the three days be  $3x$ ,  $6x$  and  $11x$  respectively.

Then, total charges collected = ₹  $(12 \times 3x + 9.5 \times 6x + 4 \times 11x)$   
 $= ₹ (36x + 57x + 44x) = ₹ (137x)$ .

Total attendance on 3 days =  $(3x + 6x + 11x) = 20x$ .

$\therefore$  Average charge per person = ₹  $\left(\frac{137x}{20x}\right) = ₹ 6.85$ .

**Ex. 48.** 7 men, 5 women and 8 children were given an assignment of distributing 2000 books to students in a school over a period of three days. All of them distributed books on the first day. On the second day, 1 man, 3 women and 3 children remained absent and on the third day, 4 men and 5 children remained absent. If the ratio of the number of books distributed in a day by a man, a woman and a child was 5 : 4 : 2 respectively, a total of how many books were distributed on the second day?

**Sol.** Let the number of books distributed in a day by a man, a woman and a child be  $5x$ ,  $4x$  and  $2x$  respectively. Then, number of books distributed on the first day

$$= (7 \times 5x + 5 \times 4x + 8 \times 2x) = 71x.$$

Number of books distributed on the second day

$$= (6 \times 5x + 2 \times 4x + 5 \times 2x) = 48x.$$

Number of books distributed on the third day

$$= (3 \times 5x + 5 \times 4x + 3 \times 2x) = 41x.$$

$$\therefore 71x + 48x + 41x = 2000 \Rightarrow 160x = 2000 \Rightarrow x = \frac{2000}{160} = \frac{25}{2}.$$

$$\text{Hence, number of books distributed on the second day} = 48x = \left(48 \times \frac{25}{2}\right) = 600.$$

**Ex. 49.** Ratio of the incomes of A, B and C last year was 3 : 4 : 5. The ratio of their individual incomes of the last year and this year are 4 : 5, 2 : 3 and 3 : 4 respectively. If the sum of their present incomes is ₹ 78800, then find the present individual incomes of A, B and C.

**Sol.** Let the incomes of A, B and C last year be ₹  $3x$ , ₹  $4x$  and ₹  $5x$  respectively.

$$\text{Then, A's present income} = ₹ \left(\frac{5}{4} \times 3x\right) = ₹ \left(\frac{15x}{4}\right).$$

$$\text{B's present income} = ₹ \left(\frac{3}{2} \times 4x\right) = ₹ 6x.$$

$$\text{C's present income} = ₹ \left(\frac{4}{3} \times 5x\right) = ₹ \left(\frac{20x}{3}\right).$$

$$\therefore \frac{15x}{4} + 6x + \frac{20x}{3} = 78800$$

$$\Rightarrow 45x + 72x + 80x = 78800 \times 12$$

$$\Rightarrow x = \frac{78800 \times 12}{197} = 4800.$$

$$\text{Hence, A's present income} = ₹ \left(\frac{15}{4} \times 4800\right) = ₹ 18000.$$

$$\text{B's present income} = ₹ (6 \times 4800) = ₹ 28800.$$

$$\text{C's present income} = ₹ \left(\frac{20}{3} \times 4800\right) = ₹ 32000.$$

**Ex. 50.** Two identical vessels A and B contain mixtures of milk and water in the ratios 4 : 5 and 5 : 1 respectively. In what ratio should quantities of mixtures be taken from A and B to form a mixture in which milk to water is in the ratio 5 : 4?

**Sol.** Milk in A =  $\frac{4}{9}$  units; Milk in B =  $\frac{5}{6}$  units;

$$\text{Water in A} = \frac{5}{9} \text{ units; Water in B} = \frac{1}{6} \text{ units.}$$

Let A and B be taken in the ratio 1 :  $y$ .

$$\text{Then, } \frac{\frac{4}{9} + \frac{5y}{6}}{\frac{5}{9} + \frac{y}{6}} = \frac{5}{4} \Rightarrow \frac{8 + 15y}{10 + 3y} = \frac{5}{4}$$

$$\Rightarrow 4(8 + 15y) = 5(10 + 3y)$$

$$\Rightarrow 32 + 60y = 50 + 15y$$

$$\Rightarrow 45y = 18 \Rightarrow y = \frac{2}{5}$$

$$\therefore \text{Required ratio} = 1 : \frac{2}{5} = 5 : 2.$$

**Ex. 51.** A pot contains 81 litres of pure milk.  $\frac{1}{3}$  of the milk is replaced by the same amount of water. Again,  $\frac{1}{3}$  of the mixture is replaced by that amount of water. Find the ratio of milk and water in the new mixture.

**Sol.** If from  $x$  units of liquid in a container,  $y$  units are taken out and replaced by water  $n$  times, then quantity of pure liquid in the mixture =  $\left[ x \left( 1 - \frac{y}{x} \right)^n \right]$  units.

Quantity of milk replaced each time =  $\frac{1}{3}$  of 81 litres = 27 litres.

So,  $x = 81$  litres,  $y = 27$  litres,  $n = 2$ .

$$\begin{aligned} \text{Quantity of milk in the new mixture} &= \left[ 81 \left( 1 - \frac{27}{81} \right)^2 \right] \text{ litres} = \left[ 81 \times \left( \frac{2}{3} \right)^2 \right] \text{ litres} \\ &= \left( 81 \times \frac{4}{9} \right) \text{ litres} = 36 \text{ litres.} \end{aligned}$$

Quantity of water in the new mixture =  $(81 - 36)$  litres = 45 litres.

$$\therefore \text{Required ratio} = 36 : 45 = 4 : 5.$$

## EXERCISE

### (OBJECTIVE TYPE QUESTIONS)

**Directions:** Mark (✓) against the correct answer :

- The total number of students in a school is 2140. If the number of girls in the school is 1200, then what is the ratio of the total number of boys to the total number of girls in the school? (Bank Recruitment, 2009)  
(a) 18 : 13 (b) 26 : 25  
(c) 47 : 60 (d) 31 : 79  
(e) None of these

**Directions (Questions 2 to 6) :** These questions are based on the following table :

Weight distribution in the average adult	
Organs	Weight (in grams)
Muscles	30000
Skeleton	10000
Blood	5000
Gastrointestinal tract	2000
Lungs	1000
Liver	1700
Brain	1500

- The total body weight of the average adult is  
(a) 50000 grams (b) 70000 grams  
(c) less than 50 kg (d) more than 51 kg  
(e) None of these

- If the weight of the skeleton is represented as  $S$ , then the weight of the liver can be represented as  
(a) 0.17S (b) 1.7S  
(c) 17S (d) 71S  
(e) None of these
- The ratio expressed in decimals of the weight of the blood to the weight of the gastrointestinal tract is  
(a) 0.25 (b) 0.4  
(c) 2.5 (d) 4  
(e) None of these
- The ratio expressed in decimals for weight of the brain to the weight of the muscles is  
(a) 0.05 (b) 0.15  
(c) 0.20 (d) 0.50  
(e) None of these
- The ratio expressed in decimals of the weight of the brain to the weight of the lungs is  
(a) 0.15 (b) 1.5  
(c) 5.1 (d) 15  
(e) None of these
- What is the ratio in ₹ 2.80 and 40 paise?  
(a) 1 : 7 (b) 2 : 7  
(c) 7 : 1 (d) 1 : 14

8. Which of the following is the ratio between a number and the number obtained by adding one-fifth of that number to it?  
 (a) 4 : 5 (b) 5 : 4  
 (c) 5 : 6 (d) 6 : 5
9. A person spends ₹ 8100 in buying some tables at ₹ 1200 each and some chairs at ₹ 300 each. The ratio of the number of chairs to that of tables when the maximum possible number of tables is purchased, is (S.S.C., 2005)  
 (a) 1 : 2 (b) 1 : 4  
 (c) 2 : 1 (d) 5 : 7
10. If 60% of  $A = \frac{3}{4}$  of  $B$ , then  $A : B$  is (S.S.C., 2010)  
 (a) 4 : 5 (b) 5 : 4  
 (c) 9 : 20 (d) 20 : 9
11. If  $\frac{2}{3}A = 75\%$  of  $B$ , then  $A : B$  is  
 (a) 1 : 1 (b) 9 : 8  
 (c) 8 : 9 (d) 10 : 11
12. Which of the following represents  $ab = 64$ ? (Bank P.O., 2010)  
 (a)  $8 : a = 8 : b$  (b)  $a : 16 = b : 4$   
 (c)  $a : 8 = b : 8$  (d)  $32 : a = b : 2$   
 (e) None of these
13. A jar contains black and white marbles. If there are ten marbles in the jar, then which of the following could not be the ratio of black to white marbles?  
 (a) 1 : 4 (b) 1 : 10  
 (c) 7 : 3 (d) 9 : 1
14. The ratio of boys and girls in a club is 3 : 2. Which of the following could be the actual number of members?  
 (a) 16 (b) 18  
 (c) 24 (d) 25
15. Which of the following is the lowest ratio? (R.R.B., 2005)  
 (a) 7 : 15 (b) 15 : 23  
 (c) 17 : 25 (d) 21 : 39
16. If  $5 : a :: 20 : 28$ , then  $a$  is equal to  
 (a) 4 (b) 6  
 (c) 7 (d) 8
17.  $\frac{3}{4} : \frac{1}{2} :: 27y : ?$  (E.S.I.C., 2007)  
 (a)  $12y$  (b)  $18y$   
 (c)  $21y$  (d)  $24y$   
 (e) None of these
18. If  $x : 7.5 = 7 : 17.5$ , the value of  $x$  is  
 (a) 1 (b) 2.5  
 (c) 3 (d) 3.5
19. The value of  $x$  where  $x : 2\frac{1}{3} :: 21 : 50$  is  
 (a)  $1\frac{1}{49}$  (b)  $1\frac{1}{50}$   
 (c)  $\frac{49}{50}$  (d)  $\frac{27}{50}$
20. If  $(x + 1) : 8 = 3.75 : 7$ , then the value of  $x$  is  
 (a)  $1\frac{2}{7}$  (b)  $2\frac{2}{7}$   
 (c)  $3\frac{2}{7}$  (d)  $4\frac{2}{7}$
21. If  $\sqrt{2} : (1 + \sqrt{3}) :: \sqrt{6} : x$ , then  $x$  is equal to  
 (a)  $\sqrt{3} + 3$  (b)  $1 - \sqrt{3}$   
 (c)  $1 + \sqrt{3}$  (d)  $\sqrt{3} - 3$
22. What will be the simplest form of the ratio 3 hours : 1 day? (R.R.B., 2006)  
 (a) 1 : 3 (b) 1 : 6  
 (c) 1 : 8 (d) 1 : 25
23. The simplest form of the ratio 1.5 : 2.5 is  
 (a) 3 : 5 (b) 6 : 10  
 (c) 15 : 25 (d) 0.75 : 1.25
24.  $9^{3.04} : 9^{2.04}$  is equal to  
 (a) 1 : 9 (b) 3 : 2  
 (c) 9 : 1 (d) 76 : 51
25. The ratio  $4^{3.5} : 2^5$  is the same as  
 (a) 2 : 1 (b) 4 : 1  
 (c) 7 : 5 (d) 7 : 10
26. In a proportion the product of 1st and 4th terms is 40 and that of 2nd and 3rd terms is  $2.5x$ . Then the value of  $x$  is (M.A.T., 2007)  
 (a) 16 (b) 26  
 (c) 75 (d) 90
27. If 20% of  $A = 30\%$  of  $B = \frac{1}{6}$  of  $C$ , then  $A : B : C$  is (S.S.C., 2007)  
 (a) 2 : 3 : 16 (b) 3 : 2 : 16  
 (c) 10 : 15 : 18 (d) 15 : 10 : 18
28. 25% of  $A$ 's income is equal to 35% of  $B$ 's income. The ratio of the incomes of  $A$  and  $B$  is  
 (a) 5 : 7 (b) 7 : 5  
 (c) 13 : 15 (d) 15 : 13
29. If  $x = \frac{1}{3}y$  and  $y = \frac{1}{2}z$ , then  $x : y : z$  is equal to  
 (a) 1 : 2 : 6 (b) 1 : 3 : 6  
 (c) 2 : 4 : 6 (d) 3 : 2 : 1
30. If  $2A = 3B = 4C$ , then  $A : B : C$  is equal to  
 (a) 2 : 3 : 4 (b) 3 : 4 : 6  
 (c) 4 : 3 : 2 (d) 6 : 4 : 3

31. If  $x^2 + 4y^2 = 4xy$ , then  $x : y$  is  
 (a) 1 : 1 (b) 1 : 2  
 (c) 2 : 1 (d) 1 : 4
32. If  $5x^2 - 13xy + 6y^2 = 0$ , then  $x : y$  is  
 (a) 2 : 1 only (b) 3 : 5 only  
 (c) 5 : 3 or 1 : 2 (d) 3 : 5 or 2 : 1
33. If  $a : b = 7 : 9$  and  $b : c = 15 : 7$ , then what is  $a : c$ ?  
 (a) 3 : 5 (b) 5 : 3  
 (c) 7 : 15 (d) 7 : 21
34. If the ratio between the ages of  $P$  and  $Q$  is 2 : 3 and that between the ages of  $Q$  and  $R$  is 4 : 5, then the ratio between the ages of  $P$  and  $R$  is  
 (a) 3 : 4 (b) 3 : 5  
 (c) 5 : 6 (d) 8 : 15
35. If  $W_1 : W_2 = 2 : 3$  and  $W_1 : W_3 = 1 : 2$ , then  $W_2 : W_3$  is (S.S.C., 2010)  
 (a) 3 : 4 (b) 4 : 3  
 (c) 2 : 3 (d) 4 : 5
36. If  $A : B = 2 : 3$ ,  $B : C = 2 : 4$  and  $C : D = 2 : 5$ , then  $A : D$  is equal to (C.P.O., 2007)  
 (a) 1 : 5 (b) 2 : 5  
 (c) 3 : 5 (d) 2 : 15
37. If  $3A = 5B$  and  $4B = 6C$ , then  $A : C$  is equal to  
 (a) 2 : 5 (b) 3 : 5  
 (c) 4 : 5 (d) 5 : 2
38. If one star equals four circles and three circles equal four diamonds, then what is the ratio of star to diamond?  
 (a) 1 : 3 (b) 3 : 4  
 (c) 3 : 16 (d) 16 : 3
39. In a business, the ratio of the capitals of  $A$  and  $B$  is 2 : 1, that of  $B$  and  $C$  is 4 : 3 and that of  $D$  and  $C$  is 6 : 5. Then the ratio of the capitals of  $A$  and  $D$  is  
 (a) 9 : 20 (b) 3 : 5  
 (c) 5 : 3 (d) 20 : 9
40. If  $A : B = 7 : 9$  and  $B : C = 5 : 4$ , then  $A : B : C$  is  
 (a) 7 : 45 : 36 (b) 28 : 36 : 35  
 (c) 35 : 45 : 36 (d) None of these
41. If  $A : B = 2 : 3$ ,  $B : C = 4 : 5$  and  $C : D = 6 : 7$ , then  $A : B : C : D$  is  
 (a) 16 : 22 : 30 : 35 (b) 16 : 24 : 15 : 35  
 (c) 16 : 24 : 30 : 35 (d) 18 : 24 : 30 : 35
42. If  $A : B = \frac{1}{2} : \frac{1}{3}$  and  $B : C = \frac{1}{2} : \frac{1}{3}$ , then  $A : B : C$  is equal to  
 (a) 1 : 2 : 6 (b) 2 : 3 : 3  
 (c) 3 : 2 : 6 (d) 9 : 6 : 4
43. If  $A : B = \frac{1}{2} : \frac{3}{8}$ ,  $B : C = \frac{1}{3} : \frac{5}{9}$  and  $C : D = \frac{5}{6} : \frac{3}{4}$ , then the ratio  $A : B : C : D$  is  
 (a) 4 : 6 : 8 : 10 (b) 8 : 6 : 10 : 9  
 (c) 6 : 8 : 9 : 10 (d) 6 : 4 : 8 : 10
44. For each 200 rupees spent by the research department, sales department spends 20 rupees. For every 400 rupees spent by the sales department, the advertising department spends 150 rupees. The triple ratio of the money spent by the research department to the money spent by the sales department to the money spent by the advertising department can be expressed as  
 (a) 2 : 1 : 5 (b) 20 : 4 : 1  
 (c) 40 : 8 : 3 (d) 80 : 8 : 3
45. In a ratio which is equal to 7 : 8, if the antecedent is 35, what is the consequent?  
 (a) 35 (b) 40  
 (c) 56 (d) 64
46. If  $8a = 9b$  then the ratio of  $\frac{a}{9}$  to  $\frac{b}{8}$  is (Campus Recruitment, 2009)  
 (a) 1 : 1 (b) 1 : 2  
 (c) 2 : 1 (d) 64 : 81  
 (e) 81 : 64
47. If  $x : y = 3 : 4$ , then  $(2x + 3y) : (3y - 2x)$  would be equal to (M.B.A., 2007)  
 (a) 2 : 1 (b) 3 : 1  
 (c) 3 : 2 (d) 21 : 1
48. If  $a : b = 2 : 5$ , then the value of  $(2a + 3b) : (7a + 5b)$  is  
 (a) 19 : 31 (b) 19 : 39  
 (c) 31 : 19 (d) 99 : 13
49. If  $x : y = 3 : 2$ , then the ratio  $(2x^2 + 3y^2) : (3x^2 - 2y^2)$  is equal to  
 (a) 5 : 3 (b) 6 : 5  
 (c) 12 : 5 (d) 30 : 19
50. If  $x : y = 3 : 1$ , then  $x^3 - y^3 : x^3 + y^3 = ?$   
 (a) 10 : 11 (b) 11 : 10  
 (c) 13 : 14 (d) 14 : 13
51. If  $5a + 3b : 2a - 3b = 23 : 5$ , then the value of  $a : b$  is  
 (a) 1 : 2 (b) 1 : 4  
 (c) 2 : 1 (d) 4 : 1
52. If  $x : y = 7 : 3$ , then the value of  $\frac{xy + y^2}{x^2 - y^2}$  is  
 (a)  $\frac{3}{4}$  (b)  $\frac{4}{3}$   
 (c)  $\frac{3}{7}$  (d)  $\frac{7}{3}$

53. If  $\frac{a}{b} = \frac{4}{5}$  and  $\frac{b}{c} = \frac{15}{16}$ , then  $\frac{c^2 - a^2}{c^2 + a^2}$  would be  
 (a)  $\frac{1}{7}$  (b)  $\frac{3}{4}$   
 (c)  $\frac{7}{25}$  (d) None of these
54. If  $a : b = b : c$ , then  $a^4 : b^4$  would be equal to  
 (M.B.A., 2007)  
 (a)  $ac : b^2$  (b)  $a^2 : c^2$   
 (c)  $c^2 : a^2$  (d)  $b^2 : ac$
55. If  $(4x^2 - 3y^2) : (2x^2 + 5y^2) = 12 : 19$ , then  $x : y$  is  
 (a)  $2 : 3$  (b)  $1 : 2$   
 (c)  $3 : 2$  (d)  $2 : 1$
56. If  $x : y = 3 : 4$  and  $a : b = 1 : 2$ , then the value of  $\frac{2xa + yb}{3yb - 4xa}$  is  
 (a)  $\frac{5}{6}$  (b)  $\frac{6}{5}$   
 (c)  $\frac{6}{7}$  (d)  $\frac{7}{6}$
57. If  $a : b : c = 2 : 3 : 4$ , then  $\frac{1}{a} : \frac{1}{b} : \frac{1}{c}$  is equal to  
 (a)  $\frac{1}{4} : \frac{1}{3} : \frac{1}{2}$  (b)  $4 : 3 : 2$   
 (c)  $6 : 4 : 3$  (d) None of these
58. If  $\frac{1}{x} : \frac{1}{y} : \frac{1}{z} = 2 : 3 : 5$ , then  $x : y : z$  is equal to  
 (a)  $2 : 3 : 5$  (b)  $15 : 10 : 6$   
 (c)  $5 : 3 : 2$  (d)  $6 : 10 : 15$
59. If  $(x + y) : (x - y) = 4 : 1$ , then  $(x^2 + y^2) : (x^2 - y^2) = ?$   
 (a)  $8 : 17$  (b)  $17 : 8$   
 (c)  $16 : 1$  (d)  $25 : 9$
60. If  $a : (b + c) = 1 : 3$  and  $c : (a + b) = 5 : 7$ , then  $b : (a + c)$  is equal to  
 (S.S.C., 2006)  
 (a)  $1 : 2$  (b)  $2 : 3$   
 (c)  $1 : 3$  (d)  $2 : 1$
61. If  $a : b = 3 : 4$ ,  $b : c = 4 : 7$ , then  $\frac{a + b + c}{c}$  is equal to  
 (Hotel Management, 2010)  
 (a) 1 (b) 2  
 (c) 3 (d) 7
62. If  $A : B : C = 2 : 3 : 5$  and  $A = x\%$  of  $(B + C)$ , then  $x$  is equal to  
 (I.A.M. 2007)  
 (a) 20 (b) 24  
 (c) 25 (d) 28
63.  $x, y, z, u$  are real numbers such that  $x : y = y : z = z : u$  and  $x : u = 64 : 27$ . The value of  $x : z$  is  
 (Campus Recruitment, 2010)  
 (a)  $64 : 27$  (b)  $16 : 9$   
 (c)  $4 : 3$  (d)  $3 : 4$
64. If  $a : b : c = 2 : 3 : 4$  and  $2a - 3b + 4c = 33$ , then the value of  $c$  is  
 (S.S.C., 2007)  
 (a) 6 (b) 9  
 (c) 12 (d)  $\frac{66}{7}$
65. If  $p : q : r = 1 : 2 : 4$ , then  $\sqrt{5p^2 + q^2 + r^2}$  is equal to  
 (C.P.O., 2006)  
 (a) 5 (b)  $2q$   
 (c)  $5p$  (d)  $4r$
66. If  $A : B : C = 2 : 3 : 4$ , then the ratio  $\frac{A}{B} : \frac{B}{C} : \frac{C}{A}$  is equal to  
 (a)  $4 : 9 : 16$  (b)  $8 : 9 : 24$   
 (c)  $8 : 9 : 12$  (d)  $8 : 9 : 16$
67. If  $a : b = 5 : 7$  and  $c : d = 2a : 3b$ , then  $ac : bd$  is  
 (a)  $10 : 21$  (b)  $20 : 38$   
 (c)  $50 : 147$  (d)  $50 : 151$
68. If  $\frac{a}{b} = \frac{b}{c} = \frac{c}{d}$ , then  $\frac{b^3 + c^3 + d^3}{a^3 + b^3 + c^3}$  will be equal to  
 (a)  $\frac{a}{b}$  (b)  $\frac{b}{c}$   
 (c)  $\frac{c}{d}$  (d)  $\frac{d}{a}$
69. If  $p : q = 3 : 4$ ,  $r : s = 8 : 5$  and  $x : y = 10 : 6$ , then  $psx : qry$  is equal to  
 (a)  $\frac{16}{25}$  (b)  $\frac{25}{32}$   
 (c) 2 (d)  $\frac{75}{32}$
70. If  $\frac{x}{2} = \frac{y}{3} = \frac{z}{4} = \frac{2x - 3y + 5z}{k}$ , then the value of  $k$  is  
 (a) 12 (b) 15  
 (c) 16 (d) 18
71. If  $a : b = c : d$ , then  $\frac{ma + nc}{mb + nd}$  is equal to  
 (a)  $m : n$  (b)  $dm : cn$   
 (c)  $an : mb$  (d)  $a : b$
72. Let  $\frac{a}{b} : -\frac{b}{a} = x : y$ . If  $(x - y) = \left\{ \frac{a}{b} + \frac{b}{a} \right\}$ , then  $x$  is equal to  
 (a)  $\frac{a - b}{a}$  (b)  $\frac{a + b}{a}$   
 (c)  $\frac{a + b}{b}$  (d) None of these



73. If  $\frac{a+b}{c} = \frac{b+c}{a} = \frac{c+a}{b} = k$ , then  $k$  is equal to

- (a) 0 (b) 1  
(c) 2 (d)  $a + b + c$

74. If  $a : b = 2 : 3$  and  $b : c = 4 : 5$ , then  $(a + b) : (b + c)$  is equal to

- (a) 6 : 8 (b) 8 : 6  
(c) 20 : 27 (d) 27 : 20

75. If  $a : b = c : d = e : f = 1 : 2$ , then  $(3a + 5c + 7e) : (3b + 5d + 7f)$  is equal to

- (a) 1 : 2 (b) 1 : 4  
(c) 2 : 1 (d) 8 : 7

**Directions (Questions 76 to 78):** These questions are based on the following information:

Given that  $a : b = 5 : 3$  and  $b : c = 2 : 5$ .

76. Which of the following is true?

- (a)  $a < b < c$  (b)  $b < a < c$   
(c)  $c > a > b$  (d)  $b < a > c$

77. If  $c = 50$ , the value of  $a + b + c$  will be

- (a) more than 50 but less than 100  
(b) more than 100 but less than 103  
(c) more than 103 but less than 105  
(d) more than 105

78.  $(c - a)$  will be equal to

I.  $10(a + c)$

II.  $10a + 25b$

- (a) Only I is true (b) Only II is true  
(c) Both I and II are true (d) Both I and II are false

79. If  $a + b : b + c : c + a = 6 : 7 : 8$  and  $a + b + c = 14$ , then the value of  $c$  is

- (a) 6 (b) 7  
(c) 8 (d) 14

80. The fourth proportional to 5, 8, 15 is

- (a) 18 (b) 20  
(c) 21 (d) 24

81. The fourth proportional to 0.12, 0.21 and 8 is

- (a) 8.9 (b) 14  
(c) 17 (d) 56

82. Fourth proportional to  $(a^2 - b^2)$ ,  $(a^2 - ab)$ ,  $(a^3 + b^3)$  is

- (a)  $(a - b)$  (b)  $a^4 + b^4$   
(c)  $a(a^2 - ab + b^2)$  (d)  $a^3 - a^2b^2 + b^2$

83. The third proportional to 38 and 15 is

- (a)  $\frac{15 \times 15}{38}$  (b)  $\frac{38 \times 15}{2}$   
(c)  $\frac{38 \times 38}{15}$  (d)  $\frac{15}{38 \times 38}$

84. The third proportional to  $(x^2 - y^2)$  and  $(x - y)$  is

- (a)  $(x + y)$  (b)  $(x - y)$   
(c)  $\frac{x + y}{x - y}$  (d)  $\frac{x - y}{x + y}$

85. The mean proportional between 234 and 104 is

- (a) 12 (b) 39  
(c) 54 (d) None of these

86. The mean proportional between 0.02 and 0.32 is

- (a) 0.3 (b) 0.08  
(c) 0.16 (d) 0.34

87. The mean proportional between  $(3 + \sqrt{2})$  and  $(12 - \sqrt{32})$  is

- (a)  $\sqrt{7}$  (b)  $2\sqrt{7}$   
(c) 6 (d)  $\frac{15 - 3\sqrt{2}}{2}$

88. The ratio between the third proportional of 12 and 30 and mean proportional of 9 and 25 is

- (a) 2 : 1 (b) 5 : 1  
(c) 7 : 15 (d) 9 : 14

89. The product of the duplicate ratio of  $2a : 6b$  and the reciprocal ratio of  $4a^2 : 25b^2$  is

- (a) 0 (b) 1  
(c)  $a : b$  (d) None of these

90. Find the two numbers whose mean proportion is 12 and the third proportional is 324. (R.R.B., 2006)

- (a) 6 and 8 (b) 4 and 36  
(c) 3 and 24 (d) None of these

91. The present ages of A, B and C are in the ratio of 8 : 14 : 22 respectively. The present ages of B, C and D are in the ratio of 21 : 33 : 44 respectively. Which of the following represents the ratio of the present ages of A, B, C and D respectively?

- (a) 12 : 21 : 36 : 44 (b) 12 : 21 : 33 : 44  
(c) 12 : 22 : 31 : 44  
(d) Cannot be determined (e) None of these

92. When 30% of one number is subtracted from another number, the second number reduces to its four-fifths. What is the ratio of the first to the second number?

(Bank P.O., 2010)

- (a) 2 : 5 (b) 3 : 2  
(c) 4 : 7 (d) Cannot be determined  
(e) None of these

93. Rita invested 25% more than Sunil. Sunil invested 30% less than Abhinav, who invested ₹ 6000. What is the ratio of the amount that Rita invested to the total amount invested by all of them together?

(Bank P.O., 2010)

- (a) 35 : 104 (b) 13 : 29  
(c) 101 : 36 (d) 35 : 103  
(e) None of these

94. One-fourth of sixty percent of a number is equal to two-fifths of twenty percent of another number. What is the respective ratio of the first number to the second number? (Bank P.O., 2008)

(a) 4 : 7 (b) 5 : 9  
(c) 8 : 13 (d) Cannot be determined  
(e) None of these

95. The total number of boys in a school is 16% more than the total number of girls in the school. What is the respective ratio of the total number of boys to the total number of girls in the school? (Bank Recruitment, 2008)

(a) 25 : 21 (b) 29 : 35  
(c) 25 : 29 (d) Cannot be determined  
(e) None of these

96. The number of students in two sections A and B having different heights is shown in the table given below.

Height (in metres)	Number of students	
	Section A	Section B
1.55	3	2
1.60	7	6
1.62	12	14
1.65	15	14
1.68	8	9
1.71	6	5
1.75	3	4

The ratio of the number of students of a particular height in section A to that in section B is the maximum for the height of

(a) 1.55 m (b) 1.60 m  
(c) 1.65 m (d) 1.71 m

97. Determine the ratio of the number of people having characteristic X to the number of people having characteristic Y in a population of 100 subjects from the following table :

Having X and Y	10
Having X but not Y	30
Having Y but not X	20
Having neither X nor Y	40

(a) 1 : 2 (b) 2 : 3  
(c) 3 : 2 (d) 4 : 3

98. Five mangoes and four oranges cost as much as three mangoes and seven oranges. What is the ratio of the cost of one mango to the cost of one orange? (Campus Recruitment, 2009)

(a) 4 : 3 (b) 1 : 3  
(c) 3 : 2 (d) 5 : 2

99. The ratio of urea and potash in a mixed fertilizer is 7 : 3. Express the quantity of urea present as percentage of the total amount of fertilizer. (P.C.S., 2008)

(a) 20% (b) 50%  
(c) 60% (d) 70%

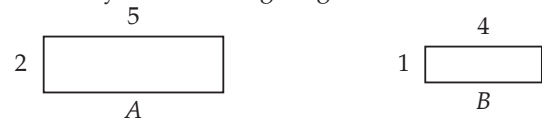
100. Profits of a business are divided among three partners A, B and C in such a way that 4 times the amount received by A is equal to 6 times the amount received by B and 11 times the amount received by C. The ratio in which the three received the amount is (M.A.T. 2006, Bank P.O., 2008)

(a) 4 : 6 : 11 (b) 11 : 6 : 4  
(c) 33 : 22 : 12 (d)  $\frac{1}{4} : \frac{1}{6} : \frac{1}{11}$

101. The bus fare and train fare of a place from Kolkata were ₹ 20 and ₹ 30 respectively. Train fare has been increased by 20% and the bus fare has been increased by 10%. The ratio of new train fare to new bus fare is (S.S.C., 2007)

(a) 3 : 5 (b) 5 : 3  
(c) 11 : 18 (d) 18 : 11

102. The monthly incomes of two families A and B are shown by the following diagrams:



If the income of family B is ₹ 12000, then the income of family A would be (P.C.S., 2006)

(a) ₹ 15000 (b) ₹ 20000  
(c) ₹ 25000 (d) ₹ 30000

103. In a class the number of girls is 20% more than that of the boys. The strength of the class is 66. If 4 more girls are admitted to the class, the ratio of the number of boys to that of the girls is

(a) 1 : 2 (b) 1 : 4  
(c) 3 : 4 (d) 3 : 5

104. If the income of A is 10% more than that of B and the income of B is 20% less than that of C, then the incomes of A, B and C respectively are in the ratio

(a) 11 : 10 : 8 (b) 22 : 20 : 25  
(c) 10 : 9 : 7 (d) 22 : 18 : 25

105. Two numbers are respectively 20 percent and 50 percent more than a third number. These two numbers are in the ratio

(a) 2 : 5 (b) 3 : 5  
(c) 4 : 5 (d) 6 : 7

106. What is the ratio whose terms differ by 40 and the measure of which is  $\frac{2}{7}$ ?

- (a) 6 : 56 (b) 14 : 56  
(c) 16 : 56 (d) 16 : 72
- 107.** ₹ 16000 are to be distributed between B and A such that B gets ₹ 4000 less than A. The ratio of the amount received by A to that received by B is  
(a) 1 : 3 (b) 3 : 5  
(c) 5 : 3 (d) 6 : 1
- 108.** Find the fraction which will bear the same ratio to  $\frac{1}{27}$  that  $\frac{3}{11}$  does to  $\frac{5}{9}$ .  
(a)  $\frac{1}{55}$  (b)  $\frac{15}{99}$   
(c)  $\frac{40}{33}$  (d) 55
- 109.** Given that 24 carat gold is pure gold ; 18 carat gold is  $\frac{3}{4}$  gold and 20 carat gold is  $\frac{5}{6}$  gold, the ratio of the pure gold in 18 carat gold to the pure gold in 20 carat gold is  
(a) 5 : 8 (b) 8 : 5  
(c) 9 : 10 (d) 15 : 22
- 110.** A, B, C and D have ₹ 40, ₹ 50, ₹ 60 and ₹ 70 respectively when they go to visit a fair. A spends ₹ 18, B spends ₹ 21, C spends ₹ 24 and D spends ₹ 27. Who has done the highest expenditure proportionate to his resources?  
(a) A (b) B  
(c) C (d) D
- 111.** The ratio of the arithmetic mean of two numbers to one of the numbers is 3 : 5. What is the ratio of the smaller number to the larger one?  
(a) 1 : 2 (b) 1 : 3  
(c) 1 : 4 (d) 1 : 5
- 112.** Seema and Meena divide a sum of ₹ 25000 in the ratio of 3 : 2 respectively. If ₹ 5000 is added to each of their shares, what would be the new ratio formed?  
(a) 2 : 3 (b) 3 : 4  
(c) 5 : 4 (d) 4 : 3  
(P.C.S., 2010)
- 113.** Of 132 examinees of a certain school, the ratio of successful to unsuccessful candidates is 9 : 2. If 4 more students passed, what would have been the ratio of successful to unsuccessful students?  
(a) 25 : 4 (b) 4 : 25  
(c) 28 : 5 (d) 3 : 28
- 114.** A person divided ₹ 10800 among his three sons in the ratio 3 : 4 : 5. Second son kept ₹ 1000 for himself, gave ₹ 600 to his wife and divided the remaining money among his two daughters in the ratio 11 : 9. Then one of his daughters received  
(a) ₹ 1000 (b) ₹ 1050  
(c) ₹ 1100 (d) ₹ 1150
- 115.** The sides of a triangle are in the ratio 3 : 4 : 5. The measure of the largest angle of the triangle is  
(a) 60° (b) 75°  
(c) 120° (d) 150°
- 116.** The numbers  $x, y, z$  are proportional to 2, 3, 5. The sum of  $x, y, z$  is 100. If  $y = px - 10$ , then  $p$  is equal to  
(M.B.A., 2011)  
(a)  $\frac{3}{2}$  (b) 2  
(c)  $\frac{5}{2}$  (d) 3
- 117.** A, B and C are boxes containing marbles in the ratio 1 : 2 : 3. Total number of marbles is 60. The above ratio can be changed to 3 : 4 : 5 by transferring  
(a) 2 marbles from A to B and 1 from C to B  
(b) 3 marbles from B to C  
(c) 4 marbles from C to B  
(d) 5 marbles from C to A
- 118.** An amount of ₹ 53 is divided among A, B and C such that A gets ₹ 7 more than B and B gets ₹ 8 more than C. What is the ratio of their shares?  
(R.R.B., 2009)  
(a) 15 : 8 : 30 (b) 16 : 9 : 18  
(c) 18 : 25 : 10 (d) 25 : 18 : 10
- 119.** A sum of money is shared in the ratio of 3 : 4 : 5. The smallest share is divided again in the ratio of 1 : 2. What fraction of the total sum of money is the larger of the two latter shares?  
(a)  $\frac{1}{3}$  (b)  $\frac{1}{6}$   
(c)  $\frac{2}{3}$  (d)  $\frac{1}{12}$
- 120.** If an amount of ₹ 1,50,000 is shared among A, B and C in the ratio of 2 : 3 : 5, then A receives the same amount as he would receive if another sum of money is shared between A, B and C in the ratio of 5 : 3 : 2. The ratio of ₹ 1,50,000 to the second amount of money is  
(a) 2 : 3 (b) 3 : 2  
(c) 5 : 2 (d) 5 : 3
- 121.** In an alloy, the ratio of copper and zinc is 5 : 2. If 1.250 kg of zinc is mixed in 17 kg 500 g of alloy, then the ratio of copper and zinc in the alloy will be  
(a) 1 : 2 (b) 2 : 1  
(c) 2 : 3 (d) 3 : 2

122. A sum of ₹ 650 is divided between A and B in such a manner that in every 100 rupees A gets 30 rupees more than B. How much does B get?  
 (a) ₹ 288 (b) ₹ 227.50  
 (c) ₹ 312.50 (d) ₹ 422.50
123. A sum of ₹ 731 is divided among A, B and C such that A receives 25% more than B and B receives 25% less than C. What is C's share in the amount?  
 (Bank P.O., 2006)  
 (a) ₹ 172 (b) ₹ 200  
 (c) ₹ 258 (d) ₹ 262  
 (e) None of these
124. A sum of ₹ 6400 is divided among three workers in the ratio  $\frac{3}{5} : 2 : \frac{5}{3}$ . The share (in rupees) of the second worker is  
 (S.S.C., 2007)  
 (a) 2560 (b) 3000  
 (c) 3200 (d) 3840
125. If ₹ x are divided between A and B in the ratio  $\frac{a}{b} : \frac{c}{d}$ , then A gets rupees  
 (a)  $\frac{adx}{ab+cd}$  (b)  $\frac{adx}{ad+bc}$   
 (c)  $\frac{abx}{ad+bc}$  (d)  $\frac{abx}{ac+bd}$
126. A man distributes ₹ 165000 among his daughter, wife and son in such a manner that  $\frac{1}{2}$  of the daughter's share,  $\frac{1}{4}$  of the wife's share and  $\frac{1}{5}$  of the son's share are equal. Find the daughter's share.  
 (a) ₹ 15000 (b) ₹ 30000  
 (c) ₹ 45000 (d) ₹ 60000
127. A sum of ₹ 1250 is divided among A, B, C so that A gets  $\frac{2}{9}$  of B's share and C gets  $\frac{3}{4}$  of A's share. The share of C is  
 (a) ₹ 75 (b) ₹ 90  
 (c) ₹ 135 (d) ₹ 150
128. Instead of dividing ₹ 117 among P, Q, R in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ , by mistake it was divided in the ratio 2 : 3 : 4. Who gained in the transaction?  
 (a) Only P (b) Only Q  
 (c) Only R (d) Both Q and R
129. ₹ 33630 are divided among A, B and C in such a manner that the ratio of the amount of A to that of B is 3 : 7 and the ratio of the amount of B to that of C is 6 : 5. The amount of money received by B is  
 (S.S.C., 2007)  
 (a) ₹ 12390 (b) ₹ 13290  
 (c) ₹ 14868 (d) ₹ 16257
130. In an innings of a cricket match, three players A, B and C scored a total of 361 runs. If the ratio of the number of runs scored by A to that scored by B and also number of runs scored by B to that scored by C be 3 : 2, the number of runs scored by A was  
 (a) 161 (b) 171  
 (c) 181 (d) 185
131. ₹ 8400 are divided among A, B, C and D in such a way that the shares of A and B, B and C as well as C and D are in the ratios of 2 : 3, 4 : 5 and 6 : 7 respectively. The share of A is  
 (a) ₹ 1280 (b) ₹ 1320  
 (c) ₹ 8210 (d) ₹ 8400
132. A sum of ₹ 1300 is divided among P, Q, R and S such that  

$$\frac{P's\ share}{Q's\ share} = \frac{Q's\ share}{R's\ share} = \frac{R's\ share}{S's\ share} = \frac{2}{3}$$
 How much is P's share?  
 (a) ₹ 140 (b) ₹ 160  
 (c) ₹ 240 (d) ₹ 320
133. The sum of three numbers is 116. The second number and the third number are in the ratio of 9 : 16 while the first number and the third number are in the ratio of 1 : 4. Find the second number.  
 (a) 8 (b) 16  
 (c) 64 (d) Cannot be determined  
 (e) None of these
134. ₹ 2010 are to be divided among A, B, C in such a way that if A gets ₹ 5, then B must get ₹ 12 and if B gets ₹ 4, then C must get ₹ 5.50. The share of C will exceed that of B by  
 (C.P.O., 2007)  
 (a) ₹ 270 (b) ₹ 360  
 (c) ₹ 430 (d) ₹ 620
135. ₹ 600 are divided among A, B, C so that ₹ 40 more than  $\frac{2}{5}$  of A's share, ₹ 20 more than  $\frac{2}{7}$  of B's share and ₹ 10 more than  $\frac{9}{17}$  of C's share may all be equal. What is A's share?  
 (L.I.C.A.A.O., 2007)  
 (a) ₹ 150 (b) ₹ 170  
 (c) ₹ 200 (d) ₹ 280
136. ₹ 1050 are divided among P, Q and R. The share of P is  $\frac{2}{5}$  of the combined share of Q and R. P gets  
 (a) ₹ 200 (b) ₹ 300  
 (c) ₹ 320 (d) ₹ 420

- 137.** A sum of ₹ 12540 is divided among A, B and C so that A may receive  $\frac{3}{7}$  of what B and C together receive and B may receive  $\frac{2}{9}$  of what A and C together receive. The difference in the shares of A and B is  
 (a) ₹ 1482 (b) ₹ 2736  
 (c) ₹ 4218 (d) ₹ 4320
- 138.** If ₹ 1066 are divided among A, B, C and D such that  $A : B = 3 : 4$ ,  $B : C = 5 : 6$  and  $C : D = 7 : 5$ , who will get the maximum?  
 (a) A (b) B  
 (c) C (d) D
- 139.** A person distributes his pens among four friends A, B, C and D in the ratio  $\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$ . What is the minimum number of pens that the person should have?  
 (a) 23 (b) 55  
 (c) 57 (d) 65
- 140.** Divide ₹ 671 among A, B and C such that if their shares be increased by ₹ 3, ₹ 7 and ₹ 9 respectively the remainder shall be in the ratio 1 : 2 : 3.  
 (M.A.T., 2008)  
 (a) ₹ 110, ₹ 220, ₹ 336 (b) ₹ 112, ₹ 223, ₹ 336  
 (c) ₹ 105, ₹ 223, ₹ 330 (d) None of these
- 141.** ₹ 1087 is divided among A, B and C such that if ₹ 10, ₹ 12 and ₹ 15 are diminished from the shares of A, B and C respectively, the remainders will be in the ratio of 5, 7 and 9. What is the share of B?  
 (M.A.T., 2008)  
 (a) ₹ 260 (b) ₹ 355  
 (c) ₹ 362 (d) ₹ 465
- 142.** Two numbers  $x$  and  $y$  are in the ratio 5 : 7 and their sum is 36. Then  $x$  is  
 (P.C.S., 2009)  
 (a) 12 (b) 15  
 (c) 18 (d) 19
- 143.** The ratio of income and expenditure of a person is 11 : 10. If he saves ₹ 9000 per annum, his monthly income is  
 (S.S.C., 2010)  
 (a) ₹ 8000 (b) ₹ 8250  
 (c) ₹ 8500 (d) ₹ 8800
- 144.** Two natural numbers are in the ratio 3 : 5 and their product is 2160. The smaller of the numbers is  
 (S.S.C., 2010)  
 (a) 12 (b) 18  
 (c) 24 (d) 36
- 145.** A sum of money is divided among A, B, C and D in the ratio of 3 : 4 : 9 : 10 respectively. If the share of C is ₹ 2580 more than the share of B, then what is the total amount of A and D together?  
 (Bank P.O., 2009)  
 (a) ₹ 5676 (b) ₹ 6192  
 (c) ₹ 6708 (d) ₹ 7224  
 (e) None of these
- 146.** Two numbers are in the ratio 4 : 5 and their L.C.M. is 180. The smaller number is  
 (C.P.O., 2007)  
 (a) 9 (b) 15  
 (c) 36 (d) 45
- 147.** The ratio of the incomes of Ram and Shyam is 7 : 17 and that of Shyam and Sohan is 7 : 17. If the income of Ram is ₹ 490, what is the income of Sohan?  
 (R.R.B., 2007)  
 (a) ₹ 490 (b) ₹ 1190  
 (c) ₹ 2790 (d) ₹ 2890
- 148.** At Narmada Sarovar Bachao demonstration, supporters of Ms. Patkar outnumbered the police by 9 : 1. The police arrested 135 NSB supporters averaging 5 for 3 policemen. How many supporters of NSB were there in the demonstration?  
 (M.A.T., 2007)  
 (a) 405 (b) 665  
 (c) 1215 (d) None of these
- 149.** The sides of a triangle are in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$  and its perimeter is 104 cm. The length of the longest side (in cm) is  
 (M.B.A., 2007)  
 (a) 26 (b) 32  
 (c) 48 (d) 52
- 150.** Two numbers are in the ratio 3 : 4. If the difference of their squares is 63, then the numbers are  
 (a) 8, 12 (b) 9, 12  
 (c) 12, 15 (d) 16, 20
- 151.** If  $A : B = 4 : 5$ ,  $B : C = 7 : 9$  and  $C : D = 3 : 4$ , and if A's share is ₹ 1680, the share of D is  
 (a) ₹ 2100 (b) ₹ 2700  
 (c) ₹ 2900 (d) ₹ 3600
- 152.** The sum of the squares of three numbers is 532 and the ratio of the first and the second as also of the second and the third is 3 : 2. The third number is  
 (M.A.T., 2010)  
 (a) 8 (b) 12  
 (c) 18 (d) 20
- 153.** A man spends a part of his monthly income and saves a part of it. The ratio of his expenditure to his savings is 26 : 3. If his monthly income is ₹ 7250, what is the amount of his monthly savings?  
 (a) ₹ 290 (b) ₹ 350  
 (c) ₹ 750 (d) ₹ 780

- 154.** Two numbers are in the ratio 17 : 45. One-third of the smaller is less than  $\frac{1}{5}$  of the bigger by 15. The smaller number is  
 (a)  $25\frac{1}{2}$  (b)  $67\frac{1}{2}$   
 (c)  $76\frac{1}{2}$  (d)  $86\frac{1}{2}$
- 155.** The sum of four numbers  $A$ ,  $B$ ,  $C$  and  $D$  is 110.  $C$  is twice  $A$ , sum of  $A$  and  $D$  is equal to that of  $B$  and  $C$  and  $A : B$  is 3 : 5. The numbers are  
 (a) 3, 5, 6, 8 (b) 15, 25, 30, 40  
 (c) 15, 25, 35, 45 (d) None of these
- 156.** The expenses of  $A$  and  $B$  are in the ratio 2 : 3. A sum of ₹ 2800 is equally divided between them. If  $A$  saves ₹ 600, then  $B$  saves  
 (a) ₹ 200 (b) ₹ 300  
 (c) ₹ 400 (d) ₹ 500
- 157.** Three numbers  $A$ ,  $B$  and  $C$  are in the ratio of 12 : 15 : 25. If the sum of these numbers is 312, the ratio between the difference of  $B$  and  $A$  and the difference of  $C$  and  $B$  is (M.A.T., 2010)  
 (a) 3 : 7 (b) 5 : 1  
 (c) 3 : 10 (d) 10 : 3
- 158.** Incomes of  $A$ ,  $B$  and  $C$  are in the ratio 7 : 9 : 12 and their respective expenditures are in the ratio 8 : 9 : 15. If  $A$  saves  $\frac{1}{4}$  of his income, then the ratio of their savings is (A.A.O. Exam., 2009)  
 (a) 56 : 99 : 69 (b) 33 : 19 : 23  
 (c) 15 : 28 : 27 (d) 56 : 69 : 99
- 159.** The total emoluments of  $A$  and  $B$  are equal. However,  $A$  gets 65% of his basic salary as allowances and  $B$  gets 80% of his basic salary as allowances. What is the ratio of the basic salaries of  $A$  and  $B$ ? (P.C.S., 2009)  
 (a) 5 : 7 (b) 7 : 9  
 (c) 12 : 11 (d) 16 : 13
- 160.** The incomes of Mr. Gupta and Mr. Verma are in the ratio 9 : 4 and their expenditures are in the ratio 7 : 3. If each saves ₹ 2000, then Mr. Gupta's expenditure is (M.A.T., 2009)  
 (a) ₹ 60000 (b) ₹ 70000  
 (c) ₹ 80000 (d) ₹ 90000
- 161.**  $A$  and  $B$  have incomes in the ratio 5 : 3. The expenses of  $A$ ,  $B$  and  $C$  are in the ratio of 8 : 5 : 2. If  $C$  spends ₹ 2000 and  $B$  saves ₹ 700, then  $A$ 's savings are  
 (a) ₹ 500 (b) ₹ 1000  
 (c) ₹ 1500 (d) ₹ 2500
- 162.** In a bank, monthly salary of clerks and officers are in the ratio of 3 : 5. Each clerk contributes 2% and each officer contributes 3 % of his salary to the Welfare Fund. If each officer's contribution is ₹ 210, what will be the clerk's salary?  
 (a) ₹ 4000 (b) ₹ 4200  
 (c) ₹ 5200 (d) ₹ 7000  
 (e) None of these
- 163.** Salaries of  $A$  and  $B$  are in the ratio of 9 : 4 respectively. When  $A$ 's salary is increased by 15%, it becomes ₹ 5175. What is  $B$ 's salary?  
 (a) ₹ 2000 (b) ₹ 2500  
 (c) ₹ 4000 (d) ₹ 4500  
 (e) None of these
- 164.** Between two consecutive years my incomes are in the ratio of 2 : 3 and expenses in the ratio 5 : 9. If my income in the second year is ₹ 45000 and my expenses in the first year is ₹ 25000 my total savings for the two years is  
 (a) Nil (b) ₹ 5000  
 (c) ₹ 10000 (d) ₹ 15000
- 165.** The sum of the salaries of  $A$  and  $B$  is ₹ 2100.  $A$  spends 80% of his salary and  $B$  spends 70% of his salary. If their savings are in the proportion of 4 : 3, then what is the salary of  $A$ ?  
 (a) ₹ 700 (b) ₹ 900  
 (c) ₹ 1200 (d) ₹ 1400
- 166.** The ratio of incomes of two persons is 5 : 3 and that of their expenditures is 9 : 5. If they save ₹ 2600 and ₹ 1800 respectively, their incomes are  
 (a) ₹ 9000, ₹ 5400 (b) ₹ 10000, ₹ 6000  
 (c) ₹ 6000, ₹ 3600 (d) ₹ 8000, ₹ 4800
- 167.** The monthly incomes of  $A$  and  $B$  are in the ratio of 5 : 4, their monthly expenses are in the ratio of 19 : 21, and their monthly savings are in the ratio of 37 : 18. If the total annual savings of  $A$  and  $B$  is ₹ 66000,  $A$ 's monthly income is  
 (a) ₹ 6000 (b) ₹ 7500  
 (c) ₹ 8000 (d) ₹ 9000
- 168.** The ratio of the number of boys and girls in a school of 720 students is 7 : 5. How many more girls should be admitted to make the ratio 1 : 1? (P.C.S., 2009)  
 (a) 90 (b) 120  
 (c) 220 (d) 240
- 169.** In a college the students in Arts and Commerce faculties were in the ratio of 4 : 5 respectively. When 65 more students joined Commerce faculty the ratio becomes 8 : 11 respectively. How many students are there in Arts faculty? (Bank P.O., 2009)  
 (a) 520 (b) 650  
 (c) 715 (d) Cannot be determined  
 (e) None of these



170. Two numbers are in the ratio 7 : 11. If 7 is added to each of the numbers, the ratio becomes 2 : 3. The smaller number is (S.S.C., 2010)  
 (a) 39 (b) 49  
 (c) 66 (d) 77
171. The ratio of boys and girls in sections A, B, C and D of class VI is respectively 7 : 5, 5 : 3, 3 : 2 and 2 : 1. If the number of students in each of the sections is equal, then maximum number of boys are enrolled in section  
 (a) A (b) B  
 (c) C (d) D
172. When a particular number is subtracted from each of 7, 9, 11 and 15, the resulting numbers are in proportion. The number to be subtracted is (C.P.O., 2007)  
 (a) 1 (b) 2  
 (c) 3 (d) 5
173. The ratio of milk to water in 80 litres of a mixture is 7 : 3. The water (in litres) to be added to it to make the ratio 2 : 1 is (S.S.C., 2006)  
 (a) 4 (b) 5  
 (c) 6 (d) 8
174. In two types of powdered detergent the ratio of soda and soap-dust is 2 : 19 and 1 : 11 respectively. If 7 kg of the first type is mixed with 4 kg of the second type, find the ratio of soda to soap-dust in the new detergent mixture.  
 (a) 1 : 9 (b) 9 : 1  
 (c) 1 : 10 (d) 20 : 1
175. What number must be added to each of the numbers 7, 11 and 19 so that the resulting numbers may be in continued proportion?  
 (a) -3 (b) -4  
 (c) 3 (d) 4
176. Two numbers are in the ratio of 3 : 5. If 9 is subtracted from each, they are in the ratio of 12 : 23. What is the larger number? (J.M.E.T., 2010)  
 (a) 40 (b) 45  
 (c) 55 (d) 60
177. In a certain company, the ratio of the number of managers to the number of production-line workers is 5 to 72. If 8 additional production-line workers were to be hired, the ratio of the number of managers to the production-line workers would be 5 to 74. How many managers does the company have? (A.T.M.A., 2006)  
 (a) 10 (b) 20  
 (c) 25 (d) 30
178. What number has to be added to the terms of 3 : 5 to make the ratio 5 : 6? (R.R.B., 2006)  
 (a) 6 (b) 7  
 (c) 12 (d) 13
179. The ratio of the number of ladies to that of gents at a party was 3 : 2. When 20 more gents joined the party, the ratio was reversed. The number of ladies present at the party was (C.P.O., 2006)  
 (a) 16 (b) 24  
 (c) 32 (d) 36
180. In a school the ratio of boys and girls is 4 : 5 respectively. When 100 girls leave the school the ratio becomes 6 : 7 respectively. How many boys are there in the school? (Bank P.O., 2008)  
 (a) 1300 (b) 1500  
 (c) 1600 (d) Cannot be determined  
 (e) None of these
181. Two numbers are in the ratio  $1\frac{1}{2} : 2\frac{2}{3}$ . When each of these is increased by 15, their ratio becomes  $1\frac{2}{3} : 2\frac{1}{2}$ . The greater of the numbers is (S.S.C., 2005)  
 (a) 27 (b) 36  
 (c) 48 (d) 64
182. Three numbers A, B and C are in the ratio 1 : 2 : 3. Their average is 600. If A is increased by 10% and B is decreased by 20%, then to get the average increased by 5%, C will be increased by  
 (a) 90 (b) 100  
 (c) 150 (d) 180
183. Two numbers are in the ratio 2 : 3. If 2 is subtracted from the first and 2 is added to the second, the ratio becomes 1 : 2. The sum of the numbers is (S.S.C., 2007)  
 (a) 10 (b) 24  
 (c) 28 (d) 30
184. 20 litres of a mixture contains milk and water in the ratio of 5 : 3. If four litres of this mixture is replaced by four litres of milk, then the ratio of the milk to that of the water in the new mixture will be  
 (a) 2 : 3 (b) 4 : 3  
 (c) 5 : 3 (d) 7 : 3
185. When 1 is added to each of the two given numbers, their ratio becomes 3 : 4 and when 5 is subtracted from each, the ratio becomes 7 : 10. One of the numbers is  
 (a) 11 (b) 15  
 (c) 26 (d) 36
186. The ratio of number of boys to that of girls in a group becomes 2 : 1 when 15 girls leave. But, afterwards, when 45 boys also leave, the ratio becomes 1 : 5. Originally the number of girls in the group was  
 (a) 20 (b) 30  
 (c) 40 (d) 50

187. Two vessels contain spirit of 0.5 and 0.75 concentrations. If 2 litres from the first vessel and 3 litres from the second vessel are mixed, then what will be the ratio of spirit and water in the resultant solution?  
 (a) 7 : 17 (b) 17 : 15  
 (c) 13 : 7 (d) 15 : 17
188. The least whole number which when subtracted from both the numerator and the denominator of the fractional number  $6 : 7$ , gives a ratio less than  $16 : 21$ , is  
 (a) 2 (b) 3  
 (c) 4 (d) 6
189. The population of a city is 9000 in a particular year. If there is an increase of 5% in men's population and 8% in women's population in the next year and the population becomes 9600, what was the ratio between the men and women in that particular year?  
 (a) 2 : 3 (b) 4 : 5  
 (c) 5 : 4 (d) Data inadequate  
 (e) None of these
190. A barrel contains a mixture of wine and water in the ratio 3 : 1. How much fraction of the mixture must be drawn off and substituted by water so that the ratio of wine and water in the resultant mixture in the barrel becomes 1 : 1?  
 (a)  $\frac{1}{3}$  (b)  $\frac{1}{4}$   
 (c)  $\frac{2}{3}$  (d)  $\frac{3}{4}$
191. One year ago the ratio of the ages of Sarika and Gouri was 3 : 4 respectively. One year hence the ratio of their ages will be 10 : 13 respectively. What is Sarika's present age? (Bank P.O., 2008)  
 (a) 18 years (b) 20 years  
 (c) 26 years (d) Cannot be determined  
 (e) None of these
192. The average age of three boys is 25 years and their ages are in the proportion 3 : 5 : 7. The age of the youngest boy is  
 (a) 9 years (b) 15 years  
 (c) 18 years (d) 21 years
193. A box contains 1 rupee, 50-paise and 25-paise coins in the ratio 8 : 5 : 3. If the total amount of money in the box is ₹ 112.50, the number of 50-paise coins is  
 (a) 30 (b) 42  
 (c) 50 (d) 80
194. There are 420 coins consisting of one-rupee coins, 50-paise coins and 25-paise coins. If the ratio of their values be 2 : 3 : 5, then the number of one-rupee coins is  
 (a) 20 (b) 30  
 (c) 90 (d) 300

195. Monthly consumption of kerosene oil in a certain household along with price variations is given below.

Rate of kerosene oil (in ₹)	1.5	2	3.0	4.5
Consumption (in litres)	60	45	30	20

When the price goes up to ₹ 6 per litre, what is the likely consumption of kerosene?

- (a) 7.5 litres (b) 10 litres  
 (c) 12.5 litres (d) 15 litres
196. If  $A$  varies directly proportional to  $C$  and  $B$  also varies directly proportional to  $C$ , which one of the following is not correct? (C.P.F., 2008)  
 (a)  $(A + B) \propto C$  (b)  $(A - B) \propto \frac{1}{C}$   
 (c)  $\sqrt{AB} \propto C$  (d)  $\frac{A}{B} = \text{constant}$
197. If  $x$  is inversely proportional to  $y$  and  $y$  is proportional to  $z$ , then  $xz$  (I.A.M., 2007)  
 (a) is proportional to  $y$   
 (b) is inversely proportional to  $y$   
 (c) is a constant  
 (d) is proportional to  $y^2$
198. The falling height of an object is proportional to the square of the time. One object falls 64 cm in 2 sec then in 6 sec from how much height the object will fall? (Campus Recruitment, 2009)  
 (a) 192 cm (b) 276 cm  
 (c) 436 cm (d) 576 cm
199.  $y$  varies directly as  $(x + 3)$  and  $y = 8$  when  $x = 1$ . What is the value of  $y$  when  $x = 2$ ? (R.B.B., 2006)  
 (a) 6 (b) 10  
 (c) 12 (d) 16
200. The ratio of the rate of flow of water in pipes varies inversely as the square of the radius of the pipes. What is the ratio of the rates of flow in two pipes of diameters 2 cm and 4 cm? (M.A.T., 2005)  
 (a) 1 : 2 (b) 2 : 1  
 (c) 4 : 1 (d) 1 : 8
201. Suppose  $y$  varies as the sum of two quantities of which one varies directly as  $x$  and the other inversely as  $x$ . If  $y = 6$  when  $x = 4$  and  $y = 3\frac{1}{3}$  when  $x = 3$ , then the relation between  $x$  and  $y$  is (M.B.A., 2006)  
 (a)  $y = 2x - \frac{8}{x}$  (b)  $y = x + \frac{4}{x}$   
 (c)  $y = 2x + \frac{4}{x}$  (d)  $y = 2x + \frac{8}{x}$



202. Consider the following table of inverse variation :

M	15	-6	2	C
N	-4	A	B	60

The values of  $A$ ,  $B$  and  $C$  in the above table respectively are

- (a) -1, -30, 10 (b) -30, 10, -1  
(c) 10, -30, -1 (d) 10, -1, 30
203.  $S$  varies directly as  $R$  and  $T$  varies inversely as  $R$ . At some particular time,  $R = 20$ ,  $S = 40$  and  $T = 10$ . If  $S$  is changed to 20, then the value of  $T$  would be equal to  
(a) 10 (b) 20  
(c) 40 (d) 80
204.  $x$  and  $y$  vary inversely with each other. When  $x$  is 12,  $y$  is 9. The pair which is not a possible pair of corresponding values of  $x$  and  $y$  is  
(a) 9 and 12 (b) 18 and 6  
(c) 24 and 18 (d) 36 and 3
205. The intensity of illumination on a surface from a source of light varies inversely as the square of the distance of the surface from the source. The effect of moving a piece of paper 3 times as far from the source is to  
(a) multiply the intensity by 3  
(b) divide the intensity by 3  
(c) multiply the intensity by 9  
(d) divide the intensity by 9
206. The boys and girls in a college are in the ratio 3 : 2. If 20% of the boys and 25% of the girls are adults, the percentage of students who are not adults is  
(P.C.S., 2009)  
(a) 67.5% (b) 58%  
(c) 78% (d) 82.5%
207. The cost of a table and a chair are in the ratio of 5 : 7. If the cost of chair and table is increased by 20% and 10% respectively, then what will be the new ratio?  
(Bank Recruitment, 2007)  
(a) 16 : 17 (b) 55 : 84  
(c) 60 : 77 (d) Data inadequate  
(e) None of these
208. The ratio of the students in schools  $A$ ,  $B$  and  $C$  is 5 : 4 : 7. If the number of students in the schools are increased by 20%, 25% and 20% respectively, what would be the new ratio of the students in schools  $A$ ,  $B$  and  $C$ ?  
(Bank P.O., 2010)  
(a) 5 : 5 : 7 (b) 30 : 25 : 42  
(c) 30 : 20 : 49 (d) Cannot be determined  
(e) None of these

209. The expenses on rice, fish and oil of a family are in the ratio 12 : 17 : 3. The prices of these articles are increased by 20%, 30% and 50% respectively. The total expenses of family on these articles are increased by  
(S.S.C., 2007)

- (a)  $7\frac{1}{8}\%$  (b)  $14\frac{1}{8}\%$   
(c)  $28\frac{1}{8}\%$  (d)  $56\frac{1}{8}\%$

210. Ratio of earnings of  $A$  and  $B$  is 8 : 9 respectively. If the earnings of  $A$  increase by 50% and the earnings of  $B$  decrease by 25%, the new ratio of their earnings becomes 16 : 9 respectively. What are  $A$ 's earnings?  
(Bank P.O., 2006)

- (a) ₹ 22000 (b) ₹ 28500  
(c) ₹ 37000 (d) Cannot be determined  
(e) None of these

211. Mr. Sharma's expenditure and savings are in the ratio of 3 : 2. His income increases by 10%. His expenditure also increases by 12%. How much percent does his savings increase?  
(M.A.T., 2010)

- (a) 6% (b) 7%  
(c) 11% (d) 13%

212. The weights of two persons  $A$  and  $B$  are in the ratio of 3 : 5.  $A$ 's weight increases by 20% and the total weight of  $A$  and  $B$  together becomes 80 kg, with an increase of 25%. By what percent did the weight of  $B$  increase?  
(M.A.T., 2008)

- (a) 20% (b) 25%  
(c) 28% (d) 30%

213. Mrs. Richi Rich inherits 3224 gold coins and divides them amongst her 3 daughters Lalita, Palita and Salita in a certain ratio. Out of the total coins each of them received, Lalita sells her 50 coins, Palita donates 85 of her coins and Salita makes jewellery out of her 39 coins. Now the ratio of gold coins with them is 24 : 21 : 16 respectively. How many coins did Lalita receive from her mother?  
(Bank Recruitment, 2009)

- (a) 1050 (b) 1135  
(c) 1200 (d) 1250  
(e) None of these

214. A wheel that has 6 cogs is meshed with a larger wheel of 14 cogs. When the smaller wheel has made 21 revolutions, the number of revolutions made by the larger wheel will be

- (a) 4 (b) 9  
(c) 12 (d) 49

- 215.** Seeta and Geeta have two glasses of equal volumes. Both have some milk in their glasses. Seeta says to Geeta. "Give me half the milk in your glass so that my glass will be full of milk." Geeta says to Seeta, "Instead you give me one-fourth of the milk in your glass so that my glass will be full of milk." Find the ratio of volumes of milk in their glasses. (S.S.C., 2006)
- (a) 1 : 2 (b) 4 : 3  
(c) 3 : 4 (d) 2 : 3
- 216.** The ratio of land to water for the whole earth is 1 : 2 and 2 : 3 in the northern hemisphere. The ratio of land to water in the southern hemisphere is
- (a) 1 : 3 (b) 1 : 4  
(c) 4 : 7 (d) 4 : 11
- 217.** The price of a diamond varies as the cube of its volume. A cubical variety of this diamond was worth ₹ 10,00,000. If this diamond accidentally broke into 8 equal cubical diamonds, then the total loss in value amounts to
- (a) ₹ 9,00,000 (b) ₹ 9,47,532  
(c) ₹ 9,50,000 (d) ₹ 9,84,375
- 218.** ₹ 720 are divided among 2 men, 5 women and 8 boys so that the shares of a man, a woman and a boy are in the ratio of 3 : 2 : 1. How much does each boy get?
- (a) ₹ 24 (b) ₹ 30  
(c) ₹ 45 (d) ₹ 72
- 219.** A person distributed two different amounts among his sons A, B, C and D. First amount was distributed in the ratio of 4 : 3 : 2 : 1 and the second amount was distributed in the ratio of 5 : 6 : 7 : 8. If the first amount is half of the second amount, then which son will get the maximum amount?
- (a) A (b) B  
(c) C (d) D
- 220.** A sum of money is divided among 160 males and some females in the ratio 16 : 21. Individually each male gets ₹ 4 and a female ₹ 3. The number of females is
- (a) 198 (b) 270  
(c) 280 (d) 284
- 221.** ₹ 180 are to be divided among 66 men and women. The ratio of the total amount of money received by men and women is 5 : 4. But the ratio of the money received by each man and woman is 3 : 2. The number of men is
- (a) 20 (b) 24  
(c) 30 (d) 36
- 222.** Prices of foodgrains have risen by 10% and of other items of consumption by 15%. If the ratio of an employee's expenditure on foodgrains and other items is 2 : 5, by how much should his salary be increased so that he may maintain the same level of consumption as before, assuming that his present salary is ₹ 3500?
- (a) ₹ 300 (b) ₹ 350  
(c) ₹ 375 (d) ₹ 475
- 223.** A student took five papers in an examination, where full marks were same on each paper. Her marks in these papers were in the proportion of 6 : 7 : 8 : 9 : 10. In all these papers together, the candidate obtained 60% of the total marks. Then the number of papers in which she got more than 50% marks is
- (a) 2 (b) 3  
(c) 4 (d) 5  
(e) None of these
- 224.** Visitors to a show were charged ₹ 15 each on the first day, ₹ 7.50 on the second day and ₹ 2.50 on the third day. The attendance on the three days was in the ratio 2 : 5 : 13. The average charge per person for the whole show was
- (a) ₹ 5 (b) ₹ 6.33  
(c) ₹ 7.50 (d) ₹ 9
- 225.** In an express train, the number of passengers travelling in A.C. sleeper class, first class and sleeper class are in the ratio 1 : 2 : 3 and the fares to each of these classes are in the ratio 5 : 4 : 2. If the total income from this train is ₹ 45600, then the income from the A.C. sleeper class is
- (a) ₹ 6000 (b) ₹ 8000  
(c) ₹ 10000 (d) ₹ 12000
- 226.** Railway fares of 1st, 2nd and 3rd classes between two stations were in the ratio of 8 : 6 : 3. The fares of 1st and 2nd class were subsequently reduced by  $\frac{1}{6}$  and  $\frac{1}{12}$  respectively. If during a year the ratio between the passengers of 1st, 2nd and 3rd classes was 9 : 12 : 26 and the total amount collected by the sale of tickets was ₹ 1088, then find the collection from the passengers of 1st class. (M.A.T., 2006)
- (a) ₹ 260 (b) ₹ 280  
(c) ₹ 300 (d) ₹ 320
- 227.** 15 men, 18 women and 12 boys working together earned ₹ 2070. If the daily wages of a man, a woman and a boy are in the ratio of 4 : 3 : 2, the daily wages (in ₹) of 1 man, 2 women and 3 boys are
- (a) 135 (b) 180  
(c) 205 (d) 240

228. An employer reduces the number of his employees in the ratio of 9 : 8 and increases their wages in the ratio 14 : 15. The difference in the amount of the total salary bill which was originally ₹ 1890 after the above two changes will be  
 (a) ₹ 90 (b) ₹ 100  
 (c) ₹ 110 (d) ₹ 120
229. Last year, the ratio between the salaries of A and B was 3 : 4. But the ratios of their individual salaries between last year and this year were 4 : 5 and 2 : 3 respectively. If the sum of their present salaries is ₹ 4160, then how much is the salary of A now?  
 (a) ₹ 1040 (b) ₹ 1600  
 (c) ₹ 2560 (d) ₹ 3120
230. A man ordered 4 pairs of black socks and some pairs of brown socks. The price of a black pair is double that of a brown pair. While preparing the bill, the clerk interchanged the number of black and brown pairs by mistake which increased the bill by 50%. The ratio of the number of black and brown pairs of socks in the original order was  
 (a) 1 : 2 (b) 2 : 1  
 (c) 1 : 4 (d) 4 : 1
231. A and B are two alloys of gold and copper prepared by mixing metals in the ratio 7 : 2 and 7 : 11 respectively. If equal quantities of the alloys are melted to form a third alloy C, then the ratio of gold and copper in alloy C will be  
 (M.B.A. 2007; M.A.T., 2005)  
 (a) 5 : 7 (b) 5 : 9  
 (c) 7 : 5 (d) 9 : 5
232. Two alloys contain zinc and copper in the ratio of 2 : 1 and 4 : 1. In what ratio the two alloys should be added together to get a new alloy having zinc and copper in the ratio of 3 : 1?  
 (a) 3 : 5 (b) 5 : 7  
 (c) 7 : 5 (d) None of these
233. Two vessels A and B contain milk and water mixed in the ratio 5 : 3 and 2 : 3. When these mixtures are mixed to form a new mixture containing half milk and half water, they must be taken in the ratio  
 (a) 2 : 5 (b) 3 : 5  
 (c) 4 : 5 (d) 7 : 3
234. Two glasses of equal volume respectively are half and three-fourths filled with milk. They are then filled to brim by adding water. Their contents are then poured into another vessel. What will be the ratio of milk to water in this vessel?  
 (a) 1 : 3 (b) 2 : 3  
 (c) 3 : 2 (d) 5 : 3
235. The ratio of milk to water in three containers of equal capacity is 3 : 2, 7 : 3 and 11 : 4 respectively. The contents of the three containers are mixed together. What is the ratio of milk to water after mixing?  
 (M.A.T., 2010)  
 (a) 19 : 4 (b) 7 : 3  
 (c) 61 : 29 (d) 41 : 18
236. Three containers A, B and C are having mixtures of milk and water in the ratio 1 : 5, 3 : 5 and 5 : 7 respectively. If the capacities of the containers are in the ratio 5 : 4 : 5, find the ratio of milk to water, if the mixtures of all the three containers are mixed together?  
 (a) 51 : 115 (b) 52 : 115  
 (c) 53 : 115 (d) 54 : 115
237. Three glasses of equal volumes are  $\frac{1}{2}$ ,  $\frac{2}{3}$  and  $\frac{3}{4}$  full of milk respectively. The remaining portion of all the glasses is filled up with water. The mixture in the three glasses is poured into a container. The ratio of milk and water in the container is  
 (a) 23 : 12 (b) 23 : 13  
 (c) 23 : 14 (d) 23 : 15
238. Six coins of gold and silver of equal weights are melted and new coins are cast. The ratio of gold and silver in one of the coins is 2 : 1, in another two coins 3 : 5 and 7 : 5 in the remaining coins. What will be the ratio between gold and silver respectively in the new coins?  
 (R.R.B., 2006)  
 (a) 1 : 1 (b) 12 : 11  
 (c) 42 : 25 (d) 19 : 17
239. A company blends two varieties of tea from two different tea gardens, one variety costing ₹ 20 per kg and the other ₹ 25 per kg in the ratio 5 : 4. He sells the blended tea at ₹ 23 per kg. Find his profit or loss percent.  
 (a) Profit of 3.5% (b) No profit, no loss  
 (c) Profit of 5% (d) Loss of 5%
240. Tea worth ₹ 126 per kg and ₹ 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth ₹ 153 per kg, then the price of the third variety per kg will be  
 (a) ₹ 169.50 (b) ₹ 170  
 (c) ₹ 175.50 (d) ₹ 180
241. A dealer buys dry fruit at the rate of ₹ 100, ₹ 80 and ₹ 60 per kg. He bought them in the ratio 12 : 15 : 20 by weight. He in total gets 20% profit by selling the first two and at last he finds he has no gain no loss in selling the whole quantity which he had. What was the percentage loss he suffered for the third quantity?  
 (M.A.T., 2007)  
 (a) 20% (b) 30%  
 (c) 40% (d) 50%
242. From a can full of milk, 10 litres of milk is taken out and replaced with water and this operation is repeated twice. If the capacity of the can is 50 litres, what is the ratio of water and milk in the can after this operation?  
 (a) 2 : 3 (b) 9 : 16  
 (c) 16 : 9 (d) None of these

243. 8 litres are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in the cask to that of the water is 16 : 65. How much wine did the cask hold originally?  
 (a) 18 litres (b) 24 litres  
 (c) 32 litres (d) 42 litres
244. Gold is 19 times as heavy as water and copper is 9 times as heavy as water. In what ratio should these be mixed to get an alloy 15 times as heavy as water?  
 (Campus Recruitment, 2010)  
 (a) 1 : 1 (b) 1 : 2  
 (c) 2 : 3 (d) 3 : 2
245. The speeds of three cars are in the ratio 5 : 4 : 6. The ratio between the time taken by them to travel the same distance is  
 (a) 5 : 4 : 6 (b) 6 : 4 : 5  
 (c) 10 : 12 : 15 (d) 12 : 15 : 10
246. Mr. X has some money with him. He has to distribute the amount among five labourers in the ratio  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{7}$ . What is the minimum amount he should have, so that each labourer gets an exact number of rupees?  
 (a) ₹ 358 (b) ₹ 420  
 (c) ₹ 512 (d) ₹ 599
247. The incomes of A, B and C are in the ratio 7 : 10 : 12 and their expenses are in the ratio 8 : 10 : 15. If A saves  $\frac{1}{5}$  of his income, then B's saving is what percent more or less than that of C's?  
 (a) 100% more (b)  $66\frac{2}{3}$ % more  
 (c)  $33\frac{1}{3}$ % less (d) 40% less
248. The present ages of a mother and her son are in the ratio 11 : 5. When the son becomes as old as his mother is now, then the ratio of his father's age to that of his mother is 19 : 17. When the son becomes as old as his father is now, then the sum of his father's age and his age will be 170 years. What is the father's present age?  
 (a) 52 years (b) 60 years  
 (c) 65 years (d) 70 years
249. Six numbers  $a, b, c, d, e, f$  are such that  $ab = 1$ ,  $bc = \frac{1}{2}$ ,  $cd = 6$ ,  $de = 2$  and  $ef = \frac{1}{2}$ . What is the value of  $(ad : be : cf)$ ?  
 (a) 4 : 3 : 27 (b) 6 : 1 : 9  
 (c) 8 : 9 : 9 (d) 72 : 1 : 9
250. A man sells 3 types of articles at 10%, 20% and 30% profit respectively. If the ratio of the cost of the articles is 1 : 2 : 3 and the ratio of the number of articles of each type sold is 3 : 2 : 1, then what is his net profit?  
 (a) 18% (b) 20%  
 (c) 24% (d) 25%
251. The respective ratio between the monthly salaries of Rene and Som is 5 : 3. Out of her monthly salary Rene gives  $\frac{1}{6}$ th as rent,  $\frac{1}{5}$ th to her mother, 30% as her education loan and keeps 25% aside for miscellaneous expenditure. Remaining ₹ 5000 she keeps as savings. What is Som's monthly salary?  
 [IBPS—RRB Officer's Gr. 'B' Exam, 2015]  
 (a) ₹21000 (b) ₹24000  
 (c) ₹27000 (d) ₹36000
252. Find the third proportional to 25 and 30.  
 [Indian Railway Gr. 'D' Exam, 2014]  
 (a) 36 (b) 32  
 (c) 34 (d) 38
253. The ratio of syrup and water in a mixture is 3 : 1, then the percentage of syrup in this mixture is  
 [SSC—CHSL (10+2) Exam, 2015]  
 (a) 75% (b) 25%  
 (c)  $66\frac{2}{3}$ % (d)  $33\frac{1}{3}$ %
254. If  $a^2 + b^2 + c^2 - ab - bc - ca = 0$  then  $a : b : c$  is  
 [SSC—CHSL (10+2) Exam, 2015]  
 (a) 1 : 1 : 2 (b) 1 : 1 : 1  
 (c) 1 : 2 : 1 (d) 2 : 1 : 1
255. 80% of a number is equal to the  $\frac{4}{5}$ th of the other number. What is the ratio between the first number and the second number respectively?  
 [United India Insurance Co. Ltd. (UIICL) Assistant (Online) Exam, 2015]  
 (a) 3 : 4 (b) 3 : 5  
 (c) 5 : 3 (d) None of these
- Direction:** Each of the questions below consists of a question and two statements I and II are given below it. You have to decide whether the data provided in the statements are sufficient to answer the question. Given answer—  
 (a) The data in statement I alone are sufficient to answer the question while II alone are not sufficient to answer the questions.  
 (b) Data in statement II alone are sufficient to answer the question while data in statement I alone are not sufficient to answer the question.  
 (c) The data in statement I alone or in statement II alone are sufficient to answer the question.  
 (d) The data in both statement I to answer the question.  
 (e) The data in both statement I and II are sufficient to answer the question.

- 256.** What is the population of the city A?  
 I. The ratio of the population of males and females in city A is 27 : 23 and the difference between their populations is 100000.  
 II. The population of city A is 80% of that of city B. The difference of population of city A and city B is 312500.  
**[IDBI Bank Executive Officer's Exam, 2015]**
- 257.**  $\frac{4}{7}$ <sup>th</sup> of the boys and  $\frac{6}{11}$ <sup>th</sup> of girls of a school participated in marathon. If the number of participating students is 208 out of which 124 are boys, what is the total, number of students in the school?  
**[NICL—AAO Exam, 2015]**
- (a) 359 (b) 411  
 (c) 371 (d) 377
- 258.** The monthly salaries of Pia and Som are in the ratio of 5 : 4. From her monthly salary, gives  $\frac{3}{5}$  to her mother, 15% towards her sister's tuition fees, 18% towards a loan and she shops with the remaining amount, which is ₹ 2100. What is the monthly salary of Som?  
**[IBPS—RRB Officer's Gr. 'B' Exam, 2015]**
- (a) ₹ 25000 (b) ₹ 30000  
 (c) ₹ 15000 (d) ₹ 24000
- 259.** Smita works in her office for 6 hours and Kajal works in her office for 7 hours 30 minutes. Find the ratio of their working hours.  
**[ESIC—UDC Exam, 2016]**
- (a) 3 : 5 (b) 4 : 5  
 (c) 6 : 7 (d) 5 : 4
- 260.** A bag has coins of 50 paise, 25 paise and 10 paise in the respective ratio of 5 : 8 : 3 whose total value is ₹ 144. Find the number of 50 paise coins.  
**[ESIC—UDC Exam, 2016]**
- (a) 163 (b) 175  
 (c) 200 (d) 150
- 261.** Express 50 paise: ₹ 4 in its simplest form.  
**[ESIC—UDC Exam, 2016]**
- (a) 1 : 8 (b) 5 : 4  
 (c) 4 : 5 (d) 8 : 1
- 262.** Raj and Suraj bought a bottle of water together in which there was 2 litres of water. Raj drank  $\frac{1}{4}$ <sup>th</sup> part of it. The rest water was drunk by Suraj. Find the amount of water used by Suraj.  
**[ESIC—UDC Exam, 2016]**
- (a) 1.5 litres (b) 0.5 litres  
 (c) 2.5 litres (d) 2 litres
- 263.**  $\frac{7}{5}$  of  $58 + \frac{3}{8}$  of 139.2 = ?  
**[SBI—Jr. Associates (Pre.) Exam, 2016]**
- (a) 133.4 (b) 137.2  
 (c) 127.8 (d) 131.6
- 264.**  $\frac{3}{7}$  of  $\frac{5}{4}$  of 3024 = ?  
**[SBI—Jr. Associates (Pre.) Exam, 2016]**
- (a) 920 (b) 940  
 (c) 960 (d) 1620
- 265.** A movie was screened for 3 days – Monday, Tuesday and Wednesday. The respective ratio between the number of spectators on Monday, Tuesday and Wednesday was 2 : 3 : 5 and the price charged for three days was in the respective ratio 2 : 3 : 4. If the difference between the amount earned on Tuesday and Wednesday was Rs. 8800. What was the total amount earned in all three days?  
**[CET—Maharashtra (MBA), 2016]**
- (a) ₹ 24800 (b) ₹ 27500  
 (c) ₹ 26400 (d) ₹ 22820

## ANSWERS

- |          |          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| 1. (c)   | 2. (d)   | 3. (a)   | 4. (c)   | 5. (a)   | 6. (b)   | 7. (c)   | 8. (c)   | 9. (a)   | 10. (b)  |
| 11. (b)  | 12. (d)  | 13. (b)  | 14. (d)  | 15. (a)  | 16. (c)  | 17. (b)  | 18. (c)  | 19. (c)  | 20. (c)  |
| 21. (a)  | 22. (c)  | 23. (a)  | 24. (c)  | 25. (b)  | 26. (a)  | 27. (d)  | 28. (b)  | 29. (b)  | 30. (d)  |
| 31. (c)  | 32. (d)  | 33. (b)  | 34. (d)  | 35. (a)  | 36. (d)  | 37. (d)  | 38. (d)  | 39. (d)  | 40. (c)  |
| 41. (c)  | 42. (d)  | 43. (b)  | 44. (d)  | 45. (b)  | 46. (a)  | 47. (b)  | 48. (b)  | 49. (d)  | 50. (c)  |
| 51. (d)  | 52. (a)  | 53. (c)  | 54. (b)  | 55. (c)  | 56. (d)  | 57. (c)  | 58. (b)  | 59. (b)  | 60. (a)  |
| 61. (b)  | 62. (c)  | 63. (b)  | 64. (c)  | 65. (c)  | 66. (b)  | 67. (c)  | 68. (d)  | 69. (b)  | 70. (b)  |
| 71. (d)  | 72. (d)  | 73. (c)  | 74. (c)  | 75. (a)  | 76. (b)  | 77. (c)  | 78. (d)  | 79. (a)  | 80. (d)  |
| 81. (b)  | 82. (c)  | 83. (a)  | 84. (d)  | 85. (d)  | 86. (b)  | 87. (b)  | 88. (b)  | 89. (d)  | 90. (b)  |
| 91. (b)  | 92. (e)  | 93. (d)  | 94. (e)  | 95. (e)  | 96. (a)  | 97. (d)  | 98. (c)  | 99. (d)  | 100. (c) |
| 101. (d) | 102. (d) | 103. (c) | 104. (b) | 105. (c) | 106. (c) | 107. (c) | 108. (a) | 109. (c) | 110. (a) |
| 111. (d) | 112. (d) | 113. (c) | 114. (c) | 115. (b) | 116. (b) | 117. (d) | 118. (d) | 119. (b) | 120. (c) |
| 121. (b) | 122. (b) | 123. (e) | 124. (b) | 125. (b) | 126. (b) | 127. (d) | 128. (d) | 129. (c) | 130. (b) |
| 131. (a) | 132. (b) | 133. (e) | 134. (a) | 135. (a) | 136. (b) | 137. (a) | 138. (c) | 139. (c) | 140. (b) |



141. (c)	142. (b)	143. (b)	144. (d)	145. (c)	146. (c)	147. (d)	148. (d)	149. (c)	150. (b)
151. (d)	152. (a)	153. (c)	154. (c)	155. (b)	156. (a)	157. (c)	158. (a)	159. (c)	160. (b)
161. (c)	162. (b)	163. (a)	164. (b)	165. (d)	166. (d)	167. (b)	168. (b)	169. (a)	170. (b)
171. (d)	172. (c)	173. (a)	174. (c)	175. (a)	176. (c)	177. (b)	178. (b)	179. (b)	180. (e)
181. (c)	182. (d)	183. (d)	184. (d)	185. (c)	186. (c)	187. (c)	188. (b)	189. (b)	190. (a)
191. (e)	192. (b)	193. (c)	194. (b)	195. (d)	196. (b)	197. (c)	198. (d)	199. (b)	200. (c)
201. (a)	202. (c)	203. (b)	204. (c)	205. (d)	206. (c)	207. (b)	208. (b)	209. (c)	210. (d)
211. (b)	212. (c)	213. (d)	214. (b)	215. (d)	216. (d)	217. (d)	218. (b)	219. (a)	220. (c)
221. (c)	222. (d)	223. (c)	224. (a)	225. (d)	226. (d)	227. (d)	228. (a)	229. (b)	230. (c)
231. (c)	232. (a)	233. (c)	234. (d)	235. (c)	236. (c)	237. (b)	238. (d)	239. (a)	240. (c)
241. (c)	242. (b)	243. (b)	244. (d)	245. (d)	246. (d)	247. (a)	248. (c)	249. (d)	250. (b)
251. (d)	252. (a)	253. (a)	254. (b)	255. (d)	256. (c)	257. (c)	258. (d)	259. (b)	260. (d)
261. (a)	262. (a)	263. (a)	264. (d)	265. (c)					

## SOLUTIONS

- Number of girls = 1200. Number of boys =  $2140 - 1200 = 940$ .  
 $\therefore$  Required ratio =  $940 : 1200 = 47 : 60$ .
- Total body weight =  $(30000 + 10000 + 5000 + 2000 + 1000 + 1700 + 1500)$  g  
 $= 51200$  g = 51 kg 200 g > 51 kg.
- $\frac{\text{Weight of the liver}}{\text{Weight of the skeleton}} = \frac{1700}{10000} \Rightarrow \text{Weight of the liver} = \frac{17}{100} S = 0.17S$ .
- Required ratio =  $\frac{5000}{2000} = \frac{5}{2} = 2.5$ .
- Required ratio =  $\frac{1500}{30000} = \frac{1}{20} = 0.05$ .
- Required ratio =  $\frac{1500}{1000} = \frac{3}{2} = 1.5$ .
- ₹ 2.80 = 280 paise.  
 $\therefore$  Required ratio =  $280 : 40 = 7 : 1$ .
- Let the number be  $x$ . Then, required ratio  
 $= x : \left(x + \frac{x}{5}\right) = x : \frac{6x}{5} = 1 : \frac{6}{5} = 5 : 6$ .
- Maximum possible number of tables = 6.  
 $[\because 1200 \times 6 = 7200]$ .  
 Number of chairs purchased =  $\frac{8100 - 7200}{300} = \frac{900}{300} = 3$ .  
 Hence, required ratio =  $3 : 6 = 1 : 2$ .
- $60\%$  of  $A = \frac{3}{4}$  of  $B \Rightarrow \frac{60}{100} A = \frac{3}{4} B \Rightarrow \frac{3}{5} A = \frac{3}{4} B$   
 $\Rightarrow \frac{A}{B} = \frac{3}{4} \times \frac{5}{3} = \frac{5}{4}$ .
- $\frac{2}{3} A = 75\%$  of  $B \Rightarrow \frac{2}{3} A = \frac{75}{100} B = \frac{3}{4} B$   
 $\Rightarrow \frac{A}{B} = \frac{3}{4} \times \frac{3}{2} = \frac{9}{8} \Rightarrow A : B = 9 : 8$ .
- (a)  $8 : a = 8 : b \Rightarrow 8a = 8b \Rightarrow a = b$ .  
 (b)  $a : 16 = b : 4 \Rightarrow 4a = 16b \Rightarrow a = 4b$ .  
 (c)  $a : 8 = b : 8 \Rightarrow 8b = 8a \Rightarrow b = a$ .  
 (d)  $32 : a = b : 2 \Rightarrow ab = 64$ .
- Since the number of black and white marbles are whole numbers, so the sum of the terms of the ratio must be a factor of 10.  
 $1 + 4 = 5$ ,  $7 + 3 = 10$  and  $9 + 1 = 10$ , but  $1 + 10 = 11$ , which is not a factor of 10.
- The total number of members must be a multiple of the sum of the ratio terms.  $3 + 2 = 5$  and 25 is a multiple of 5.
- $7 : 15 = \frac{7}{15} = 0.466$ ,  $15 : 23 = \frac{15}{23} = 0.652$ ,  $17 : 25 = \frac{17}{25} = 0.68$ ,  $21 : 39 = \frac{21}{39} = 0.538$ .  
 Clearly,  $7 : 15$  is the lowest.
- $5 : a :: 20 : 28 \Leftrightarrow 20a = 5 \times 28 \Leftrightarrow a = \frac{5 \times 28}{20} = 7$ .
- Let the missing number be  $x$ . Then,  $\frac{1}{3} : \frac{1}{2} :: 27y : x \Leftrightarrow \frac{3}{4}x = \frac{1}{2} \times 27y \Leftrightarrow x = \frac{27y}{2} \times \frac{4}{3} = 18y$ .
- $x : 7.5 = 7 : 17.5 \Leftrightarrow 17.5x = 7.5 \times 7 \Leftrightarrow x = \frac{7.5 \times 7}{17.5} = 3$ .
- $x : 2\frac{1}{3} :: 21 : 50 \Leftrightarrow 50x = \frac{7}{3} \times 21 = 49 \Leftrightarrow x = \frac{49}{50}$ .
- $(x + 1) : 8 = 3.75 : 7 \Leftrightarrow 7(x + 1) = 8 \times 3.75 = 30$   
 $\Leftrightarrow x + 1 = \frac{30}{7} \Leftrightarrow x = \frac{30}{7} - 1 = \frac{23}{7} = 3\frac{2}{7}$ .
- $\sqrt{2} : (1 + \sqrt{3}) :: \sqrt{6} : x \Leftrightarrow \sqrt{2}x = \sqrt{6}(1 + \sqrt{3})$   
 $\Leftrightarrow x = \frac{\sqrt{6}(1 + \sqrt{3})}{\sqrt{2}} = \sqrt{3}(1 + \sqrt{3}) = \sqrt{3} + 3$ .
- 1 day = 24 hours.  $\therefore$  Given ratio =  $3 : 24 = 1 : 8$ .

$$23. 1.5 : 2.5 = \frac{1.5}{2.5} = \frac{15}{25} = \frac{3}{5} = 3 : 5.$$

$$24. 9^{3.04} : 9^{2.04} = \frac{9^{3.04}}{9^{2.04}} = 9^{(3.04-2.04)} = 9^1 = 9 = 9 : 1.$$

$$25. 4^{3.5} : 2^5 = (2^2)^{3.5} : 2^5 = \frac{2^7}{2^5} = 2^{(7-5)} = 2^2 = 4 : 1.$$

26. Product of 1st and 4th terms (extremes) = Product of 2nd and 3rd terms (means)

$$\Rightarrow 2.5x = 40 \Rightarrow x = \frac{40}{2.5} = 16.$$

$$27. 20\% \text{ of } A = 30\% \text{ of } B = \frac{1}{6} \text{ of } C \Rightarrow \frac{20A}{100} = \frac{30B}{100} = \frac{C}{6}$$

$$\Rightarrow \frac{A}{5} = \frac{3B}{10} = \frac{C}{6} = k \text{ (say)}$$

$$\Rightarrow A = 5k, B = \frac{10k}{3}, C = 6k.$$

$$\therefore A : B : C = 5k : \frac{10k}{3} : 6k = 5 : \frac{10}{3} : 6 = 15 : 10 : 18.$$

$$28. 25\% \text{ of } A = 35\% \text{ of } B \Rightarrow \frac{25}{100}A = \frac{35}{100}B \Rightarrow \frac{A}{4} = \frac{7B}{20}$$

$$\Rightarrow \frac{A}{B} = \frac{7}{20} \times 4 = \frac{7}{5} \Rightarrow A : B = 7 : 5.$$

$$29. x = \frac{1}{3}y = \frac{1}{3} \times \frac{1}{2}z = \frac{1}{6}z. \text{ Let } x = \frac{1}{3}y = \frac{1}{6}z = k.$$

$$\text{Then, } x = k, y = 3k, z = 6k.$$

$$\therefore x : y : z = k : 3k : 6k = 1 : 3 : 6.$$

$$30. \text{ Let } 2A = 3B = 4C = k. \text{ Then, } A = \frac{k}{2}, B = \frac{k}{3}, C = \frac{k}{4}.$$

$$\therefore A : B : C = \frac{k}{2} : \frac{k}{3} : \frac{k}{4} = \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3.$$

$$31. x^2 + 4y^2 = 4xy \Rightarrow x^2 - 4xy + 4y^2 = 0 \Rightarrow (x - 2y)^2 = 0 \Rightarrow x = 2y \Rightarrow \frac{x}{y} = 2 \Rightarrow x : y = 2 : 1.$$

$$32. 5x^2 - 13xy + 6y^2 = 0 \Rightarrow 5x^2 - 10xy - 3xy + 6y^2 = 0 \Rightarrow 5x(x - 2y) - 3y(x - 2y) = 0$$

$$\Rightarrow (x - 2y)(5x - 3y) = 0 \Rightarrow x = 2y \text{ or } 5x = 3y$$

$$\Rightarrow \frac{x}{y} = 2 \text{ or } \frac{x}{y} = \frac{3}{5} \Rightarrow x : y = 2 : 1 \text{ or } 3 : 5.$$

$$33. \frac{a}{b} = \frac{7}{9} \text{ and } \frac{b}{c} = \frac{15}{7} \Rightarrow \frac{a}{c} = \left(\frac{a}{b} \times \frac{b}{c}\right) = \frac{7}{9} \times \frac{15}{7} = \frac{5}{3} \Rightarrow a : c = 5 : 3.$$

$$34. \frac{P}{Q} = \frac{2}{3} \text{ and } \frac{Q}{R} = \frac{4}{5} \Rightarrow \frac{P}{R} = \left(\frac{P}{Q} \times \frac{Q}{R}\right)$$

$$= \frac{2}{3} \times \frac{4}{5} = \frac{8}{15} \Rightarrow P : R = 8 : 15.$$

$$35. \frac{W_2}{W_1} = \frac{3}{2} \text{ and } \frac{W_1}{W_3} = \frac{1}{2}$$

$$\Rightarrow \frac{W_2}{W_3} = \left(\frac{W_2}{W_1} \times \frac{W_1}{W_3}\right) = \frac{3}{2} \times \frac{1}{2} = \frac{3}{4} \Rightarrow W_2 : W_3 = 3 : 4.$$

$$36. \frac{A}{B} = \frac{2}{3}, \frac{B}{C} = \frac{2}{4}, \frac{C}{D} = \frac{2}{5} \Rightarrow \frac{A}{D} = \left(\frac{A}{B} \times \frac{B}{C} \times \frac{C}{D}\right)$$

$$= \frac{2}{3} \times \frac{2}{4} \times \frac{2}{5} = \frac{2}{15} \Rightarrow A : D = 2 : 15.$$

$$37. 3A = 5B \text{ and } 4B = 6C \Rightarrow \frac{A}{B} = \frac{5}{3} \text{ and } \frac{B}{C} = \frac{6}{4} = \frac{3}{2}$$

$$\Rightarrow \frac{A}{C} = \left(\frac{A}{B} \times \frac{B}{C}\right) = \frac{5}{3} \times \frac{3}{2} = \frac{5}{2} \Rightarrow A : C = 5 : 2.$$

$$38. 1S = 4C \text{ and } 3C = 4D \Rightarrow \frac{S}{C} = \frac{4}{1} \text{ and } \frac{C}{D} = \frac{4}{3}$$

$$\Rightarrow \frac{S}{D} = \left(\frac{S}{C} \times \frac{C}{D}\right) = \frac{4}{1} \times \frac{4}{3} = \frac{16}{3} \Rightarrow S : D = 16 : 3.$$

$$39. \frac{A}{B} = \frac{2}{1}, \frac{B}{C} = \frac{4}{3}, \frac{C}{D} = \frac{5}{6} \Rightarrow \frac{A}{D}$$

$$= \left(\frac{A}{B} \times \frac{B}{C} \times \frac{C}{D}\right) = \left(\frac{2}{1} \times \frac{4}{3} \times \frac{5}{6}\right) = \frac{20}{9}$$

$$\Rightarrow A : D = 20 : 9.$$

$$40. A : B = 7 : 9 \text{ and } B : C = 5 : 4 = \left(5 \times \frac{9}{5}\right) : \left(4 \times \frac{9}{5}\right) = 9 : \frac{36}{5}$$

$$\Rightarrow A : B : C = 7 : 9 : \frac{36}{5} = 35 : 45 : 36.$$

$$41. A : B = 2 : 3, B : C = 4 : 5 = \left(4 \times \frac{3}{4}\right) : \left(5 \times \frac{3}{4}\right) = 3 : \frac{15}{4}$$

$$C : D = 6 : 7 = \left(6 \times \frac{5}{8}\right) : \left(7 \times \frac{5}{8}\right) = \frac{15}{4} : \frac{35}{8}$$

$$\Rightarrow A : B : C : D = 2 : 3 : \frac{15}{4} : \frac{35}{8} = 16 : 24 : 30 : 35.$$

$$42. A : B = \frac{1}{2} : \frac{1}{3} = 3 : 2,$$

$$B : C = \frac{1}{2} : \frac{1}{3} = 3 : 2 = \left(3 \times \frac{2}{3}\right) : \left(2 \times \frac{2}{3}\right) = 2 : \frac{4}{3}.$$

$$\Rightarrow A : B : C = 3 : 2 : \frac{4}{3} = 9 : 6 : 4.$$

$$43. A : B = \frac{1}{2} : \frac{3}{8} = 4 : 3, B : C = \frac{1}{3} : \frac{5}{9} = 3 : 5,$$

$$C : D = \frac{5}{6} : \frac{3}{4} = 10 : 9 = 5 : \frac{9}{2}.$$

$$\therefore A : B : C : D = 4 : 3 : 5 : \frac{9}{2} = 8 : 6 : 10 : 9.$$

$$44. R : S = 200 : 20 = 10 : 1, S : A = 400 : 150 = 8 : 3$$

$$= \left(8 \times \frac{1}{8}\right) : \left(3 \times \frac{1}{8}\right) = 1 : \frac{3}{8}.$$

$$\therefore R : S : A = 10 : 1 : \frac{3}{8} = 80 : 8 : 3.$$

$$45. \text{ Let the consequent be } x. \text{ Then, } \frac{7}{8} = \frac{35}{x} \Rightarrow 7x = 35 \times 8$$

$$\Rightarrow x = \frac{35 \times 8}{7} = 40.$$

$$46. 8a = 9b \Rightarrow a = \frac{9}{8}b. \therefore \frac{a}{9} : \frac{b}{8} = \frac{\left(\frac{9}{8}b\right)}{9} : \frac{b}{8} = \frac{b}{8} : \frac{b}{8} = 1 : 1.$$

47.  $\frac{x}{y} = \frac{3}{4} \Rightarrow \frac{2x+3y}{3y-2x} = \frac{2\left(\frac{x}{y}\right)+3}{3-2\left(\frac{x}{y}\right)} = \frac{2 \times \frac{3}{4} + 3}{3 - 2 \times \frac{3}{4}} = \frac{9}{2} \times \frac{2}{3} = 3$   
 $\Rightarrow (2x + 3y) : (3y - 2x) = 3 : 1$ .
48.  $\frac{a}{b} = \frac{2}{5} \Rightarrow \frac{2a+3b}{7a+5b} = \frac{2\left(\frac{a}{b}\right)+3}{7\left(\frac{a}{b}\right)+5} = \frac{2 \times \frac{2}{5} + 3}{7 \times \frac{2}{5} + 5} = \frac{19}{5} \times \frac{5}{39} = \frac{19}{39}$   
 $\Rightarrow (2a + 3b) : (7a + 5b) = 19 : 39$ .
49.  $\frac{x}{y} = \frac{3}{2} \Rightarrow \frac{x^2}{y^2} = \frac{9}{4} \Rightarrow \frac{2x^2+3y^2}{3x^2-2y^2} = \frac{2 \times \frac{9}{4} + 3}{3 \times \frac{9}{4} - 2} = \frac{15}{2} \times \frac{4}{19} = \frac{30}{19}$   
 $\Rightarrow (2x^2 + 3y^2) : (3x^2 - 2y^2) = 30 : 19$ .
50.  $\frac{x}{y} = \frac{3}{1} \Rightarrow \frac{x^3}{y^3} = \frac{27}{1} \Rightarrow \frac{x^3 - y^3}{x^3 + y^3} = \frac{\left(\frac{x^3}{y^3}\right) - 1}{\left(\frac{x^3}{y^3}\right) + 1} = \frac{27 - 1}{27 + 1} = \frac{26}{28} = \frac{13}{14}$   
 $\Rightarrow (x^3 - y^3) : (x^3 + y^3) = 13 : 14$ .
51.  $\frac{5a+3b}{2a-3b} = \frac{23}{5} \Rightarrow 5(5a+3b) = 23(2a-3b)$   
 $\Rightarrow 25a + 15b = 46a - 69b \Rightarrow 21a = 84b \Rightarrow \frac{a}{b} = 4$ .  
Hence,  $a : b = 4 : 1$ .
52.  $\frac{x}{y} = \frac{7}{3} \Rightarrow \frac{xy+y^2}{x^2-y^2} = \frac{\left(\frac{x}{y}\right)+1}{\left(\frac{x^2}{y^2}\right)-1} = \frac{\frac{7}{3}+1}{\left(\frac{7}{3}\right)^2-1} = \frac{10}{3} \times \frac{9}{40} = \frac{3}{4}$ .
53.  $\frac{a}{b} = \frac{4}{5}$  and  $\frac{b}{c} = \frac{15}{16} \Rightarrow \frac{a}{c} = \frac{a}{b} \times \frac{b}{c} = \frac{4}{5} \times \frac{15}{16} = \frac{3}{4} \Rightarrow \frac{c}{a} = \frac{4}{3}$   
 $\Rightarrow \frac{c^2}{a^2} = \frac{16}{9} \Rightarrow \frac{c^2 - a^2}{c^2 + a^2} = \frac{\frac{c^2}{a^2} - 1}{\frac{c^2}{a^2} + 1} = \frac{\frac{16}{9} - 1}{\frac{16}{9} + 1} = \frac{7}{9} \times \frac{9}{25} = \frac{7}{25}$ .
54.  $\frac{a}{b} = \frac{b}{c} \Rightarrow b^2 = ac \Rightarrow \frac{a^4}{b^4} = \frac{a^4}{(ac)^2} = \frac{a^4}{a^2c^2} = \frac{a^2}{c^2}$   
 $\Rightarrow a^4 : b^4 = a^2 : c^2$ .
55.  $\frac{4x^2-3y^2}{2x^2+5y^2} = \frac{12}{19} \Rightarrow 19(4x^2-3y^2) = 12(2x^2+5y^2)$   
 $\Rightarrow 76x^2 - 57y^2 = 24x^2 + 60y^2$   
 $\Rightarrow 52x^2 = 117y^2 \Rightarrow 4x^2 = 9y^2$   
 $\Rightarrow \frac{x^2}{y^2} = \frac{9}{4} \Rightarrow \left(\frac{x}{y}\right)^2 = \left(\frac{3}{2}\right)^2 \Rightarrow \frac{x}{y} = \frac{3}{2}$ .  
 $\therefore x : y = 3 : 2$ .

56.  $\frac{x}{y} = \frac{3}{4}$  and  $\frac{a}{b} = \frac{1}{2} \Rightarrow \frac{xa}{yb} = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$   
 $\Rightarrow \frac{2xa+yb}{3yb-4xa} = \frac{2\left(\frac{xa}{yb}\right)+1}{3-4\left(\frac{xa}{yb}\right)} = \frac{2 \times \frac{3}{8} + 1}{3 - 4 \times \frac{3}{8}} = \frac{7}{4} \times \frac{2}{3} = \frac{7}{6}$ .
57.  $a : b : c = 2 : 3 : 4 \Rightarrow \frac{1}{a} : \frac{1}{b} : \frac{1}{c} = \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$ .
58.  $\frac{1}{x} : \frac{1}{y} : \frac{1}{z} = 2 : 3 : 5 \Rightarrow x : y : z = \frac{1}{2} : \frac{1}{3} : \frac{1}{5} = 15 : 10 : 6$ .
59.  $\frac{(x+y)}{(x-y)} = 4 \Rightarrow x + y = 4x - 4y \Rightarrow 3x = 5y$   
 $\Rightarrow \frac{x}{y} = \frac{5}{3}$   
 $\Rightarrow \frac{x^2}{y^2} = \frac{25}{9} \Rightarrow \frac{x^2+y^2}{x^2-y^2} = \frac{\frac{x^2}{y^2}+1}{\frac{x^2}{y^2}-1} = \frac{\frac{25}{9}+1}{\frac{25}{9}-1} = \frac{34}{9} \times \frac{9}{16} = \frac{17}{8}$ .  
 $\therefore (x^2 + y^2) : (x^2 - y^2) = 17 : 8$ .
60.  $\frac{a}{b+c} = \frac{1}{3} \Rightarrow a = \frac{b+c}{3}$ .  
 $\frac{c}{a+b} = \frac{5}{7} \Rightarrow 7c = 5a + 5b = \frac{5(b+c)}{3} + 5b$   
 $\Rightarrow 7c - \frac{5}{3}c = 5b + \frac{5}{3}b \Rightarrow \frac{16c}{3} = \frac{20b}{3}$   
 $\Rightarrow 16c = 20b \Rightarrow b = \frac{4}{5}c$ .  
 $a = \frac{b+c}{3} = \frac{\frac{4}{5}c+c}{3} = \frac{9c}{5} \times \frac{1}{3} = \frac{3}{5}c$ .  
 $\therefore \frac{b}{a+c} = \frac{\left(\frac{4}{5}c\right)}{\left(\frac{3}{5}c+c\right)} = \frac{4c}{5} \times \frac{5}{8c} = \frac{1}{2} = 1:2$ .
61.  $a : b = 3 : 4$ ,  $b : c = 4 : 7 \Rightarrow a : b : c = 3 : 4 : 7$ .  
Let  $a = 3k$ ,  $b = 4k$ ,  $c = 7k$ .  
Then,  $\frac{a+b+c}{c} = \frac{3k+4k+7k}{7k} = \frac{14k}{7k} = 2$ .
62. Let  $A = 2k$ ,  $B = 3k$ ,  $C = 5k$ .  
 $A = x\%$  of  $(B + C) \Rightarrow 2k = x\%$  of  $(3k + 5k) = x\%$  of  $8k$   
 $\Rightarrow \frac{x}{100} = \frac{2k}{8k} = \frac{1}{4} \Rightarrow x = \frac{100}{4} = 25$ .
63. Let  $\frac{x}{y} = \frac{y}{z} = \frac{z}{u} = k$ . Now,  $\frac{x}{u} = \frac{64}{27} \Rightarrow \frac{x}{y} \times \frac{y}{z} \times \frac{z}{u} = \frac{64}{27}$   
 $\Rightarrow k^3 = \left(\frac{4}{3}\right)^3 \Rightarrow k = \frac{4}{3}$ .  
So,  $x : y = y : z = z : u = 4 : 3$ .  
 $\therefore \frac{x}{z} = \frac{x}{y} \times \frac{y}{z} = \frac{4}{3} \times \frac{4}{3} = \frac{16}{9}$ .



64. Let  $a = 2k$ ,  $b = 3k$ ,  $c = 4k$ .

$$\text{Then, } 2a - 3b + 4c = 33$$

$$\Rightarrow 2 \times 2k - 3 \times 3k + 4 \times 4k = 33$$

$$\Rightarrow 4k - 9k + 16k = 33$$

$$\Rightarrow 11k = 33 \Rightarrow k = 3.$$

$$\therefore c = 4k = 4 \times 3 = 12.$$

65. Let  $p = k$ ,  $q = 2k$ ,  $r = 4k$ .

$$\begin{aligned} \text{Then, } \sqrt{5p^2 + q^2 + r^2} &= \sqrt{5k^2 + (2k)^2 + (4k)^2} \\ &= \sqrt{5k^2 + 4k^2 + 16k^2} = \sqrt{25k^2} = 5k = 5p. \end{aligned}$$

66. Let  $A = 2k$ ,  $B = 3k$ ,  $C = 4k$ .

$$\text{Then, } \frac{A}{B} = \frac{2k}{3k} = \frac{2}{3}, \frac{B}{C} = \frac{3k}{4k} = \frac{3}{4}, \frac{C}{A} = \frac{4k}{2k} = 2$$

$$\Rightarrow \frac{A}{B} : \frac{B}{C} : \frac{C}{A} = \frac{2}{3} : \frac{3}{4} : 2 = 8 : 9 : 24.$$

67. Let  $a = 5k$ ,  $b = 7k$ . Then,  $c = 2 \times 5k$

$$= 10k, d = 3 \times 7k = 21k.$$

$$ac : bd = 5k \times 10k : 7k \times 21k$$

$$= 50k^2 : 147k^2 = 50 : 147.$$

68. Let  $\frac{a}{b} = \frac{b}{c} = \frac{c}{d} = k$ . Then,  $a = bk$ ,  $b = ck$ ,  $c = dk$ .

$$\text{Also, } \frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} = k^3 \Rightarrow k^3 = \frac{a}{d}.$$

$$\begin{aligned} \therefore \frac{b^3 + c^3 + d^3}{a^3 + b^3 + c^3} &= \frac{b^3 + c^3 + d^3}{(bk)^3 + (ck)^3 + (dk)^3} \\ &= \frac{b^3 + c^3 + d^3}{k^3(b^3 + c^3 + d^3)} = \frac{1}{k^3} = \frac{d}{a}. \end{aligned}$$

69.  $\frac{p}{q} = \frac{3}{4}$ ,  $\frac{r}{s} = \frac{8}{5}$ ,  $\frac{x}{y} = \frac{10}{6} \Rightarrow p = \frac{3q}{4}$ ,  $r = \frac{8s}{5}$ ,  $x = \frac{5y}{3}$ .

$$\therefore \frac{psx}{qry} = \frac{\frac{3q}{4} \times s \times \frac{5y}{3}}{q \times \frac{8s}{5} \times y} = \frac{\frac{5}{4} qsy}{\frac{8}{5} qsy} = \frac{5}{4} \times \frac{5}{8} = \frac{25}{32}.$$

70. Let  $\frac{x}{2} = \frac{y}{3} = \frac{z}{4} = l$ . Then,  $x = 2l$ ,  $y = 3l$ ,  $z = 4l$ .

$$\therefore \frac{x}{2} = \frac{2x - 3y + 5z}{k} \Rightarrow \frac{2l}{2} = \frac{2 \times 2l - 3 \times 3l + 5 \times 4l}{k}$$

$$\Rightarrow k = 4 - 9 + 20 = 15.$$

71. Let  $\frac{a}{b} = \frac{c}{d} = k$ . Then,  $a = bk$ ,  $c = dk$ .

$$\therefore \frac{ma + nc}{mb + nd} = \frac{mbk + ndk}{mb + nd} = \frac{k(mb + nd)}{(mb + nd)} = k = \frac{a}{b}.$$

72.  $\frac{x}{y} = \frac{\left(\frac{a}{b}\right)}{\left(-\frac{b}{a}\right)} = -\frac{a^2}{b^2} \Rightarrow y = \left(-\frac{b^2}{a^2}\right)x.$

$$\therefore x - y = \frac{a}{b} + \frac{b}{a} \Rightarrow x + \frac{b^2}{a^2}x = \frac{a^2 + b^2}{ab}$$

$$\Rightarrow x \left( \frac{a^2 + b^2}{a^2} \right) = \frac{a^2 + b^2}{ab} \Rightarrow x = \frac{a^2}{ab} = \frac{a}{b}.$$

73.  $a + b = ck$ ,  $b + c = ak$ ,  $c + a = bk$ .

$$\text{Adding, we get : } 2(a + b + c) = ak + bk + ck = k(a + b + c) \text{ or } k = 2.$$

74.  $a : b = 2 : 3$ ,  $b : c = 4 : 5 = 4 \times \frac{3}{4} : 5 \times \frac{3}{4} = 3 : \frac{15}{4}.$

$$\text{So, } a : b : c = 2 : 3 : \frac{15}{4} = 8 : 12 : 15.$$

$$\text{Let } a = 8k, b = 12k, c$$

$$= 15k. \text{ Then, } \frac{(a+b)}{(b+c)} = \frac{(8k+12k)}{(12k+15k)} = \frac{20k}{27k} = \frac{20}{27}.$$

75.  $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \frac{1}{2} \Rightarrow b = 2a, d = 2c, f = 2e.$

$$\begin{aligned} \frac{3a+5c+7e}{3b+5d+7f} &= \frac{3a+5c+7e}{3 \times 2a + 5 \times 2c + 7 \times 2e} \\ &= \frac{3a+5c+7e}{2(3a+5c+7e)} = \frac{1}{2}. \end{aligned}$$

76.  $a : b = 5 : 3$ ,  $b : c = 2 : 5 = \left(2 \times \frac{3}{2}\right) : \left(5 \times \frac{3}{2}\right) = 3 : \frac{15}{2}.$

$$\text{So, } a : b : c = 5 : 3 : \frac{15}{2} = 10 : 6 : 15.$$

$$\text{Clearly, } b < a < c.$$

77. Let  $a = 10x$ ,  $b = 6x$ ,  $c = 15x$ . Then,  $15x = 50$  or  $x = \frac{10}{3}.$

$$\therefore a + b + c = 10x + 6x + 15x = 31x$$

$$= \left(31 \times \frac{10}{3}\right) = 103.33 > 103.$$

78.  $(c - a) = (15x - 10x) = 5x.$

$$\text{I. } 10(a + c) = 10(10x + 15x) = 10 \times 25x = 250x.$$

$$\text{II. } 10a + 25b = 10 \times 10x + 25 \times 6x = 100x + 150x = 250x.$$

79. Let  $a + b = 6k$ ,  $b + c = 7k$  and  $c + a = 8k$ .

$$\begin{aligned} \text{Adding, we get : } 2(a + b + c) &= 21k \Rightarrow 2 \times 14 = 21k \\ \Rightarrow k &= \frac{28}{21} = \frac{4}{3}. \end{aligned}$$

$$\text{So, } a + b = 6k = 6 \times \frac{4}{3} = 8.$$

$$\therefore c = (a + b + c) - (a + b) = 14 - 8 = 6.$$

80. Let the fourth proportional to 5, 8, 15 be  $x$ .

$$\text{Then, } 5 : 8 :: 15 : x \Leftrightarrow 5x = 8 \times 15 \Leftrightarrow x = \frac{8 \times 15}{5} = 24.$$

81. Let the fourth proportional to 0.12, 0.21 and 8 be  $x$ .

$$\text{Then, } 0.12 : 0.21 :: 8 : x \Leftrightarrow 0.12x = 0.21 \times 8$$

$$\Leftrightarrow x = \frac{0.21 \times 8}{0.12} = \frac{21 \times 8}{12} = 14.$$

82. Let the fourth proportional to  $(a^2 - b^2)$ ,  $(a^2 - ab)$ ,  $(a^3 + b^3)$  be  $x$ .

$$\text{Then, } (a^2 - b^2) : (a^2 - ab) :: (a^3 + b^3) : x$$

$$\Leftrightarrow (a^2 - b^2)x = (a^3 + b^3)(a^2 - ab)$$

$$\Leftrightarrow x = \frac{(a^3 + b^3)(a^2 - ab)}{(a^2 - b^2)} = \frac{(a + b)(a^2 - ab + b^2)a(a - b)}{(a - b)(a + b)} \\ = a(a^2 - ab + b^2).$$

83. Let the third proportional to 38 and 15 be  $x$ .

$$\text{Then, } 38 : 15 :: 15 : x \Leftrightarrow 38x = 15 \times 15 \Leftrightarrow x = \frac{15 \times 15}{38}.$$

84. Let the third proportional to  $(x^2 - y^2)$  and  $(x - y)$  be  $t$ .

$$\text{Then, } (x^2 - y^2) : (x - y) :: (x - y) : t$$

$$\Leftrightarrow (x^2 - y^2)t = (x - y)^2 \Leftrightarrow t = \frac{(x - y)^2}{(x^2 - y^2)} = \frac{(x - y)(x - y)}{(x - y)(x + y)} = \frac{(x - y)}{(x + y)}.$$

85. Required mean proportional =  $\sqrt{234 \times 104}$   
 $= \sqrt{13 \times 9 \times 2 \times 13 \times 8} = 13 \times 3 \times 4 = 156.$

86. Required mean proportional =  $\sqrt{0.02 \times 0.32}$   
 $= \sqrt{0.0064} = 0.08.$

87. Required mean proportional =  $\sqrt{(3 + \sqrt{2})(12 - \sqrt{32})}$   
 $= \sqrt{(3 + \sqrt{2})(12 - 4\sqrt{2})}$   
 $= \sqrt{36 - 8} = \sqrt{28} = 2\sqrt{7}.$

88. Let the third proportional to 12 and 30 be  $x$ .

$$\text{Then, } 12 : 30 :: 30 : x \Leftrightarrow 12x = 30 \times 30$$

$$\Leftrightarrow x = \frac{(30 \times 30)}{12} = 75.$$

$\therefore$  Third proportional to 12 and 30 = 75.

$$\text{Mean proportional between 9 and 25} = \sqrt{9 \times 25} = 15.$$

$\therefore$  Required ratio =  $75 : 15 = 5 : 1$ .

89. Duplicate ratio of  $2a : 6b = (2a)^2 : (6b)^2$   
 $= 4a^2 : 36b^2 = a^2 : 9b^2.$

$$\text{Reciprocal ratio of } 4a^2 : 25b^2 = \frac{1}{4a^2} : \frac{1}{25b^2} = 25b^2 : 4a^2.$$

$$\therefore \text{ Required product} = \frac{a^2}{9b^2} \times \frac{25b^2}{4a^2} = \frac{25}{36}.$$

90. Let the two numbers be  $x$  and  $y$ .

$$\text{Then, } \sqrt{xy} = 12 \text{ and } x : y :: y : 324$$

$$\Rightarrow xy = (12)^2 = 144 \text{ and } y^2 = 324x$$

$$\Rightarrow x = \frac{144}{y} \text{ and } y^2 = 324 \times \frac{144}{y}$$

$$\Rightarrow y^3 = 324 \times 144 = (6 \times 3 \times 2)^3 \Rightarrow y = 6 \times 3 \times 2 = 36$$

$$\Rightarrow x = \frac{144}{36} = 4.$$

Hence, the two numbers are 4 and 36.

91.  $A : B : C = 8 : 14 : 22$ ,  $B : C : D = 21 : 33 : 44$

$$= \left(21 \times \frac{2}{3}\right) : \left(33 \times \frac{2}{3}\right) : \left(44 \times \frac{2}{3}\right) = 14 : 22 : \frac{88}{3}.$$

$$\therefore A : B : C : D = 8 : 14 : 22 : \frac{88}{3} = 24 : 42 : 66 : 88 \\ = 12 : 21 : 33 : 44.$$

92. Let the numbers be  $x$  and  $y$ .

$$\text{Then, } y - 30\% \text{ of } x = \frac{4}{5}y \Rightarrow y - \frac{4}{5}y = \frac{30}{100}x \Rightarrow \frac{y}{5} = \frac{3x}{10}$$

$$\Rightarrow \frac{x}{y} = \frac{1}{5} \times \frac{10}{3} = \frac{2}{3} \Rightarrow x : y = 2 : 3.$$

93. Abhinav's investment = ₹ 6000.

Sunil's investment =  $(100 - 30)\%$  of ₹ 6000 =  $70\%$  of

$$\text{₹ } 6000 = \text{₹ } \left(\frac{70}{100} \times 6000\right) = \text{₹ } 4200.$$

Rita's investment =  $(100 + 25)\%$  of ₹ 4200 =  $125\%$  of

$$\text{₹ } 4200 = \text{₹ } \left(\frac{125}{100} \times 4200\right) = \text{₹ } 5250.$$

Total amount invested = ₹  $(6000 + 4200 + 5250)$

$$= \text{₹ } 15450.$$

$\therefore$  Required ratio =  $5250 : 15450 = 35 : 103$ .

94. Let the numbers be  $x$  and  $y$ .

$$\text{Then, } \frac{1}{4} \text{ of } (60\% \text{ of } x) = \frac{2}{5} \text{ of } (20\% \text{ of } y)$$

$$\Rightarrow \left(\frac{1}{4} \times \frac{60}{100} \times x\right) = \left(\frac{2}{5} \times \frac{20}{100} \times y\right) \Rightarrow \frac{3x}{20} = \frac{2y}{25}$$

$$\Rightarrow \frac{x}{y} = \frac{2}{25} \times \frac{20}{3} = \frac{8}{15} \Rightarrow x : y = 8 : 15.$$

95. Let the number of girls be  $x$ .

$$\text{Then, number of boys} = 116\% \text{ of } x = \frac{29}{25}x.$$

$$\therefore \text{ Required ratio} = \frac{29}{25}x : x = 29 : 25.$$

96. Ratio for different heights (Section A : Section B) is as under:

$$1.55 \rightarrow \frac{3}{2} = 1.5 ; 1.60 \rightarrow \frac{7}{6} = 1.16 ; 1.62 \rightarrow \frac{12}{14} = \frac{6}{7} = 0.86 ;$$

$$1.65 \rightarrow \frac{15}{14} = 1.07 ; 1.68 \rightarrow \frac{8}{9} = 0.89 ; 1.71 \rightarrow \frac{6}{5} = 1.2 ;$$

$$1.75 \rightarrow \frac{3}{4} = 0.75.$$

97. Number of people having characteristic

$$X = (10 + 30) = 40.$$

Number of people having characteristic

$$Y = (10 + 20) = 30.$$

$\therefore$  Required ratio =  $40 : 30 = 4 : 3$ .

98.  $5M + 4O = 3M + 7O \Rightarrow 2M = 3O \Rightarrow \frac{M}{O} = \frac{3}{2}.$

99. Required percentage

$$= \left(\frac{7}{7+3} \times 100\right)\% = \left(\frac{7}{10} \times 100\right)\% = 70\%.$$

100.  $4A = 6B = 11C = k$  (say).

$$\text{Then, } A = \frac{k}{4}, B = \frac{k}{6}, C = \frac{k}{11}$$

$$\Rightarrow A : B : C = \frac{1}{4} : \frac{1}{6} : \frac{1}{11} = 33 : 22 : 12.$$

101. Required ratio =  $120\%$  of ₹ 30 :  $110\%$  of ₹ 20  
 $= 36 : 22 = 18 : 11.$

102. Ratio of the monthly incomes of families A and B  
= Ratio of the areas of rectangles A and B  
=  $5 \times 2 : 4 \times 1 = 10 : 4 = 5 : 2$ .

Let the monthly income of family A be ₹  $x$ .

Then,  $5 : 2 :: x : 12000 \Rightarrow 2x = 5 \times 12000 = 60000$

$$\Rightarrow x = \frac{60000}{2} = 30000.$$

103. Let the number of boys be  $x$ . Then, number of girls  
= 120% of  $x = \frac{6x}{5}$ .

$$\therefore x + \frac{6x}{5} = 66 \Rightarrow \frac{11x}{5} = 66 \Rightarrow x = \frac{66 \times 5}{11} = 30.$$

So, number of boys = 30. And, new number of girls

$$= \left( \frac{6 \times 30}{5} \right) + 4 = 40.$$

$\therefore$  Required ratio =  $30 : 40 = 3 : 4$ .

104. Let C's income be ₹  $x$ . Then, B's income = 80% of

$$\text{₹ } x = \text{₹ } \left( \frac{4x}{5} \right).$$

$$A's \text{ income} = 110\% \text{ of } \text{₹ } \left( \frac{4x}{5} \right) = \text{₹ } \left( \frac{110}{100} \times \frac{4x}{5} \right) = \text{₹ } \left( \frac{22x}{25} \right).$$

$$\therefore A : B : C = \frac{22x}{25} : \frac{4x}{5} : x = 22 : 20 : 25.$$

105. Let the third number be  $x$ . Then, first number = 120% of

$$x = \frac{120}{100}x = \frac{6x}{5}.$$

$$\text{And, second number} = 150\% \text{ of } x = \frac{150}{100}x = \frac{3x}{2}.$$

$$\therefore \text{Required ratio} = \frac{6x}{5} : \frac{3x}{2} = 12 : 15 = 4 : 5.$$

106. Let the terms of the ratio be  $x$  and  $x + 40$ .

$$\text{Then, } \frac{x}{x+40} = \frac{2}{7} \Rightarrow 7x = 2x + 80 \Rightarrow 5x = 80 \Rightarrow x = 16.$$

$\therefore$  Required ratio =  $16 : 56$ .

107.  $A + B = 16000$ ,  $B = A - 4000 \Rightarrow A + (A - 4000) = 16000$   
 $\Rightarrow 2A = 20000 \Rightarrow A = 10000$ .

So,  $A = 10000$ ,  $B = 6000$ .

$$\therefore A : B = 10000 : 6000 = 5 : 3.$$

108.  $x : \frac{1}{27} :: \frac{3}{11} : \frac{5}{9} \Rightarrow \frac{5}{9}x = \frac{1}{27} \times \frac{3}{11} = \frac{1}{99} \Rightarrow x = \frac{1}{99} \times \frac{9}{5} = \frac{1}{55}$ .

109. Required ratio =  $\frac{3}{4}x : \frac{5}{6}x = \frac{3}{4} : \frac{5}{6} = 9 : 10$ .

110. Ratio of the expenditures of A, B, C and D are as under :

$$A \rightarrow \frac{18}{40} = \frac{9}{20} = 0.45 ; B \rightarrow \frac{21}{50} = 0.42 ;$$

$$C \rightarrow \frac{24}{60} = \frac{2}{5} = 0.4 ; D \rightarrow \frac{27}{70} = 0.385.$$

Clearly, A has done the highest expenditure proportionate to his resources.

111. Let the two numbers be  $x$  and  $y$ .

$$\frac{x+y}{2} : x = 3 : 5 \Rightarrow \frac{x+y}{2x} = \frac{3}{5} \Rightarrow 5x + 5y = 6x$$

$$\Rightarrow x = 5y \Rightarrow \frac{x}{y} = \frac{5}{1}.$$

$\therefore$  Ratio of smaller number to larger number =  $1 : 5$ .

112. Seema's share = ₹  $\left( 25000 \times \frac{3}{5} \right) = ₹ 15000$ . Meena's share

$$= ₹ \left( 25000 \times \frac{2}{5} \right) = ₹ 10000.$$

$$\therefore \text{Required ratio} = (15000 + 5000) : (10000 + 5000) \\ = 20000 : 15000 = 4 : 3.$$

113. Number of successful candidates =  $\left( \frac{9}{11} \times 132 \right) = 108$ .

$$\text{Number of unsuccessful candidates} = \left( \frac{2}{11} \times 132 \right) = 24.$$

$$\therefore \text{Required ratio} = (108 + 4) : (24 - 4) = 112 : 20 = 28 : 5.$$

114. Second son's share = ₹  $\left( 10800 \times \frac{4}{12} \right) = ₹ 3600$ .

$$\text{Money distributed between the two daughters} \\ = ₹ [3600 - (1000 + 600)] = ₹ 2000.$$

$$\text{First daughter's share} = ₹ \left( 2000 \times \frac{11}{20} \right) = ₹ 1100.$$

$$\text{Second daughter's share} = ₹ \left( 2000 \times \frac{9}{20} \right) = ₹ 900.$$

115. Sum of the angles of a triangle =  $180^\circ$ .

$$\therefore \text{Largest angle} = \left( 180 \times \frac{5}{12} \right)^\circ = 75^\circ.$$

116.  $x : y : z = 2 : 3 : 5$ .

$$\therefore x = \left( 100 \times \frac{2}{10} \right) = 20 ; y = \left( 100 \times \frac{3}{10} \right) = 30.$$

$$y = px - 10 \Rightarrow 30 = 20p - 10 \Rightarrow 20p = 40 \Rightarrow p = 2.$$

117. When marbles are shared in the ratio  $1 : 2 : 3$

$$A's \text{ share} = \left( 60 \times \frac{1}{6} \right) = 10 ; B's \text{ share} = \left( 60 \times \frac{2}{6} \right) = 20 ;$$

$$C's \text{ share} = \left( 60 \times \frac{3}{6} \right) = 30.$$

When marbles are shared in the ratio  $3 : 4 : 5$

$$A's \text{ share} = \left( 60 \times \frac{3}{12} \right) = 15 ; B's \text{ share} = \left( 60 \times \frac{4}{12} \right) = 20 ;$$

$$C's \text{ share} = \left( 60 \times \frac{5}{12} \right) = 25.$$

Clearly, 5 marbles have been transferred from C to A.

118. Let C's share = ₹  $x$ . Then, B's share = ₹  $(x + 8)$ ; A's share = ₹  $(x + 15)$ .

$$\text{So, } (x + 15) + (x + 8) + x = 53$$

$$\Rightarrow 3x = 30 \Rightarrow x = 10.$$

$$\therefore A : B : C = (x + 15) : (x + 8) : x = 25 : 18 : 10.$$

119. Let the total sum be ₹  $x$ .

$$\text{Then, smallest share} = ₹ \left( \frac{3}{12}x \right) = ₹ \frac{x}{4}.$$

$$\therefore \text{Larger share of the two} = ₹ \left( \frac{x}{4} \times \frac{2}{3} \right) = ₹ \frac{x}{6}.$$

120. Let the second amount be ₹  $x$ .

Then, A's share from first amount

$$= ₹ \left( 150000 \times \frac{2}{10} \right) = ₹ 30000.$$

$$\text{A's share from second amount} = ₹ \left( x \times \frac{5}{10} \right) = ₹ \frac{x}{2}.$$

$$\therefore \frac{x}{2} = 30000 \text{ or } x = 60000.$$

Required ratio = 150000 : 60000 = 5 : 2.

121. Quantity of copper in 17.5 kg of alloy

$$= \left( 17.5 \times \frac{5}{7} \right) \text{ kg} = 12.5 \text{ kg}.$$

Quantity of zinc in 17.5 kg of alloy

$$= \left( 17.5 \times \frac{2}{7} \right) \text{ kg} = 5 \text{ kg}.$$

$$\therefore \text{Required ratio} = 12.5 : (5 + 1.25) = 12.5 : 6.25 = 2 : 1.$$

122.  $A + B = 100$ ,  $A = B + 30 \Rightarrow (B + 30) + B = 100$

$$\Rightarrow 2B = 70 \Rightarrow B = 35 \Rightarrow A = (100 - 35) = 65.$$

$$A : B = 65 : 35 = 13 : 7.$$

$$\therefore \text{B's share} = ₹ \left( 650 \times \frac{7}{20} \right) = ₹ 227.50.$$

123.  $B = 75\%$  of  $C = \frac{3}{4}C$ ;  $A = 125\%$  of

$$B = 125\% \text{ of } \frac{3}{4}C = \left( \frac{5}{4} \times \frac{3}{4}C \right) = \frac{15}{16}C.$$

$$\therefore A : B : C = \frac{15}{16}C : \frac{3}{4}C : C = 15 : 12 : 16.$$

Sum of ratio terms =  $(15 + 12 + 16) = 43$ .

$$\text{C's share} = ₹ \left( 731 \times \frac{16}{43} \right) = ₹ 272.$$

124. Ratio of shares =  $\frac{3}{5} : 2 : \frac{5}{3} = 9 : 30 : 25$ .

$$\text{Second worker's share} = ₹ \left( 6400 \times \frac{30}{64} \right) = ₹ 3000.$$

125.  $A : B = \frac{a}{b} : \frac{c}{d} = \left( \frac{a}{b} \times bd \right) : \left( \frac{c}{d} \times bd \right) = ad : bc$ .

$$\therefore \text{A's share} = ₹ \left( \frac{adx}{ad+bc} \right).$$

126. Let  $\frac{1}{2}D = \frac{1}{4}W = \frac{1}{5}S = k$ . Then,  $D = 2k$ ,  $W = 4k$ ,  $S = 5k$ .

So,  $D : W : S = 2k : 4k : 5k = 2 : 4 : 5$ .

$$\therefore \text{Daughter's share} = ₹ \left( 165000 \times \frac{2}{11} \right) = ₹ 30000.$$

127.  $A = \frac{2}{9}B$ ,  $C = \frac{3}{4}A = \left( \frac{3}{4} \times \frac{2}{9} \right)B = \frac{1}{6}B$ .

$$A : B : C = \frac{2}{9}B : B : \frac{1}{6}B = 4 : 18 : 3.$$

$$\text{C's share} = ₹ \left( 1250 \times \frac{3}{25} \right) = ₹ 150.$$

128. When money is divided in ratio of  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$

$$\text{Ratio of shares} = \frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3.$$

$$P's \text{ share} = ₹ \left( 117 \times \frac{6}{13} \right) = ₹ 54;$$

$$Q's \text{ share} = ₹ \left( 117 \times \frac{4}{13} \right) = ₹ 36;$$

$$R's \text{ share} = ₹ \left( 117 \times \frac{3}{13} \right) = ₹ 27.$$

When money is divided in ratio of 2 : 3 : 4

$$P's \text{ share} = ₹ \left( 117 \times \frac{2}{9} \right) = ₹ 26;$$

$$Q's \text{ share} = ₹ \left( 117 \times \frac{3}{9} \right) = ₹ 39;$$

$$R's \text{ share} = ₹ \left( 117 \times \frac{4}{9} \right) = ₹ 52.$$

Clearly, both Q and R gained in the transaction.

129.  $A : B = 3 : 7$ ,  $B : C = 6 : 5 = \left( 6 \times \frac{7}{6} \right) : \left( 5 \times \frac{7}{6} \right) = 7 : \frac{35}{6}$ .

$$A : B : C = 3 : 7 : \frac{35}{6}$$

$$= 18 : 42 : 35. \text{ Sum of ratio terms} \\ = (18 + 42 + 35) = 95.$$

$$\therefore \text{B's share} = ₹ \left( 33630 \times \frac{42}{95} \right) = ₹ 14868.$$

130.  $A : B = 3 : 2$ ,  $B : C = 3 : 2 = \left( 3 \times \frac{2}{3} \right) : \left( 2 \times \frac{2}{3} \right) = 2 : \frac{4}{3}$ .

$$A : B : C = 3 : 2 : \frac{4}{3} = 9 : 6 : 4.$$

$$\therefore \text{A's score} = \left( 361 \times \frac{9}{19} \right) = 171.$$

131.  $A : B = 2 : 3$ ,  $B : C = 4 : 5 = \left( 4 \times \frac{3}{4} \right) : \left( 5 \times \frac{3}{4} \right) = 3 : \frac{15}{4}$ ,

$$C : D = 6 : 7 = \left( 6 \times \frac{5}{6} \right) : \left( 7 \times \frac{5}{6} \right) = \frac{15}{4} : \frac{35}{8}.$$

$$A : B : C : D = 2 : 3 : \frac{15}{4} : \frac{35}{8} = 16 : 24 : 30 : 35.$$

Sum of ratio terms =  $(16 + 24 + 30 + 35) = 105$ .

$$\therefore \text{A's share} = ₹ \left( 8400 \times \frac{16}{105} \right) = ₹ 1280.$$

132.  $P : Q = 2 : 3$ ,  $Q : R = 2 : 3 = \left( 2 \times \frac{3}{2} \right) : \left( 3 \times \frac{3}{2} \right) = 3 : \frac{9}{2}$ ,

$$R : S = 2 : 3 = \left( 2 \times \frac{9}{2} \right) : \left( 3 \times \frac{9}{2} \right) = \frac{9}{2} : \frac{27}{4}.$$

$$\therefore P : Q : R : S = 2 : 3 : \frac{9}{2} : \frac{27}{4} = 8 : 12 : 18 : 27.$$

Sum of ratio terms =  $(8 + 12 + 18 + 27) = 65$ .

$$P's \text{ share} = ₹ \left( 1300 \times \frac{8}{65} \right) = ₹ 160.$$

133. Second : Third = 9 : 16, Third :

$$\text{First} = 4 : 1 = 16 : 4.$$

$$\therefore \text{Second} : \text{Third} : \text{First} = 9 : 16 : 4.$$

$$\text{Second number} = \left(116 \times \frac{9}{29}\right) = 36.$$

134.  $A : B = 5 : 12$ ,

$$B : C = 4 : 5.50 = 12 : 16.5 = 12 : \frac{33}{2}.$$

$$A : B : C = 5 : 12 : \frac{33}{2} = 10 : 24 : 33.$$

$$\text{Sum of ratio terms} = 10 + 24 + 33 = 67.$$

$$C's \text{ share} = ₹ \left(2010 \times \frac{33}{67}\right) = ₹ 990.$$

$$B's \text{ share} = ₹ \left(2010 \times \frac{24}{67}\right) = ₹ 720.$$

$$\text{Required difference} = ₹ (990 - 720) = ₹ 270.$$

135.  $\frac{2}{5}A + 40 = \frac{2}{7}B + 20$

$$\Rightarrow \frac{2}{7}B = \frac{2}{5}A + 20 \Rightarrow B = \frac{7}{2} \left(\frac{2}{5}A + 20\right) = \frac{7}{5}A + 70.$$

$$\text{And, } \frac{2}{5}A + 40 = \frac{9}{17}C + 10 \Rightarrow \frac{9}{17}C = \frac{2}{5}A + 30$$

$$\Rightarrow C = \frac{17}{9} \left(\frac{2}{5}A + 30\right) = \frac{34}{45}A + \frac{170}{3}.$$

$$A + B + C = 600 \Rightarrow A + \left(\frac{7}{5}A + 70\right) + \left(\frac{34}{45}A + \frac{170}{3}\right) = 600$$

$$\Rightarrow \frac{142A}{45} = 600 - \frac{380}{3} = \frac{1420}{3}$$

$$\Rightarrow A = \frac{1420}{3} \times \frac{45}{142} = 150.$$

136.  $P = \frac{2}{5} (Q + R) \Rightarrow P : (Q + R) = 2 : 5.$

$$\therefore P's \text{ share} = ₹ \left(1050 \times \frac{2}{7}\right) = ₹ 300.$$

137.  $A = \frac{3}{7} (B + C); B = \frac{2}{9} (A + C)$

$$\Rightarrow A = \frac{3}{7} \left(\frac{2}{9}A + \frac{2}{9}C + C\right) = \frac{3}{7} \left(\frac{2}{9}A + \frac{11}{9}C\right) = \frac{2}{21}A + \frac{11}{21}C$$

$$\Rightarrow \frac{19A}{21} = \frac{11}{21}C \Rightarrow A = \left(\frac{21}{19} \times \frac{11}{21}\right)C = \frac{11}{19}C.$$

$$\therefore B = \frac{2}{9} \left(\frac{11}{19}C + C\right) = \left(\frac{2}{9} \times \frac{30}{19}\right)C = \frac{20}{57}C.$$

$$\text{So, } A : B : C = \frac{11}{19}C : \frac{20}{57}C : C = 33 : 20 : 57. \text{ Sum of ratio terms} = (33 + 20 + 57) = 110.$$

$$A's \text{ share} = ₹ \left(12540 \times \frac{33}{110}\right) = ₹ 3762.$$

$$B's \text{ share} = ₹ \left(12540 \times \frac{20}{110}\right) = ₹ 2280.$$

$$\therefore \text{Required difference} = ₹ (3762 - 2280) = ₹ 1482.$$

$$138. A : B = 3 : 4, B : C = 5 : 6 = \left(5 \times \frac{4}{5}\right) : \left(6 \times \frac{4}{5}\right) = 4 : \frac{24}{5},$$

$$C : D = 7 : 5 = \left(7 \times \frac{24}{35}\right) : \left(5 \times \frac{24}{35}\right) = \frac{24}{5} : \frac{24}{7}.$$

$$\therefore A : B : C : D = 3 : 4 : \frac{24}{5} : \frac{24}{7} = 105 : 140 : 168 : 120.$$

Clearly, C will get the maximum.

$$139. A : B : C : D = \frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{6} = 20 : 15 : 12 : 10.$$

For each person to have a whole number of pens, the minimum number of pens required  
 $= 20 + 15 + 12 + 10 = 57.$

$$140. \text{Remainder} = ₹ [671 + (3 + 7 + 9)] = ₹ 690.$$

$$A's \text{ share} = ₹ \left[\left(690 \times \frac{1}{6}\right) - 3\right] = ₹ 112.$$

$$B's \text{ share} = ₹ \left[\left(690 \times \frac{2}{6}\right) - 7\right] = ₹ 223.$$

$$C's \text{ share} = ₹ \left[\left(690 \times \frac{3}{6}\right) - 9\right] = ₹ 336.$$

$$141. \text{Remainder} = ₹ [1087 - (10 + 12 + 15)] = ₹ 1050.$$

$$\therefore B's \text{ share} = ₹ \left[\left(1050 \times \frac{7}{21}\right) + 12\right] = ₹ 362.$$

$$142. \text{Let } x = 5k \text{ and } y = 7k. \text{ Then, } x + y = 36 \Rightarrow 5k + 7k = 36 \Rightarrow 12k = 36 \Rightarrow k = 3.$$

$$\therefore x = 5k = 5 \times 3 = 15.$$

$$143. \text{Let income} = ₹ 11x \text{ and expenditure} = ₹ 10x.$$

$$\text{Then, } 11x - 10x = 9000 \Rightarrow x = 9000.$$

$$\text{Annual income} = 11x = ₹ (11 \times 9000) = ₹ 99000.$$

$$\therefore \text{Monthly income} = ₹ \left(\frac{99000}{12}\right) = ₹ 8250.$$

$$144. \text{Let the numbers be } 3x \text{ and } 5x.$$

$$\text{Then, } 3x \cdot 5x = 2160 \Rightarrow 15x^2 = 2160$$

$$\Rightarrow x^2 = 144 \Rightarrow x = 12.$$

$$\therefore \text{Smaller number} = 3x = 3 \times 12 = 36.$$

$$145. \text{Let the shares of } A, B, C \text{ and } D \text{ be } ₹ 3x, 4x, 9x \text{ and } 10x \text{ respectively.}$$

$$9x - 4x = 2580 \Rightarrow 5x = 2580 \Rightarrow x = 516.$$

$$\therefore \text{Required amount} = 3x + 10x = 13x \\ = ₹ (13 \times 516) = ₹ 6708.$$

$$146. \text{Let the numbers be } 4x \text{ and } 5x. \text{ Then, their L.C.M.} = 20x.$$

$$20x = 180 \text{ or } x = 9.$$

$$\therefore \text{Smaller number} = 4x = 4 \times 9 = 36.$$

$$147. \text{Ram : Shyam} = 7 : 17$$

$$\text{Shyam : Sohan} = 7 : 17 = \left(7 \times \frac{17}{7}\right) : \left(17 \times \frac{17}{7}\right) = 17 : \frac{289}{7}.$$

$$\text{Ram : Shyam : Sohan} = 7 : 17 : \frac{289}{7} = 49 : 119 : 289.$$

$$\text{Let Sohan's income be } ₹ x.$$

$$\text{Then, } 49 : 289 :: 490 : x \text{ or } x = 2890.$$

148. Number of policemen =  $\left(\frac{135}{5} \times 3\right) = 81$ .

$\therefore$  Number of supporters =  $81 \times 9 = 729$ .

149. Ratio of sides =  $\frac{1}{2} : \frac{1}{3} : \frac{1}{4} = 6 : 4 : 3$ .

Let the sides be  $6x$ ,  $4x$  and  $3x$ .

Then,  $6x + 4x + 3x = 104$  or  $13x = 104$  or  $x = 8$ .

$\therefore$  Longest side =  $6x = (6 \times 8) \text{ m} = 48 \text{ m}$ .

150. Let the numbers be  $3x$  and  $4x$ .

Then,  $(4x)^2 - (3x)^2 = 63 \Rightarrow 16x^2 - 9x^2 = 63$

$\Rightarrow 7x^2 = 63 \Rightarrow x^2 = 9 \Rightarrow x = 3$ .

$\therefore$  The numbers are 9 and 12.

151.  $A : B = 4 : 5$ ;  $B : C = 7 : 9 = \left(7 \times \frac{5}{7}\right) : \left(9 \times \frac{5}{7}\right) = 5 : \frac{45}{7}$ ;

$C : D = 3 : 4 = \left(3 \times \frac{15}{7}\right) : \left(4 \times \frac{15}{7}\right) = \frac{45}{7} : \frac{60}{7}$ .

$A : B : C : D = 4 : 5 : \frac{45}{7} : \frac{60}{7} = 28 : 35 : 45 : 60$ .

Let the shares of  $A$ ,  $B$ ,  $C$ ,  $D$  be  $28x$ ,  $35x$ ,  $45x$ ,  $60x$  respectively.

Then,  $28x = 1680 \Rightarrow x = 60$ .

$\therefore$   $D$ 's share =  $60x = ₹ (60 \times 60) = ₹ 3600$ .

152. First : Second =  $3 : 2$ , Second :

Third =  $3 : 2 = \left(3 \times \frac{2}{3}\right) : \left(2 \times \frac{2}{3}\right) = 2 : \frac{4}{3}$ .

$\therefore$  Ratio between the numbers =  $3 : 2 : \frac{4}{3} = 9 : 6 : 4$ .

Let the numbers be  $9x$ ,  $6x$  and  $4x$ . Then,

$(9x)^2 + (6x)^2 + (4x)^2 = 532 \Rightarrow 81x^2 + 36x^2 + 16x^2 = 532$

$\Rightarrow 133x^2 = 532 \Rightarrow x^2 = 4 \Rightarrow x = 2$ .

So, third number =  $4x = 4 \times 2 = 8$ .

153. Let the man's expenditure be ₹  $26x$  and savings be ₹  $3x$ .

Then, monthly income = ₹  $(26x + 3x) = ₹ (29x)$ .

So,  $29x = 7250$  or  $x = 250$ .

$\therefore$  Monthly savings = ₹  $(3 \times 250) = ₹ 750$ .

154. Let the numbers be  $17x$  and  $45x$ .

Then,  $\frac{1}{5}$  of  $45x - \frac{1}{3}$  of  $17x = 15 \Leftrightarrow 9x - \frac{17}{3}x = 15$

$\Leftrightarrow \frac{10x}{3} = 15 \Leftrightarrow x = 15 \times \frac{3}{10} = \frac{9}{2}$ .

$\therefore$  Smaller number =  $17x = \left(17 \times \frac{9}{2}\right) = \frac{153}{2} = 76\frac{1}{2}$ .

155. Let  $A = 3x$ ,  $B = 5x$ . Then,  $C = 2 \times 3x = 6x$ ,  $A + D = B + C$   
 $\Rightarrow 3x + D = 5x + 6x \Rightarrow D = 8x$ .

$A + B + C + D = 110 \Rightarrow 3x + 5x + 6x + 8x = 110$

$\Rightarrow 22x = 110 \Rightarrow x = 5$ .

So, the numbers are  $(3 \times 5)$ ,  $(5 \times 5)$ ,  $(6 \times 5)$  and  $(8 \times 5)$  i.e., 15, 25, 30 and 40.

156.  $A$ 's expenses = ₹  $(1400 - 600) = ₹ 800$ .

Let  $B$ 's expenses be ₹  $x$ .

Then,  $800 : x :: 2 : 3$  or  $2x = 800 \times 3$  or  $x = \frac{2400}{2} = 1200$ .

$\therefore$   $B$ 's saving = ₹  $(1400 - 1200) = ₹ 200$ .

157.  $A : B : C = 12 : 15 : 25$ . Let the numbers be  $12x$ ,  $15x$  and  $25x$ .

Required ratio =  $(B - A) : (C - B) = (15x - 12x) : (25x - 15x) = 3x : 10x = 3 : 10$ .

158. Let the incomes of  $A$ ,  $B$ ,  $C$  be  $7x$ ,  $9x$  and  $12x$  and their expenditures be  $8y$ ,  $9y$  and  $15y$  respectively.

Then,  $A$ 's saving =  $(7x - 8y)$ .

$\therefore 7x - 8y = \frac{1}{4}$  of  $7x \Rightarrow 8y = 7x - \frac{7x}{4} \Rightarrow 8y = \frac{21}{4}x$

$\Rightarrow y = \frac{21}{32}x$ .

So,  $A$ 's expenditure =  $\left(8 \times \frac{21}{32}x\right) = \frac{168}{32}x$ ;

$B$ 's expenditure =  $\left(9 \times \frac{21}{32}x\right) = \frac{189}{32}x$ ;

$C$ 's expenditure =  $\left(15 \times \frac{21}{32}x\right) = \frac{315}{32}x$ .

$\therefore A$ 's saving =  $\left(7x - \frac{168}{32}x\right) = \frac{56}{32}x$ ;

$B$ 's saving =  $\left(9x - \frac{189}{32}x\right) = \frac{99}{32}x$ ;

$C$ 's saving =  $\left(12x - \frac{315}{32}x\right) = \frac{69}{32}x$ .

Hence, required ratio =  $\frac{56}{32}x : \frac{99}{32}x : \frac{69}{32}x = 56 : 99 : 69$ .

159. Let the basic salaries of  $A$  and  $B$  be ₹  $x$  and ₹  $y$  respectively.

Then,  $x + 65\%$  of  $x = y + 80\%$  of  $y$

$\Rightarrow \frac{165}{100}x = \frac{180}{100}y \Rightarrow 165x = 180y$

$\Rightarrow \frac{x}{y} = \frac{180}{165} = \frac{12}{11}$ .

$\therefore$  Required ratio =  $12 : 11$ .

160. Let the incomes of Mr. Gupta and Mr. Verma be ₹  $9x$  and ₹  $4x$  respectively and their expenditures be ₹  $7y$  and ₹  $3y$  respectively.

Then,  $9x - 7y = 4x - 3y \Rightarrow 5x = 4y \Rightarrow x = \frac{4y}{5}$ .

Now,  $9x - 7y = 2000 \Rightarrow 9 \times \frac{4}{5}y - 7y = 2000$

$\Rightarrow \frac{36}{5}y - 7y = 2000 \Rightarrow y = 10000$ .

$\therefore$  Mr. Gupta's expenditure = ₹  $(7 \times 10000) = ₹ 70000$ .

161. Let the incomes of  $A$  and  $B$  be ₹  $5x$  and ₹  $3x$  respectively and the expenses of  $A$ ,  $B$  and  $C$  be ₹  $8y$ , ₹  $5y$  and ₹  $2y$  respectively.

Then,  $2y = 2000$  or  $y = 1000$ .

And,  $3x - 5y = 700 \Rightarrow 3x - 5000 = 700$

$\Rightarrow 3x = 5700 \Rightarrow x = 1900$ .

$$\therefore A's \text{ savings} = 5x - 8y = ₹ (5 \times 1900 - 8 \times 1000) \\ = ₹ (9500 - 8000) = ₹ 1500.$$

162. Let the monthly salary of a clerk and an officer be ₹ 3x and ₹ 5x respectively.

$$\text{Then, } 3\% \text{ of } 5x = 210 \Rightarrow \left(\frac{3}{100} \times 5x\right) = 210$$

$$\Rightarrow x = \left(\frac{210 \times 100}{15}\right) = 1400.$$

$$\therefore \text{Clerk's salary} = ₹ (3 \times 1400) = ₹ 4200.$$

163. Let the salaries of A and B be ₹ 9x and ₹ 4x respectively.

$$\text{Then, } 115\% \text{ of } 9x = 5175 \Rightarrow \frac{115}{100} \times 9x = 5175$$

$$\Rightarrow x = \left(\frac{5175 \times 100}{115 \times 9}\right) = 500.$$

$$\therefore B's \text{ salary} = ₹ (4 \times 500) = ₹ 2000.$$

164. Let income in the first year be ₹ x and expenses in the second year be ₹ y.

$$\text{Then, } \frac{x}{45000} = \frac{2}{3} \text{ and } \frac{25000}{y} = \frac{5}{9}$$

$$\Rightarrow x = \frac{2 \times 45000}{3} = 30000 \text{ and } y = \frac{25000 \times 9}{5} = 45000.$$

$$\therefore \text{Total savings for 2 years}$$

$$= ₹ [(30000 - 25000) + (45000 - 45000)] = ₹ 5000.$$

165. Clearly, A and B save 20% and 30% of their respective salaries.

Let the salaries of A and B be x and y respectively.

$$\text{Then, } \frac{20\% \text{ of } x}{30\% \text{ of } y} = \frac{4}{3} \Rightarrow \frac{x}{5} \times \frac{10}{3y} = \frac{4}{3} \Rightarrow \frac{x}{y} = 2 \Rightarrow x = 2y.$$

$$\therefore x + y = 2100 \Rightarrow 2y + y = 2100$$

$$\Rightarrow 3y = 2100 \Rightarrow y = 700.$$

$$A's \text{ salary} = x = 2y = ₹ (2 \times 700) = ₹ 1400.$$

166. Let the incomes of the two persons be 5x and 3x and their expenditures be 9y and 5y respectively.

$$\text{Then, } 5x - 9y = 2600 \quad \dots(i)$$

$$\text{and } 3x - 5y = 1800 \quad \dots(ii)$$

Multiplying (i) by 3 and (ii) by 5, we get :

$$15x - 27y = 7800 \quad \dots(iii)$$

$$\text{and } 15x - 25y = 9000 \quad \dots(iv)$$

Subtracting (iii) from (iv), we get :  $2y = 1200$  or  $y = 600$ .

Putting  $y = 600$  in (i), we get :  $5x = 8000$  or  $x = 1600$ .

$\therefore$  Their incomes are ₹  $(5 \times 1600)$  and ₹  $(3 \times 1600)$  i.e., ₹ 8000 and ₹ 4800 respectively.

167. Let the annual incomes of A and B be 5x and 4x and their annual expenses be 19y and 21y respectively.

$$\text{Then, } \frac{5x - 19y}{4x - 21y} = \frac{37}{18} \Rightarrow 90x - 342y = 148x - 777y$$

$$\Rightarrow 58x = 435y \Rightarrow x = \frac{435}{58}y.$$

$$\text{And, } (5x - 19y) + (4x - 21y) = 66000$$

$$\Rightarrow 9x - 40y = 66000 \Rightarrow 9 \times \frac{435}{58}y - 40y = 66000$$

$$\Rightarrow 3915y - 2320y = 3828000$$

$$\Rightarrow 1595y = 3828000 \Rightarrow y = 2400.$$

$$\text{So, } x = \left(\frac{435}{58} \times 2400\right) = 18000.$$

$$A's \text{ annual income} = ₹ (5 \times 18000) = ₹ 90000.$$

$$\therefore A's \text{ monthly income} = ₹ \left(\frac{90000}{12}\right) = ₹ 7500.$$

168. Number of boys =  $\left(720 \times \frac{7}{12}\right) = 420$ ;

$$\text{Number of girls} = (720 - 420) = 300.$$

$$\text{Let the required number of girls be } x. \text{ Then, } \frac{420}{300 + x} = 1$$

$$\Rightarrow 420 = 300 + x \Rightarrow x = 120.$$

169. Let the number of students in Arts and Commerce faculties be 4x and 5x respectively.

$$\text{Then, } \frac{4x}{5x + 65} = \frac{8}{11} \Rightarrow 44x = 8(5x + 65)$$

$$\Rightarrow 4x = 520 \Rightarrow x = 130.$$

$$\therefore \text{Number of students in Arts faculty} \\ = (4 \times 130) = 520.$$

170. Let the numbers be 7x and 11x respectively.

$$\text{Then, } \frac{7x + 7}{11x + 7} = \frac{2}{3} \Rightarrow 21x + 21 = 22x + 14 \Rightarrow x = 7.$$

$$\therefore \text{Smaller number} = 7 \times 7 = 49.$$

171. Ratio of boys in the four sections is as under :

$$A \rightarrow \frac{7}{12} = 0.58; B \rightarrow \frac{5}{8} = 0.625; C \rightarrow \frac{3}{5} = 0.6; D \rightarrow \frac{2}{3} = 0.66.$$

Clearly, maximum number of boys are enrolled in section D.

172. Let the required number be x.

$$\text{Then, } \frac{7 - x}{9 - x} = \frac{11 - x}{15 - x} \Rightarrow (7 - x)(15 - x) = (11 - x)(9 - x)$$

$$\Rightarrow 105 - 22x + x^2 = 99 - 20x + x^2 \Rightarrow 2x = 6 \Rightarrow x = 3.$$

173. Quantity of milk =  $\left(80 \times \frac{7}{10}\right)$  litres = 56 litres.

$$\text{Quantity of water} = (80 - 56) \text{ litres} = 24 \text{ litres.}$$

Let the quantity of water to be added be x litres.

$$\text{Then, } \frac{56}{24 + x} = \frac{2}{1} \Rightarrow 48 + 2x = 56 \Rightarrow 2x = 8 \Rightarrow x = 4.$$

174. Quantity of soda in the mixture

$$= \left(7 \times \frac{2}{21} + 4 \times \frac{1}{12}\right) \text{ kg} = \left(\frac{2}{3} + \frac{1}{3}\right) \text{ kg} = 1 \text{ kg.}$$

Quantity of soap-dust in the mixture

$$= [(7 + 4) - 1] \text{ kg} = 10 \text{ kg.}$$

$\therefore$  Required ratio = 1 : 10.

175. Let the required number be x. Then,

$$(7 + x) : (11 + x) :: (11 + x) : (19 + x)$$

$$\Rightarrow \frac{7 + x}{11 + x} = \frac{11 + x}{19 + x} \Rightarrow (7 + x)(19 + x) = (11 + x)^2$$

$$\Rightarrow x^2 + 26x + 133 = x^2 + 22x + 121$$

$$\Rightarrow 4x = -12 \Rightarrow x = -3.$$



176. Let the numbers be  $3x$  and  $5x$ .

$$\text{Then, } \frac{3x-9}{5x-9} = \frac{12}{23} \Rightarrow 23(3x-9) = 12(5x-9)$$

$$\Rightarrow 69x - 207 = 60x - 108 \Rightarrow 9x = 99 \Rightarrow x = 11.$$

$$\therefore \text{Larger number} = 5 \times 11 = 55.$$

177. Let the number of managers and production-line workers be  $5x$  and  $72x$  respectively. Then,

$$\frac{5x}{72x+8} = \frac{5}{74} \Rightarrow 370x = 360x + 40 \Rightarrow 10x = 40 \Rightarrow x = 4.$$

$$\therefore \text{Number of managers} = 5 \times 4 = 20.$$

178. Let the number to be added be  $x$ .

$$\text{Then, } \frac{3+x}{5+x} = \frac{5}{6} \Rightarrow 6(3+x) = 5(5+x)$$

$$\Rightarrow 18 + 6x = 25 + 5x \Rightarrow x = 7.$$

179. Let the number of ladies and gents at the party be  $3x$  and  $2x$  respectively. Then,

$$\frac{3x}{2x+20} = \frac{2}{3} \Rightarrow 9x = 4x + 40 \Rightarrow 5x = 40 \Rightarrow x = 8.$$

$$\therefore \text{Number of ladies} = 3 \times 8 = 24.$$

180. Let the number of boys and girls be  $4x$  and  $5x$  respectively.

$$\text{Then, } \frac{4x}{5x-100} = \frac{6}{7} \Rightarrow 28x = 30x - 600$$

$$\Rightarrow 2x = 600 \Rightarrow x = 300.$$

$$\therefore \text{Number of boys} = 4 \times 300 = 1200.$$

181. Ratio of numbers =  $1\frac{1}{2} : 2\frac{2}{3} = \frac{3}{2} : \frac{8}{3} = 9 : 16$ .

Let the numbers be  $9x$  and  $16x$ .

$$\text{Then, } \frac{9x+15}{16x+15} = \frac{\left(1\frac{1}{2}\right)}{\left(2\frac{2}{3}\right)} = \frac{5}{3} \times \frac{2}{5} = \frac{2}{3}$$

$$\Rightarrow 27x + 45 = 32x + 30 \Rightarrow 5x = 15 \Rightarrow x = 3.$$

$$\therefore \text{Greater number} = 16 \times 3 = 48.$$

182. Let  $A = x$ ,  $B = 2x$ ,  $C = 3x$ . Then,  $\frac{x+2x+3x}{3} = 600$

$$\Rightarrow 2x = 600 \Rightarrow x = 300.$$

$$\text{So, } A = 300, B = 600, C = 900.$$

$$\text{New value of } A = 110\% \text{ of } 300 = 330.$$

$$\text{New value of } B = 80\% \text{ of } 600 = 480.$$

$$\text{New average} = 105\% \text{ of } 600 = 630.$$

$$\text{New value of } C = (630 \times 3) - (330 + 480) = 1080.$$

$$\therefore \text{Increase in value of } C = (1080 - 900) = 180.$$

183. Let the numbers be  $2x$  and  $3x$ .

$$\text{Then, } \frac{2x-2}{3x+2} = \frac{1}{2} \Rightarrow 4x - 4 = 3x + 2 \Rightarrow x = 6.$$

$$\therefore \text{Sum of the numbers} = 2x + 3x = 5x = 5 \times 6 = 30.$$

184. Quantity of milk in the mixture

$$= \left(20 \times \frac{5}{8}\right) \text{ litres} = \frac{25}{2} \text{ litres} = 12\frac{1}{2} \text{ litres.}$$

Quantity of water in the mixture

$$= \left(20 - 12\frac{1}{2}\right) \text{ litres} = 7\frac{1}{2} \text{ litres.}$$

Quantity of milk removed

$$= \left(4 \times \frac{5}{8}\right) \text{ litres} = \frac{5}{2} \text{ litres} = 2\frac{1}{2} \text{ litres.}$$

$$\text{Quantity of water removed} = \left(4 - 2\frac{1}{2}\right) \text{ litres} = 1\frac{1}{2} \text{ litres.}$$

Quantity of milk in the new mixture

$$= \left[\left(12\frac{1}{2} - 2\frac{1}{2}\right) + 4\right] \text{ litres} = 14 \text{ litres.}$$

Quantity of water in the new mixture

$$= \left(7\frac{1}{2} - 1\frac{1}{2}\right) \text{ litres} = 6 \text{ litres.}$$

$$\therefore \text{Required ratio} = 14 : 6 = 7 : 3.$$

185. Let the numbers be  $x$  and  $y$ .

$$\text{Then, } \frac{x+1}{y+1} = \frac{3}{4} \text{ and } \frac{x-5}{y-5} = \frac{7}{10}$$

$$\Rightarrow 4x + 4 = 3y + 3 \text{ and } 10x - 50 = 7y - 35$$

$$\Rightarrow 4x - 3y = -1 \text{ and } 10x - 7y = 15$$

$$\Rightarrow 20x - 15y = -5$$

...(i)

$$\text{and } 20x - 14y = 30$$

...(ii)

Subtracting (i) from (ii), we get :  $y = 35$ .

Putting  $y = 35$  in (i), we get :

$$20x = 520 \text{ or } x = 26.$$

186. Let the number of boys and girls, after leaving of 15 girls, be  $2x$  and  $x$  respectively.

$$\text{Then, } \frac{2x-45}{x} = \frac{1}{5} \Rightarrow 10x - 225 = x$$

$$\Rightarrow 9x = 225 \Rightarrow x = 25.$$

$$\therefore \text{Original number of girls} = x + 15 = (25 + 15) = 40.$$

187. Quantity of spirit in the resultant solution

$$= [(0.5 \times 2) + (0.75 \times 3)] \text{ litres}$$

$$= (1 + 2.25) \text{ litres} = 3.25 \text{ litres.}$$

Quantity of water in the resultant solution

$$= [(1 - 0.5) \times 2 + (1 - 0.75) \times 3] \text{ litres}$$

$$= (1 + 0.75) \text{ litres} = 1.75 \text{ litres.}$$

$$\therefore \text{Required ratio} = 3.25 : 1.75 = 13 : 7.$$

188. Let the required number be  $x$ .

$$\text{Then, } \frac{6-x}{7-x} < \frac{16}{21} \Rightarrow 21(6-x) < 16(7-x)$$

$$\Rightarrow 126 - 21x < 112 - 16x$$

$$\Rightarrow 5x > 14 \Rightarrow x > \frac{14}{5} \Rightarrow x > 2\frac{4}{5} \Rightarrow x = 3.$$

189. Let the number of men and women in the city be  $x$  and  $(9000 - x)$  respectively.

$$\text{Then, } 105\% \text{ of } x + 108\% \text{ of } (9000 - x) = 9600$$

$$\Rightarrow \frac{21x}{20} + \frac{27}{25} (9000 - x) = 9600$$

$$\Rightarrow \frac{21x}{20} + 9720 - \frac{27x}{25} = 9600$$



$$\Rightarrow \frac{3x}{100} = 120 \Rightarrow x = \frac{120 \times 100}{3} = 4000.$$

$\therefore$  Number of men = 4000, Number of women = 5000.

Hence, required ratio = 4000 : 5000 = 4 : 5.

- 190.** Let the quantity of wine and water in the original mixture be  $3x$  and  $x$  litres only.

Total quantity of the mixture =  $(3x + x)$  litres =  $4x$  litres.

Let  $y$  litres of the mixture be replaced by water.

Quantity of wine in  $y$  litres of mixture =  $\left(\frac{3y}{4}\right)$  litres.

Quantity of water in  $y$  litres of mixture =  $\left(\frac{y}{4}\right)$  litres.

$$\therefore 3x - \frac{3y}{4} = x - \frac{y}{4} + y \Rightarrow 2x = \frac{3y}{2} \Rightarrow 4x = 3y.$$

$$\text{Required fraction} = \frac{y}{4x} = \frac{1}{3}.$$

- 191.** Let Sarika's and Gauri's ages one year ago be  $3x$  and  $4x$  years respectively.

Sarika's age 1 year hence =  $(3x + 2)$  years.

Gauri's age 1 year hence =  $(4x + 2)$  years.

$$\therefore \frac{3x+2}{4x+2} = \frac{10}{13} \Rightarrow 13(3x+2) = 10(4x+2)$$

$$\Rightarrow 39x + 26 = 40x + 20 \Rightarrow x = 6.$$

Hence, Sarika's present age =  $3x + 1$

$$= (3 \times 6 + 1) \text{ years} = 19 \text{ years}.$$

- 192.** Sum of ages of 3 boys =  $(25 \times 3)$  years = 75 years.

$\therefore$  Age of the youngest boy

$$= \left(75 \times \frac{3}{15}\right) \text{ years} = 15 \text{ years}.$$

- 193.** Let the number of 1-rupee, 50-paise and 25-paise coins be  $8x$ ,  $5x$  and  $3x$  respectively.

$$\text{Then, sum of their values} = \text{₹} \left( 8x + \frac{50 \times 5x}{100} + \frac{25 \times 3x}{100} \right)$$

$$= \text{₹} \left( 8x + \frac{5}{2}x + \frac{3}{4}x \right) = \text{₹} \left( \frac{45}{4}x \right).$$

$$\therefore \frac{45x}{4} = 112.50 \Rightarrow x = \frac{112.50 \times 4}{45} = 10.$$

So, number of 50-paise coins =  $5x = 50$ .

- 194.** Let the values of one-rupee, 50-paise and 25-paise coins be ₹  $2x$ , ₹  $3x$  and ₹  $5x$  respectively.

Then, number of one-rupee coins =  $2x$ ;

$$\text{number of 50-paise coins} = \frac{3x}{0.5} = 6x;$$

$$\text{number of 25-paise coins} = \frac{5x}{0.25} = 20x.$$

$$\therefore 2x + 6x + 20x = 420 \Leftrightarrow 28x = 420 \Leftrightarrow x = 15.$$

Hence, number of one-rupee coins =  $2 \times 15 = 30$ .

- 195.** Let the required consumption be  $x$  litres.

Clearly,  $1.5 \times 60 = 2 \times 45 = 3 \times 30 = 4.5 \times 20 = 6x$ .

$$\therefore 6x = 90 \Rightarrow x = 15.$$

- 196.**  $A \propto C$  and  $B \propto C \Rightarrow A = kC$  and  $B = mC$  for some constants  $k$  and  $m$

$$\therefore A + B = kC + mC = (k + m)C \Rightarrow (A + B) \propto C.$$

$$A - B = kC - mC = (k - m)C \Rightarrow (A - B) \propto C.$$

$$\sqrt{AB} = \sqrt{kC \times mC} = \sqrt{kmC^2} = \sqrt{km} \cdot C \Rightarrow \sqrt{AB} \propto C.$$

$$\frac{A}{B} = \frac{kC}{mC} = \frac{k}{m} = \text{constant}.$$

- 197.**  $x \propto \frac{1}{y}$  and  $y \propto z \Rightarrow x = \frac{k}{y}$  and  $y = mz$  for some constants  $k$  and  $m$ .

$$\therefore xz = \frac{k}{y} \times \frac{y}{m} = \frac{k}{m} = \text{constant}.$$

- 198.**  $h \propto t^2 \Rightarrow h = kt^2$  for some constant  $k$

$$\Rightarrow 64 = k \times 2^2 = 4k \Rightarrow k = 16.$$

Let the required height be  $x$  cm.

$$\text{Then, } x = 16 \times 6^2 = (16 \times 36) \text{ cm} = 576 \text{ cm}.$$

- 199.**  $y \propto (x + 3) \Rightarrow y = k(x + 3)$  for some constant  $k$ .

$$\text{When } y = 8, x = 1, y = k(x + 3) \Rightarrow 8 = k(1 + 3)$$

$$\Rightarrow k = 2.$$

$$\text{When } x = 2, y = 2(x + 3) = 2(2 + 3) = 2 \times 5 = 10.$$

- 200.** Rate of flow  $\propto \frac{1}{r^2} \Rightarrow$  Rate of flow

$$= \frac{k}{r^2} \text{ for some constant } k.$$

$$\therefore \text{Required ratio} = \frac{k}{1^2} : \frac{k}{2^2} = \frac{k}{1} : \frac{k}{4} = 1 : \frac{1}{4} = 4 : 1.$$

- 201.**  $y \propto \left(x + \frac{1}{x}\right) \Rightarrow y = kx + \frac{m}{x}$ , where  $k$  and  $m$  are constants.

$$\text{Then, } 4k + \frac{m}{4} = 6 \quad \dots(i)$$

$$\text{and } 3k + \frac{m}{3} = \frac{10}{3} \quad \dots(ii)$$

Multiplying (i) by 3 and (ii) by 4, we get :

$$12k + \frac{3m}{4} = 18 \quad \dots(iii)$$

$$\text{and } 12k + \frac{4m}{3} = \frac{40}{3} \quad \dots(iv)$$

Subtracting (iv) from (iii), we get :

$$\frac{3m}{4} - \frac{4m}{3} = 18 - \frac{40}{3} \Rightarrow -\frac{7m}{12} = \frac{14}{3} \Rightarrow m = -8.$$

$$\text{Putting } m = -8 \text{ in (i), we get : } 4k + \frac{(-8)}{4} = 6$$

$$\Rightarrow 4k = 8 \Rightarrow k = 2 \quad \therefore y = 2x - \frac{8}{x}.$$

- 202.**  $M \propto \frac{1}{N} \Rightarrow M = \frac{k}{N}.$

When  $M = 15$ ,  $N = -4$ .

$$\therefore 15 = \frac{k}{(-4)} \Rightarrow k = 15 \times (-4) = -60.$$

When  $M = -6$ ,  $N = A$ .

$$\therefore -6 = \frac{-60}{A} \Rightarrow A = \frac{-60}{-6} = 10.$$

When  $M = 2$ ,  $N = B$ .

$$\therefore 2 = \frac{-60}{B} \Rightarrow B = \frac{-60}{2} = -30.$$

When  $M = C$ ,  $N = 60$ .

$$\therefore C = \frac{-60}{60} = -1.$$

- 203.**  $S \propto R$  and  $T \propto \frac{1}{R} \Rightarrow S = kR$  and  $T = \frac{m}{R}$  for some constants  $k$  and  $m$ .

When  $R = 20$ ,  $S = 40$  and  $T = 10$ ,  $S = kR$

$$\Rightarrow 40 = 20k \Rightarrow k = 2.$$

$$\text{And, } T = \frac{m}{R} \Rightarrow 10 = \frac{m}{20} \Rightarrow m = 10 \times 20 = 200.$$

When  $S = 20$ , we have :  $20 = 2R$  or  $R = 10$ .

$$\text{And, } T = \frac{200}{R} = \frac{200}{10} = 20.$$

- 204.**  $x \propto \frac{1}{y} \Rightarrow x = \frac{k}{y}$ . When  $x = 12$ ,  $y = 9$ ,

$$k = xy = 12 \times 9 = 108.$$

Clearly,  $xy \neq 108$  for  $x = 24$ ,  $y = 18$ .

- 205.**  $I \propto \frac{1}{d^2} \Rightarrow I = \frac{k}{d^2}$  (where  $k$  is a constant)  $\Rightarrow k = Id^2$ .

$$\therefore I_{\text{new}} = \frac{k}{(3d)^2} = \frac{Id^2}{9d^2} = \frac{I}{9}.$$

- 206.** Let the number of boys and girls be  $3x$  and  $2x$  respectively. Then, number of boys and girls who are adults = 20% of  $3x$  + 25% of  $2x$

$$= \left( \frac{20}{100} \times 3x \right) + \left( \frac{25}{100} \times 2x \right) = \frac{3}{5}x + \frac{x}{2} = \frac{11x}{10}.$$

$\therefore$  Number of boys and girls who are not adults

$$= \left[ (3x + 2x) - \frac{11x}{10} \right] = 5x - \frac{11x}{10} = \frac{39x}{10}.$$

$$\text{Required percentage} = \left( \frac{39x}{10} \times \frac{1}{5x} \times 100 \right) \% = 78\%.$$

- 207.** Let the cost of the table and chair be ₹  $5x$  and ₹  $7x$  respectively.

$$\text{New cost of chair} = 120\% \text{ of } ₹ 7x = ₹ \left( \frac{6}{5} \times 7x \right) = ₹ \frac{42x}{5}.$$

$$\text{New cost of table} = 110\% \text{ of } ₹ 5x = ₹ \left( \frac{11}{10} \times 5x \right) = ₹ \frac{55x}{10}.$$

$$\therefore \text{New ratio} = \frac{55x}{10} : \frac{42x}{5} = 55 : 84.$$

- 208.** Let the number of students in schools  $A$ ,  $B$  and  $C$  be  $5x$ ,  $4x$  and  $7x$  respectively.

$$\text{New strength of school } A = 120\% \text{ of } 5x = \left( \frac{6}{5} \times 5x \right) = 6x.$$

$$\text{New strength of school } B = 125\% \text{ of } 4x = \left( \frac{5}{4} \times 4x \right) = 5x.$$

$$\text{New strength of school } C = 120\% \text{ of } 7x$$

$$= \left( \frac{6}{5} \times 7x \right) = \frac{42x}{5}.$$

$$\therefore \text{New ratio} = 6x : 5x : \frac{42x}{5} = 30 : 25 : 42.$$

- 209.** Let the original expenses on rice, fish and oil be ₹  $12x$ , ₹  $17x$  and ₹  $3x$  respectively.

New expense on rice = 120% of ₹  $12x$

$$= ₹ \left( \frac{6}{5} \times 12x \right) = ₹ \left( \frac{72x}{5} \right).$$

New expense on fish = 130% of ₹  $17x$

$$= ₹ \left( \frac{13}{10} \times 17x \right) = ₹ \left( \frac{221x}{10} \right).$$

$$\text{New expense on oil} = 150\% \text{ of } ₹ 3x = ₹ \left( \frac{3}{2} \times 3x \right) = ₹ \left( \frac{9x}{2} \right).$$

Total original expenses = ₹  $(12x + 17x + 3x) = ₹ (32x)$ .

$$\text{Total new expenses} = ₹ \left( \frac{72x}{5} + \frac{221x}{10} + \frac{9x}{2} \right) = ₹ (41x).$$

Increase in expenses = ₹  $(41x - 32x) = ₹ 9x$ .

$$\therefore \text{Increase \%} = \left( \frac{9x}{32x} \times 100 \right) \% = \frac{225}{8} \% = 28\frac{1}{8} \%.$$

- 210.** Let the earnings of  $A$  and  $B$  be ₹  $8x$  and ₹  $9x$  respectively.

$$\text{Then, } \frac{150\% \text{ of } 8x}{75\% \text{ of } 9x} = \frac{16}{9} \Rightarrow \frac{\frac{3}{2} \times 8x}{\frac{3}{4} \times 9x} = \frac{16}{9} \Rightarrow \frac{16}{9} = \frac{16}{9}.$$

Hence,  $A$ 's earnings cannot be determined.

- 211.** Let Mr. Sharma's expenditure be ₹  $3x$  and his savings be ₹  $2x$ .

$$\text{Income} = ₹ (3x + 2x) = ₹ 5x.$$

$$\text{Increased income} = 110\% \text{ of } ₹ 5x = ₹ 5.5x.$$

$$\text{Increased expenditure} = 112\% \text{ of } ₹ 3x = ₹ 3.36x.$$

$$\text{Increased savings} = ₹ (5.5x - 3.36x) = ₹ 2.14x.$$

$$\text{Increase in savings} = ₹ (2.14 - 2)x = ₹ 0.14x.$$

$$\therefore \text{Increase \%} = \left( \frac{0.14}{2x} \times 100 \right) \% = 7\%.$$

- 212.** Let the initial total weight of  $A$  and  $B$  be  $x$  kg.

$$\text{Then, } 125\% \text{ of } x = 80 \Rightarrow x = 80 \times \frac{100}{125} = 64 \text{ kg.}$$

$$A's \text{ initial weight} = \left( 64 \times \frac{3}{8} \right) \text{ kg} = 24 \text{ kg. } B's \text{ initial weight}$$

$$= \left( 64 \times \frac{5}{8} \right) \text{ kg} = 40 \text{ kg.}$$

$$A's \text{ new weight} = 120\% \text{ of } 24 \text{ kg} = 28.8 \text{ kg. } B's \text{ new weight} = (80 - 28.8) \text{ kg} = 51.2 \text{ kg.}$$

$$\text{Increase in } B's \text{ weight} = (51.2 - 40) \text{ kg} = 11.2 \text{ kg.}$$

$$\therefore \text{Increase \%} = \left( \frac{11.2}{40} \times 100 \right) \% = 28\%.$$

- 213.** Let the number of coins with Lalita, Palita and Salita in the end be  $24x$ ,  $21x$  and  $16x$  respectively.

Then, number of coins received by Lalita, Palita and Salita from their mother are  $(24x + 50)$ ,  $(21x + 85)$  and  $(16x + 39)$  respectively.

So,  $(24x + 50) + (21x + 85) + (16x + 39) = 3224$   
 $\Rightarrow 61x = 3050 \Rightarrow x = 50$ .

Hence, number of coins received by Lalita from her mother  
 $= (24 \times 50 + 50) = 1250$ .

- 214.** Let the number of revolutions made by the larger wheel be  $x$ .

Then,  $6 : 14 :: x : 21$  or  $14x$

$$= 6 \times 21 \text{ or } x = \frac{6 \times 21}{14} = 9.$$

- 215.** Let the capacity of each glass be  $z$ .

Let  $x$  and  $y$  denote the quantities of milk in glasses of Seeta and Geeta respectively.

$$\text{Then, } x + \frac{1}{2}y = z \quad \dots(i)$$

$$\text{and } y + \frac{1}{4}x = z \quad \dots(ii)$$

$$\text{So, } x + \frac{1}{2}y = y + \frac{1}{4}x \Rightarrow \frac{3}{4}x = \frac{1}{2}y \Rightarrow \frac{x}{y} = \frac{1}{2} \times \frac{4}{3} = \frac{2}{3}.$$

Hence, required ratio =  $2 : 3$ .

- 216.** Let the area of earth be  $x$ .

$$\text{Then, area of land on earth} = \frac{x}{3};$$

$$\text{area of water on earth} = \frac{2x}{3}.$$

$$\text{Area of Northern Hemisphere} = \frac{x}{2}.$$

$$\text{Area of land in Northern Hemisphere} = \left(\frac{x}{2} \times \frac{2}{5}\right) = \frac{x}{5}.$$

$$\text{Area of water in Northern Hemisphere} = \left(\frac{x}{2} \times \frac{3}{5}\right) = \frac{3x}{10}.$$

$$\text{Area of land in Southern Hemisphere} = \left(\frac{x}{3} - \frac{x}{5}\right) = \frac{2x}{15}.$$

$$\text{Area of water in Southern Hemisphere} = \left(\frac{2x}{3} - \frac{3x}{10}\right) = \frac{11x}{30}.$$

$$\therefore \text{Required ratio} = \frac{2x}{15} : \frac{11x}{30} = 4 : 11.$$

- 217.** Let the volume of each small piece be  $x$  cu . units.

Then, original volume of the diamond =  $(8x)$  cu . units.

Original price of the diamond =  $k \times (8x)^3 = 512kx^3$ ,  
 where  $k$  is a constant.

$$512kx^3 = 1000000 \Rightarrow kx^3 = \frac{1000000}{512}.$$

Price of each smaller piece =  $kx^3$ .

Total price of the 8 pieces =  $8kx^3$ .

$$\therefore \text{Loss in value} = (512kx^3 - 8kx^3) = 504kx^3$$

$$= 504 \times \frac{1000000}{512} = 984375.$$

- 218.** Let the share of a man, a woman and a boy be ₹  $3x$ , ₹  $2x$  and ₹  $x$  respectively.

Then,  $2 \times 3x + 5 \times 2x + 8 \times x = 720$

$$\Rightarrow 24x = 720 \Rightarrow x = 30.$$

Hence, share of each boy = ₹ 30.

- 219.** Let the first amount be ₹  $x$ . Then, second amount = ₹  $(2x)$ .

$$A's \text{ share} = ₹ \left( \frac{4}{10} \times x + \frac{5}{26} \times 2x \right) = ₹ \left( \frac{4x}{10} + \frac{5x}{13} \right) = ₹ \left( \frac{102x}{130} \right).$$

$$B's \text{ share} = ₹ \left( \frac{3}{10} \times x + \frac{6}{26} \times 2x \right) = ₹ \left( \frac{3x}{10} + \frac{6x}{13} \right) = ₹ \left( \frac{99x}{130} \right).$$

$$C's \text{ share} = ₹ \left( \frac{2}{10} \times x + \frac{7}{26} \times 2x \right) = ₹ \left( \frac{2x}{10} + \frac{7x}{13} \right) = ₹ \left( \frac{96x}{130} \right).$$

$$D's \text{ share} = ₹ \left( \frac{1}{10} \times x + \frac{8}{26} \times 2x \right) = ₹ \left( \frac{x}{10} + \frac{8x}{13} \right) = ₹ \left( \frac{93x}{130} \right).$$

Clearly,  $A$  got the maximum amount.

- 220.** Let the number of females be  $x$ .

$$\text{Then, } \frac{160 \times 4}{3x} = \frac{16}{21} \Rightarrow 48x = 160 \times 4 \times 21$$

$$\Rightarrow x = \frac{160 \times 4 \times 21}{48} = 280.$$

- 221.** Total money received by men = ₹  $\left( 180 \times \frac{5}{9} \right)$  = ₹ 100.

$$\text{Total money received by women} = ₹ \left( 180 \times \frac{4}{9} \right) = ₹ 80.$$

Let the number of men be  $x$ .

Then, number of women =  $66 - x$ .

Money received by each man = ₹  $\left( \frac{100}{x} \right)$ . Money received

by each woman = ₹  $\left( \frac{80}{66 - x} \right)$ .

$$\therefore \frac{100}{x} \times \frac{(66 - x)}{80} = \frac{3}{2} \Rightarrow 10(66 - x) = 12x$$

$$\Rightarrow 22x = 660 \Rightarrow x = 30.$$

- 222.** Let the man's original expenditure on foodgrains and other items be ₹  $2x$  and ₹  $5x$  respectively.

Then, total original expenditure = ₹  $(2x + 5x)$  = ₹  $7x$ .

Total new expenditure = ₹  $(110\% \text{ of } 2x + 115\% \text{ of } 5x)$

$$= ₹ \left( \frac{110}{100} \times 2x + \frac{115}{100} \times 5x \right) = ₹ \left( \frac{11x}{5} + \frac{23x}{4} \right)$$

$$= ₹ \left( \frac{159x}{20} \right).$$

Ratio of increased expenditure to original expenditure

$$= \frac{159x}{20} \times \frac{1}{7x} = \frac{159}{140}.$$

$$\therefore \text{Required salary} = ₹ \left( \frac{159}{140} \times 3500 \right) = ₹ 3975.$$

Desired increase in salary = ₹  $(3975 - 3500)$  = ₹ 475.

- 223.** Let the full marks for each paper be  $x$ .

Let the marks obtained in the five papers be  $6y$ ,  $7y$ ,  $8y$ ,  $9y$  and  $10y$  respectively.

$$\text{Then, } \frac{6y + 7y + 8y + 9y + 10y}{5x} = \frac{60}{100}$$

$$\Rightarrow \frac{40y}{5x} = \frac{3}{5} \Rightarrow 40y = 3x \Rightarrow x = \frac{40}{3}y$$

$$50\% \text{ of } x = \left( \frac{50}{100} \times \frac{40}{3} y \right) = \frac{20y}{3} = 6\frac{2}{3}y.$$

Clearly, the student got more than 50% marks in each of the last 4 papers.

- 224.** Let the number of visitors on the three days be  $2x$ ,  $5x$  and  $13x$  respectively.

Then, total charges collected on three days

$$= ₹ (15 \times 2x + 7.50 \times 5x + 2.50 \times 13x) \\ = ₹ (30x + 37.50x + 32.50x) = ₹ (100x).$$

$\therefore$  Average charge per person

$$= ₹ \left( \frac{100x}{2x + 5x + 13x} \right) = ₹ \left( \frac{100x}{20x} \right) = ₹ 5.$$

- 225.** Let the number of passengers travelling in A.C. sleeper class, first class and sleeper class be  $x$ ,  $2x$  and  $3x$  and let their fares be  $5y$ ,  $4y$  and  $2y$  respectively.

$$\text{Then, } x \times 5y + 2x \times 4y + 3x \times 2y = 45600$$

$$\Rightarrow 5xy + 8xy + 6xy = 45600 \Rightarrow 19xy = 45600$$

$$\Rightarrow xy = 2400.$$

$\therefore$  Income from A.C. sleeper class =  $5xy$

$$= ₹ (5 \times 2400) = ₹ 12000.$$

- 226.** Let the initial fares of 1st, 2nd and 3rd class be ₹  $8x$ , ₹  $6x$  and ₹  $3x$  respectively.

$$\text{Revised fare of 1st class} = \frac{5}{6} \text{ of } ₹ 8x = ₹ \left( \frac{20x}{3} \right).$$

$$\text{Revised fare of 2nd class} = \frac{11}{12} \text{ of } ₹ 6x = ₹ \left( \frac{11x}{2} \right).$$

Let the number of passengers of 1st, 2nd and 3rd class be  $9y$ ,  $12y$  and  $26y$  respectively.

$$\text{Then, } \frac{20x}{3} \times 9y + \frac{11x}{2} \times 12y + 3x \times 26y = 1088$$

$$\Rightarrow 60xy + 66xy + 78xy = 1088 \Rightarrow 204xy = 1088$$

$$\Rightarrow xy = \frac{1088}{204} = \frac{16}{3}.$$

$\therefore$  Collection from passengers of 1st class =  $60xy$

$$= ₹ \left( 60 \times \frac{16}{3} \right) = ₹ 320.$$

- 227.** Let the daily wage of a man, a woman and a boy be ₹  $4x$ , ₹  $3x$  and ₹  $2x$  respectively.

$$\text{Then, } 15 \times 4x + 18 \times 3x + 12 \times 2x = 2070$$

$$\Rightarrow 60x + 54x + 24x = 2070$$

$$\Rightarrow 138x = 2070 \Rightarrow x = 15.$$

$\therefore$  Daily wages of 1 man, 2 women and 3 boys

$$= ₹ (4x + 2 \times 3x + 3 \times 2x)$$

$$= ₹ (4x + 6x + 6x) = ₹ 16x$$

$$= ₹ (16 \times 15) = ₹ 240.$$

- 228.** Let the initial number of employees be  $9x$  and their wages be ₹  $14y$ .

Then, reduced number of employees =  $8x$ . And, increased wages = ₹  $15y$ .

$$\text{Original wage bill} = ₹ (9x \times 14y) = ₹ (126xy).$$

$$126xy = 1890 \Rightarrow xy = \frac{1890}{126} = 15.$$

$$\text{New wage bill} = ₹ (8x \times 15y) = ₹ (120xy)$$

$$= ₹ (120 \times 15) = ₹ 1800.$$

$$\text{Required difference} = ₹ (1890 - 1800) = ₹ 90.$$

- 229.** Let the salaries of A and B last year be ₹  $3x$  and ₹  $4x$  respectively.

$$\text{Then, A's present salary} = ₹ \left( \frac{5}{4} \times 3x \right) = ₹ \left( \frac{15x}{4} \right).$$

$$\text{B's present salary} = ₹ \left( \frac{3}{2} \times 4x \right) = ₹ 6x.$$

$$\therefore \frac{15x}{4} + 6x = 4160 \Rightarrow 39x = 4160 \times 4 \Rightarrow x = \frac{4160 \times 4}{39}.$$

$$\text{So, A's present salary} = ₹ \left( \frac{15}{4} \times \frac{4160 \times 4}{39} \right) = ₹ 1600.$$

- 230.** Suppose the man ordered  $x$  pairs of brown socks.

Let the price of a brown pair be ₹  $y$ . Then, price of a black pair = ₹  $(2y)$ .

$$\text{Original bill} = ₹ (4 \times 2y + xy) = ₹ (8y + xy).$$

$$\text{Changed bill} = ₹ (4y + x \times 2y) = ₹ (4y + 2xy).$$

$$\therefore (4y + 2xy) = 150\% \text{ of } (8y + xy)$$

$$\Leftrightarrow 4y + 2xy = \frac{3}{2} (8y + xy)$$

$$\Leftrightarrow 8y + 4xy = 24y + 3xy$$

$$\Leftrightarrow xy = 16y \Leftrightarrow x = 16.$$

$$\therefore \text{Required ratio} = 4 : 16 = 1 : 4.$$

- 231.** Gold in C =  $\left( \frac{7}{9} + \frac{7}{18} \right)$  units =  $\frac{7}{6}$  units.

$$\text{Copper in C} = \left( \frac{2}{9} + \frac{11}{18} \right) \text{ units} = \frac{5}{6} \text{ units.}$$

$$\therefore \text{Gold : Copper} = \frac{7}{6} : \frac{5}{6} = 7 : 5.$$

- 232.** Zinc in first alloy =  $\frac{2}{3}$  units;

$$\text{Zinc in second alloy} = \frac{4}{5} \text{ units.}$$

$$\text{Copper in first alloy} = \frac{1}{3} \text{ units;}$$

$$\text{Copper in second alloy} = \frac{1}{5} \text{ units.}$$

Let the first and second alloys be mixed in the ratio  $1 : y$ .

$$\text{Then, } \frac{\frac{2}{3} + \frac{4y}{5}}{\frac{1}{3} + \frac{y}{5}} = \frac{3}{1} \Rightarrow 10 + 12y = 3(5 + 3y)$$

$$\Rightarrow 10 + 12y = 15 + 9y \Rightarrow 3y = 5 \Rightarrow y = \frac{5}{3}.$$

$$\therefore \text{Required ratio} = 1 : \frac{5}{3} = 3 : 5.$$

- 233.** Milk in A =  $\frac{5}{8}$  units; Milk in B =  $\frac{2}{5}$  units.

$$\text{Water in A} = \frac{3}{8} \text{ units; Water in B} = \frac{3}{5} \text{ units.}$$

Let the mixtures in A and B be taken in the ratio 1 : y.

$$\text{Then, } \frac{5}{8} + \frac{2y}{5} = \frac{3}{8} + \frac{3y}{5} \Rightarrow 25 + 16y = 15 + 24y$$

$$\Rightarrow 8y = 10 \Rightarrow y = \frac{5}{4}.$$

$$\therefore \text{ Required ratio} = 1 : \frac{5}{4} = 4 : 5.$$

**234.** Milk in 1st glass =  $\frac{1}{2}$  unit; Milk in 2nd glass =  $\frac{3}{4}$  unit.

$$\text{Water in 1st glass} = \frac{1}{2} \text{ unit;}$$

$$\text{Water in 2nd glass} = \frac{1}{4} \text{ unit.}$$

$$\therefore \text{ Required ratio} = \frac{\frac{1}{2} + \frac{3}{4}}{\frac{1}{2} + \frac{1}{4}} = \frac{5}{4} \times \frac{4}{3} = 5 : 3.$$

**235.** Milk in the mixture =  $\left(\frac{3}{5} + \frac{7}{10} + \frac{11}{15}\right)$  units =  $\frac{61}{30}$  units.

$$\text{Water in the mixture} = \left(\frac{2}{5} + \frac{3}{10} + \frac{4}{15}\right) \text{ units} = \frac{29}{30} \text{ units.}$$

$$\therefore \text{ Required ratio} = \frac{61}{30} : \frac{29}{30} = 61 : 29.$$

**236.** Let the containers A, B and C contain 5x, 4x and 5x litres of mixtures respectively.

$$\text{Milk in A} = \left(5x \times \frac{1}{6}\right) \text{ litres} = \frac{5x}{6} \text{ litres;}$$

$$\text{Water in A} = \left(5x - \frac{5x}{6}\right) \text{ litres} = \frac{25x}{6} \text{ litres.}$$

$$\text{Milk in B} = \left(4x \times \frac{3}{8}\right) \text{ litres} = \frac{3x}{2} \text{ litres;}$$

$$\text{Water in B} = \left(4x - \frac{3x}{2}\right) \text{ litres} = \frac{5x}{2} \text{ litres.}$$

$$\text{Milk in C} = \left(5x \times \frac{5}{12}\right) \text{ litres} = \frac{25x}{12} \text{ litres;}$$

$$\text{Water in C} = \left(5x - \frac{25x}{12}\right) \text{ litres} = \frac{35x}{12} \text{ litres.}$$

$$\begin{aligned} \text{Total milk in final mixture} &= \left(\frac{5x}{6} + \frac{3x}{2} + \frac{25x}{12}\right) \text{ litres} \\ &= \left(\frac{53x}{12}\right) \text{ litres.} \end{aligned}$$

$$\begin{aligned} \text{Total water in final mixture} &= \left(\frac{25x}{6} + \frac{5x}{2} + \frac{35x}{12}\right) \text{ litres} \\ &= \left(\frac{115x}{12}\right) \text{ litres.} \end{aligned}$$

$$\therefore \text{ Required ratio of milk and water} = \frac{53x}{12} : \frac{115x}{12} = 53 : 115.$$

**237.** Milk in 1st glass =  $\frac{1}{2}$  unit; Milk in second glass =  $\frac{2}{3}$  unit;

$$\text{Milk in 3rd glass} = \frac{3}{4} \text{ unit;}$$

$$\text{Water in 1st glass} = \frac{1}{2} \text{ unit;}$$

$$\text{Water in second glass} = \frac{1}{3} \text{ unit;}$$

$$\text{Water in 3rd glass} = \frac{1}{4} \text{ unit.}$$

$$\therefore \text{ Required ratio} = \frac{\frac{1}{2} + \frac{2}{3} + \frac{3}{4}}{\frac{1}{2} + \frac{1}{3} + \frac{1}{4}} = \frac{6+8+9}{6+4+3} = \frac{23}{13}.$$

**238.** Gold in new coins =  $\left(\frac{2}{3} + 2 \times \frac{3}{8} + 3 \times \frac{7}{12}\right)$  units  
 $= \left(\frac{2}{3} + \frac{3}{4} + \frac{7}{4}\right) \text{ units} = \frac{19}{6} \text{ units.}$

$$\begin{aligned} \text{Silver in new coins} &= \left(\frac{1}{3} + 2 \times \frac{5}{8} + 3 \times \frac{5}{12}\right) \text{ units} \\ &= \left(\frac{1}{3} + \frac{5}{4} + \frac{5}{4}\right) \text{ units} = \frac{17}{6} \text{ units.} \end{aligned}$$

$$\therefore \text{ Required ratio} = \frac{19}{6} : \frac{17}{6} = 19 : 17.$$

**239.** Let 5 kg of the first variety be mixed with 4 kg of second variety.

$$\text{Then, C.P. of 9 kg of tea} = ₹ (20 \times 5 + 25 \times 4) = ₹ 200.$$

$$\text{S.P. of 9 kg of tea} = ₹ (23 \times 9) = ₹ 207.$$

$$\text{Profit} = ₹ (207 - 200) = ₹ 7.$$

$$\therefore \text{ Profit \%} = \left(\frac{7}{200} \times 100\right) \% = 3.5\%.$$

**240.** Let the quantities of the three varieties taken be x kg, x kg and 2x kg respectively.

$$\text{Let the cost of the third variety be ₹ y per kg.}$$

$$\text{Then, } 126x + 135x + 2xy = 153(x + x + 2x)$$

$$\Leftrightarrow 261x + 2xy = 612x$$

$$\Leftrightarrow 2y = 612 - 261 = 351$$

$$\Leftrightarrow y = 175.50.$$

**241.** Let the weights of the three varieties be 12x, 15x and 20x kg respectively.

$$\begin{aligned} \text{Then, total C.P.} &= ₹ (100 \times 12x + 80 \times 15x + 60 \times 20x) \\ &= ₹ (3600x). \end{aligned}$$

$$\text{Total S.P.} = ₹ (3600x).$$

$$\text{S.P. of the first two varieties} = ₹ \left(\frac{120}{100} \times 2400x\right) = ₹ (2880x).$$

$$\text{S.P. of the third variety} = ₹ (3600x - 2880x) = ₹ 720x.$$

$$\text{Loss on third variety} = ₹ (1200x - 720x) = ₹ 480x.$$

$$\text{Loss \%} = \left(\frac{480x}{1200x} \times 100\right) \% = 40\%.$$

**242.** Clearly, x = 50 litres, y = 10 litres, n = 2.

$$\text{Quantity of milk in the final mixture}$$

$$= \left[50 \left(1 - \frac{10}{50}\right)^2\right] \text{ litres} = \left[50 \times \left(\frac{4}{5}\right)^2\right] \text{ litres}$$

$$= \left(50 \times \frac{16}{25}\right) \text{ litres} = 32 \text{ litres.}$$

Quantity of water in the final mixture =  $(50 - 32)$  litres  
= 18 litres.

$\therefore$  Required ratio =  $18 : 32 = 9 : 16$ .

- 243.** Let the original quantity of the wine be  $x$  litres.  
Then,  $y = 8$ ,  $n = 4$ .

$$\begin{aligned}\text{Quantity of wine in the final mixture} &= \left[ x \left( 1 - \frac{8}{x} \right)^4 \right] \text{ litres} \\ &= \frac{x(x-8)^4}{x^4} \text{ litres.}\end{aligned}$$

$$\begin{aligned}\text{Quantity of water in the final mixture} &= \left[ x - \frac{x(x-8)^4}{x^4} \right] \\ \text{litres} &= \left[ \frac{x^5 - x(x-8)^4}{x^4} \right] \text{ litres.}\end{aligned}$$

$$\begin{aligned}\therefore \frac{x(x-8)^4}{x^5 - x(x-8)^4} &= \frac{16}{65} \Rightarrow 65x(x-8)^4 \\ &= 16x^5 - 16x(x-8)^4 \\ \Rightarrow 81x(x-8)^4 &= 16x^5 \\ \Rightarrow (x-8)^4 &= \frac{16}{81}x^4 = \left(\frac{2}{3}\right)^4 x^4 \Rightarrow x-8 = \frac{2}{3}x \Rightarrow \frac{x}{3} = 8 \\ \Rightarrow x &= 24.\end{aligned}$$

- 244.**  $G = 19$  W and  $C = 9$  W.

Let 1 gm of gold be mixed with  $x$  gm of copper to get  $(1+x)$  gm of the alloy.

(1 gm gold) + ( $x$  gm copper) =  $(x+1)$  gm of alloy

$$\Leftrightarrow 19W + 9Wx = (x+1) \times 15W$$

$$\Leftrightarrow 19 + 9x = 15(x+1)$$

$$\Leftrightarrow 6x = 4 \Leftrightarrow x = \frac{2}{3}.$$

$$\therefore \text{Ratio of gold and copper} = 1 : \frac{2}{3} = 3 : 2.$$

- 245.** Ratio of time taken =  $\frac{1}{5} : \frac{1}{4} : \frac{1}{6} = 12 : 15 : 10$ .

- 246.** L.C.M. of 2, 3, 4, 5, 7 = 420.

$$\begin{aligned}\text{Given ratio} &= \frac{1}{2} : \frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{7} \\ &= \left(\frac{1}{2} \times 420\right) : \left(\frac{1}{3} \times 420\right) : \left(\frac{1}{4} \times 420\right) : \left(\frac{1}{5} \times 420\right) : \left(\frac{1}{7} \times 420\right) \\ &= 210 : 140 : 105 : 84 : 60 \\ \therefore \text{Required minimum amount} &= \text{Sum of ratio terms} \\ &= ₹ (210 + 140 + 105 + 84 + 60) = ₹ 599.\end{aligned}$$

- 247.** Let the incomes of A, B and C be ₹  $7x$ , ₹  $10x$  and ₹  $12x$  respectively and their expenses be ₹  $8y$ , ₹  $10y$  and ₹  $15y$  respectively.

$$\text{Then, } 7x - 8y = \frac{1}{5} \times 7x$$

$$\Rightarrow 8y = 7x - \frac{7x}{5} = \frac{28x}{5}$$

$$\Rightarrow 28x = 40y \Rightarrow \frac{x}{y} = \frac{40}{28} = \frac{10}{7}.$$

Let  $x = 10t$  and  $y = 7t$ .

$$\begin{aligned}\text{Then, B's saving} &= ₹ (10x - 10y) = ₹ [10(x-y)] \\ &= ₹ [10(10t - 7t)] = ₹ (30t).\end{aligned}$$

$$\text{C's saving} = ₹ (12x - 15y) = ₹ (120t - 105t) = ₹ (15t).$$

$$\therefore \text{Required percentage} = \left( \frac{30t - 15t}{15t} \times 100 \right) \% = 100\%.$$

- 248.** Let the present ages of the mother, son and father be  $11x$ ,  $5x$  and  $y$  years respectively.

Then, the son will become as old as his mother is now, after  $(11x - 5x) = 6x$  years.

After  $6x$  years, father's age =  $(y + 6x)$  years; mother's age =  $(11x + 6x)$  years =  $17x$  years.

$$\therefore \frac{y + 6x}{17x} = \frac{19}{17} \Rightarrow y + 6x = 19x \Rightarrow y = 13x.$$

Again, the son will become as old as his father is now, after  $(y - 5x) = (13x - 5x) = 8x$  years.

After  $8x$  years, father's age =  $(y + 8x)$  years =  $21x$  years; son's age =  $(5x + 8x)$  years =  $13x$  years.

$$\therefore 21x + 13x = 170 \Rightarrow 34x = 170 \Rightarrow x = 5.$$

Hence, father's present age =  $y = 13x = (13 \times 5)$  years = 65 years.

$$\text{249. } ad = \frac{ab \times cd}{bc} = \frac{1 \times 6}{(1/2)} = 12.$$

$$be = \frac{bc \times de}{cd} = \frac{\frac{1}{2} \times 2}{6} = \frac{1}{6}.$$

$$cf = \frac{cd \times ef}{de} = \frac{6 \times \frac{1}{2}}{2} = \frac{3}{2}.$$

$$\therefore ad : be : cf = 12 : \frac{1}{6} : \frac{3}{2} = 72 : 1 : 9.$$

- 250.** Let the C.P. of the articles be ₹  $x$ , ₹  $2x$  and ₹  $3x$  respectively and the number of articles of each type sold be  $3y$ ,  $2y$  and  $y$  respectively. Then,

$$\text{Total C.P.} = ₹ (x \times 3y + 2x \times 2y + 3x \times y) = ₹ (10xy).$$

$$\begin{aligned}\text{Total S.P.} &= ₹ \left( \frac{110}{100} \times x \times 3y + \frac{120}{100} \times 2x \times 2y + \frac{130}{100} \times 3x \times y \right) \\ &= ₹ \left( \frac{33xy}{10} + \frac{48xy}{10} + \frac{39xy}{10} \right) = ₹ (12xy).\end{aligned}$$

$$\therefore \text{Net gain \%} = \left( \frac{2xy}{10xy} \times 100 \right) \% = 20\%.$$

- 251.** Let the monthly salaries of Rene and Som be  $5a$  and  $3a$  respectively

Money spent by Rene

$$= \left( \frac{1}{6} \text{ of } 5a + \frac{1}{5} \text{ of } 5a + 30\% \text{ of } 5a + 25\% \text{ of } 5a \right)$$

According to given information

$$\Rightarrow 5a - \left[ 5a \times \frac{1}{6} + 5a \times \frac{1}{5} + 5a \times \frac{3}{10} + \frac{5a}{4} \right] = 5000$$

$$\Rightarrow 5a - \left[ \frac{5a}{6} + a + \frac{3a}{2} + \frac{5a}{4} \right] = 5000$$

$$\Rightarrow 5a - \left( \frac{55a}{12} \right) = 5000$$

$$\Rightarrow 60a - 55a = 60000 \Rightarrow a = 12000$$

$$\therefore \text{Som's salary} = 3 \times 12000 = ₹ 36000$$

252. Let third proportional be  $x$

$$\Rightarrow 25 : 30 :: 30 : x$$

$$\Rightarrow 25 \times x = 30 \times 30$$

$$\Rightarrow x = \frac{30 \times 30}{25} = 36$$

253. Ratio of syrup and water in the mixture = 3 : 1

$$\text{Quantity of syrup} = \frac{3}{4}$$

$$\text{Quantity of water} = \frac{1}{4}$$

$$\text{Percentage of syrup} = \frac{3}{4} \times 100 = 75\%$$

254.  $a^2 + b^2 + c^2 - ab - bc - ca = 0 \dots (i)$

Multiple equation (i) by 2 we get

$$\Rightarrow 2a^2 + 2b^2 + 2c^2 - 2ab - 2bc - 2ca = 0$$

$$\Rightarrow (a^2 + b^2 - 2ab) + (b^2 + c^2 - 2bc) + (c^2 + a^2 - 2ca) = 0$$

$$\left\{ \because (a+b)^2 = a^2 + b^2 + 2ab \right\}$$

$$\Rightarrow (a-b)^2 + (b-c)^2 + (c-a)^2 = 0$$

[If  $x^2 + y^2 + z^2 = 0$  then  $x = 0, y = 0, z = 0$ ]

$$\therefore a - b = 0 \Rightarrow a = b$$

$$b - c = 0 \Rightarrow b = c$$

$$c - a = 0 \Rightarrow c = a$$

$$\therefore a = b = c$$

$$\therefore a : b : c = 1 : 1 : 1$$

255. Let the first number be  $x$  and second number be  $y$

According to the question, 80% of  $x = \frac{4}{5}$  of  $y$

$$\Rightarrow \frac{80 \times x}{100} = \frac{4 \times y}{5}$$

$$\Rightarrow \frac{4x}{5} = \frac{4y}{5}$$

$$\Rightarrow x : y = 1 : 1$$

256. Statement I

Let the population of males and females in city be  $27x$  and  $23x$  respectively and given

$$27x - 23x = 100000$$

$$4x = 100000$$

$$x = 25000$$

$$\text{Population of males in city A} = 25000 \times 27 = 675000$$

$$\text{Population of females in city A} = 25000 \times 23 = 575000$$

$$\text{Total population} = 12,50,000$$

Statement II

$$\text{Population of A} = \frac{80}{100} \text{ of city B}$$

Difference between the population of A and B

$$\Rightarrow B - A = 3,12,500$$

$$B \times \frac{20}{100} = 3,12,500$$

$$B's \text{ population} = 15,62,500$$

$$A's \text{ population} = 12,50,000$$

The data in statement I alone or in statement II alone are sufficient to answer the question.

Hence statement C is correct.

257. Number of students participated in marathon = 208

Number of boys students participated in marathon = 124

According to given information  $\frac{4}{7}$  th of boys = 124

$$\text{Total boys} = \frac{124 \times 7}{4} = 217$$

Let total number of girls in school be  $x$ , Number of girls participated in marathon =  $208 - 124 = 84$

Number of girls

$$\therefore \frac{6}{11} \text{ of } x = 84$$

$$\Rightarrow x = \frac{84 \times 11}{6} = 154$$

Total students in school

$$= 217 + 154 = 371$$

258. Let the monthly salary of Pia and Som be  $5a$  and  $4a$  respectively.

Then money given by Pia to her mother =  $5a \times \frac{3}{5} = 3a$

Money given by Pia as sister's tuition fees

$$= 15\% \text{ of } 5a = \frac{15 \times 5a}{100} = \frac{75a}{100} = 0.75a$$

Money given by Pia towards loan

$$= 18\% \text{ of } 5a = \frac{18 \times 5a}{100} = \frac{90a}{100} = 0.9a$$

$$\therefore \text{Total money given} = 3a + 0.75a + 0.90a = 4.65a$$

$$\therefore \text{Remaining amount} = 5a - 4.65 = 0.35a$$

Pia have remaining amount = ₹ 2100

$$0.35a = 2100$$

$$\therefore \frac{35a}{100} = 2100$$

$$\Rightarrow a = \frac{2100 \times 100}{35}$$

$$a = ₹ 6000$$

$$\therefore \text{Monthly salary of Som} = 4a = 4 \times 6000 = ₹ 24000$$

259. Working hours of Smita = 6 hours

Working hours of Kajal = 7 hours 30 minutes =  $1\frac{1}{2}$  hours.

$$\text{Required ratio} = 6 : 7\frac{1}{2} = 6 : \frac{15}{2}$$

$$= 12 : 15 = 4 : 5$$

260. Ratio of the number of 50 paise, 25 paise and 10 paise coins. = 5 : 8 : 3

$$\text{Ratio of their values} = \frac{5}{2} : \frac{8}{4} : \frac{3}{10}$$

LCM of 2, 4 and 10 = 20

$$= \left( \frac{5}{2} \times 20 \right) : \left( \frac{8}{4} \times 20 \right) : \left( \frac{3}{10} \times 20 \right) = 50 : 40 : 6$$

Sum of the terms of ratio =  $50 + 40 + 6 = 96$

$$\therefore \text{Value of 50 paise coins} = \frac{50}{96} \times 144 = 75$$

$$\therefore \text{Number of 50 paise coins} = 75 \times 2 = 150$$



261. ₹ 1 = 100 paisa

₹ 4 = 400 paisa

Required ratio

= 50 paisa : 400 paisa

= 1 : 8

262. Quantity of water in bottle = 2 liters

Part of water drank by Raj =  $\frac{1}{4}$  part

Part of water drank by Suraj =  $\frac{3}{4}$  part

Water taken by Suraj =  $\frac{3}{4} \times 2 = 1.5$  liters.

263. Given  $\frac{7}{5}$  of 58 +  $\frac{3}{8}$  of 139.2 = ?

$\frac{7}{5} \times 58 + \frac{3}{8} \times 139.2$

= 81.2 + 52.2 = 133.4

264. Given  $\frac{3}{7}$  of  $\frac{5}{4}$  of 3024 = ?

$\frac{3}{7} \times \frac{5}{4} \times 3024 = 1620$

265. Let the number of spectators on Monday, Tuesday and Wednesday be  $2p$ ,  $3p$  and  $5p$ , respectively.

Let the price charged on Monday, Tuesday and Wednesday be  $2q$ ,  $3q$  and  $4q$  respectively.

According to the question.

$4q \times 5p \times 3p = 8800$

$20pq - 9pq = 8800$

$\Rightarrow 11pq = 8800$

$\Rightarrow pq = 800$

Now, total amount earned on all three days

=  $4pq + 9pq + 20pq$

=  $4 \times 800 + 9 \times 800 + 20 \times 800$

= ₹ (3200 + 7200 + 16000)

= ₹ 26400

## EXERCISE

### (DATA SUFFICIENCY TYPE QUESTIONS)

**Directions (Questions 1 to 15):** Each of the questions below consists of a statement and/or a question and two statements labelled I and II given below it. You have to decide whether the data provided in the statements is/are sufficient to answer the question. Read both the statements and

Give answer (a) if the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient to answer the question;

Give answer (b) if the data in Statement II alone are sufficient to answer the question, while the data in Statement I alone are not sufficient to answer the question;

Give answer (c) if the data either in Statement I or in Statement II alone are sufficient to answer the question;

Give answer (d) if the data even in both Statements I and II together are not sufficient to answer the question; and

Give answer (e) if the data in both Statements I and II are necessary to answer the question.

1. What is the value of the ratio  $p : q$ ?

I.  $3p = 2q$

II.  $2p + q = 6$

2. What is the value of  $x + y : x - y$ ?

I.  $x : y = 1 : 2$

II.  $x = \frac{y}{2}$  and  $y - x = 3$

3. Rohan and Sachin together earn ₹ 14000 per month. How much does Rohan earn?

I. Their salaries are in the ratio 3 : 4.

II. Sachin earns ₹ 2000 per month more than Rohan.

4. What is the value of  $a$ ?

I. Ratio of  $a$  and  $b$  is 3 : 5, where  $b$  is positive.

II. Ratio of  $2a$  and  $b$  is 12 : 10, where  $a$  is positive.

5. What was the ratio between the ages of  $P$  and  $R$  four years ago?

I. The ratio between the present ages of  $P$  and  $Q$  is 3 : 4.

II. The ratio between the present ages of  $Q$  and  $R$  is 4 : 5.

6. What is the present age of the mother? (M.A.T., 2007)

I. Father's age is 8 years more than the mother's age. Father got married at the age of 28 years.

II. Present age of the father is 30 years. Four years back the ratio of mother's age to father's age was 12 : 13.

7. How many boys are there in the class? (M.A.T., 2007)

I. The class has 45 children in all and ratio of boys to girls is 4 : 5.

II. The ratio of girls to boys is 4 : 5 and boys are nine more than the girls.

8. Is  $x^2 : y^2 < 1$ ?

(M.A.T., 2006)

I.  $(y - x)(x + y) = 40\%$  of 60 – 120% of 20

II.  $x < y$

9. Vipin's and Javed's salaries are in the proportion of 4 : 3 respectively. What is Vipin's salary?

(M.A.T., 2006)

- I. Javed's salary is 75% that of Vipin's salary.  
 II. Javed's salary is ₹ 4500.
10. The ages of Vinay and Sameer are in the ratio of 7 : 6. What is the age of Sameer?  
 I. The ages of Vinay and Ajay are in the ratio of 7 : 4.  
 II. After 5 years the ratio of Vinay's and Sameer's ages will be 8 : 7. (Bank P.O., 2008)
11. The ages of Tanya and Simran are in the ratio of 6 : 5. What is Simran's age?  
 I. The ages of Tanya and Deepti are in the ratio of 3 : 2.  
 II. After 6 years the ratio of Deepti's and Simran's ages will be 6 : 7.
12. What is Rajan's present age? (Bank P.O., 2009)  
 I. Ratio of present ages of Rajan and Madan is 3 : 4 respectively.  
 II. Five years hence the ratio of ages of Rajan and Madan will be 4 : 5 respectively.
13. What is the difference between the ages of Sumit and Dinesh? (Bank P.O., 2006)  
 I. The ratio of their ages is 7 : 9 respectively.  
 II. Five years hence the sum of their ages will be 58 years.
14. How many students are there in the class?  
 I. Boys and girls are in the ratio of 2 : 3 respectively.  
 II. Difference between the number of girls and the number of boys is 8 and 60% of the students are girls.
15. Aruna is twice as old as Sneha. What is the difference in their ages?  
 I. Five years hence, the ratio of their ages would be 9 : 5.  
 II. Ten years back, the ratio of their ages was 3 : 1.

## ANSWERS

1. (a)    2. (c)    3. (c)    4. (d)    5. (d)    6. (b)    7. (c)    8. (c)    9. (b)    10. (b)  
 11. (e)    12. (e)    13. (e)    14. (b)    15. (c)

## SOLUTIONS

1. I.  $3p = 2q \Rightarrow \frac{p}{q} = \frac{2}{3} \Rightarrow p : q = 2 : 3$ .

II. From the given equation, we have :  $2p = 6 - q$ .  
 So,  $p : q$  cannot be determined.

Thus, only I gives the answer.

∴ Correct answer is (a).

2. I.  $\frac{x+y}{x-y} = \frac{\frac{x}{y}+1}{\frac{x}{y}-1} = \frac{\frac{1}{2}+1}{\frac{1}{2}-1} = \frac{3}{-1} \times (-2) = -3$ .

II.  $x = \frac{y}{2}$  and  $y - x = 3 \Rightarrow y - \frac{y}{2} = 3 \Rightarrow \frac{y}{2} = 3 \Rightarrow y = 6$ .

So,  $x = \frac{y}{2} = \frac{6}{2} = 3$ .

∴  $\frac{x+y}{x-y} = \frac{3+6}{3-6} = \frac{9}{(-3)} = -3$ .

Thus, either I alone or II alone gives the answer.  
 ∴ Correct answer is (c).

3. I. Let Rohan's and Sachin's salaries be ₹  $3x$  and ₹  $4x$  respectively.

Then,  $3x + 4x = 14000 \Rightarrow 7x = 14000 \Rightarrow x = 2000$ .

∴ Rohan earns ₹ 6000 per month.

II. Let Rohan's salary = ₹  $x$ .

Then, Sachin's salary = ₹  $(x + 2000)$ .

$x + (x + 2000) = 14000 \Rightarrow 2x = 12000 \Rightarrow x = 6000$ .

Thus, either I alone or II alone gives the answer.

∴ Correct answer is (c).

4. I.  $\frac{a}{b} = \frac{3}{5}$     II.  $\frac{2a}{b} = \frac{12}{10} \Rightarrow \frac{a}{b} = \frac{1}{2} \times \frac{12}{10} = \frac{3}{5}$ .

Hence,  $a$  cannot be determined even from both I and II taken together.

∴ Correct answer is (d).

5. From both I and II, we have :

$P : Q = 3 : 4$  and  $Q : R = 4 : 5 \Rightarrow P : R = 3 : 5$ .

Let the present ages of  $P$  and  $R$  be  $3x$  and  $5x$  respectively.

Then, ratio of their ages 4 years ago =  $\frac{3x-4}{5x-4}$ ,

which cannot be evaluated.

Thus, the answer cannot be obtained even from both I and II taken together.

∴ Correct answer is (d).

6. I. Let mother's present age be  $x$  years.

Then, father's present age =  $(x + 8)$  years.

II. Father's age 4 years back =  $(30 - 4)$  years = 26 years.

Let the mother's and father's age 4 years back be  $12x$  and  $13x$  years respectively.

Then,  $13x = 26$  or  $x = 2$ .

∴ Mother's present age =  $[(12 \times 2) + 4]$  years = 28 years.

Thus, II alone gives the answer.

∴ Correct answer is (b).

7. I. Let the number of boys and girls be  $4x$  and  $5x$  respectively.

$$\text{Then, } 4x + 5x = 45 \Rightarrow 9x = 45 \Rightarrow x = 5.$$

$$\therefore \text{Number of boys} = (4 \times 5) = 20.$$

- II. Let the number of girls and boys be  $4x$  and  $5x$  respectively.

$$\text{Then, } 5x - 4x = 9 \Rightarrow x = 9.$$

$$\therefore \text{Number of boys} = (5 \times 9) = 45.$$

Thus, either I alone or II alone gives the answer.

∴ Correct answer is (c).

8. I.  $(y - x)(y + x) = \left(\frac{40}{100} \times 60\right) - \left(\frac{120}{100} \times 20\right) = 24 - 24 = 0$

$$\Rightarrow y^2 - x^2 = 0 \Rightarrow x^2 = y^2$$

$$\Rightarrow \frac{x^2}{y^2} = 1. \text{ So, } x^2 : y^2 \nless 1.$$

- II.  $x < y \Rightarrow x^2 < y^2$

$$\Rightarrow \frac{x^2}{y^2} < 1 \Rightarrow x^2 : y^2 < 1.$$

Thus, either I alone or II alone gives the answer.

∴ Correct answer is (c).

9. Let Vipin's and Javed's salaries be ₹  $4x$  and ₹  $3x$  respectively.

- I. The fact stated in I is the same as that given in the question.

$$\text{II. } 3x = 4500 \Rightarrow x = 1500.$$

$$\text{So, Vipin's salary} = 4x = ₹ (4 \times 1500) = ₹ 6000.$$

Thus, II alone gives the answer while I alone does not.

∴ Correct answer is (b).

10. Let Vinay's and Sameer's present ages be  $7x$  and  $6x$  years respectively.

- I. Nothing can be deduced from the information given in I.

II. After 5 years, Vinay's age =  $(7x + 5)$  and Sameer's age =  $(6x + 5)$ .

$$\text{So, } \frac{7x+5}{6x+5} = \frac{8}{7} \Rightarrow 7(7x+5) = 8(6x+5) \Rightarrow 49x+35 =$$

$$48x+40 \Rightarrow x = 5.$$

$$\therefore \text{Sameer's age} = (6 \times 5) \text{ years} = 30 \text{ years.}$$

Thus, II alone gives the answer while I alone does not.

∴ Correct answer is (b).

11. From both I and II, we have :

$$\text{Deepthi : Tanya} = 2 : 3 = 4 : 6 \text{ and Tanya :}$$

$$\text{Simran} = 6 : 5.$$

$$\text{So, Deepthi : Tanya : Simran} = 4 : 6 : 5.$$

Let Deepthi's and Simran's present ages be  $4x$  and  $5x$  years respectively.

$$\text{Then, } \frac{4x+6}{5x+6} = \frac{6}{7} \Rightarrow 7(4x+6) = 6(5x+6)$$

$$\Rightarrow 28x + 42 = 30x + 36 \Rightarrow 2x = 6 \Rightarrow x = 3.$$

$$\therefore \text{Simran's age} = (5 \times 3) \text{ years} = 15 \text{ years.}$$

Thus, both I and II together give the answer.

∴ Correct answer is (e).

12. From both I and II, we have :

Let the present ages of Rajan and Madan be  $3x$  and  $4x$  years respectively.

$$\text{Then, } \frac{3x+5}{4x+5} = \frac{4}{5} \Rightarrow 5(3x+5) = 4(4x+5)$$

$$\Rightarrow 15x + 25 = 16x + 20 \Rightarrow x = 5.$$

$$\text{So, Rajan's present age} = (3 \times 5) \text{ years} = 15 \text{ years.}$$

Thus, both I and II together give the answer.

∴ Correct answer is (e).

13. From both I and II, we have :

Let the present ages of Sumit and Dinesh be  $7x$  and  $9x$  years respectively.

$$\text{Then, Sumit's age 5 years hence} = (7x + 5) \text{ years;}$$

$$\text{Dinesh's age 5 years hence} = (9x + 5) \text{ years.}$$

$$\text{So, } (7x + 5) + (9x + 5) = 58$$

$$\Rightarrow 16x = 48 \Rightarrow x = 3.$$

$$\therefore \text{Required difference} = 9x - 7x = 2x$$

$$= (2 \times 3) \text{ years} = 6 \text{ years.}$$

Thus, both I and II together give the answer.

∴ Correct answer is (e).

14. I. Let the number of boys and girls be  $2x$  and  $3x$  respectively.

- II. Let the total strength of the class be  $x$ .

$$\text{Then, number of girls} = 60\% \text{ of } x = \frac{3x}{5}; \text{ number of boys}$$

$$= 40\% \text{ of } x = \frac{2x}{5}.$$

$$\text{So, } \frac{3x}{5} - \frac{2x}{5} = 8 \Rightarrow \frac{x}{5} = 8 \Rightarrow x = 40.$$

$$\therefore \text{Total number of students} = 40.$$

Thus, II alone gives the answer while I alone does not.

∴ Correct answer is (b).

15. Let the present ages of Sneha and Aruna be  $x$  and  $2x$  years respectively. Then,

$$\text{I. } \frac{2x+5}{x+5} = \frac{9}{5} \Rightarrow 5(2x+5) = 9(x+5) \Rightarrow x = 20.$$

$$\text{So, required difference} = 2x - x = x = 20 \text{ years.}$$

$$\text{II. } \frac{2x-10}{x-10} = \frac{3}{1} \Rightarrow 2x-10 = 3(x-10) \Rightarrow 2x-10 = 3x-$$

$$30 \Rightarrow x = 20.$$

$$\text{So, required difference} = 20 \text{ years.}$$

Thus, either I alone or II alone gives the answer.

∴ Correct answer is (c).