Ratio and Proportion

7

RATIO

A *ratio* is a comparison of two quantities by division. It is a relation that one quantity bears to another with respect to magnitude. In other words, ratio means what part one quantity is of another. The quantities may be of same kind or different kinds. For example, when we consider the ratio of the weight 45 Kg of a bag of rice to the weight 29 Kg of a bag of sugar, we are considering the quantities of same kind but when we talk of allotting 2 cricket bats to 5 sportsmen, we are considering quantities of different kinds. Normally, we consider the ratio between quantities of the same kind.

If a and b are two numbers, the ratio of a to b is $\frac{a}{b}$ or $a \div b$ and is denoted by $a:b$. The two quantities that are being compared are called *terms*. The first is called *antecedent* and the second term is called *consequent*.

For example, the ratio 3:5 represents $\frac{3}{5}$ with antecedent 3 and consequent 5.

Note:

1. A ratio is a number in order to find the ratio of two quantities and they must be expressed in the same units.
2. A ratio does not change, if both of its terms are multiplied or divided by the same number. Thus,

$$\frac{2}{3} = \frac{4}{6} = \frac{6}{9} \text{ etc.}$$

TYPES OF RATIOS

1. **Duplicate Ratio:** The ratio of the squares of two numbers is called the *duplicate ratio* of the two numbers.
   For example, $\frac{3^2}{4^2}$ or $\frac{9}{16}$ is called the duplicate ratio of $\frac{3}{4}$.
2. **Triplicate Ratio:** The ratio of the cubes of two numbers is called the *triplicate ratio* of the two numbers.
   For example, $\frac{3^3}{4^3}$ or $\frac{27}{64}$ is triplicate ratio of $\frac{3}{4}$.
3. **Sub-duplicate Ratio:** The ratio of the square roots of two numbers is called the *sub-duplicate ratio* of two numbers.
   For example, $\frac{3}{4}$ is the sub-duplicate ratio of $\frac{9}{16}$.
4. **Sub-triplicate Ratio:** The ratio of the cube roots of two numbers is called the *sub-triplicate ratio* of two numbers.
   For example, $\frac{2}{3}$ is the sub-triplicate ratio of $\frac{8}{27}$.
5. **Inverse Ratio or Reciprocal Ratio:** If the antecedent and consequent of a ratio interchange their places, the new ratio is called the *inverse ratio* of the first.
   Thus, if $a:b$ be the given ratio, then $\frac{1}{a}:\frac{1}{b}$ or $b:a$ is its inverse ratio.
   For example, $\frac{3}{5}$ is the inverse ratio of $\frac{5}{3}$.
6. **Compound Ratio:** The ratio of the product of the antecedents to that of the consequents of two or more given ratios is called the *compound ratio*. Thus, if $a:b$ and $c:d$ are two given ratios, then $ac:bd$ is the compound ratio of the given ratios.
   For example, if $\frac{3}{4}$, $\frac{4}{5}$ and $\frac{5}{7}$ be the given ratios, then their compound ratio is $\frac{3\times4\times5}{4\times5\times7}$, that is, $\frac{3}{7}$.

PROPORTION

The equality of two ratios is called *proportion*.

If $\frac{a}{b} = \frac{c}{d}$, then a, b, c and d are said to be in proportion and we write $a:b::c:d$. This is read as "a is to b as c is to d".

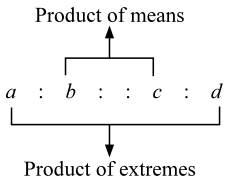
For example, since $\frac{3}{4} = \frac{6}{8}$, we write 3:4::6:8 and say 3, 4, 6 and 8 are in proportion.

Each term of the ratio $\frac{a}{b}$ and $\frac{c}{d}$ is called a *proportional*. a, b, c and d are respectively the first, second, third and fourth proportionals.

Here, a, d are known as *extremes* and b, c are known as *means*.

SOME BASIC FORMULAE

1. If four quantities are in proportion, then
   Product of Means = Product of Extremes
   For example, in the proportion $a:b::c:d$, we have, $bc = ad$.



   From this relation, we see that if any three of the four quantities are given, then the fourth quantity can be determined.

2. **Fourth proportional:** If $a:b::c:x$, then x is called the *fourth proportional* of a, b, c.

   We have, $\frac{a}{b} = \frac{c}{x}$ or, $x = \frac{b \times c}{a}$.

   Thus, fourth proportional of a, b, c is $\frac{b \times c}{a}$.

Illustration 1: Find a fourth proportional to the numbers 2, 5, 4.

Solution: Let x be the fourth proportional, then

$2:5::4:x$ or, $\frac{2}{5} = \frac{4}{x}$.

$\therefore \quad x = \frac{5 \times 4}{2} = 10$

3. **Third Proportional:** If $a:b::b:x$, then x is called the third proportional of a, b.

   We have, $\frac{a}{b} = \frac{b}{x}$ or, $x = \frac{b^2}{a}$.

   Thus, third proportional of a, b is $\frac{b^2}{a}$.

Illustration 2: Find a third proportional to the numbers 2.5, 1.5.

Solution: Let x be the third proportional, then

$2{\cdot}5:1{\cdot}5::1{\cdot}5:x$ or $\frac{2{\cdot}5}{1{\cdot}5} = \frac{1{\cdot}5}{x}$. $\therefore \quad x = \frac{1{\cdot}5 \times 1{\cdot}5}{2{\cdot}5} = 0.9$.

4. **Mean Proportional:** If $a:x::x:b$, then x is called the *mean* or *second proportional* of a, b.

   We have, $\frac{a}{x} = \frac{b}{x}$ or, $x^2 = ab$ or, $x = \sqrt{ab}$.

   $\therefore$ Mean proportional of a and b is $\sqrt{ab}$.
   We also say that, a, x, b are in *continued proportion*.

Illustration 3: Find the mean proportional between 48 and 12.

Solution: Let x be the mean proportional. Then,

$48:x::x:12$ or, $\frac{48}{x} = \frac{x}{12}$ or, $x^2 = 576$ or, $x = 24$.

5. If $\frac{a}{b} = \frac{c}{d}$, then

   (i) $\frac{a+b}{b} = \frac{c+d}{d}$ (Componendo)

   (ii) $\frac{a-b}{b} = \frac{c-d}{d}$ (Dividendo)

   (iii) $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ (Componendo and Dividendo)

   (iv) $\frac{a}{b} = \frac{a+c}{b+d} = \frac{a-c}{b-d}$.

Illustration 4: The sum of two numbers is c and their quotient is $\frac{p}{q}$. Find the numbers.

Solution: Let the numbers be x, y.

Given: $x + y = c$ ...(1)

and, $\frac{x}{y} = \frac{p}{q}$ ...(2)

$\therefore \quad \frac{x}{x+y} = \frac{p}{p+q} \Rightarrow \frac{x}{c} = \frac{p}{p+q}$ [Using (1)]

$\Rightarrow \quad x = \frac{pc}{p+q}$.

SOME USEFUL SHORTCUT METHODS

1. (a) If two numbers are in the ratio of $a:b$ and the sum of these numbers is x, then these numbers will be $\frac{ax}{a+b}$ and $\frac{bx}{a+b}$, respectively.

   or

   If in a mixture of x litres, two liquids A and B are in the ratio of $a:b$, then the quantities of liquids A and B in the mixture will be $\frac{ax}{a+b}$ litres and $\frac{bx}{a+b}$ litres, respectively.

   (b) If three numbers are in the ratio of $a:b:c$ and the sum of these numbers is x, then these numbers will be $\frac{ax}{a+b+c}, \frac{bx}{a+b+c}$ and $\frac{cx}{a+b+c}$, respectively.

Explanation

Let the three numbers in the ratio $a:b:c$ be A, B and C. Then,

$$A = ka,\ B = kb,\ C = kc$$

and, $A + B + C = ka + kb + kc = x$

$$\Rightarrow \quad k(a + b + c) = x \Rightarrow k = \frac{x}{a+b+c}.$$

$$\therefore \qquad A = ka = \frac{ax}{a+b+c}$$

$$B = kb = \frac{bx}{a+b+c}$$

$$C = kc = \frac{cx}{a+b+c}.$$

Illustration 5: Two numbers are in the ratio of 4:5 and the sum of these numbers is 27. Find the two numbers.

Solution: Here, $a = 4$, $b = 5$ and $x = 27$.

$\therefore$ The first number $= \frac{ax}{a+b} = \frac{4\times27}{4+5} = 12$

and, the second number $= \frac{bx}{a+b} = \frac{5\times27}{4+5} = 15.$

Illustration 6: Three numbers are in the ratio of 3:4:8 and the sum of these numbers is 975. Find the three numbers.

Solution: Here, $a = 3$, $b = 4$, $c = 8$ and $x = 975$.

$\therefore$ The first number $= \frac{ax}{a+b+c} = \frac{3\times975}{3+4+8} = 195.$

The second number $= \frac{bx}{a+b+c} = \frac{4\times975}{3+4+8} = 260.$

and, the third number $= \frac{cx}{a+b+c} = \frac{8\times975}{3+4+8} = 520.$

2. If two numbers are in the ratio of $a:b$ and difference between these numbers is x, then these numbers will be

   (a) $\frac{ax}{a-b}$ and $\frac{bx}{a-b}$, respectively (where $a > b$)

   (b) $\frac{ax}{b-a}$ and $\frac{bx}{b-a}$, respectively (where $a < b$).

Explanation

Let the two numbers be ak and bk.
Let $a > b$. Given: $ak - bk = x$

$\Rightarrow (a - b)k = x$ or, $k = \frac{ax}{a-b}$.

Therefore, the two numbers are $\frac{ax}{a-b}$ and $\frac{bx}{a-b}$.

Illustration 7: Two numbers are in the ratio of 4:5. If the difference between these numbers is 24, then find the numbers.

Solution: Here, $a = 4$, $b = 5$ and $x = 24$.

$\therefore$ The first number $= \frac{ax}{b-a} = \frac{4\times24}{5-4} = 96$

and, the second number $= \frac{bx}{b-a} = \frac{5\times24}{5-4} = 120.$

3. (a) If $a:b = n_1:d_1$ and $b:c = n_2:d_2$, then
   $a:b:c = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$.

   (b) If $a:b = n_1:d_1$, $b:c = n_2:d_2$ and $c:d = n_3:d_3$, then
   $a:b:c:d = (n_1 \times n_2 \times n_3):(d_1 \times n_2 \times n_3)$
   $:(d_1 \times d_2 \times n_3):(d_1 \times d_2 \times d_3)$.

Illustration 8: If $A:B = 3:4$ and $B:C = 8:9$, find $A:B:C$.

Solution: Here, $n_1 = 3$, $n_2 = 8$, $d_1 = 4$ and $d_2 = 9$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$
$= (3 \times 8):(4 \times 8):(4 \times 9)$
$= 24:32:36$ or, $6:8:9$.

Illustration 9: If $A:B = 2:3$, $B:C = 4:5$ and $C:D = 6:7$, find $A:D$.

Solution: Here, $n_1 = 2$, $n_2 = 4$, $n_3 = 6$, $d_1 = 3$, $d_2 = 5$ and $d_3 = 7$.

$$\therefore \quad A:B:C:D = (n_1 \times n_2 \times n_3):(d_1 \times n_2 \times n_3) :(d_1 \times d_2:n_3):(d_1 \times d_2 \times d_3)$$

$$= (2 \times 4 \times 6) :(3 \times 4 \times 6):(3 \times 5 \times 6) :(3 \times 5 \times 7)$$

$$= 48:72:90:105 \text{ or, } 16:24:30:35.$$

Thus, $A:D = 16:35$.

4. (a) The ratio between two numbers is $a:b$. If x is added to each of these numbers, the ratio becomes $c:d$. The two numbers are given as:

$$\frac{ax(c-d)}{ad-bc} \text{ and } \frac{bx(c-d)}{ad-bc}.$$

Explanation

Let two numbers be ak and bk.

Given: $\frac{ak+x}{bk+x} = \frac{c}{d} \Rightarrow akd + dx = cbk + cx$

$$\Rightarrow k(ad - bc) = x(c - d)$$

$$\Rightarrow k = \frac{x(c-d)}{ad-bc}.$$

Therefore, the two numbers are $\frac{ax(c-d)}{ad-bc}$ and $\frac{bx(c-d)}{ad-bc}$.

(b) The ratio between two numbers is $a:b$. If x is subtracted from each of these numbers, the ratio becomes $c:d$.
The two numbers are given as:

$$\frac{ax(d-c)}{ad-bc} \text{ and } \frac{bx(d-c)}{ad-bc}.$$

Explanation

Let the two numbers be ak and bk.

Given: $\frac{ak-x}{bk-x} = \frac{c}{d} \Rightarrow akd - xd = bck - xc$

$$\Rightarrow k(ad - bc) = x(d - c)$$

$$\Rightarrow k = \frac{x(d-c)}{ad-bc}.$$

Therefore, the two numbers are $\frac{ax(d-c)}{ad-bc}$ and $\frac{bx(d-c)}{ad-bc}$.

Illustration 10: Given two numbers which are in the ratio of 3:4. If 8 is added to each of them, their ratio is changed to 5:6. Find the two numbers.

Solution: We have,

$$a:b = 3:4,\ c:d = 5:6 \text{ and } x = 8.$$

$$\therefore \text{ The first number } = \frac{ax(c-d)}{ad-bc}$$

$$= \frac{3\times8\times(5-6)}{(3\times6-4\times5)} = 12$$

$$\text{and, the second number } = \frac{bx(c-d)}{ad-bc}$$

$$= \frac{4\times8\times(5-6)}{(3\times6-4\times5)} = 16.$$

Illustration 11: The ratio of two numbers is 5:9. If each number is decreased by 5, the ratio becomes 5:11. Find the numbers.

Solution: We have,

$$a:b = 5:9,\ c:d = 5:11 \text{ and } x = 5.$$

$$\therefore \text{ The first number } = \frac{ax(d-c)}{ad-bc}$$

$$= \frac{5\times5\times(11-5)}{(5\times11-9\times5)} = 15$$

$$\text{and, the second number } = \frac{bx(d-c)}{ad-bc}$$

$$= \frac{9\times5\times(11-5)}{(5\times11-9\times5)} = 27.$$

5. (a) If the ratio of two numbers is $a:b$, then the numbers that should be added to each of the numbers in order to make this ratio $c:d$ is given by

$$\frac{ad-bc}{c-d}.$$

Explanation

Let the required number be x.

Given: $\frac{a+x}{b+x} = \frac{c}{d} \Rightarrow ad + xd = bc + xc$

$$\Rightarrow x(d - c) = bc - ad$$

$$\text{or, } x = \frac{ad-bc}{c-d}.$$

(b) If the ratio of two numbers is $a:b$, then the number that should be subtracted from each of the numbers in order to make this ratio $c:d$ is given by

$$\frac{bc-ad}{c-d}.$$

Explanation

Let the required number be x.

Given: $\frac{a-x}{b-x}=\frac{c}{d} \Rightarrow ad - xd = bc - xc$

$\Rightarrow x(c - d) = bc - ad$

or, $x = \frac{bc-ad}{c-d}$.

Illustration 12: Find the number that must be subtracted from the terms of the ratio 5:6 to make it equal to 2:3.

Solution: We have, $a:b$ = 5:6 and $c:d$ = 2:3.

$\therefore$ The required number $= \frac{bc-ad}{c-d}$

$= \frac{6\times2-5\times3}{2-3} = 3.$

Illustration 13: Find the number that must be added to the terms of the ratio 11:29 to make it equal to 11:20.

Solution: We have, $a:b$ = 11:29 and $c:d$ = 11:20.

$\therefore$ The required number $= \frac{ad-bc}{c-d}$

$= \frac{11\times20-29\times11}{11-20} = 11.$

6. There are four numbers a, b, c and d.

(i) The number that should be subtracted from each of these numbers so that the remaining numbers may be proportional is given by

$$\frac{ad-bc}{(a+d)-(b+c)}.$$

Explanation

Let x be subtracted from each of the numbers.

The remainders are $a - x$, $b - x$, $c - x$ and $d - x$.

Given: $\frac{a-x}{b-x}=\frac{c-x}{d-x}$

$\Rightarrow (a - x)(d - x) = (b - x)(c - x)$

$\Rightarrow ad - x(a + d) + x^2 = bc - x(b + c) + x^2$

$\Rightarrow (b + c)x - (a + d)x = bc - ad$

$\therefore x = \frac{bc-ad}{(b+c)-(a+d)}$ or $\frac{ad-bc}{(a+d)-(b+c)}$

(ii) The number that should be added to each of these numbers so that the new numbers may be proportional is given by,

$$\frac{bc-ad}{(a+d)-(b+c)}.$$

Explanation

Let x be added to each of the numbers.

The new numbers are $a + x$, $b + x$, $c + x$ and $d + x$.

Given: $\frac{a+x}{b+x}=\frac{c+x}{d+x}$.

$\Rightarrow (a + x)(d + x) = (b + x)(c + x)$

$\Rightarrow ad + x(a + d) + x^2 = bc + x(b + c) + x^2$

$\Rightarrow (a + d)x - (b + c)x = bc - ad.$

$\therefore x = \frac{bc-ad}{(a+d)-(b+c)}$.

Illustration 14: Find the number subtracted from each of the numbers 54, 71, 75 and 99 leaves the remainders which are proportional.

Solution: We have, a = 54, b = 71, c = 75 and d = 99.

The required number $= \frac{ad-bc}{(a+d)-(b+c)}$

$= \frac{54\times99-71\times75}{(54+99)-(71+75)} = 3.$

7. The incomes of two persons are in the ratio of $a:b$ and their expenditures are in the ratio of $c:d$. If the saving of each person be ₹S, then their incomes are given by

$$₹\frac{aS(d-c)}{ad-bc} \text{ and } ₹\frac{bS(d-c)}{ad-bc}.$$

and, their expenditures are given by

$$₹\frac{cS(b-a)}{ad-bc} \text{ and } ₹\frac{dS(b-a)}{ad-bc}.$$

Explanation

Let their incomes be ₹ak and ₹bk, respectively. Since each person saves ₹S,

$\therefore$ Expenditure of first person = ₹$(ak - S)$

and, expenditure of second person = ₹$(bk - S)$.

Given: $\frac{ak-S}{bk-S} = \frac{c}{d}$

$\Rightarrow \quad akd - Sd = bkc - Sc$

$\Rightarrow \quad k(ad - bc) = (d - c)S$ or, $k = \frac{(d-c)S}{ad-bc}$.

Therefore, the incomes of two persons are

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

and, their expenditures are

$$ak - S \text{ and } bk - S$$

i.e., $\frac{a(d-c)S}{ad-bc} - S$ and $\frac{b(d-c)S}{ad-bc} - S$

or, $\frac{cS(b-a)}{ad-bc}$ and $\frac{dS(b-a)}{ad-bc}$.

Illustration 15: Annual income of A and B is in the ratio of 5:4 and their annual expenses bear a ratio of 4:3. If each of them saves ₹500 at the end of the year, then find their annual income.

Solution: We have, $a:b = 5:4$, $c:d = 4:3$ and $S = 500$.

$\therefore$ Annual income of A $= \frac{aS(d-c)}{ad-bc}$

$= \frac{5\times500\times(3-4)}{(5\times3-4\times4)}$

$=$ ₹2500.

and annual income of B $= \frac{bS(d-c)}{ad-bc}$

$= \frac{4\times500\times(3-4)}{(5\times3-4\times4)}$

$=$ ₹2000.

Illustration 16: The incomes of Mohan and Sohan are in the ratio 7:2 and their expenditures are in the ratio 4:1. If each saves ₹1000, find their expenditures.

Solution: We have, $a:b = 7:2$, $c:d = 4:1$ and $S = 1000$.

$\therefore$ Mohan's expenditure $= \frac{cS(b-a)}{ad-bc} = \frac{4\times1000\times(2-7)}{(7\times1-2\times4)}$

$=$ ₹20000

and, Sohan's expenditure $= \frac{dS(b-a)}{ad-bc} = \frac{1\times1000\times(2-7)}{(7\times1-2\times4)}$

$=$ ₹5000.

8. (a) If in a mixture of x litres of two liquids A and B, the ratio of liquids A and B is $a:b$, then the quantity of liquid B to be added in order to make this ratio.

$c:d$ is $\frac{x(ad-bc)}{c(a+b)}$.

Quantity of liquid A in the mixture $= \frac{ax}{a+b}$.

Quantity of liquid B in the mixture $= \frac{bx}{a+b}$.

Let/litres of liquid B to be added in order to make this ratio as $c:d$.

Then, $\frac{ax}{a+b} : \frac{bx}{a+b} + l = c:d$

or, $\frac{ax}{a+b} : \frac{bx+l(a+b)}{a+b} = c:d$

or, $\frac{ax}{bx+l(a+b)} = \frac{c}{d}$ or, $axd = bcx + cl(a+b)$

or, $l = \frac{x(ad-bc)}{(a+b)c}$.

(b) In a mixture of two liquids A and B, the ratio of liquids A and B is $a:b$. If on adding x litres of liquid B to the mixture, the ratio of A to B becomes $a:c$, then in the beginning the quantity of liquid A in the mixture was $\frac{ax}{c-b}$ litres and that of liquid B was $\frac{bx}{c-b}$ litres.

Explanation

Let the quantity of mixture be M litres.

Then, the quantity of liquid $A = \frac{aM}{a+b}$ litres

and the quantity of liquid $B = \frac{bM}{a+b}$ litres.

If x litres of liquid B is added, then

$$\frac{aM}{a+b} : \frac{bM}{a+b} + x = a:c$$

or, $\frac{aM}{a+b} : \frac{bM + x(a+b)}{a+b} = a:c$

or, $\frac{aM}{bM + x(a+b)} = \frac{a}{c}$ or, $cM = bM + x(a + b)$

or, $M = \frac{x(a+b)}{c-b}$.

$\therefore$ Quantity of liquid A $= \frac{ax(a+b)}{(c-b)(a+b)}$

$= \frac{ax}{c-b}$ litres

and, quantity of liquid B $= \frac{bx(a+b)}{(c-b)(a+b)}$

$= \frac{bx}{c-b}$ litres.

Illustration 17: 729 ml of a mixture contains milk and water in the ratio 7:2. How much more water is to be added to get a new mixture containing milk and water in the ratio of 7:3.

Solution: Here, x = 729, $a:b$ = 7:2 and $c:d$ = 7:3.

$\therefore$ The quantity of water to be added

$= \frac{x(ad-bc)}{c(a+b)} = \frac{729 \times (7 \times 3 - 2 \times 7)}{7(7+2)} = 81$ ml.

Illustration 18: A mixture contains alcohol and water in the ratio of 6:1. On adding 8 litres of water, the ratio of alcohol to water becomes 6:5. Find the quantity of water in the mixture.

Solution: We have, $a:b$ = 6:1, $a:c$ = 6:5 and $x = 8$.

$\therefore$ The quantity of water in the mixture

$= \frac{bx}{c-b} = \frac{1 \times 8}{5-1} = 2$ litres.

9. When two ingredients A and B of quantities q_1 and q_2 and cost price/unit c_1 and c_2 are mixed to get a mixture c having cost price/unit c_m, then

   (a) $\frac{q_1}{q_2} = \frac{c_2 - c_m}{c_m - c_1}$ and

   (b) $c_m = \frac{c_1 \times q_1 + c_2 \times q_2}{q_1 + q_2}$.

Illustration 19: In what ratio the two kinds of tea must be mixed together, one at ₹9 per Kg and another at ₹15 per Kg, so that mixture may cost ₹10.2 per Kg?

Solution: We have, c_1 = 9, c_2 = 15, c_m = 10.2

$\therefore \quad \frac{q_1}{q_2} = \frac{c_2 - c_m}{c_m - c_1} = \frac{15 - 10.2}{10.2 - 9} = \frac{4.8}{1.2} = \frac{4}{1}$.

Thus, the two kinds of tea are mixed in the ratio 4:1.

Illustration 20: In a mixture of two types of oils O_1 and O_2, the ratio $O_1:O_2$ is 3:2. If the cost of oil O_1 is ₹4 per litre and that of O_2 is ₹9 per litre, then find the cost per litre of the resulting mixture.

Solution: We have, $q_1 = q_2 = 2$, $c_1 = 4$ and $c_2 = 9$.

$\therefore$ The cost of resulting mixture

$= \frac{c_1 \times q_1 + c_2 \times q_2}{q_1 + q_2} = \frac{4 \times 3 + 9 \times 2}{3 + 2} = \frac{30}{5}$

= ₹6.

10. (a) If a mixture contains two ingredients A and B in the ratio $a:b$, then

    percentage of A in the mixture $= \frac{a}{a+b} \times 100\%$ and percentage of B in the mixture

    $= \frac{b}{a+b} \times 100\%$

    (b) If two mixtures M_1 and M_2 contain ingredients A and B in the ratios $a:b$ and $c:d$, respectively, then a third mixture M_3 obtained by mixing M_1 and M_2 in the ratio $x:y$ will contain

    $\left[\frac{\frac{a \times x}{a+b} + \frac{c \times y}{c+d}}{x+y}\right] \times 100\%$ ingredient A, and

    $\left[100\% - \left\{\frac{\frac{ax}{a+b} + \frac{cy}{c+d}}{x+y}\right\}\right]$

    or, $\left[\frac{\frac{bx}{a+b} + \frac{dy}{c+d}}{x+y}\right] \times 100\%$ ingredient B.

Illustration 21: If a mixture contains water and alcohol in the ratio 2:3, then what is the percentage quantity of water in the mixture?

Solution: Here, $a = 2$, $b = 3$.

$\therefore$ percentage quantity of water in the mixture

$$= \frac{a}{a+b} \times 100\% = \frac{2}{2+3} \times 100\%$$
$$= \frac{2}{5} \times 100\%$$
$$= \frac{200}{5} \text{ or, } 40\%$$

Illustration 22: Two alloys contain silver and copper in the ratio 3:1 and 5:3. In what ratio the two alloys should be added together to get a new alloy having silver and copper in the ratio of 2:1?

Solution: We have, $a:b = 3:1$, $c:d = 5:3$

Let the two alloys be mixed in the ratio $x:y$.

Then, percentage quantity of sliver in the new alloy

$$= \left[\frac{\frac{ax}{a+b} + \frac{cy}{c+d}}{x+y}\right] \times 100\%$$
$$= \left[\frac{\frac{3x}{4} + \frac{5y}{8}}{x+y}\right] \times 100\%$$
$$= \frac{6x+5y}{8(x+y)} \times 100\% \quad \cdots(1)$$

Since, the ratio of silver and copper in the new alloys is 2:1.

$\therefore$ percentage quantity of sliver in the new alloy

$$= \frac{2}{2+1} \times 100\% = \frac{200}{3}\% \quad \cdots(2)$$

From (1) and (2), we get

$$\frac{6x+5y}{8(x+y)} = \frac{2}{3} \text{ or, } 18x + 15y = 16x + 16y$$

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

Hence, the two alloys should be mixed in the ratio 1:2.

EXERCISE-I

1. Find a fourth proportional to the numbers 60, 48, 30.
(a) 36 (b) 24
(c) 48 (d) None of these

2. Find the value of x in the following proportion:
27:72::x:8
(a) 5 (b) 7
(c) 3 (d) None of these

3. Find a third proportional to the numbers 4, 42.
(a) 441 (b) 541
(c) 641 (d) None of these

4. If $18:x = x:8$, then x is equal to:
(a) 12 (b) 16
(c) 18 (d) None of these

5. The third proportional to 0.8 and 0.2 is:
(a) 0.6 (b) 0.05
(c) 0.7 (d) None of these

6. The fourth proportional to 0.2, 0.12 and 0.3 is:
(a) 0.24 (b) 0.16
(c) 0.18 (d) None of these

7. In a ratio 11:14, if the antecedent is 55, the consequent is:
(a) 70 (b) 90
(c) 60 (d) None of these

8. The mean proportional between 64 and 81 is:
(a) 48 (b) 68
(c) 72 (d) None of these

9. The mean proportional of 0.25 and 0.04 is:
(a) 0.01 (b) 0.1
(c) $10\sqrt{10}$ (d) None of these

10. The ratio of two numbers is 3:4 and their sum is 420. The greater of the two numbers is:
(a) 360 (b) 240
(c) 180 (d) None of these

11. The ratio of boys and girls in a school is 9:5. If the total number of students in the school is 1050, then the number of boys is:

(a) 785 (b) 890
(c) 675 (d) None of these

12. An amount of ₹1200 is distributed among A, B and C in the ratio of 5:7:13. What is the difference between the shares of C and B?

(a) ₹288 (b) ₹328
(c) ₹296 (d) None of these

13. Amit, Sumit and Puneet share an amount of ₹660 in the ratio of 3:4:5. What is the share of Puneet?

(a) ₹375 (b) ₹275
(c) ₹575 (d) None of these

14. Three numbers A, B and C are in the ratio of 12:15:25. If sum of these numbers is 312, find the ratio between the difference of B and A and the difference of C and B.

(a) 3:7 (b) 10:3
(c) 3:10 (d) None of these

15. The prices of a scooter and a television set are in the ratio of 3:2. If a scooter costs ₹600 more than the television set, then the price of television set is:

(a) ₹1800 (b) ₹1200
(c) ₹2400 (d) None of these

16. Two numbers are in the ratio of 4:9. If the larger number is 35 more than the smaller number, then the product of the numbers is:

(a) 1764 (b) 1564
(c) 1864 (d) None of these

17. If the income of A, B and C is in the ratio of 2:5:11 and the income of B is ₹291 more than that of A, then the income of C is:

(a) ₹907 (b) ₹1127
(c) ₹1067 (d) None of these

18. If $A:B = 7:5$ and $B:C = 9:11$, then $A:B:C$ is equal to:

(a) 55:45:63 (b) 63:45:55
(c) 45:63:55 (d) None of these

19. If $A:B = 3/4$, $B:C = 4/5$, $C:D = 5/6$, then $A:D$ will be:

(a) 2:3 (b) 4:3
(c) 1:2 (d) None of these

20. If $3A = 4B = 5C$, then $A:B:C$ is:

(a) 16:20:18 (b) 15:20:16
(c) 20:15:12 (d) None of these

21. If $3A = 5B$ and $2B = 3C$, then $A:C$ is:

(a) 5:2 (b) 7:2
(c) 3:2 (d) None of these

22. Ajay, Aman, Suman and Geeta rented a house and agreed to share the rent as follows:

Ajay:Aman = 8:15, Aman:Suman = 5:8 and Suman:Geeta and Geeta = 4:5. The part of rent paid by Suman will be:

(a) $\frac{24}{77}$ (b) $\frac{12}{55}$

(c) $\frac{13}{66}$ (d) None of these

23. The ratio of money with Anju and Sanju is 4:5 and that with Sanju and Manju is 5:6. If Anju has ₹280, then the amount of money Manju has:

(a) ₹320 (b) ₹420
(c) ₹640 (d) None of these

24. There are three sections A, B and C in a school of class I. The ratio of students in sections A and B is 3:5 and that in B and C is 4:7. If the total number of students in the class be 201, then the number of students in section A are:

(a) 24 (b) 36
(c) 48 (d) None of these

25. The sum of three numbers is 124. If the ratio between the first and second be 2:3 and that between the second and third be 7:9, then the third number is:

(a) 54 (b) 64
(c) 48 (d) None of these

26. A, B, C and D share a property worth ₹77500. If A:B = 3:2, B:C = 5:4 and C:D = 3:7, find the share of B.

(a) ₹20000 (b) ₹15000
(c) ₹25000 (d) None of these

27. Two numbers are in the ratio 3:5. If each number is increased by 10, the ratio becomes 5:7. The numbers are:

(a) 15, 25 (b) 30, 45
(c) 48, 60 (d) None of these

28. The ratio between two numbers is 2:3. If each number is increased by 4, the ratio becomes 5:7. The numbers are:

(a) 8, 16 (b) 16, 24
(c) 24, 32 (d) None of these

29. Two numbers are in the ratio of 5:6. If 5 is subtracted from each number, the ratio becomes 4:5. The numbers are:

(a) 25, 30 (b) 30, 45
(c) 15, 20 (d) None of these

30. The ratio of present ages of Suresh and Mahesh is 7:5. If after 6 years their ages will be in the ratio of 4:3, the present age of Mahesh is:

(a) 32 years (b) 36 years
(c) 30 years (d) None of these

31. The ratio of present ages of Sita and Gita is 4:3. If 4 years before, the ratio of their ages was 2:1, the present age of Sita is:

(a) 8 years (b) 10 years
(c) 12 years (d) None of these

32. Two numbers are in the ratio of 5:8. If 12 be added to each, they are in the ratio of 3:4. Find the sum of two numbers.

(a) 43 (b) 39
(c) 47 (d) None of these

33. Two numbers are in the ratio of 5:7. If 25 be subtracted from each, they are in the ratio of 35:59. Find the difference of the two numbers.

(a) 48 (b) 52
(c) 24 (d) None of these

34. When x is added to each term of 7:12, the ratio becomes 2:3. The value of x is:

(a) 7 (b) 11
(c) 5 (d) None of these

35. Find the number which when subtracted from the terms of the ratio 12:17 makes it equal to the ratio 2:3.

(a) 2 (b) 6
(c) 8 (d) None of these

36. The value of k that must be added to 7, 16, 43 and 79, so that they are in proportion is:

(a) 7 (b) 5
(c) 9 (d) None of these

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

(a) 2 (b) 4
(c) 6 (d) None of these

38. The number that must be added to each of the numbers 8, 21, 13 and 31 to make the ratio of first two numbers equal to the ratio of last two numbers is:

(a) 5 (b) 7
(c) 9 (d) None of these

39. The incomes of A and B are in the ratio 3:2 and their expenditures in the ratio 5:3. If each saves ₹1000, A's income is:

(a) ₹5000 (b) ₹6000
(c) ₹8000 (d) None of these

40. The annual incomes and expenditures of a man and his wife are in the ratios of 5:3 and 3:1, respectively. If they decide to save equally and find a balance of ₹4000 at the end of year, their incomes were:

(a) ₹5000, ₹3000 (b) ₹6000, ₹4000
(c) ₹3000, ₹2000 (d) None of these

41. The incomes of Gupta and Verma are in the ratio 9:4 and their expenditures are in the ratio 7:3. If each saves ₹2000, then Gupta's expenditure is:

(a) ₹6000 (b) ₹8000
(c) ₹7000 (d) None of these

42. In a mixture of 60 litres, the ratio of milk and water is 2:1. What amount of water must be added to make the ratio of milk and water as 1:2?

(a) 75 litres (b) 55 litres
(c) 60 litres (d) None of these

43. A mixture contains alcohol and water in the ratio of 12:5. On adding 14 litres of water, the ratio of alcohol to water becomes 4:3. The quantity of alcohol in the mixture is:

(a) 18 litres (b) 24 litres
(c) 26 litres (d) None of these

44. If an alloy contains copper and silver in the ratio 3:7, then the percentage quantity of silver in the alloy is:

(a) 90% (b) 70%
(c) 60% (d) None of these

45. 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) 7:5 (b) 5:7
(c) 3:5 (d) None of these

46. Mixture of milk and water has been kept in two separate containers. Ratio of milk to water in one of the containers is 5:1 and that in the other container is 7:2. In what ratio the mixtures of these two containers should be added together so that the quantity of milk in the new mixture may become 80%?

(a) 2:3 (b) 3:2
(c) 4:5 (d) None of these

EXERCISE-2
(BASED ON MEMORY)

1. 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?
(a) 18:23:21 (b) 12:18:1
(c) 18:21:17 (d) Cannot be determined
(e) None of these

[NABARD PO, 2008]

2. Seven men, five women and eight 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. One the second day two women and three children remained absent and on the third day three men and five 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 approximately how many books were distributed on the second day?
(a) 1000 (b) 800
(c) 650 (d) 900
(e) Cannot be determined

[SBI PO, 2005]

3. If $ab = 36$, which of the following proportions is correct?
(a) $9:a = 4:b$ (b) $a:18 = b:3$
(c) $a:6 = b:6$ (d) $a:9 = 4:b$
(e) Cannot be determined

[Bank of Maharashtra (SO), 2006]

4. The ratio of the number of students studying in schools A, B and C is 5:6:8. If the number of students studying in each of the schools is increased by 30%, 25% and 25% respectively, what will be the new ratio of the students in schools A, B and C?
(a) 14:15:20 (b) 13:15:20
(c) 13:14:15 (d) 15:17:19
(e) None of these

[Bank of Maharashtra (S O), 2006]

5. When 20% of a number is added to another number the number increased by 50%. What is the ratio of the first number to the second?
(a) 3:2 (b) 2:3
(c) 5:2 (d) Cannot be determined
(e) None of these

[IOB PO, 2006]

6. In a school the ratio of boys to girls is 4:5. When 100 girls leave the school the ratio becomes 6:7. How many boys are there in the school?
(a) 1600 (b) 1500
(c) 1300 (d) Cannot be determined
(e) None of these

[IOB PO, 2006]

7. A sum of ₹817 is divided among A, B and C such that 'A' receives 25% more than 'B' and 'B' receives 25% less than 'C'. What is A's share in the amount:
(a) ₹228 (b) ₹247
(c) ₹285 (d) ₹304
(e) None of these

[Bank of Baroda PO, 2007]

8. A sum of money is divided among A, B, C and D in the ratio 3:5:8:9 respectively. If the share of D is ₹1,872 more than the share of A, then what is the total amount of money of B & C together?
(a) ₹4,156 (b) ₹4,165
(c) ₹4,056 (d) ₹4,065
(e) None of these

[IDBI Bank Officers', 2007]

9. The ratio of earnings of A and B is 4:5. If the earnings of A increase by 20% and the earnings of B decrease by 20%, the new ratio of their earnings becomes 6:5. What are A's earnings?
(a) ₹22, 000 (b) ₹27, 500
(c) ₹26,400 (d) Cannot be determined
(e) None of these

[Andhra Bank PO, 2007]

10. A sum of money is divided among W, X, Y and Z in the ratio of 3:7:9:13. If the share of W and Y together is ₹11, 172, then what is the difference between the amounts of X and Z?
(a) ₹7,672 (b) ₹6,834
(c) ₹5,586 (d) Cannot be determined
(e) None of these

[Andhra Bank PO, 2007]

11. The age of Surabhi and Neerja are in the ratio of 6:7. After 6 yea₹the ratio of their ages will be 15:17. What is the age of Neerja?
(a) 24 years (b) 32 years
(c) 26 years (d) 28 years
(e) None of these

[Andhra Bank PO, 2007]

12. Samiara, Mahira and Kiara rented a set of DVDs at a rent of ₹578. If they used it for 8 hours, 12 hours and 14 hours respectively, what is Kiara's share of rent to be paid:

(a) ₹238 (b) ₹204
(c) ₹192 (d) ₹215
(e) None of these

[Bank of Maharashtra PO, 2008]

13. 20 boys and 32 girls form a group for social work. During their membership drive same number of boys and girls joined the group. How many members does the group have now, if the ratio of boys to girls is 3:4 respectively?

(a) 33 (b) 60
(c) 75 (d) Cannot be determined
(e) None of these

[Andhra Bank PO, 2006]

14. Amit, Sumit and Vinit Divide an amount of ₹2,800 amongst themselves in the ratio of 5:6:3 respectively. If an amount of ₹200 is added to each of their shares. What will be the new ratio of their shares of the amount?

(a) 8:9:6 (b) 6:7:4
(c) 7:8:5 (d) 4:5:2
(e) None of these

[LIC ADO, 2007]

15. If two numbers are respectively 20% and 50% of a third number, then what is the ratio between the two numbers?

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

[SSC (GL) Prel. Examination, 2008]

16. If A:B = 3:4 , B:C = 5:7 and C:D = 8:9, then the ratio A:D is:

(a) 3:7 (b) 7:3
(c) 21:10 (d) 10:21

[SSC (GL) Prel. Examination, 2008]

17. If $a:b = 5:7$ and $c:d = 2a:3b$, then $ac:bd$ is:

(a) 20:38 (b) 50:147
(c) 10:21 (d) 50:151

[SSC (GL) Prel. Examination, 2008]

18. Two numbers are in the ratio 2:3. If 2 is subtracted from the first and 2 is added to the second, then the ratio becomes 1:2. The sum of the numbers is:

(a) 30 (b) 28
(c) 24 (d) 10

[SSC (GL) Prel. Examination, 2008]

19. ₹68000 are divided among A, B, and C in the ratio $\frac{1}{2}:\frac{1}{4}:\frac{5}{16}$. The difference of the greatest and the smallest parts is:

(a) ₹6000 (b) ₹14440
(c) ₹9200 (d) ₹16000

[SSC (GL) Prel. Examination, 2008]

20. Three numbers are in the ratios $\frac{1}{2}:\frac{2}{3}:\frac{3}{4}$. The difference between the greatest and the smallest numbers is 36. The numbers are:

(a) 72, 84, 108 (b) 60, 72, 96
(c) 72, 84, 96 (d) 72, 96, 108

[SSC (GL) Prel. Examination, 2008]

21. The ratio of the incomes of two persons is 5:3 and that of their expenditure is 9:5. If they save ₹2600 and ₹1800 respectively, then their incomes are:

(a) ₹8000, ₹4800 (b) ₹6000, ₹3600
(c) ₹10000, ₹60000 (d) ₹9000, ₹5400

[SSC (GL) Prel. Examination, 2008]

22. A and B are two different alloys of gold and copper prepared by mixing metals in the proportion 7:2 and 7:11, respectively. If equal quantities of the alloys are melted to form a third alloy C, find the ratio of gold and copper in C.

(a) 5:7 (b) 6:6
(c) 7:5 (d) 14:13

23. If $\frac{x}{2y} = \frac{6}{7}$, the value of $\frac{x-y}{x+y} + \frac{14}{19}$ equals

(a) $\frac{13}{19}$ (b) $\frac{15}{19}$
(c) 1 (d) $1\frac{1}{19}$

[SI of Police Rec. Examination, 1997]

24. The ratio between the annual incomes of A and B is 4:3 and between their annual expenditure is 3 : 2. If at the end of a year both save ₹600 each, find the difference in their incomes.

(a) ₹450 (b) ₹500
(c) ₹600 (d) ₹750

[SI of Police Rec. Examination, 1997]

25. If a, b, c and d are real numbers such that $a:b = b:c = c:d$ and $a:d = 8:125$, then the value of $a:c$ is:

(a) 25:4 (b) 125:8
(c) 4:25 (d) 8:25

[SI of Police Rec. Examination, 1997]

26. Three pots have the same volume. The ratio of milk and water in first, second and third pots are 3:2, 7:3 and 11:4, respectively. If the liquid of three pots are mixed, then the ratio of milk and water in the mixture is:

(a) 61:29 (b) 61:30
(c) 5:4 (d) 29:61

[SI of Police Rec. Examination, 1997]

27. If $\frac{x}{y}=\frac{6}{5}$ the value of $\frac{x^2+y^2}{x^2-y^2}$ is:

(a) $\frac{36}{25}$ (b) $\frac{25}{36}$

(c) $\frac{61}{11}$ (d) $\frac{11}{61}$

[SI of Police Rec. Examination, 1997]

28. If $a:5 = b:7 = c:8$, then $\frac{a+b+c}{a}$:

(a) 4 (b) 2
(c) 7 (d) 1/4

[SI of Police Rec. Examination, 1997]

29. If $a:b:c = 2:3:4$, then $\frac{1}{a}:\frac{1}{b}:\frac{1}{c}$ is equal to:

(a) 4:3:2 (b) $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$

(c) $\frac{1}{4}:\frac{1}{3}:\frac{1}{2}$ (d) 3:4:6

[SI of Police Rec. Examination, 1997]

30. If $x:y = 8:9$, then $5x - 4y:3x + 2y$ is equal to:

(a) 3:2 (b) 2:3
(c) 3:4 (d) 2:21

[SI of Police Rec. Examination, 1997]

31. Two numbers are in the ratio of 3:4. If 5 is subtracted from each, then the ratio will be 2:3. What is the smaller number?

(a) 15 (b) 18
(c) 20 (d) 24

[SI of Police Rec. Examination, 1997]

32. Monthly income of Anil and Sunil are in the ratio 5:4 and their expenses are in the ratio 4:3. If each of them saves ₹1200 at the end of the month, their monthly incomes, respectively are:

(a) ₹6000, ₹4800
(b) ₹8000, ₹6400
(c) ₹8000, ₹7200
(d) ₹2000, ₹1600

[SI of Police Rec. Examination, 1999]

33. A bag contains one rupee, 50 paise and 25 paise coins in the ratio 2:3:5. Their total value is ₹144. The value of 50-paise coins is:

(a) ₹24 (b) ₹36
(c) ₹48 (d) ₹72

[SI of Police Rec. Examination, 1999]

34. 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) 280 (b) 198
(c) 284 (d) 270

[SI of Police Rec. Examination, 1999]

35. Tea at ₹126 per Kg. and at ₹135 per Kg are mixed with a third variety in the ratio 1:1:2. If the mixture is worth ₹153 per Kg, the price of the third variety (per Kg) is:

(a) ₹169.50 (b) ₹175
(c) ₹175.50 (d) ₹185

[SI of Police Rec. Examination, 1999]

36. Two numbers are in the ratio 3:4. If 50 is added to each number, the ratio becomes 7:9. The sum of the numbers is:

(a) 50 (b) 350
(c) 700 (d) 800

[SI of Police Rec. Examination, 1999]

37. If $3A = 5B$ and $4B = 6C$, then $A:C$ is equal to:

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

[SI of Police Rec. Examination, 1999]

38. A sum of ₹370 is to be divided among A, B and C such that $\frac{\text{A's share}}{\text{B's share}}=\frac{\text{B's share}}{\text{C's share}}=\frac{3}{4}$

Then A's share (in rupees) is:

(a) 240 (b) 120
(c) 100 (d) 90

[Assistant's Grade Examination, 1997]

39. If the ratio of boys to girls in a class is B and the ratio of girls to boys is G, then 3(B + G) is:

(a) Equal to 3
(b) Less than 3
(c) More than 3
(d) Less than $\frac{1}{3}$

[Assistant's Grade Examination, 1997]

40. The monthly incomes of two persons are in the ratio 4:7 and their expenses are in the ratio 11:20. If each of them saves ₹400 per month then their monthly income must be respectively:

(a) ₹3600, ₹4200 (b) ₹4000, ₹7000
(c) ₹4200, ₹7350 (d) ₹4800, ₹8400

[Assistant's Grade Examination, 1997]

41. What number should be subtracted from both the terms of the ratio 15:19 in order to make it 3:4?

(a) 9 (b) 6
(c) 5 (d) 3

[SSC (GL) Prel. Examination, 2000]

42. If $p:q = r:s:t:u = 2:3$, then:

$(mp + nr + ot):(mq + ns + ou)$ is equal to:
(a) 1:3 (b) 1:2
(c) 2:3 (d) 3:2

[SSC (GL) Prel. Examination, 2000]

43. If $a:b = c:d = e:f = 1:2$, then

$(pa + qc + re):(pb + qd + rf)$ is equal to:
(a) $p:(q + r)$ (b) $(p + q):r$
(c) 2:3 (d) 1:2

[SSC (GL) Prel. Examination, 2000]

44. If $x:y = 3:1$, then $x^3 - y^3:x^3 + y^3 = ?$

(a) 13:14 (b) 14:13
(c) 10:11 (d) 11:10

[SSC (GL) Prel. Examination, 2000]

45. If 10% of m is the same as 20% of n. Then $m:n$ is equal to:

(a) 2:1 (b) 1:2
(c) 1:10 (d) 1:20

[SSC (GL) Prel. Examination, 2000]

46. The ratio $2^{1.5}:2^{0.5}$ is the same as:

(a) 2:1 (b) 3:1
(c) 6:1 (d) 3:2

[SSC (GL) Prel. Examination, 2000]

47. If $m:n = 3:2$, then $(4m + 5n):(4m - 5n)$ is equal to:

(a) 4:9 (b) 9:4
(c) 11:1 (d) 9:1

[SSC (GL) Prel. Examination, 2000]

48. The smallest integer, which when subtracted from both the terms of 6:7 gives a ratio less than 16 : 21, is:

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

[SSC (GL) Prel. Examination, 2000]

49. If $\frac{a}{b} = \frac{2}{3}$ and $\frac{b}{c} = \frac{4}{5}$, then the ratio $\frac{a+b}{b+c}$ is equal to:

(a) $\frac{20}{27}$ (b) $\frac{27}{20}$
(c) $\frac{6}{8}$ (d) $\frac{8}{6}$

50. The sum of two numbers is 40 and their difference is 4. The ratio of the numbers is:

(a) 21:19 (b) 22:9
(c) 11:9 (d) 11:18

[SSC (GL) Prel. Examination, 2000]

51. Neeta bought a book at 30% discount on the listed price. Had she not got the discount, she would have paid ₹82.50 extra. At what price did she buy the book?

(a) ₹192.50 (b) ₹275
(c) ₹177.85 (d) Cannot be determined
(e) None of these

[Canara Bank PO 2003]

52. A man spends ₹1810 for buying bags at ₹200 each and bottles at ₹70 each. What will be the ratio of bags to bottles when maximum number of bags are bought?

(a) 3:8 (b) 8:3
(c) 9:1 (d) 1:9
(e) None of these

[IBPS Jr. Executive Examination, 2000]

53. If $a:b = 2:3$ and $b:c = 4:5$, find $a^2:b^2:bc$:

(a) 4:9:45 (b) 16:36:45
(c) 16:36:20 (d) 4:36:20

[SSC (GL) Prel. Examination, 2002]

54. 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) 6:4:8:10 (b) 6:8:9:10
(c) 8:6:10:9 (d) 4:6:8:10

[SSC (GL) Prel. Examination, 2002]

55. Two numbers are in the ratio of 5:7. On diminishing each of them by 40, they become in the ratio 17:27. The difference of the numbers is:

(a) 18 (b) 52
(c) 137 (d) 50

[SSC (GL) Prel. Examination, 2002]

56. The ratio of the number of boys and girls of a school with 504 students is 13:11. What will be the new ratio if 12 more girls are admitted?

(a) 91:81 (b) 81:91
(c) 9:10 (d) 10:9

[SSC (GL) Prel. Examination, 2002]

57. A and B have monthly incomes in the ratio 5:6 and monthly expenditures in the ratio 3:4. If they save ₹1800 and ₹1600 respectively, find the monthly income of B.

(a) ₹3400 (b) ₹2700
(c) ₹1720 (d) ₹7200

[SSC (GL) Prel. Examination, 2002]

58. A sum of ₹9000 is to be distributed among A, B and C in the ratio 4:5:6. What will be the difference between A's and C's shares?

(a) ₹600 (b) ₹1000
(c) ₹900 (d) ₹1200

[SSC (GL) Prel. Examination, 2002]

59. Zinc and copper are in the ratio of 5:3 in 200 gm of an alloy. How many grams of copper should be added to make the ratio 3:5?

(a) $133\frac{1}{3}$ (b) $\frac{1}{200}$
(c) 72 (d) 66

[SSC (GL) Prel. Examination, 2002]

60. Divide ₹7500 among A, B and C such that A's share to B's share is in the ratio 5:2 and B's share to C's share is in the ratio 7:13. How much will B receive?

(a) ₹1400 (b) ₹3500
(c) ₹2600 (d) ₹7000

[SSC (GL) Prel. Examination, 2002]

61. The ratio of copper and zinc in brass is 13:7. How much zinc will be there in 100 kg of brass?

(a) 20 Kg (b) 55 Kg
(c) 35 Kg (d) 40 Kg

[SSC (GL) Prel. Examination, 2002]

62. If $A:B:C = 2:3:4$, then $\frac{A}{B}:\frac{B}{C}:\frac{C}{A}$ is equal to:

(a) 8:9:16 (b) 8:9:12
(c) 8:9:24 (d) 4:9:16

[SSC (GL) Prel. Examination, 2002]

63. If $A:B = 1:2$, $B:C = 3:4$ and $C:D = 5:6$, find $D:C:B:A$:

(a) 6:5:4:2 (b) 6:3:2:1
(c) 6:4:2:1 (d) 48:40:30:15

[SSC (GL) Prel. Examination, 2002]

64. Two numbers are in the ratio $1\frac{1}{2}:2\frac{2}{3}$. When each of these is increased by 15, they become in the ratio $1\frac{2}{3}:2\frac{1}{2}$. The greater of the numbers is:

(a) 27 (b) 36
(c) 48 (d) 64

[SSC (GL) Prel. Examination, 2002]

65. The students in three classes are in the ratio 2:3:5. If 40 students are increased in each class, the ratio changes to 4:5:7. Originally, the total number of students was:

(a) 100 (b) 180
(c) 200 (d) 400

[SSC (GL) Prel. Examination, 2002]

66. The ratio of incomes of two persons is 5:3 and that of their expenditures is 9:5. Find the income of each person, if they save ₹1,300 and ₹900, respectively.

(a) ₹4000, ₹2400 (b) ₹3000, ₹1800
(c) ₹5000 ₹300 (d) ₹450 ₹2700

[SSC (GL) Prel. Examination, 2002]

67. If the ratio of the areas of two squares is 1:4, then the ratio of their perimeters is:

(a) 1:2 (b) 1:4
(c) 1:6 (d) 1:8

[SSC (GL) Prel. Examination, 2002]

68. An equilational triangle is described on the diagonal of a square. What is the ratio of the area of the triangle to that of the square?

(a) $\sqrt{3:2}$ (b) $2:\sqrt{3}$
(c) $\sqrt{3}:4$ (d) $4:\sqrt{3}$

[SSC (GL) Prel. Examination, 2002]

69. If $x:y = 3:4$, then $(7x + 3y):(7x - 3y)$ is equal to:

(a) 5:2 (b) 4:3
(c) 11:3 (d) 37:19

[SSC (GL) Prel. Examination, 2002]

70. If $a:b = 5:7$ and $c:d = 2a:3b$, then $ac:bd$ is:

(a) 20:38 (b) 50:147
(c) 10:21 (d) 50:151

[SSC (GL) Prel. Examination, 2002]

71. If $A:B = 2:3$, $B:C = 4:5$, and $C:D = 6:7$, then $A:B:C:D$ is:

(a) 18:24:30:35 (b) 16:24:30:35
(c) 16:22:30:35 (d) 16:24:15:35

[SSC (GL) Prel. Examination, 2002]

72. The 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.

(a) 72, 84, 108 (b) 60, 72, 96
(c) 72, 84, 96 (d) 72, 96, 108

[SSC (GL) Prel. Examination, 2002]

73. The ratio of the number of girls and boys participating in sports of a school is 4:5. If the number of girls is 212, then determine the number of boys participating in the sports:

(a) 256 (b) 265
(c) 251 (d) 263

[SSC (GL) Prel. Examination, 2002]

74. The ratio of market price of wheat and paddy is 2 : 3 and the ratio of the quantities consumed in a family is 5:4. Find the ratio of the expenditures of wheat and paddy:

(a) 6:5 (b) 5:6
(c) 1:1 (d) 8:15

[SSC (GL) Pre. Examination, 2002]

75. 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 $a:b:c:d$ is:

(a) 4:6:7:9 (b) 16:24:30:35
(c) 8:12:15:7 (d) 30:35:24:16

[SSC (GL) Prel. Examination, 2003]

76. The incomes of A, B and C are in the ratio 7:9:12 and their spendings are in the ratio 8:9:15. If A saves $\frac{1}{4}$ of his income, then the savings of A, B and C are in the ratio of:

(a) 56:99:69 (b) 69:56:99
(c) 99:56:69 (d) 99:69:56

[SSC (GL) Prel. Examination, 2003]

77. In an alloy, the ratio of copper and zinc is 5:2. If 1.250 Kg of zinc is mixed in 17 Kg 500 gm of alloy, then the ratio of copper and zinc will be:

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

[SSC (GL) Prel. Examination, 2003]

78. If 378 coins consist of rupee, 50 paise and 25 paise coins whose values are in the ratio of 13:11:7, the number of 50-paise coins will be:

(a) 132 (b) 128
(c) 136 (d) 133

[SSC (GL) Prel. Examination, 2003]

79. If $A:B$ = 2:3 and $B:C$ = 4:5, then $A:B:C$ is:

(a) 2:12:5 (b) 8:12:15
(c) 12:8:15 (d) 15:12:8

[SSC (GL) Prel. Examination, 2000]

80. If $A:B = \frac{1}{2}:\frac{1}{3}$, $B:C = \frac{1}{2}:\frac{1}{3}$, then $A:B:C$ is equal to:

(a) 2:3:3 (b) 1:2:6
(c) 3:2:6 (d) 9:6:4

[SSC (GL) Prel. Examination, 2000]

81. Instead of dividing ₹117 among P, Q, R in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$, it was divided in the ratio 2:3:4 by mistake. Who gained in this transaction?

(a) Only P (b) Only Q
(c) Only R (d) Both Q and R

[SSC (GL) Prel. Examination, 2000]

82. A boy contains 10-paise coins and 25-paise coins in the ratio 17:6. If the total money in the bag is ₹112, then the number of 10-paise coins is:

(a) 35 (b) 210
(c) 490 (d) 595

[SSC (GL) Prel. Examination, 2000]

83. If 2A = 3B and 4B = 5C, Then A:C is:

(a) 4:3 (b) 8:15
(c) 15:8 (d) 3:4

[OBC PO Examination, 2000]

84. If $(x:y)$ = 2:1 then $(x^2 - y^2):(x^2 + y^2)$ is:

(a) 3:5 (b) 5:3
(c) 1:3 (d) 3:1
(e) None of these

[RRB, 2009]

85. 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) Divide the intensity by 3
(b) Multiply the intensity by 3
(c) Divide the intensity by 9
(d) Multiply the intensity by 9

86. 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) 9:1 (b) 7:3
(c) 1:10 (d) 1:4

87. Eight people are planning to share equally the cost of a rental car. If one person withdraws from the arrangement and the others share equally the entire cost of the car, then the share of each of the remaining persons increased by:

(a) One-ninth (b) One-eighth
(c) One-seventh (d) Seven-eighth

88. 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) 4:3 (b) 3:2
(c) 1:2 (d) 2:3

89. When a number is added to another number the total becomes $3\frac{1}{3}$ per cent of the second number. What is the ratio between the first and the second number?

(a) 3:7 (b) 7:4
(c) 7:3 (d) Data inadequate

[BSRB Mumbai PO, 1998]

90. An amount of money is to be distributed among P, Q and R in the ratio 6:19:7, respectively. If R gives ₹200 of his share to Q, the ratio among P, Q and R becomes 3:10:3, respectively. What was the total amount?

(a) ₹6400 (b) ₹12800
(c) ₹3200 (d) Data inadequate

[Bank of Baroda PO, 1999]

91. A man in his will distributed his money in such a way that half of it is for his wife, two-third of the remaining equally to three of his sons and the remaining amount equally to four of his daughters. If each of the daughters receives ₹20000, how much money will each of his sons receive?

(a) ₹50333.33 (b) ₹48233.33
(c) ₹53333.33 (d) Data inadequate

[SBI Associates PO, 1999]

92. The ratio between the present ages of P and Q is 5:8. After 4 years, the ratio between their ages will be 2:3. What is Q's age at present?

(a) 36 years (b) 20 years
(c) 24 years (d) None of these

[Guwahati PO, 1999]

93. The ratio of P's and Q's ages is 5:7. If the difference between the present age of Q and the age of P six years hence is 2, then what is the total of present ages of P and Q?

(a) 52 years (b) 48 years
(c) 56 years (d) Data inadequate

[Guwahati PO, 1999]

94. An amount of money is to be distributed among P, Q and R in the ratio 5:8:12, respectively. If the total share of Q and R is four times that of P, what is definitely P's share?

(a) ₹3000 (b) ₹5000
(c) ₹8000 (d) Data inadequate

[BSRB Mumbai PO, 1999]

95. In a business, A and C invested amounts in the ratio 2:1, whereas the ratio between amounts invested by A and B was 3:2. If ₹1,57,300 was their profit, how much amount did B receive?

(a) ₹72600 (b) ₹48400
(c) ₹36300 (d) ₹24200

[BSRB Calcutta PO, 1999]

96. An amount of money is to be divided among P, Q and R in the ratio 4:9:16. If R gets 4 times more that P, what is Q's share in it?

(a) ₹1800 (b) ₹2700
(c) ₹3600 (d) Data inadequate

[BSRB Hyderabad PO, 1999]

97. When 30 per cent of a number is added to another number, the second number increases by its 20 per cent. What is the ratio between the first and the second number?

(a) 3:2 (b) 2:3
(c) 2:5 (d) Data inadequate

[NABARD, 1999]

98. The ratio of A's and B's salary is 9:4. If A's salary is increased by 15%, then his total salary becomes ₹5175. What is the salary of B?

(a) ₹2000 (b) ₹4000
(c) ₹4500 (d) ₹2500

[BSRB Chennai PO, 2000]

99. Mohan is younger than Sohan by 10 years. If 5 years back their ages were in the ratio 1:2, how old is Sohan?

(a) 20 (b) 15
(c) 25 (d) Data inadequate

[BSRB Chennai PO, 2000]

100. Ratio of present ages of P and Q is 7:3. After four years their ages are in the ratio 2:1. What is the present age of P?

(a) 24 years (b) 28 years
(c) 32 years (d) Data inadequate

[BSRB Chennai PO, 2000]

101. An amount of ₹125000 is to be distributed among Raju, Monu and Sonu in the respective ratio of 2:3:5. What will be the difference between Monu and Raju's share?

(a) ₹25000 (b) ₹12500
(c) ₹18750 (d) ₹2500

[BSRB Bangalore PO, 2000]

102. The ratio of present ages of Ram and Shyam is 7:8, respectively. Four years after, hence this ratio becomes 9:10, respectively. What is Ram's present age in years?

(a) 18 (b) 14
(c) 17 (d) Data inadequate

[BSRB Bangalore PO, 2000]

103. Salaries of A, B and C were in the ratio 3:5:7, respectively. If their salaries were increased by 50 per cent, 60 per cent and 50 per cent, respectively, what will be the new ratio of their respective salaries?

(a) 3:6:7 (b) 4:5:7
(c) 4:5:8 (d) None of these

[BSRB Delhi PO, 2000]

104. The incomes of A, B and C are in the ratio 7:9:12 and their spending are in the ratio 8:9:15. If A saves one-fourth of his income, then the savings of A, B and C are in the ratio of:

(a) 69:56:48 (b) 47:74:99
(c) 37:72:49 (d) 56:99:69

[SSC (GL), 2011]

105. The third proportional of 38 and 15 is:

(a) $\frac{38\times38}{15}$ (b) $\frac{15}{38\times38}$

(c) $\frac{15\times15}{38}$ (d) $\frac{38\times15}{2}$

[BSRB Patna PO, 2001]

106. An amount of money is to be divided among P, Q and R in the ratio of 3:5:7, respectively. If the amount received by R is ₹4,000 more than the amount received by Q, what will be the total amount received by P and Q together?

(a) ₹8,000 (b) ₹12,000
(c) ₹16,000 (d) Cannot be determined

[Gramin Bank U.P. (SO) Examination, 2012]

107. The ratio of students in school A, B and C is 5:4:7 respectively. If number of students in schools are increased by 20 per cent, 25 per cent and 20 per cent respectively then what will be the ratio of students in school A, B and C, respectively?

(a) 5:5:7 (b) 30:25:42
(c) 30:20:49 (d) Cannot be determined

[Syndicate Bank PO, 2010]

108. On Republic Day, sweets were to be equally distributed among 450 children. But on that particular day, 150 children remained absent. Thus, each child got 3 sweets extra. How many sweets did each child get?

(a) 6 (b) 12
(c) 9 (d) Cannot be determined

[Bank of India PO, 2010]

109. If $\frac{x}{2y}=\frac{6}{7}$, the value of $\frac{x-y}{x+y}+\frac{14}{19}$ equals

(a) $\frac{13}{19}$ (b) $\frac{15}{19}$

(c) 1 (d) $1\frac{1}{19}$

[SI of Police Rec. Examination, 1997]

110. The ratio between the annual incomes of A and B is 4:3 and between their annual expenditure is 3:2. If at the end of a year both save ₹600 each, find the difference in their incomes.

(a) ₹450 (b) ₹500
(c) ₹600 (d) ₹750

[SI of Police Rec. Examination, 1997]

111. If a, b, c and d are real numbers such that $a:b = b:c = c:d$ and $a:d = 8:125$, then the value of $a:c$ is:

(a) 25:4 (b) 125:8
(c) 4:25 (d) 8:25

[SI of Police Rec. Examination, 1997]

112. Three pots have the same volume. The ratio of milk and water in first, second and third pots are 3:2, 7:3 and 11:4, respectively. If the liquid of three pots are mixed, then the ratio of milk and water in the mixture is:

(a) 61:29 (b) 61:30
(c) 5:4 (d) 29:61

[SI of Police Rec. Examination, 1997]

113. An AC consumes 8 units of electricity in 30 minutes and a bulb consumes 18 units of electricity in 6 hours. How much total unit of electricity will both AC and bulb consume in 8 days if they run 10 hours a day?

(a) 1280 units (b) 1528 units
(c) 1520 units (c) 1520 units

[Corporation Bank PO, 2009]

114. Monthly income of Anil and Sunil are in the ratio 5:4 and their expenses are in the ratio 4:3. If each of them saves ₹1200 at the end of the month, their monthly incomes, respectively are:

(a) ₹6000, ₹4800
(b) ₹8000, ₹6400
(c) ₹8000, ₹7200
(d) ₹2000, ₹1600

[SI of Police Rec. Examination, 1999]

115. The respective ratio between the speeds of a car, a jeep and a tractor is 3:5:2. The speed of the jeep is 250 per cent the speed of the tractor which covers 360 Km in 12 hours. What is the average speed of car and jeep together?

(a) 60 Km/h (b) 75 Km/h
(c) 40 Km/h (d) Cannot be determined

[CBI (PO), 2010]

116. 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) 280 (b) 198
(c) 284 (d) 270

[SI of Police Rec. Examination, 1999]

117. Tea at ₹126 per Kg. and at ₹135 per Kg are mixed with a third variety in the ratio 1:1:2. If the mixture is worth ₹153 per Kg, the price of the third variety (per Kg) is:

(a) ₹169.50 (b) ₹175
(c) ₹175.50 (d) ₹185

[SI of Police Rec. Examination, 1999]

118. Mr. Pandit owned 950 gold coins all of which he distributed amongst his three daughters Lalita, Amita and Neela. Lalita gave 25 gold coins to her husband, Amita donated 15 gold coins and Neeta made jewellery out of 30 gold coins. The new respective ratio of the coins left with them was 20:73:83. How many gold coins did Amita receive from Mr. Pandit?

(a) 380 (b) 415
(c) 400 (d) 350

[Punjab National Bank PO, 2010]

119. When 30 per cent of one number is subtracted from another number, the second number reduces to its four-fifth. What is the ratio between the first and the second number respectively?

(a) 4:7 (b) 3:2
(c) 2:5 (d) Cannot be determined

[Allahabad Bank PO, 2010]

120. A sum of ₹370 is to be divided among A, B and C such that $\frac{\text{A's share}}{\text{B's share}} = \frac{\text{B's share}}{\text{C's share}} = \frac{3}{4}$

Then A's share (in rupees) is:

(a) 240 (b) 120
(c) 100 (d) 90

[Assistant's Grade Examination, 1997]

121. If $p:q = r:s::t:u = 2:3$, then

$(mp + nr + ot):(mq + ns + ou)$ is equal to:

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

[SSC (GL) Prel. Examination, 2000]

122. Neeta bought a book at 30 per cent discount on the listed price. Had she not got the discount, she would have paid ₹82.50 extra. At what price did she buy the book?

(a) ₹192.50
(b) ₹275
(c) ₹177.85
(d) Cannot be determined

[Canara Bank PO, 2003]

123. A man spends ₹1810 for buying bags at ₹200 each and bottles at ₹70 each. What will be the ratio of bags to bottles, when maximum number of bags are bought?

(a) 3:8 (b) 8:3
(c) 9:1 (d) 1:9

[IBPS Jr. Executive Examination, 2000]

124. If $a:b = 2:3$ and $b:c = 4:5$, find $a^2:b^2:bc$:

(a) 4:9:45 (b) 16:36:45
(c) 16:36:20 (d) 4:36:20

[SSC (GL) Prel. Examination, 2002]

125. Zinc and copper are in the ratio of 5:3 in 200 gm of an alloy. How many grams of copper should be added to make the ratio 3:5?

(a) $133\frac{1}{3}$ (b) $\frac{1}{200}$
(c) 72 (d) 66

[SSC (GL) Prel. Examination, 2002]

126. Divide ₹7500 among A, B and C such that A's share to B's share is in the ratio 5:2 and B's share to C's share is in the ratio 7:13. How much will B receive?

(a) ₹1400 (b) ₹3500
(c) ₹2600 (d) ₹7000

[SSC (GL) Prel. Examination, 2002]

127. Two numbers are in the ratio $1\frac{1}{2}:2\frac{2}{3}$. When each of these is increased by 15, they become in the ratio $1\frac{2}{3}:2\frac{1}{2}$. The greater of the numbers is:

(a) 27 (b) 36
(c) 48 (d) 64

[SSC (GL) Prel. Examination, 2002]

128. The students in three classes are in the ratio 2:3:5. If 40 students are increased in each class, the ratio changes to 4:5:7. Originally, the total number of students was:

(a) 100 (b) 180
(c) 200 (d) 400

[SSC (GL) Prel. Examination, 2002]

129. An equilateral triangle is described on the diagonal of a square. What is the ratio of the area of the triangle to that of the square?

(a) $\sqrt{3}:2$ (b) $2:\sqrt{3}$
(c) $\sqrt{3}:4$ (d) $4:\sqrt{3}$

[SSC (GL) Prel. Examination, 2002]

130. The 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.

(a) 72, 84, 108 (b) 60, 72, 96
(c) 72, 84, 96 (d) 72, 96, 108

[SSC (GL) Prel. Examination, 2002]

131. 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 $a:b:c:d$ is:

(a) 4:6:7:9 (b) 16:24:30:35
(c) 8:12:15:7 (d) 30:35:24:16

[SSC (GL) Prel. Examination, 2003]

132. The incomes of A, B and C are in the ratio 7:9:12 and their spendings are in the ratio 8:9:15. If A saves one-fourth of his income, then the savings of A, B and C are in the ratio of:

(a) 56:99:69 (b) 69:56:99
(c) 99:56:69 (d) 99:69:56

[SSC (GL) Prel. Examination, 2003]

133. In an alloy, the ratio of iron and chromium is 5:2. If 1.250 Kg of chromium is mixed in 17.500 Kg of alloy, then the ratio of iron and chromium will be:

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

[SSC (GL) Prel. Examination, 2003]

134. Instead of dividing ₹117 among P, Q, R in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$, it was divided in the ratio 2:3:4 by mistake. Who gained in this transaction?

(a) Only P (b) Only Q
(c) Only R (d) Both Q and R

[SSC (GL) Prel. Examination, 2000]

135. A man divides his property so that his son's share to his wife's and wife's share to his daughter's are both in the ratio 3:1. If the daughter gets ₹10,000 less than son, the value (in rupees) of the whole property is:

(a) ₹16,250 (b) ₹16,000
(c) ₹18,250 (d) ₹17,000

[SSC, 2014]

136. In a class there are z students. Out of them x are boys. What part of the class is composed of girls?

(a) $\frac{x}{z}$ (b) $\frac{z}{x}$
(c) $1-\frac{x}{z}$ (d) $\frac{x}{z}-1$

[SSC, 2013]

137. The third proportional of 12 and 18 is:

(a) 3 (b) 6
(c) 27 (d) 144

[SSC, 2013]

138. Ram got twice as many marks in English as in Science. His total marks in English, Science and Mathematics are 180. If the ratio of his marks in English and Mathematics is 2:3, what are his marks in Science?

(a) 30 (b) 60
(c) 72 (d) 90

[SSC, 2013]

139. Three numbers are in the ratio 2:3:4. If the sum of their squares is 1856, then the numbers are:

(a) 8, 12 and 16 (b) 16, 24 and 32
(c) 12, 18 and 24 (d) None of the above

[SSC, 2013]

140. If x runs are scored by A, y runs by B and z runs by C, then $x:y = y:z = 3:2$. If total number of runs scored by A, B and C is 342, the runs scored by each would be respectively:

(a) 144, 96, 64 (b) 162, 108, 72
(c) 180, 120, 80 (d) 189, 126, 84

[SSC, 2013]

141. ₹900 is divided among A, B, C; the division is such that $\frac{1}{2}$nd of A's money $= \frac{1}{3}$rd of B's money $= \frac{1}{4}$th of C's money. Find the amount received by A, B and C.

(a) 300, 400, 200
(b) 350, 450, 100
(c) 200, 300, 400
(d) 400, 150, 350

[SSC, 2013]

142. If ₹126.50 is divided among A, B and C in the ratio of 2:5:4, the share of B exceeds that of A by:

(a) ₹36.50 (b) ₹35.50
(c) ₹34.50 (d) ₹33.50

[SSC, 2013]

143. A box contains ₹56 in the form of coins of one-rupee, 50-paise and 25-paise. The number of 50-paise coins is double the number of 25-paise coins and four times the number of one-rupee coins. How many 50-paise coins are there in the box?

(a) 52 (b) 64
(c) 32 (d) 16

[SSC Assistant Grade III, 2013]

144. The students in three classes are in the ratio 4:6:9. If 12 students are increased in each class, the ratio changes to 7:9:12. Then the total number of students in the three classes before the increase is:

(a) 95 (b) 76
(c) 100 (d) 114

[SSC, 2012]

145. There is a ratio of 5:4 between two numbers. If 40 per cent of the first is 12, then 50% of the second number is:

(a) 12 (b) 24
(c) 18 (d) 20

[SSC, 2012]

146. Annual income of Amit and Veer are in the ratio 3:2, while the ratio of their expenditures is 5:3. If at the end of the year each saves ₹1,000, the annual income of Amit is:

(a) ₹9,000 (b) ₹8,000
(c) ₹7,000 (d) ₹6,000

[SSC, 2012]

147. P varies inversely with the product of Q and R. When $Q = 6$ and $R = 12$, $P = 75$. When $Q = 5$, $R = 10$, then P is:

(a) 75 (b) 6
(c) 108 (d) 12

[SSC, 2012]

148. ₹846 is divided among A, B and C such that 8 times A's share is equal to 12 times B's share and also equal to 6 times C's share. How much did B get?

(a) ₹399 (b) ₹192
(c) ₹288 (d) ₹72

[SSC, 2012]

149. The population of town is 3,11,250. The ratio between women and men is 43:40. If there are 24% literate among men and 8% literate among women, the total number of literate persons in the town is:

(a) 41,800 (b) 48,900
(c) 56,800 (d) 99,600

[SSC, 2012]

150. A and B earn in the ratio 2:1. They spend in the ratio 5:3 and save in the ratio 4:1. If the total monthly savings of both A and B are ₹5,000, the monthly income of B is:

(a) ₹3,000 (b) ₹14,000
(c) ₹5,000 (d) ₹10,000

[SSC, 2011]

151. The ratio of the sum of two numbers and their difference is 5:1. The ratio of the greater number to the smaller number is:

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

[SSC, 2011]

152. An employer reduces the number of his employees in the ratio 9:8 and increases their wages in the ratio 14:15. If the original wage bill was ₹18,900, find the ratio in which the wage bill is decreased.

(a) 20:21 (b) 21:20
(c) 20:19 (d) 19:21

[SSC, 2011]

153. ₹1050 are divided among A, B and C in such a way that the share of A is $\frac{2}{5}$ of the combinedshare of B and C. A will get:

(a) ₹200 (b) ₹300
(c) ₹320 (d) ₹420

[SSC, 2010]

154. If A:B = 2:3, B:C = 4:5 and C:D = 5:9, then A:D is equal to:

(a) 11:17 (b) 8:27
(c) 5:9 (d) 2:9

[SSC, 2010]

Directions (Q. 155–167): Read the following information carefully to answer the following questions.
In a college, 150 students of MBA are enrolled. The ratio of boys to girls is 7:8. There are three disciplines in the college, namely, Marketing, HR and Finance. In the Marketing discipline, there are 50% girls of their total number and the boys are 40% of their total number. In the HR discipline, girls are 30% of their total number while boys are 30% of their total number. The Finance discipline has girls 20% of their total number and the boys are 30% of their total number. 7 boys and 9 girls are in the HR and Marketing both. 6 boys and 7 girls are in the HR and Finance both. 5 boys and 8 girls are in the Marketing and Finance both. 2 boys and 3 girls are enrolled in all the three disciplines.

155. What percentage of students are enrolled in all three disciplines?

(a) 3.33% (b) 7.2%
(c) 8.5% (d) 9.32%
(e) None of these

[IBPS PO/MT, 2013]

156. What is the ratio of boys to girls only in the Marketing discipline?

(a) 13:9 (b) 9:13
(c) 9:11 (d) 11:9
(e) None of these

[IBPS PO/MT, 2013]

157. The ratio of the number of boys in the Marketing and Finance disciplines both to that of girls only in the Finance discipline is:

(a) 5:3 (b) 3:5
(c) 5:4 (d) 4:7
(e) None of these

[IBPS PO/MT, 2013]

158. By what percent is the number of boys in the Marketing discipline more than the number of girls in the HR discipline?

(a) $13\frac{1}{3}\%$ (b) $33\frac{1}{3}\%$
(c) $14\frac{2}{3}\%$ (d) $16\frac{2}{3}\%$
(e) None of these

[IBPS PO/MT, 2013]

159. The ratio of boys to girls enrolled only in the HR discipline is:

(a) 10:11 (b) 9:10
(c) 7:5 (d) 5:7
(e) None of these

[IBPS PO/MT, 2013]

160. When X is subtracted from the numbers 9, 15 and 27, the remainders are in continued proportion. What is the value of X?

(a) 8 (b) 6
(c) 4 (d) 5
(e) None of these

[IBPS PO/MT, 2012]

161. A certain amount was to be distributed among A, B and C in the ratio 2:3:4, but was erroneously distributed in the ratio 7:2:5. As a result of this, B received ₹40 less. What is the actual amount?

(a) ₹210 (b) ₹270
(c) ₹230 (d) ₹280
(e) None of these

[IBPS PO/MT, 2012]

162. ₹73,689 are divided between A and B in the ratio 4:7. What is the difference between thrice the share of A and twice the share of B?

(a) ₹36,699 (b) ₹46,893
(c) ₹20,097 (d) ₹26,796
(e) ₹13,398

[IBPS PO/MT, 2012]

163. What is the amount invested in Scheme 'B'?

Statements:

I. The amounts invested in Schemes 'A' and 'B' are in the ratio of 2:3.
II. The amount invested in Scheme 'A' is 40% of the total amount invested.
III. The amount invested in Scheme 'A' is ₹45,000.

(a) Only I and II (b) Only I and III
(c) Only II and III (d) All I, II and III
(e) Only III and either I or II.

[SBI Associates Banks PO, 2011]

164. 20 boys and 32 girls form a group for social work. During their membership drive, an equal number of boys and girls also joined the group. How many members does the group have now, if the ratio of boys to girls is 3:4?

(a) 75 (b) 86
(c) 68 (d) 82
(e) None of these

[Andhra Bank PO, 2011]

165. 53% of a number is 358 less than the square of 26. What is the value of 3/4 of 23% of that number?

(a) 101 (b) 109.5
(c) 113 (d) 103.5
(e) None of these

[Corporation Bank PO, 2011]

166. The ratio of the present ages of Anju and Sandhya is 13:17. Four years ago the ratio of their ages was 11:15. What will be the ratio of their ages six years later?

(a) 3:4 (b) 7:8
(c) 5:4 (d) 6:5
(e) None of these

[Corporation Bank PO, 2010]

167. When 30% of one number is subtracted from another number, the second number reduces to its 4/5. What is the ratio of the first to the second number?

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

[Allahabad Bank PO, 2010]

Directions (Q. 168–172): Study the information carefully to answer the following questions.

On the occasion of an opening ceremony of a sports event, in a stadium, there are 600 players who are participating in four different events, that is, Athletics, Table Tennis, Kho-Kho and Lawn Tennis. The ratio of male to female players is 11:4. 30% of the female players are participating in Athletics. 10% of the female players are participating in Table Tennis. The remaining female players are participating in Kho-Kho and Lawn Tennis in the ratio of 1:3. The ratio of male players who are participating in Athletics and other events together is 3:5. 4% of those male players who are not participating in Athletics are participating in Lawn Tennis. Remaining male players are participating in Table Tennis and Kho-Kho in the ratio 5:3.

168. What is the ratio of the male players participating in Lawn Tennis to the female players participating in Table Tennis?

(a) 11:72 (b) 11:38
(c) 11:16 (d) 16:13
(e) None of these

[Indian Bank PO, 2010]

169. What is the total number of players (both males and females together) participating in Table Tennis and Athletics together?

(a) 360 (b) 358
(c) 374 (d) 396
(e) None of these

[Indian Bank PO, 2010]

170. What is the ratio of the female players participating in Lawn Tennis to those participating in Table Tennis?

(a) 9:5 (b) 4:7
(c) 7:4 (d) 9:2
(e) None of these

[Indian Bank PO, 2010]

171. What is the difference between the male players participating in Kho-Kho and the female players participating in Lawn Tennis?

(a) 27 (b) 31
(c) 83 (d) 76
(e) None of these

[Indian Bank PO, 2010]

172. What is the total number of female players who are participating in Athletics and Kho-Kho together?

(a) 68 (b) 72
(c) 58 (e) 67
(e) None of these

[Indian Bank PO, 2010]

ANSWER KEYS

EXERCISE-I

1. (b)	**2.** (c)	**3.** (a)	**4.** (a)	**5.** (b)	**6.** (c)	**7.** (a)	**8.** (c)	**9.** (b)	**10.** (b)	**11.** (c)	**12.** (a)	**13.** (b)
14. (c)	**15.** (b)	**16.** (a)	**17.** (c)	**18.** (b)	**19.** (c)	**20.** (c)	**21.** (a)	**22.** (a)	**23.** (b)	**24.** (b)	**25.** (a)	**26.** (b)
27. (a)	**28.** (b)	**29.** (a)	**30.** (c)	**31.** (a)	**32.** (b)	**33.** (c)	**34.** (c)	**35.** (a)	**36.** (b)	**37.** (a)	**38.** (a)	**39.** (b)
40. (a)	**41.** (d)	**42.** (c)	**43.** (b)	**44.** (b)	**45.** (c)	**46.** (a)						

EXERCISE-2

1. (a)	**2.** (c)	**3.** (d)	**4.** (b)	**5.** (c)	**6.** (e)	**7.** (c)	**8.** (c)	**9.** (d)	**10.** (c)	**11.** (d)	**12.** (a)	**13.** (e)
14. (b)	**15.** (b)	**16.** (d)	**17.** (b)	**18.** (a)	**19.** (d)	**20.** (d)	**21.** (a)	**22.** (c)	**23.** (c)	**24.** (c)	**25.** (c)	**26.** (a)
27. (c)	**28.** (a)	**29.** (b)	**30.** (d)	**31.** (a)	**32.** (a)	**33.** (b)	**34.** (a)	**35.** (c)	**36.** (c)	**37.** (a)	**38.** (d)	**39.** (c)
40. (d)	**41.** (d)	**42.** (c)	**43.** (d)	**44.** (a)	**45.** (a)	**46.** (a)	**47.** (c)	**48.** (c)	**49.** (a)	**50.** (c)	**51.** (a)	**52.** (b)
53. (b)	**54.** (c)	**55.** (d)	**56.** (a)	**57.** (d)	**58.** (d)	**59.** (a)	**60.** (a)	**61.** (c)	**62.** (c)	**63.** (d)	**64.** (c)	**65.** (c)
66. (a)	**67.** (a)	**68.** (a)	**69.** (c)	**70.** (b)	**71.** (b)	**72.** (d)	**73.** (b)	**74.** (b)	**75.** (b)	**76.** (a)	**77.** (a)	**78.** (a)
79. (b)	**80.** (d)	**81.** (c)	**82.** (d)	**83.** (c)	**84.** (a)	**85.** (c)	**86.** (c)	**87.** (c)	**88.** (a)	**89.** (c)	**90.** (a)	**91.** (c)
92. (d)	**93.** (b)	**94.** (d)	**95.** (b)	**96.** (d)	**97.** (b)	**98.** (a)	**99.** (c)	**100.** (b)	**101.** (b)	**102.** (b)	**103.** (d)	**104.** (d)
105. (c)	**106.** (c)	**107.** (b)	**108.** (c)	**109.** (c)	**110.** (c)	**111.** (c)	**112.** (a)	**113.** (c)	**114.** (a)	**115.** (a)	**116.** (a)	**117.** (c)
118. (a)	**119.** (d)	**120.** (d)	**121.** (c)	**122.** (a)	**123.** (b)	**124.** (b)	**125.** (a)	**126.** (a)	**127.** (c)	**128.** (c)	**129.** (a)	**130.** (d)
131. (b)	**132.** (a)	**133.** (a)	**134.** (c)	**135.** (a)	**136.** (c)	**137.** (c)	**138.** (a)	**139.** (b)	**140.** (b)	**141.** (c)	**142.** (c)	**143.** (b)
144. (b)	**145.** (a)	**146.** (d)	**147.** (c)	**148.** (b)	**149.** (b)	**150.** (a)	**151.** (b)	**152.** (b)	**153.** (b)	**154.** (b)	**155.** (a)	**156.** (b)
157. (c)	**158.** (d)	**159.** (a)	**160.** (e)	**161.** (a)	**162.** (e)	**163.** (e)	**164.** (e)	**165.** (d)	**166.** (e)	**167.** (e)	**168.** (c)	**169.** (e)
170. (d)	**171.** (a)	**172.** (b)										

EXPLANATORY ANSWERS

EXERCISE-I

1. (b) Let x be the fourth proportional, then

60:48:30:x or, $\frac{60}{48}=\frac{30}{x}$

$\therefore\ x=\frac{30\times 38}{60}=24.$

2. (c) We have, 27:72::x:8 or, $\frac{27}{72}=\frac{x}{8}$

$\therefore\ x=\frac{8\times 27}{72}=3.$

3. (a) Let x be the third proportional, then

4:42::42:x or, $\frac{4}{42}=\frac{42}{x}$.

$\therefore\ x=\frac{42\times 42}{4}=441.$

4. (a) We have, $\frac{18}{x}=\frac{x}{8}$ or, $x^2 = 18 \times 8$

or, $x=\sqrt{144}=12.$

5. (b) Let x be the third proportional. Then,

0.8:0.2::0.2:x or, $\frac{0.8}{0.2}=\frac{0.2}{x}$

$\therefore\ x=\frac{0.2\times 0.2}{0.8}=0{\cdot}05.$

6. (c) Let x be the fourth proportional. Then,

0.2:0.2::0.2 x or, $\frac{0.2}{0.12}=\frac{0.3}{x}$.

$\therefore\ x=\frac{0.3\times 0.12}{0.2}=0.18$

7. (a) $\frac{11}{14}=\frac{11\times5}{14\times5}=\frac{55}{70}$.

$\therefore$ Consequent = 70.

8. (c) Let x be the mean proportional. Then,

$64:x::x:81$ or, $\frac{64}{x}=\frac{x}{81}$ or, $x^2 = 5184$ or, $x = 72$.

9. (b) Let x be the mean proportional. Then,

$0.25:x:x:0.04$ or, $\frac{0.25}{x}=\frac{x}{0.04}$

or, $x^2 = 0.01$ or, $x = 0.1$

10. (b) Here, $a = 3$, $b = 4$ and $x = 420$.

$\therefore$ The first number $= \frac{ax}{a+b}=\frac{3\times420}{3+4} = 180$.

and, the second number $= \frac{bx}{a+b}=\frac{4\times420}{3+4} = 240$.

11. (c) Here, $a = 9$, $b = 5$ and $x = 1050$.

$\therefore$ Number of boys $= \frac{ax}{a+b}=\frac{9\times1050}{9+5} = 675$.

12. (a) We have, $a = 5$, $b = 7$, $c = 13$ and $x = 1200$.

$\therefore$ Share of B $= \frac{bx}{a+b+c}=\frac{7\times1200}{5+7+13} = 336$

and, share of C $= \frac{cx}{a+b+c}=\frac{13\times1200}{5+7+13} = 624$.

The difference between the shares of C and B = 624 − 336 = 288

13. (b) Here, $a = 3$, $b = 4$, $c = 5$ and $x = 660$.

$\therefore$ Share of Puneet $= \frac{cx}{a+b+c}=\frac{5\times660}{3+4+5} = ₹275$.

14. (c) We have, $a = 12$, $b = 15$, $c = 25$ and $x = 312$.

$\therefore$ A $= \frac{ax}{a+b+c}=\frac{12\times312}{12+15+25} = 72$,

B $= \frac{bx}{a+b+c}=\frac{15\times312}{12+15+25} = 90$

and, C $= \frac{cx}{a+b+c}=\frac{25\times312}{12+15+25} = 150$.

$\therefore$ B − A = 18 and C − B = 60

Thus, their ratio = 18:60 or, 3:10.

15. (b) Here, $a = 3$, $b = 2$ and $x = 600$.

$\therefore$ The price of a television set $= \frac{bx}{a-b}=\frac{2\times600}{3-2}$

= ₹1200.

16. (a) Here, $a = 4$, $b = 9$ and $x = 35$.

$\therefore$ The first number $= \frac{ax}{b-a}=\frac{4\times35}{9-4} = 28$

and, the second number $= \frac{bx}{b-a}=\frac{9\times35}{9-4} = 63$.

Thus, the product of the numbers = 28 × 63 = 1764.

17. (c) Ratio of the income of A, B and C = 2:5:11.

$\therefore$ Ratio of the income of A and B = 2:5.

Difference between income of A and B = ₹291.

$\therefore$ Income of C $= \frac{cx}{b-a}=\frac{11\times291}{5-2} = ₹1067$.

[Here, $a = 2$, $b = 5$, $c = 11$ and $x = 291$]

18. (b) Here, $n_1 = 7$, $n_2 = 9$, $d_1 = 5$ and $d_2 = 11$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$

$= (7 \times 9):(5 \times 9):(5 \times 11)$

$= 63:45:55$.

19. (c) We have, $n_1 = 3$, $n_2 = 4$, $n_3 = 5$,

$d_1 = 4$, $d_2 = 5$ and $d_3 = 6$.

$\therefore$ $A:B:C:D = (n_1 \times n_2 \times n_3):(d_1 \times n_2 \times n_3)$

$(d_1 \times d_2 \times n_3):(d_1 \times d_2 \times d_3)$

$= (3 \times 4 \times 5):(4 \times 4 \times 5):(4 \times 5 \times 5):(4 \times 5 \times 6)$

$= 60:80:100:120$ or, $3:4:5:6$.

Thus, $A:D = 3:6$ or, $1:2$.

20. (c) We have, $A:B = 4:3$ and $B:C = 5:4$.

Here, $n_1 = 4$, $n_2 = 5$, $d_1 = 3$ and $d_2 = 4$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$

$= (4 \times 5):(3 \times 5):(3 \times 4)$

$= 20:15:12$.

21. (a) We have, $A:B = 5:3$ and $B:C = 3:2$.

Here, $n_1 = 5$, $n_2 = 3$, $d_1 = 3$ and $d_2 = 2$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$

$= (5 \times 3):(3 \times 3):(3 \times 2)$

$= 15:9:6$ or $5:3:2$.

Thus, $A:C = 5:2$.

22. (a) We have, $A:B = 8:15$, $B:C = 5:8$ and $C:D = 4:5$.

Here, $n_1 = 8$, $n_2 = 5$, $n_3 = 4$, $d_1 = 15$, $d_2 = 8$ and $d_3 = 5$.

$\therefore$ $A:B:C:D = (n_1 \times n_2 \times n_3):(d_1 \times n_2 \times n_3):(d_1 \times d_2 \times n_3)$

$:(d_1 \times d_2 \times d_3)$

$= (8 \times 5 \times 4):(15 \times 5 \times 4):(15 \times 8 \times 4)$

$:(15 \times 8 \times 5)$

$= 160:300:480:600$ or, $8:15:24:30$.

Thus, Suman pays $= \frac{24}{8+15+2430}$ of the rent

$= \frac{24}{77}$ of the rent.

23. (b) We have, $A:B = 4:5$ and $B:C = 5:6$.

Here, $n_1 = 4$, $n_2 = 5$, $d_1 = 5$ and $d_2 = 6$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$

$= (4 \times 5):(5 \times 5):(5 \times 6)$

$= 20:25:30$ or, $4:5:6$.

Thus, ratio of money with Anju, Sanju and Manju is 4:5:6.

Since, Anju has ₹280, the amount of money Manju has

$= \frac{280}{4} \times 6 = ₹420$.

24. **(b)** We have, $A:B = 3:5$ and $B:C = 4:7$.

Here, $n_1 = 3$, $n_2 = 4$, $d_1 = 5$ and $d_2 = 7$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$

$= (3 \times 4):(5 \times 4):(5 \times 7)$

$= 12:20:35$.

The total number of students = 201.

$\therefore$ The number of students in section A

$$= \frac{12}{12+20+35} \times 201 = 36.$$

25. **(a)** We have, $A:B = 2:3$ and $B:C = 7:9$.

Here, $n_1 = 2$, $n_2 = 7$, $d_1 = 3$ and $d_2 = 9$.

$\therefore$ $A:B:C = (n_1 \times n_2):(d_1 \times n_2):(d_1 \times d_2)$

$= (2 \times 7):(3 \times 7):(3 \times 9)$

$= 14:21:27$.

Since, the sum of the numbers is 124, the third number is $\frac{27}{14+21+27} \times 124 = 54$.

26. **(b)** We have, $A:B = 3:2$, $B:C = 5:4$ and $C:D = 3:7$.

Here, $n_1 = 3$, $n_2 = 5$, $n_3 = 3$, $d_1 = 2$, $d_2 = 4$ and $d_3 = 7$.

$\therefore$ $A:B:C:D = (n_1 \times n_2 \times n_3):(d_1 \times n_2 \times n_3) :(d_1 \times d_2 \times n_3):(d_1 \times d_2 \times d_3)$

$= (3 \times 5 \times 3):(2 \times 5 \times 3):(2 \times 4 \times 3):(2 \times 4 \times 7)$

$= 45:30:24:56$

$\therefore$ B's share of property worth ₹77500 is

$$= \left(\frac{30}{45+30+24+56}\right) \times 77500 = ₹15000.$$

27. **(a)** We have, $a:b = 3:5$, $c:d = 5:7$ and $x = 10$.

$\therefore$ The first number $= \frac{ax(c-d)}{ad-bc} = \frac{3\times10\times(5-7)}{(3\times7-5\times5)} = 15$

and, the second number $= \frac{bx(c-d)}{ad-bc}$

$$= \frac{5\times10\times(5-7)}{(3\times7-5\times5)} = 25.$$

28. **(b)** We have, $a:b = 2:3$, $c:d = 5:7$ and $x = 4$.

$\therefore$ The first number $= \frac{ax(c-d)}{ad-bc}$

$$= \frac{2\times4\times(5-7)}{(2\times7-3\times5)} = 16.$$

and, the second number $= \frac{bx(c-d)}{ad-bc}$

$$= \frac{3\times4\times(5-7)}{(2\times7-3\times5)} = 24.$$

29. **(a)** We have, $a:b = 5:6$, $c:d = 4:5$ and, $x = 5$.

$\therefore$ The first number $= \frac{ax(d-c)}{ad-bc}$

$$= \frac{5\times5\times(5-4)}{(5\times5-6\times4)} = 25$$

and, the second number $= \frac{bx(d-c)}{ad-bc}$

$$= \frac{6\times5\times(5-4)}{(5\times5-6\times4)} = 30.$$

30. **(c)** We have, $a:b = 7:5$, $c:d = 4:3$ and $x = 6$.

$\therefore$ The present age of Mahesh $= \frac{bx(c-d)}{ad-bc}$

$$= \frac{5\times6\times(4-3)}{(7\times3-5\times4)}$$

$= 30$ years.

31. **(a)** We have, $a:b = 4:3$, $c:d = 2:1$ and $x = 4$.

$\therefore$ The present age of Sita $= \frac{ax(d-c)}{ad-bc}$

$$= \frac{4\times4\times(1-2)}{(4\times1-3\times2)}$$

$= 8$ years.

32. **(b)** We have, $a:b = 5:8$, $c:d = 3:4$ and $x = 12$.

$\therefore$ The first number $= \frac{ax(c-d)}{ad-bc}$

$$= \frac{5\times12\times(3-4)}{(5\times4-8\times3)} = 15$$

and, the second number $= \frac{bx(c-d)}{ad-bc}$

$$= \frac{8\times12\times(3-4)}{(5\times4-8\times3)} = 24.$$

The sum of two numbers = 24 + 15 = 39

33. **(c)** We have, $a:b = 5:7$, $c:d = 35:59$ and $x = 25$.

$\therefore$ The first number $= \frac{ax(d-c)}{ad-bc}$

$$= \frac{5\times25\times(59-35)}{(5\times59-7\times35)} = 60$$

and, the second number $= \frac{bx(d-c)}{ad-bc}$

$$= \frac{7\times25\times(59-35)}{(5\times59-7\times35)} = 84$$

$\therefore$ The difference of two numbers = 84 − 60 = 24.

34. **(c)** We have, $a:b = 7:13$ and $c:d = 2:3$.

$\therefore$ $x = \frac{ad-bc}{c-d} = \frac{7\times3-13\times2}{2-3} = 5$.

35. **(a)** We have, $a:b = 12:17$ and $c:d = 2:3$.

$\therefore$ The required number $= \frac{bc-ad}{c-d}$

$$= \frac{17\times2-12\times3}{2-3} = 2.$$

36. **(b)** Here, $a = 7$, $b = 16$, $c = 43$ and $d = 79$.

$$\therefore \quad k = \frac{bc - ad}{(a+d)-(b+c)} = \frac{16\times 43 - 7\times 79}{(7+79)-(16+43)} = 5.$$

37. **(a)** Here, $a = 15$, $b = 28$, $c = 20$ and $d = 38$.

$$\therefore \text{ The required number } = \frac{ad - bc}{(a+d)-(b+c)}$$

$$= \frac{15\times 38 - 28\times 20}{(15+38)-(28+20)}$$

$$= 2.$$

38. **(a)** Here, $a = 8$, $b = 21$, $c = 13$ and $d = 31$.

$$\therefore \text{ The required number } = \frac{bc - ad}{(a+d)-(b+c)}$$

$$= \frac{21\times 13 - 8\times 31}{(8+31)-(21+13)}$$

$$= 5.$$

39. **(b)** We have, $a:b = 3:2$, $c:d = 5:3$ and $S = 1000$.

$$\therefore \ A\text{'s income } = \frac{aS(d-c)}{ad - bc}$$

$$= \frac{3\times 1000\times (3-5)}{(3\times 3 - 2\times 5)}$$

$$= ₹6000.$$

40. **(a)** We have, $a:b = 5:3$, $c:d = 3:1$ and $S = 2000$.

$$\therefore \text{ Income of man } = \frac{aS(d-c)}{ad - bc}$$

$$= \frac{5\times 2000\times (1-3)}{(5\times 1 - 3\times 3)}$$

$$= ₹5000$$

and, the income of his wife

$$= \frac{bS(d-c)}{ad - bc} = \frac{3\times 2000\times (1-3)}{(5\times 1 - 3\times 3)}$$

$$= ₹3000.$$

41. **(d)** We have, $a:b = 9:4$, $c:d = 7:3$ and $S = 2000$.

$$\therefore \text{ Gupta's expenditure } = \frac{cS(b-a)}{ad - bc}$$

$$= \frac{7\times 2000\times (4-9)}{(9\times 3 - 4\times 7)} = ₹70000.$$

42. **(c)** Here, $x = 60$, $a:b = 2:1$ and $c:d = 1:2$.

$\therefore$ Required amount of water to be added

$$= \frac{x(ad - bc)}{c(a+b)} = \frac{60\times (2\times 2 - 1\times 1)}{1(2+1)} = 60 \text{ litres.}$$

43. **(b)** The two given ratios are 12:5 and 4:3.

In order to equate the antecedents of the two ratios, we write the second ratio as 12:9.

Now, we have, $a:b = 12:5$, $c:d = 12:9$ and $x = 14$

$\therefore$ The quantity of alcohol in the mixture

$$= \frac{ax}{c-b} = \frac{12\times 14}{12-5} = 24 \text{ litres.}$$

44. **(b)** Here, $a = 3$ and $b = 7$.

$\therefore$ percentage quantity of silver in the alloy

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

45. **(c)** We have, $a:b = 2:1$, $c:d = 4:1$.

Let the two alloys be mixed in the ratio $x:y$.

Then, percentage quantity of zinc in the new alloy

$$= \left[\frac{\frac{ax}{a+b} + \frac{cy}{c+d}}{x+y}\right] \times 100\%$$

$$= \left[\frac{\frac{2x}{3} + \frac{4y}{5}}{x+y}\right] \times 100\%$$

$$= \frac{10x + 12y}{15(x+y)} \times 100\% \qquad \cdots(1)$$

Since, the ratio of zinc and copper in the new alloy is 3:1

$\therefore$ percentage quantity of zinc in the new alloy

$$= \frac{3}{3+1}\times 100\% = \frac{300}{4}\% \text{ or, } 57\% \qquad \cdots(2)$$

From (1) and (2), we get

$$\frac{10x + 12y}{15(x+y)} = \frac{3}{4} \quad \text{or,} \quad 40x + 48y = 45\ (x + y)$$

or, $5x = 3y$ or, $x:y = 3:5$.

Hence, the alloys should be mixed in the ratio 3:5.

46. **(a)** Here, $a:b = 5:1$, $c:d = 7:2$.

Let the mixtures of the two containers be added together in the ratio of $x:y$.

$\therefore$ percentage quantity of milk in the new mixture

$$= \left[\frac{\frac{ax}{a+b} + \frac{cy}{c+d}}{x+y}\right] \times 100\%$$

$$= \left[\frac{\frac{5x}{6} + \frac{7y}{9}}{x+y}\right] \times 100\% = \frac{45x + 42y}{(x+y)} \times 100\%$$

Since the percentage quantity of milk in the new mixture is 80%

$$\therefore \quad \frac{45x + 42y}{54(x+y)} \times 100\% = 80\%$$

$$\Rightarrow \quad (45x + 42y) \times 5 = 4 \times 54(x + y)$$

$$\Rightarrow \quad 225x + 210y = 216x + 216y$$

$$\Rightarrow \quad 9x = 6y \text{ or, } x:y = 2:3.$$

EXERCISE-2
(BASED ON MEMORY)

1. (a)

		A		B		C
Present students	=	$6x$		$8x$		$7x$
New strength	=	$6 \times 1.2x$		$8 \times 1.15x$		$7 \times 1.2x$
		$7.2x$		$9.2x$		$8.4x$
New ratio	=	72	:	92	:	84
	=	18	:	23	:	21

2. (c) Let the books distributed by a man, a woman and a child be $5x$, $4x$ and $2x$ respectively.

$\therefore$ No. of books distributed in Ist day

$= 7\times5x+5\times4x+8\times2x = 71x$

No. of books distributed in IInd day

$= 7\times5x+3\times4x+5\times2x = 57x$

And No. of books distributed in IIIrd day

$= 4\times5x+5\times4x+3\times2x = 46x$

$71x + 57x + 46x = 2000$, $x = \dfrac{2000}{174}$

$57x = \dfrac{2000}{174}\times 57 = 650$ (Approx.)

3. (d) Go through the options. $\dfrac{a}{9}=\dfrac{4}{b}$

$a.\ b = 9 \times 4 = 36$

4. (b) The required ratio

$= \dfrac{5\times130}{100}:\dfrac{6\times125}{100}:8\times\dfrac{125}{100}$

$= 650:750:1000$

$= 13:15:20$

5. (c) We have

20% of the first number

= 50% of the second number

$\therefore \dfrac{\text{1st number}}{\text{2nd number}}=\dfrac{50}{20}=5:2$

6. (e) $\dfrac{4k}{5k-100}=\dfrac{6}{7}$

or, $28k = 30k - 600$

or, $k = 300$

$\therefore\ 4k = 4 \times 300 = 1200$

7. (c) Here A:B = 125:100 = 5:4

B:C = 75:100 = 3:4

A	:	B	:	C
5	:	4		
		3	:	4
5×3	:	4×3	:	4×4
i.e., 15	:	12	:	16

$\therefore$ A's share $= \dfrac{15}{(15+12+16)}\times 817 = ₹285$

8. (c) Share of B + C $= \dfrac{1872}{9-3}\times(5+8) = ₹4056$

9. (d) We can not find the value without knowing any absolute value in rupees,

10. (c) Difference between amounts of X and Z

$= \dfrac{11,172}{3+9}\times(13-7)=\dfrac{11,172}{12}\times6 = ₹5586$

11. (d) We have $\dfrac{6x+6}{7x+6}=\dfrac{15}{17}$

$\therefore\ 102x + 102 = 105x + 90$

$x=\dfrac{102-90}{3}=4$

$\therefore$ Age of Neeraj $= 7 \times 4 = 28$ years

12. (a) Kiara's share $\dfrac{578}{8+12+14}\times14 = ₹238$

13. (e) According to the given informations.

$\dfrac{20+x}{32+x}=\dfrac{3}{4}$ or $x = 16$

Now, present strength of the social group

$= 20 + 32 + 16 + 16 = 84$

14. (b) Amit's new share

$= \dfrac{2800}{5+6+3}\times5+200=1200$

Sumit's new share $= \dfrac{2800}{14}\times6+200=1400$

Vinit's new share $=\dfrac{2800}{5+6+3}\times3+200=800$

$\therefore$ reqd. ratio = 1200:1400:800

= 6:7:4

15. (b) Let x, y and z be the $2r$ units

$\therefore\ x$ = 20% of z, y = 50% of z

$\Rightarrow\ x=\dfrac{z}{5},\ y=\dfrac{z}{2}\Rightarrow5x=2y$

$\Rightarrow\ \dfrac{x}{y}=\dfrac{2}{5}$

16. (d) $\dfrac{A}{B}=\dfrac{3}{4}=\dfrac{30}{40},\dfrac{B}{C}=\dfrac{5}{7}=\dfrac{40}{56},\dfrac{C}{D}=\dfrac{8}{9}=\dfrac{56}{63}$

$= \dfrac{A}{D}=\dfrac{A}{B}\times\dfrac{B}{C}\times\dfrac{C}{D}=\dfrac{30}{63}=\dfrac{10}{21}$

17. (b) $\dfrac{a}{b}=\dfrac{5}{7},\dfrac{c}{d}=\dfrac{2a}{3b}=\dfrac{2}{3}\times\dfrac{5}{7}=\dfrac{10}{21}$

$\therefore\ \dfrac{ac}{bd}=\dfrac{a}{b}\times\dfrac{c}{d}=\dfrac{5}{7}\times\dfrac{10}{21}=\dfrac{50}{147}$

18. **(a)** Let the two numbers be x and y.

$\therefore \quad \frac{x}{y}=\frac{2}{3} \Rightarrow \frac{x-2}{y+2}=\frac{1}{2}$

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

$\Rightarrow \quad 2x - y = 6$

$\Rightarrow \quad 2\times\frac{2y}{3}-y=6$

$\Rightarrow \quad 4y - 3y = 18 \quad \therefore \quad y = 18$

$\Rightarrow \quad x = 12$

$\therefore \quad x + y + 12 + 18 = 30$

19. **(d)** ₹68, 000 are divided in the ratio $\frac{1}{2}:\frac{1}{4}:\frac{5}{16}$, i.e., 8:4:5.

$\therefore$ Difference of the greatest and the smallest part

$=\frac{8-4}{8+4+5}\times 68000$

$=\frac{4}{17}\times 6800=16000$

20. **(d)** let the tow numbers be x, y and z.

$\therefore \quad \frac{x}{1/2}=\frac{y}{2/3}=\frac{z}{3/4}=k$

$\therefore \quad x=\frac{1}{2}k,\ y=\frac{2}{3}k,\ z=\frac{3}{4}k$

Given: $\frac{3}{4}k-\frac{1}{2}k=36 \quad \therefore \quad k = 144$

$\therefore \quad x = 72, \quad y = 96, \quad z = 108$

21. **(a)** Let I_1 and I_2 be the incomes of two persons and E_1, E_2 be their expenditure respectively.

$\therefore \quad \frac{I_1}{I_2}=\frac{5}{3},\ \frac{E_1}{E_2}=\frac{9}{5}$

and $I_1 - E_2 = 2600$ ···(1)

$I_2 - E_2 = 1800$

$\Rightarrow \quad \frac{3I_1}{5}-\frac{5E_1}{9}=1800$

$\Rightarrow \quad 27I_1 - 27E_1 = 1800\times 45$ ···(2)

$\Rightarrow \quad 27I_1 - 27E_1 = 2600\times 27$ ···(3)

$\therefore$ From (2) and (3), we get

$2E_1 = 1800\times 45 - 2600\times 27$

$E_1 = 900\times 45 - 1300\times 27 = 100(405 - 351) = 5400$

$\therefore \quad I_1 = 8{,}000; \quad I_2 = 4800$, i.e.,

The incomes of the two persons are ₹8000 and 4800 respectively.

22. **(c)** Suppose 18 Kg each is melted. Ratio of gold and copper in one alloy will be 14:4 and in another 7 : 11.

$\therefore$ Ratio of gold and copper in the new alloys

$C = 14 + 7{:}4 + 11 = 21{:}15 = 7{:}5.$

23. **(c)** $\frac{x}{2y}=\frac{6}{7} \Rightarrow \frac{x}{y}=\frac{12}{7}$

$\therefore \quad \frac{x-y}{x+y}+\frac{14}{19}=\frac{\frac{x}{y}-1}{\frac{x}{y}+1}+\frac{14}{19}=\frac{\frac{12}{7}-1}{\frac{12}{7}}+\frac{14}{19}$

$= \frac{5}{19}+\frac{14}{19} = 1.$

24. **(c)** Annual incomes of A and B are $4k$ and $3k$, say.

Annual expenditure of A and B are $3L$ and $2L$, say.

$\therefore \quad 4k - 3L = 600$

$3k - 2L = 600$

$\Rightarrow \quad k = 600, \ L = 600$

$\therefore$ Difference in incomes of A and B

$= 4k - 3k = k = 600.$

25. **(c)** $\frac{a}{b}=\frac{b}{c}=\frac{c}{b}=k$, say.

Given: $\frac{a}{b}=\frac{8}{125}=\frac{a}{b}\times\frac{b}{c}\times\frac{c}{d}=k^3$

$\Rightarrow \quad k=\frac{2}{5}$

Now, $\frac{a}{c}=\frac{a}{b}\times\frac{b}{c}=k^2=\frac{4}{25}.$

26. **(a)** Ratio of milk and water

$=\frac{3}{5}+\frac{7}{10}+\frac{11}{15}:\frac{2}{5}+\frac{3}{10}+\frac{4}{15}$

$=\frac{18+21+22}{30}:\frac{12+9+8}{30}=61{:}29.$

27. **(c)** $\frac{x^2+y^2}{x^2-y^2}=\frac{\frac{x^2}{y^2}+1}{\frac{x^2}{y^2}-1}=\frac{\frac{36}{25}+1}{\frac{36}{25}-1}=\frac{\frac{61}{25}}{\frac{11}{25}}=\frac{61}{11}.$

28. **(a)** $\frac{a}{5}=\frac{b}{7}=\frac{c}{8}=k \Rightarrow a = 5k,\ b = 7k,\ c = 8k$

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

29. **(b)** $\frac{a}{2}=\frac{b}{3}=\frac{c}{4}=k$

$\Rightarrow \quad a = 2k, \ b = 3k, \ c = 4k$

$\Rightarrow \quad \frac{1}{a}:\frac{1}{b}:\frac{1}{c}=\frac{1}{2k}:\frac{1}{3k}:\frac{1}{k4}=\frac{1}{2}:\frac{1}{3}:\frac{1}{4}.$

30. **(d)** $\frac{x}{8}=\frac{y}{9}=k \Rightarrow x = 8k,\ y = 9k$

$\therefore \quad \frac{5x-4y}{3x+2y}=\frac{40k-36k}{24k+18k}=\frac{4}{42}=\frac{2}{21}.$

31. **(a)** $x = 3k, \ y = 4k$, say

$\therefore \quad \frac{x-5}{y-5}=\frac{2}{3} \Rightarrow \frac{3k-5}{4k-5}=\frac{2}{3} \Rightarrow k = 5.$

32. **(a)** Suppose income of Anil and Sunil are $5k$ and $4k$, respectively.

Expenses of Anil and Sunil are $4L$ and $3L$.

$\therefore\ 5k - 4L = 1200$

$4k - 3L = 1200 \ \Rightarrow\ k = 1200,\ L = ₹1200$

33. **(b)** Let the number of one-rupee coins, 50-paise coins and 25-paise coins be $2k$, $3k$ and $5k$, respectively.

$\therefore\ 2k \times 1 + 3k \times 0.50 + 5k \times 0.25 = 114$

$\Rightarrow\ 2k + 1.50k + 1.25k = 114$

$\Rightarrow\ 4.75k = 114$

$\Rightarrow\ k = 24.$

34. **(a)** Let number of females $= F$

Suppose 160 males get ₹$16k$ and F females get ₹$21k$

$\therefore\ 160 \times 4 = 16k$

$\Rightarrow\ k = 40$

$\therefore\ F$ females get ₹840

$\therefore$ Number of females $= \dfrac{840}{3} = 280.$

35. **(c)** Let k Kg of 1st variety, k Kg of 2nd variety and $2k$ Kg of 3rd variety of tea are mixed.

Let price of the third variety = ₹x per Kg

$\therefore\ 126k + 135k + x(2k) = 153(k + k + 2k)$

$\Rightarrow\ x = 175.50.$

36. **(c)** Let the numbers be $3k$ and $4k$

$\therefore\ \dfrac{3k+50}{4k+50} = \dfrac{7}{9} \ \Rightarrow\ k = 100$

$\therefore$ Sum of the numbers $= 7k = 700.$

37. **(a)** $\dfrac{A}{B} = \dfrac{5}{3}, \dfrac{B}{C} = \dfrac{6}{4} = \dfrac{2}{3}$

$\therefore\ \dfrac{A}{C} = \dfrac{A}{B} \times \dfrac{B}{C} = \dfrac{5}{3} \times \dfrac{3}{2} = \dfrac{5}{2}$

38. **(d)** Suppose A's share = ₹$3k$

B's share = ₹$4k$

C's share = ₹ $\dfrac{16}{3}$

$\therefore$ Rs 370 are divided among A, B and C in the ratio 9:12:16

$\therefore$ A's share $= \dfrac{9}{37} \times 370 =$ ₹90.

39. **(c)** B $= \dfrac{1}{G} \ \Rightarrow$ B + G > 1

$\therefore\ 3(\text{B} + \text{G}) > 3.$

40. **(d)** Let the incomes be $4k$ and $7k$ and expenses be $11L$ and $20L$, respectively.

$\Rightarrow\ 4k - 11L = 400$

$7k - 20L = 400$

$\Rightarrow\ k = 1200,\ L = 400$

$\therefore$ Monthly incomes are ₹4800 and ₹8400, respectively.

41. **(d)** $\dfrac{15-x}{19-x} = \dfrac{3}{4} \ \Rightarrow\ 60 - 4x = 57 - 3x \ \Rightarrow\ x = 3.$

42. **(c)** $\dfrac{p}{q} = \dfrac{r}{s} = \dfrac{t}{u} = \dfrac{2}{3}$

$\therefore\ \dfrac{mp + nr + ot}{mq + ns + ou} = \dfrac{m\dfrac{2q}{3} + n \cdot \dfrac{2s}{3} + 0 \cdot \dfrac{2u}{3}}{mq + ns + ou} = \dfrac{2}{3}.$

43. **(d)** $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = \dfrac{1}{2}$

$\Rightarrow\ \dfrac{pq + qc + re = \dfrac{\dfrac{pb}{2} + \dfrac{qd}{2} + \dfrac{rf}{2}}{pb + qd + rf} = \dfrac{1}{2}}{pb + qd + rf}.$

44. **(a)** $\dfrac{x}{y} = \dfrac{3}{1} \ \Rightarrow\ \dfrac{x}{3} = \dfrac{y}{1} = k \Rightarrow x = 3k,\ y = k$

$\therefore\ \dfrac{x^3 - y^3}{x^3 + y^3} = \dfrac{27k^3 - k^3}{27k^3 + k^3}.$

45. **(a)** 10% of m = 20% of $n \ \Rightarrow 10m = 20n$

$\Rightarrow\ \dfrac{m}{n} = \dfrac{2}{1}.$

46. **(a)** $2^{1.5} : 2^{0.5} = 2\sqrt{2} : \sqrt{2} = 2:1.$

47. **(c)** If $m:n = 3:2 \ \Rightarrow\ \dfrac{m}{n} = \dfrac{3}{2} \ \Rightarrow\ m = \dfrac{3}{2}n$

then, $\dfrac{4m+5n}{4m-5n} = \dfrac{4 \times \dfrac{3}{2}n + 5n}{4 \times \dfrac{3}{2}n - 5n} = \dfrac{22n}{2n} = 11:1.$

48. **(c)** Let the two numbers be $6x$ and $7x$, respectively.

$\dfrac{6x-n}{7x-n} < \dfrac{16}{21}$ (n = smallest integer)

or, $126x - 21n < 112x - 16n$

or, $14x < 5n$

$\therefore\ n > \dfrac{14}{5}x.$

49. **(a)** $\dfrac{a}{b} = \dfrac{2}{3},\ \dfrac{b}{c} = \dfrac{4}{5}$. Then,

$\dfrac{a+b}{b+c} = \dfrac{\dfrac{2}{3}b + b}{b + \dfrac{5}{4}b} = \dfrac{\dfrac{5}{3}b}{\dfrac{9}{4}b} = \dfrac{5 \times 4}{9 \times 3} = \dfrac{20}{27}.$

50. **(c)** Let the two numbers be a and b, respectively.

Then, $a + b = 40$ and $a - b = 4$

On solving, we get $a = 22,\ b = 18$

$\therefore$ Ratio = 22:18 = 11:9.

51. **(a)** List price of book $= \dfrac{82 \cdot 50}{30} \times 100 =$ ₹275

Neeta bought the book in

$275 \times 0 \cdot 70 =$ ₹192·50.

52. **(b)** The man cannot purchase more than 8 bags
$\therefore$ Cost of 8 bags = 8 × 200 = ₹1600
Remaining amount = ₹(1810 – 1600) = ₹210
In ₹210, the man can purchase
$\frac{210}{70}$ = 3 bottles
$\therefore$ Required ratio = 8:3.

53. **(b)** We have, $\frac{a}{b}=\frac{2}{3}$ and $\frac{b}{c}=\frac{4}{5}$

$\Rightarrow \quad \frac{a}{2}=\frac{b}{3}$ and $\frac{b}{4}=\frac{c}{5}$

$\Rightarrow \quad \frac{a}{8}=\frac{b}{12}=\frac{c}{15}$

$\therefore \quad a:b:c = 8:12:15$

$\therefore \quad a^2:b^2:bc = 64:144:180 = 16:36:45.$

55. **(d)** $\frac{(7-5)(27-17)\times 40}{27\times 5-17\times 7}=\frac{2\times 10\times 40}{16} = 50.$

56. **(a)** $\frac{504\times 13}{(13+11)}\div\left(\frac{504\times 11}{13+11}+12\right) = 91:81.$

57. **(d)** $5x - 3y = 1800$
$6x - 4y = 1600$
Solving the two equations, we get
$x = 1200 \quad \therefore$ Monthly income of B = 6 × 1200
= ₹7200.

58. **(d)** Required difference = $\frac{9000}{(4+5+6)} \times (6 - 4)$
= 1200.

59. **(a)** $\frac{200\times(5\times 5-3\times 3)}{3(5+3)}=\frac{200\times 16}{3\times 8}$

$= \frac{400}{3}$ gram.

60. **(a)**

A		B		C
5		2		
7		13		
5 × 7	:	2 × 7	:	2 × 13
or, 35	:	14	:	26

Hence, share of B = $\frac{14\times 7500}{35+14+26}$
= ₹1400.

61. **(c)** Quantity of zinc in brass
$= \frac{7}{13+7} \times 100 = 7 \times 5 = 35$ Kg.

62. **(c)** $A:B:C = 2:3:4$
or, $\frac{A}{B}, \frac{2}{3}, \frac{B}{C}=\frac{3}{4}$ and, $\frac{C}{A}=\frac{4}{2}=2$

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

64. **(c)** Let the numbers be $\frac{3}{2}x$ and $\frac{8}{3}x$

$\frac{\frac{3}{2}x+15}{\frac{8}{3}x+15}=\frac{\frac{5}{3}}{\frac{5}{2}}$ or, $\frac{\frac{3x+30}{2}}{\frac{8x+45}{3}}=\frac{2}{3}$

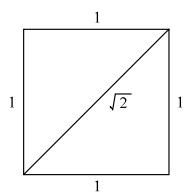
or, $\frac{3x+30}{8x+45}\times\frac{3}{2}=\frac{2}{3}$ or, $=\frac{3x+30}{8x+45}=\frac{4}{9}$ or, $x = 18.$

$\therefore$ greater of the numbers $=\frac{8}{3} \times 18 = 48.$

65. **(c)** Let the number of students in three classes be $2x$, $3x$ and $5x$
Now, according to the question
$2x + 40:3x + 40:5x + 40 = 4:5:7$
or, $\frac{2x+40}{3x+40}=\frac{4}{5}$ or, $10x + 200 = 12x + 160$
$\therefore \quad x = 20$
$\therefore$ total number of students
$= 2x + 3x + 5x = 10x = 10 \times 20 = 200.$

66. **(a)** Let the incomes of two persons be $5x$ and $3x$ and their expenditures be $9y$ and $5y$.
According to question
$5x - 9y = 1300$ ···(1)
$3x - 5y = 900$ ···(2)
By solving equations (1) and (2), we have $x = 800$
$\therefore$ persons income = 5 × 800 = ₹4000 and
3 × 800 = ₹2400.

68. **(a)** Area of equilateral triangle with side $\sqrt{2}$



$= \frac{\sqrt{3}}{4}\times(\sqrt{2})^2=\frac{\sqrt{3}}{2}$

Area of the square with side 1 = 1
$\therefore$ Required ratio = $\sqrt{3}:2$.

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

$= \frac{7\times\frac{3}{4}+3}{7\times\frac{3}{4}-3}=\frac{\frac{33}{4}}{\frac{9}{4}}=\frac{33}{9}=\frac{11}{3}.$

70. **(b)** $\frac{a}{b}=\frac{5}{7}, \frac{c}{d}=\frac{2a}{2b}=\frac{2}{3}\times\frac{5}{7}=\frac{10}{21}$

$\therefore \quad \frac{ac}{bd}=\frac{50}{147}$

$\therefore \quad ac:bd = 50:147$

71. **(b)** $\frac{A}{B}=\frac{2}{3}, \frac{B}{C}=\frac{4}{5}, \frac{C}{D}=\frac{6}{7}$

$\therefore \quad \frac{A}{16}=\frac{B}{24}=\frac{C}{30}=\frac{D}{35}.$

72. **(d)** Let the number be $\frac{1}{2}k, \frac{2}{3}k$ and $\frac{3}{4}k$

$\therefore \quad \frac{3}{4}k-\frac{1}{2}k = 36 \quad \Rightarrow \quad k = 144$

$\therefore$ The numbers are 72, 96 and 108.

73. **(b)** Let the number of girls and boys be $4k$ and $5k$, respectively.

$\therefore \quad 4k = 212 \quad \Rightarrow \quad k = 53$

$\therefore$ Number of boys $= 5k = 265.$

75. **(b)** $a:b = \frac{2}{9}:\frac{1}{3} = 2:3$

$b:c = \frac{2}{7}:\frac{5}{14} = 4:5$

$c:d = \frac{3}{5}:\frac{7}{10} = 6:7$

Now, $a:b = 2:3$

$b:c = 4:5$

$c:d = 6:7$

$\therefore \quad a:b:c:d = 48:72:90:105$

$= 16:24:30:35.$

76. **(a)** Let the incomes of A, B and C be $7x$, $9x$ and $12x$ respectively, and the expenditures $8y$, $9y$ and $15y$, respectively. We have to find the value of

$(7x - 8y):(9x - 9y):(12x - 15y)$

Also, $7x - 8y = \frac{7x}{4}$

or, $7x - \frac{7x}{4} = 8y$

or, $\frac{x}{y}=\frac{32}{21}$

Now, $(7 \times 32 - 8 \times 21):(9 \times 32 - 9 \times 21) : (12 \times 32 - 15 \times 21) = 56:99:69.$

77. **(a)** Amount of copper $= \frac{5}{7} \times 17.5 = 12.5$ Kg

Amount of zinc $= \frac{2}{7} \times 17.5 = 5$

Now, the amount of zinc $= 5 + 1.25 = 6.25$

$= 6.25$ Kg

$\therefore$ Required ratio $= 12.5:6.25 = 2:1.$

78. **(a)** The ratio of number of coins

$= 13 \times \frac{100}{100}:11\times\frac{100}{50}:7\times\frac{100}{25}$

$= 13:22:28$

No. of 50 paise coins $= \frac{22}{63}\times 378 = 132.$

79. **(b)** $\frac{A}{2}=\frac{B}{3}$ and $\frac{B}{4}=\frac{C}{5} \Rightarrow \frac{A}{8}=\frac{B}{12}=\frac{C}{15}.$

80. **(d)** $A:B = \frac{1}{2}:\frac{1}{3} = 3:2$

$B:C = \frac{1}{2}:\frac{1}{3} = 3:2$

$\therefore \quad \frac{A}{3}=\frac{B}{2}$ and $\frac{B}{3}=\frac{C}{2}$

$\Rightarrow \quad \frac{A}{9}=\frac{B}{6}=\frac{C}{4}.$

81. **(c)** If ₹117 are divided in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$ that is, 6:4:3 among P, Q and R, then

Share of P = ₹54

Share of Q = ₹36

Share of R = ₹27

If ₹117 are divided in the ratio of 2:3:4 among, P, Q and R, then

Share of P = ₹26

Share of Q = ₹39

Share of R = ₹52

82. **(d)** $17k \times 0{\cdot}10 + 6k \times 0{\cdot}25 = 112$

$\Rightarrow 1{\cdot}7k + 1{\cdot}5k = 112 \Rightarrow 3{\cdot}2k = 112 \Rightarrow k = 35$

$\therefore$ No. of 10-paise coins $= 17 \times 35 = 595$

83. (c) $2A = 3B$

$\therefore \quad \frac{A}{B}=\frac{3}{2}$ and $4B = 5C$

$\therefore \quad \frac{B}{C}=\frac{5}{4}$

$\frac{A}{B}\times\frac{B}{C}=\frac{3}{2}\times\frac{5}{4}=\frac{15}{8}$

$\Rightarrow$ A:C = 15 : 8

84. **(a)** $\frac{x}{y}=\frac{2}{1}$ (given)

$\frac{x^2-y^2}{x^2+y^2}$

Divide numerator and denominator by y^2

$\frac{\frac{x^2}{y^2}-1}{\frac{x^2}{y^2}+1}=\frac{\left(\frac{2}{1}\right)^2-1}{\left(\frac{2}{1}\right)^2+1}=\frac{\frac{4}{1}-1}{\frac{4}{1}+1}=\frac{3}{5}$

85. **(c)** $I\alpha\frac{1}{R^2}$.

86. **(c)** 1:10 ⇒ There must be atleast 11 marbles in the jar.

87. **(c)** When there are eight people, the share of each person is $\frac{1}{8}$ of the total cost.

When there are seven people, the share of each person is $\frac{1}{7}$ of the total cost.

∴ Increase in the share of each person

$$= \frac{1}{7}-\frac{1}{8} = \frac{1}{56}, \text{ i.e., } \frac{1}{7}\text{ of }\frac{1}{8}, \text{ i.e., } \frac{1}{7}$$

of the original share of each person.

88. **(a)** Number of people having characteristic X

$$= 10 + 30 = 40$$

Number of people having characteristic Y

$$= 10 + 20 = 30$$

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

89. **(c)** Let the first and second numbers be x and y, respectively.

Then, $x + y = \frac{10}{3}y$ or, $x = \frac{7}{3}y$

∴ $x:y = 7:3$.

90. **(a)** Let the sums of P, Q and R be $6x$, $19x$ and $7x$

∴ Total sum $= 6x + 19x + 7x = 32x$

From the question,

$6x:19x + 200:7x - 200 = 3:10:3$

i.e. $6x = 7x - 200$

∴ $x = 200$

∴ Total sum $= 32 \times 200 = ₹6400$.

91. **(c)** Let the man have ₹x

Amount given to his wife $= \frac{x}{2}$

Remaining $= x - \frac{x}{2} = \frac{x}{2}$

∴ Amount given to each son $= \frac{x}{2}\times\frac{2}{3}\times\frac{1}{3} = \frac{x}{9}$

∴ Amount given to each daughter

$$= \left(\frac{x}{2}-\frac{x}{3}\right)\times\frac{1}{4} = \frac{x}{24}$$

$\Rightarrow \frac{x}{24} = 20000$

∴ $x = ₹480000$

∴ Amount gives to each son

$$= 480000 \times \frac{1}{9}$$
$$= ₹53333.33.$$

92. **(d)** $\frac{P}{Q} = \frac{5}{8}$ or, $P = \frac{5Q}{8}$ ···(1)

$\frac{P+4}{Q+4} = \frac{2}{3}$

or, $3P + 12 = 2Q + 8$

or, $2Q - 3P = 4$ ···(2)

Putting value of P from equation (1), we get

$2Q - 3\left(\frac{5Q}{8}\right) = 4$

$\Rightarrow Q = 32$ years.

93. **(b)** $\frac{P}{Q} = \frac{5}{7}$ or, $Q = \frac{7P}{5}$

Case I: $Q - (P + 6) = 2$ or, $Q = P + 8$

∴ $\frac{7P}{5} = P + 8$ or, $7P = 5P + 40$

∴ $P = 20$ and $Q = \frac{7}{5} \times 20$

$Q = 28$

∴ $P + Q = 20 + 28 = 48$ years.

Case II: $(P + 6) - Q = 2$

or, $P + 6 - \frac{7}{5}P = 2$ or, $P = 10$ and $Q = 14$

∴ $P + Q = 10 + 14 = 24$ years.

94. **(d)** P:Q:R = 5:8:12

$$\frac{\text{Total share of Q and R}}{\text{share of P}} = \frac{8+12}{5} = \frac{20}{5} = 4.$$

Thus, we see that no new information has been given in the question and therefore P's share cannot be determined.

95. **(b)** Ratio A:B = 3:2

and A:C = 2:1

∴ A:B:C = 6:4:3

Profit share of B $= \frac{4}{13} \times 1{,}57{,}300 = ₹48400$.

96. **(d)** Here, neither the total amount nor the individual amount is given. So the share of Q cannot be determined.

97. **(b)** 30% of I + II = II $\times \frac{120}{100}$

or, $\frac{3}{10}\text{I} + \text{II} = \frac{12}{10}\text{II}$

or, $\frac{3}{10}\text{I} = \frac{2}{10}\text{II}$

$\Rightarrow$ I:II = 2:3.

98. **(a)** Let the salaries of A and B be $9x$ and $4x$.

$$9x \times \frac{115}{100} = 5175$$

∴ $x = 500$

∴ Salary of B $= 500 \times 4 = ₹2000$

99. **(c)** Sohan − Mohan = 10 ···(1)

$$\frac{\text{Mohan}-5}{\text{Sohan}-5} = \frac{1}{2}$$

$\Rightarrow$ 2 Mohan − Sohan = 5 ···(2)

On solving (1) and (2), we get

Mohan = 15 years and Sohan = 25 years.

100. (b) $\frac{P}{Q} = \frac{7}{3}$

$\Rightarrow \quad Q = \frac{3P}{7} \quad \cdots(1)$

and, $\frac{P+4}{Q+4} = \frac{2}{1}$

or, $P + 4 = 2Q + 8$

or, $2Q = P - 4 \quad \cdots(2)$

Solving equations (1) and (2), we get

$P = 28$ years.

101. (b) Required difference between Monu's and Raju's shares

$= \frac{3-2}{2+3+5} \times 125000 = ₹12500.$

102. (b) Ram Shyam

7 8

4 9 10

Present age of Ram $= \frac{4\times(10-9)}{9\times8-10\times7} \times 7$

$= 14$ years.

103. (d) Suppose the salaries of A, B and C were 300 k, 500 k and 700 k, respectively.

After increment, salary of

A = 300 k + 50% of 300 k = 450 k

B = 500 k + 50% of 500 k = 800 k

C = 700 k + 50% of 700 k = 1050 k

Hence, new ratio of the respective salaries of A, B and C = 450 k:800 k:1050 k = 9:16:21.

104. (d) let A's income, B's income, C's income and be ₹7x, ₹9x and ₹12x, respectively and their expenditures be ₹8y, ₹9y and ₹15y respectively.

Therefore,

$7x - 8y = \frac{7x}{4}$

$\Rightarrow \quad 4(7x - 8y) = 7x$

$\Rightarrow \quad 28x - 32y = 7x$

$\Rightarrow \quad 28x - 7x = 32y$

$\Rightarrow \quad 21x = 32y$

$\Rightarrow \quad y = \frac{21x}{32}$

A's saving $= \frac{7x}{y}$

B's saving $= 9x - 9y$

$= 9\left(x - \frac{21x}{32}\right) = 9\left(\frac{32x}{32} - 21x\right)$

$= \frac{9\times11x}{32} = \frac{99x}{32}$

C's saving $= 12x - 15y$

$= 12x - \frac{15\times21x}{32} = \frac{69x}{32}$

Hence, the required ratio

$= \frac{7x}{4}; \frac{99x}{32}; \frac{69x}{32}$

$= 56; 99; 69$

105. (c) Let k be the third proportional of 38 and 15

38:15::15:k

$\Rightarrow \quad k = \frac{15\times15}{38}.$

106. (c) Let the amount of P, Q, R be ₹3x, ₹5x and ₹7x, respectively.

$\because \quad 7x - 5x = 4000$

$x = 2000$

$\therefore$ Total amount received by P and Q together

$= (3 + 5) \times ₹2000$

$= ₹16000$

107. (b) A:B:C = 5:4:7

After increasing ratio $= 5 \times \frac{120}{100} : 4 \times \frac{125}{100} : 7 \times \frac{120}{100}$

$= 600:500:840$

$= 30:25:42$

108. (c) Suppose the number of sweets is = x.

$\therefore \quad \frac{x}{450-150} - \frac{x}{450} = 3$

$\frac{x}{300} - \frac{x}{450} = 3$

$\frac{3x-2x}{900} = 3$

$x = 2700$

Number of sweets to each children

$= \frac{2700}{300} = 9$

109. (c) $\frac{x}{2y} = \frac{6}{7} \quad \Rightarrow \quad \frac{x}{y} = \frac{12}{7}$

$\therefore \quad \frac{x-y}{x+y} + \frac{14}{19} = \frac{\frac{x}{y}-1}{\frac{x}{y}+1} + \frac{14}{19} = \frac{\frac{12}{7}-1}{\frac{12}{7}} + \frac{14}{19}$

$= \frac{5}{19} + \frac{14}{19} = 1.$

110. (c) Annual incomes of A and B are 4k and 3k, say.

Annual expenditure of A and B are 3L and 2L, say.

$\therefore \quad 4k - 3L = 600$

$3k - 2L = 600$

$\Rightarrow \quad k = 600, L = 600$

$\therefore$ Difference in incomes of A and B
$= 4k - 3k = k = 600.$

111. (c) $\frac{a}{b} = \frac{b}{c} = \frac{c}{d} = k$, say.

Given: $\frac{a}{d} = \frac{8}{125}$

$= \frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} = k^3$

$\Rightarrow k = \frac{2}{5}$

Now, $\frac{a}{c} = \frac{a}{b} \times \frac{b}{c} = k^2 = \frac{4}{25}$.

112. (a) Ratio of milk and water

$= \frac{3}{5} + \frac{7}{10} + \frac{11}{15} : \frac{2}{5} + \frac{3}{10} + \frac{4}{15}$

$= \frac{18+21+22}{30} : \frac{12+9+8}{30}$

$= 61:29.$

113. (c) Total consumption of electricity

$= (10 \times 16 \times 8 + 3 \times 10 \times 8)$ units

$= (1280 \times 240)$ units

$= 1520$ units

114. (a) Suppose income of Anil and Sunil are $5k$ and $4k$, respectively.

Expenses of Anil and Sunil are $4L$ and $3L$.

$\therefore \quad 5k - 4L = 1200$

$4k - 3L = 1200$

$\Rightarrow k = 1200, L = ₹1200$

115. (a) Speed of the Tractor $= \frac{360}{12} = 30$ Km/h

Speed of the Jeep $= 30 \times \frac{250}{100} = 75$ Km/h

Speed of the Car $= \frac{3}{5} \times 75 = 45$ Km/h

Average speed of Car and Jeep together

$= \frac{75+45}{2} = 60$ Km/h

116. (a) Let number of females $= F$

Suppose 160 males get ₹16 k and F females get ₹21 k

$\therefore \quad 160 \times 4 = 16k$

$\Rightarrow k = 40$

$\therefore$ F females get ₹840

$\therefore$ Number of females $= \frac{840}{3} = 280.$

117. (c) Let k Kg of 1st variety, k Kg of 2nd variety and $2k$ Kg of 3rd variety of tea are mixed.

Let price of the third variety = ₹x per Kg

$\therefore \quad 126k + 135k + x(2k) = 153(k + k + 2k)$

$\Rightarrow x = 175.50.$

118. (a) Total = 950 coins

Ratio of coins before $= (20x + 25):(73x + 15):(83x + 30)$ (Lalita:Amita:Neeta)

Now, $20x + 25 + 73x + 15 + 83x + 30 = 950$

$\therefore \quad 176x = 880 \quad \therefore \quad x = 5$

$\therefore$ Amita $= 73x + 15$

$= 73 \times 5 + 15 = 380$ coins

119. (d) Suppose first number is x and second number is y.

$y = 0.3x = \frac{4}{5}y$

$y - 0.8y = 0.3x$

$0.2y = 0.3\ x$

$\frac{x}{y} = \frac{2}{3}$

120. (d) Suppose A's share = ₹$3k$

B's share = ₹$4k$

C's share = ₹$\frac{16}{3}$

$\therefore$ ₹370 are divided among A, B and C in the ratio 9:12:16

$\therefore$ A's share $= \frac{9}{37} \times 370 = ₹90.$

121. (c) $\frac{p}{q} = \frac{r}{s} = \frac{t}{u} = \frac{2}{3}$

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

122. (a) List price of book $= \frac{82 \cdot 50}{30} \times 100 = ₹275$

Neeta bought the book in

$275 \times 0.70 = ₹192.50.$

123. (b) The man cannot purchase more than 8 bags

$\therefore$ Cost of 8 bags $= 8 \times 200 = ₹1600$

Remaining amount $= ₹(1810 - 1600) = ₹210$

In ₹210, the man can purchase

$\frac{210}{70} = 3$ bottles

$\therefore$ Required ratio = 8:3.

124. (b) We have $\frac{a}{b} = \frac{2}{3}$ and, $\frac{b}{c} = \frac{4}{5}$

$\Rightarrow \quad \frac{a}{2} = \frac{b}{3}$ and, $\frac{b}{4} = \frac{c}{5}$

$\Rightarrow \quad \frac{a}{8} = \frac{b}{12} = \frac{c}{15}$

$\therefore \quad a:b:c = 8:12:15$

$\therefore \quad a^2:b^2:bc = 64:144:180$

$= 16:36:45.$

125. (a) $\frac{200\times(5\times5-3\times3)}{3(5+3)}=\frac{200\times16}{3\times8}$

$=\frac{400}{3}$ gram.

126. (a)

A		B		C
5		2		
7		13		
5 × 7	:	2 × 7	:	2 × 13
or, 35	:	14	:	26

Hence, share of B $=\frac{14\times7500}{35+14+26}$

$=$ ₹1400.

127. (c) Let the numbers be $\frac{3}{2}x$ and $\frac{8}{3}x$

$\frac{\frac{3}{2}x+15}{\frac{8}{3}x+15}=\frac{\frac{5}{3}}{\frac{5}{2}}$, or, $\frac{\frac{3x+30}{2}}{\frac{8x+45}{3}}=\frac{2}{3}$

or, $\frac{3x+30}{8x+45}\times\frac{3}{2}=\frac{2}{3}$ or, $\frac{3x+30}{8x+45}=\frac{4}{9}$ or, $x = 18$.

$\therefore$ greater of the numbers $=\frac{8}{3}\times18=48$.

128. (c) Let, the number of students in three classes be $2x$, $3x$ and $5x$.

Now, according to the question

$2x + 40:3x + 40:5x + 40 = 4:5:7$

or, $\frac{2x+40}{3x+40}=\frac{4}{5}$

or, $10x + 200 = 12x + 160$

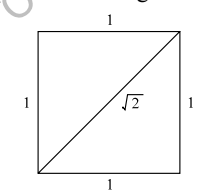
$\therefore$ $x = 20$

$\therefore$ Total number of students

$= 2x + 3x + 5x = 10x$

$= 10 \times 20 = 200$.

129. (a) Area of equilateral triangle with side $\sqrt{2}$



$=\frac{\sqrt{3}}{4}\times(\sqrt{2})^2=\frac{\sqrt{3}}{2}$

Area of the square with side 1 = 1

$\therefore$ Required ratio = $\sqrt{3}:2$.

130. (d) Let, the number be $\frac{1}{2}k$, $\frac{2}{3}k$ and $\frac{3}{4}k$

$\therefore$ $\frac{3}{4}k-\frac{1}{2}k=36\Rightarrow k=144$

$\therefore$ The numbers are 72, 96 and 108.

131. (b) $a:b=\frac{2}{9}:\frac{1}{3}=2:3$

$b:c=\frac{2}{7}:\frac{5}{14}=4:5$

$c:d=\frac{3}{5}:\frac{7}{10}=6:7$

Now, $a:b = 2:3$

$b:c = 4:5$

$c:d = 6:7$

$\therefore$ $a:b:c:d = 48:72:90:105$

$= 16:24:30:35$.

132. (a) Let, the incomes of A, B and C be $7x$, $9x$ and $12x$ respectively, and the expenditures $8y$, $9y$ and $15y$, respectively. We have to find the value of

$(7x - 8y):(9x - 9y):(12x - 15y)$

Also, $7x - 8y = \frac{7x}{4}$ or, $7x - \frac{7x}{4} = 8y$

or, $\frac{x}{y}=\frac{32}{21}$

Now, $(7 \times 32 - 8 \times 21):(9 \times 32 - 9 \times 21)$ $:(12 \times 32 - 15 \times 21) = 56:99:69$.

133. (a) Amount of iron $=\frac{5}{7}\times17.5=12.5$ Kg

Amount of chromium $=\frac{2}{7}\times17.5=5$

Now, the amount of chromium = 5 + 1.25

= 6.25 = 6.25 Kg

$\therefore$ Required ratio = 12.5:6.25 = 2:1.

134. (c) If ₹117 are divided in the ratio $\frac{1}{2}:\frac{1}{3}:\frac{1}{4}$ that is, 6:4:3 among P, Q and R, then

Share of P = ₹54

Share of Q = ₹36

Share of R = ₹27

If ₹117 are divided in the ratio of 2:3:4 among, P, Q and R, then

Share of P = ₹26

Share of Q = ₹39

Share of R = ₹52

135. (a) Son : wife = 3:1 = 9:3

Wife : daughter = 3:1

$\therefore$ Son : wife : daughter = 9:3:1

Sum of ratios = 9 + 3 + 1 = 13

Let, total wealth be ₹x.

$\therefore$ Son's share – daughter's share = ₹10,000

$\Rightarrow$ $\frac{9x}{13}-\frac{x}{13}=10000$

$\Rightarrow \quad \frac{9x-x}{13}=10000$

$\Rightarrow \quad 8x=130000$

$\Rightarrow \quad \frac{130000}{8}=₹16250$

136. (c) Boys = x, Girls = $z - x$

$\therefore$ Part of girls $=\frac{z-x}{z}=1-\frac{x}{z}$

137. (c) Let the third proportional of 12 and 18 be x.

Now, according to the question,

12:18 = 18:x

$\Rightarrow \quad x=\frac{18\times 18}{12}=27$

138. (a) Marks in English = $2x$

Marks in Mathematics = $3x$

Marks in Science = x

Now, according to the question,

$x + 2x + 3x = 180$

$\Rightarrow \quad 6x=180 \quad \Rightarrow \quad x=30$

139. (b) Let the numbers be $2x$, $3x$ and $4x$.

Now, according to the question,

$(2x)^2+(3x)^2+(4x)^2=1856$

$\Rightarrow \quad 4x^2+9x^2+16x^2=1856$

$\Rightarrow \quad 29x^2=1856 \quad \Leftrightarrow \quad x^2=1856\div 29=64$

$\therefore \quad x=\sqrt{64}=8$

$\therefore$ Numbers = 16, 24 and 32

140. (b) Let $x:y$ = 3:2 = 9:6 and

$y:z$ = 3:2 = 6:4

$\therefore$ $x:y:z$ = 9:6:4

Now, according to the question,

$9a + 6a + 4a = 342$

$\Rightarrow \quad 19a=342 \quad \Leftrightarrow \quad a=342\div 19=18$

$\therefore \quad A \Rightarrow 18\times 9=162$

$B \Rightarrow 18\times 6=108$

$C \Rightarrow 18\times 4=72$

141. (c) $A\times\frac{1}{2}=B\times\frac{1}{3}=C\times\frac{1}{4}$

$\Rightarrow \quad \frac{A}{2}=\frac{B}{3}=\frac{C}{4} \quad \Leftrightarrow \quad A:B:C=2:3:4$

$\therefore \quad A \Rightarrow \frac{2}{9}\times 900=₹200$

$B \Rightarrow \frac{3}{9}\times 900=₹300$

$C \Rightarrow \frac{4}{9}\times 900=₹400$

142. (c) A:B:C = 2:5:4

Sum of ratios = 2 + 5 + 4 =11

$\therefore$ Required difference $=\left(\frac{5}{11}-\frac{2}{11}\right)\times 126.50$

$=\frac{3}{11}\times 126.50=₹34.50$

143. (b) Number of one-rupee coins = x

Number of 50-paise coins = $4x$

Number of 25-paise coins = $2x$

$\therefore$ Ratio of their values $=x:\frac{4x}{2}:\frac{2x}{4}=2:4:1$

$\therefore$ Value of 50-paise coins $=\frac{4}{2+4+1}\times 56$

$=\frac{4}{7}\times 56=₹32$

$\therefore$ Their number = 32 × 2 = 64

144. (b) Let the original number of students be $4x$, $6x$ and $9x$.

Now, according to the question,

$\frac{4x+12}{6x+12}=\frac{7}{9}$

$\Rightarrow \quad 42x + 84 = 36x + 108$

$\Rightarrow \quad 42x - 36x = 108 - 84$

$\Rightarrow \quad 6x = 24$

$\Rightarrow \quad x = 4$

$\therefore$ Required number of students = $4x + 6x + 9x$

$= 19x = 19 \times 4 = 76$

145. (a) Let the numbers be $5x$ and $4x$

Now, according to the question,

$5x\times\frac{40}{100}=12$

$\Rightarrow \quad 2x = 12$

$\Rightarrow \quad x = 6$

$\therefore$ Second number = $4x = 6 \times 4 = 24$

$\therefore \quad 50\%$ of $24=24\times\frac{50}{100}=12$

146. (d) Amit's income = ₹$3x$ and his expenditure = ₹$5y$

Veeri's income = ₹$2x$ and his expenditure = ₹$3y$

$\therefore \quad 3x - 5y = 2x - 3y$

$\Rightarrow \quad x = 2y$

$\therefore \quad 3x - 5y = 1000$

$\Rightarrow \quad 6y - 5y = 1000 \quad \Rightarrow \quad y = 1000$

$\therefore \quad x = 2000$

$\therefore$ Amit's income = $3x$ = ₹(3×2000)

= ₹6000

147. (c) $P\alpha\frac{1}{QR}$

$\Rightarrow PQR = k$ (constant)

$\Rightarrow k = 75 \times 6 \times 12$

$\Rightarrow PQR = 75 \times 6 \times 12$

When, $Q = 5$ and $R = 10$, then

$P \times 5 \times 10 = 75 \times 6 \times 12$

$\Rightarrow p = \frac{75\times6\times12}{5\times10} = 108$

148. (b) $8 \times A = B \times 12 = 6 \times C$

$\Rightarrow \frac{8A}{24} = \frac{12B}{24} = \frac{6C}{24}$

$\Rightarrow \frac{A}{3} = \frac{B}{2} = \frac{C}{4}$

$\therefore$ A:B:C = 3:2:4

$\therefore$ B's share $= ₹\left(\frac{2}{3+2+4}\times864\right)$

$= ₹\left(\frac{2}{9}\times864\right) = ₹192$

149. (b) Women $= \frac{43}{83}\times311250 = 161250$

Men = 311250 − 161250 = 150000

$\therefore$ Total number of literate persons

$= \frac{161250\times8}{100} + 150000\times\frac{24}{100}$

= 12900 + 36000 = 48900

150. (a) Let the incomes of A and B be ₹$2x$ and ₹x respectively and their expenditures be ₹$5y$ and ₹$3y$ respectively.

A's savings $= \frac{4}{5}\times5000 = ₹4000$

B's savings = ₹1000

$\therefore$ $2x - 5y = 4000$ …(1)

$x - 3y = 1000$ …(2)

By equation (1) × 3 − equation (2) × 5, we have

$6x - 15y - (5x - 15y) = 12000 - 5000 = 7000$

$\Rightarrow 6x - 5x = 7000$

$\Rightarrow x = ₹7000$

151. (b) Let the numbers be x and y, where $x > y$

Now, according to the question,

$\frac{x+y}{x-y} = \frac{5}{1}$

(By componendo and dividendo)

$\Rightarrow \frac{x+y+x-y}{x+y-x+y} = \frac{5+1}{5-1}$

$\Rightarrow \frac{x}{y} = \frac{6}{4} = \frac{3}{2}$

152. (b) Let the initial number of employees be $9x$ and the employer gives ₹$14y$ as wage to each.

Now, according to the question,

$9x \times 14y = 18900$

$\Rightarrow xy = \frac{18900}{9\times14} = 150$

and the later bill = $8x \times 15y = 120xy$

= 120 × 150 = 18000

$\therefore$ required ratio = 18000:18900 = 20:21

Quicker Method:

Required ratio = 9 × 14:8 × 15

= 21:20

153. (b) $\because$ A + B + C = 1050

$\Rightarrow$ (B + C) = (1050 − A) According to the question,

$\Rightarrow A = (B+C)\frac{2}{5} = (1050 - A)\frac{2}{5}$

$\Rightarrow$ 5A = 2 (1050 − A)

$\Rightarrow$ 7A = 2100

$\therefore$ Share of A = ₹300

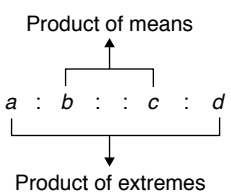
154. (b) $\therefore \frac{A}{B} = \frac{2}{3}, \frac{B}{C} = \frac{4}{5}, \frac{C}{D} = \frac{5}{9}$

$\therefore \frac{A}{D} = \frac{A}{B}\times\frac{B}{C}\times\frac{C}{D} = \frac{2}{3}\times\frac{4}{5}\times\frac{5}{9} = \frac{8}{27}$

A:D = 8:27

(155-159). Boys $= \frac{7}{15}\times150 = 70$; Girls $= \frac{8}{15}\times150 = 80$

	Boy	Girl
Marketing, $n(M)$	28	40
HR, $n(M)$	21	24
Finance, $n(F)$	21	16
HR + Marketing, $n(H \cap M)$	7	9
HR + Finance, $n(H \cap F)$	6	7
Marketing + Finance, $n(M \cap F)$	5	8
Marketing + Finance + HR, $n(M \cap F \cap H)$	2	3



155. (a) Requried% $= \frac{5}{150}\times100 = 3.33\%$

156. (b) Required ratio = 18:26 = 9:13

157. (c) Required ratio = 5:4

158. (d) Required percentage $= \frac{28-24}{24} \times 100 = \frac{4}{24} \times 100 = 16\frac{2}{3}\%$

159. (a) Required ratio = 10:11

160. (e) Let x be subtracted from the numbers 9, 15 and 27 we get continue proportion.

Now, $(9 - x):(15 - x):(27 - x)$

$\therefore \; b^2 = ac$

$\Rightarrow (15 - x)^2 = (9 - x)(27 - x)$

or, $225 - 30x + x^2 = 243 + x^2 - 36x$

or, $6x = 243 - 225 = 18$

$\therefore \; x = 3$

Hence, number become $9 - x = 9 - 3 = 6$

$15 - x = 15 - 3 = 12$

and, $27 - x = 27 - 3 = 24$

$\therefore$ 6:12:24 = 1:2:4

Thus 1:2:4 is continued proportion.

161. (a) Let the amount be x.

Then, B's share $= \frac{3x}{9}$

Due to error B's share $= \frac{2x}{14}$

Difference in B's share due to error = 40

$\frac{3x}{9} - \frac{2x}{14} = 40$

or, $\frac{42x - 18x}{126} = 40$ or, $24x = 40 \times 126$

$\therefore \; x = \frac{40 \times 126}{24} = ₹210$

162. (e) Let, A's share be $4x$ and B's share be $7x$.

$\therefore 4x + 7x = 73689$

or, $11x = 73689$

$\therefore \; x = \frac{73689}{11} = 6699$

A's share = $6699 \times 4 = 26796$

B's share = $6699 \times 7 = 44893$

Thrice the share of $A = 26796 \times 3 = 80388$

Twice the share of $B = 46893 \times 2 = 93786$

Difference = 93786 – 80388 = ₹13398

163. (e) Using Statement I:

$\frac{A}{B} = \frac{2}{3}$

Using Statement II:

A is 40% of total. So B is 60% of total amount invested.

$\frac{A}{B} = \frac{40}{60} = \frac{2}{3}$

Using Statement III:

A = 45000

Putting the value of Statement III in any of the Statements I or II,

we can find the amount invested in scheme B.

164. (e) Let, x boys and x girls join the group of 20 boys and 32 girls to make the ratio 3:4. So,

$\frac{20 + x}{32 + x} = \frac{3}{4} = 80 + 4x = 96 + 3x$

$\Rightarrow x = 16$

Total number of people in the group will be 20 + 32 + 16 + 16 = 84

165. (d) Let, the number be x.

$\therefore$ 53% of x = 676 – 358 = 318

$\therefore \; x = 600$

$\therefore$ 23% of x = 138

$\therefore$ three-fourths of $138 = 138 \times \frac{3}{4} = 103.5$

166. (e) Let, their present ages be $13x$ and $17x$.

Then, $\frac{13x - 4}{17x - 4} = \frac{11}{15}$. Solving this, we get:

Required ratio $= \frac{13 \times 2 + 6}{17 \times 2 + 6} = \frac{32}{40} = \frac{4}{5}$

167. (e) Let, the two numbers be x and y.

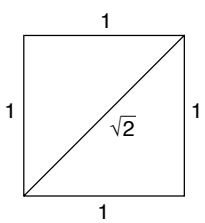
Then $Y - \frac{30}{100} \times = \frac{4}{5}Y$

$\Rightarrow \; \frac{Y}{5} = \frac{3}{10}X$

$\Rightarrow \; \frac{X}{Y} = \frac{2}{3}$.

(168–172):

Female	Games	Male
48	Athletics	165
16	Table Tennis	165
24	Kho-Kho	99
72	Lawn Tennis	11



168. (c) Required ratio = 11:16

169. (e) 48 + 165 + 16 + 165 = 394

170. (d) Required ratio = 72:16 = 9:2

171. (a) 99 – 72 = 27