EXPLANATIONS

TYPE-I

1. (1) $a : c = (a : b) \times (b : c)$

$= \dfrac{7}{9} \times \dfrac{15}{7} = \dfrac{15}{9}$ = 5 : 3

Aliter : Using Rule 18,

A : C = 7 × 15 : 9 × 7 = 5 : 3

2. (3) $x = \dfrac{1}{3} y \Rightarrow x : y = 1 : 3$

Again, $y = \dfrac{1}{2} z \Rightarrow y : z$

= 1 : 2 = 3 : 6

∴ x : y : z = 1 : 3 : 6

3. (3) Using Rule 33,

If $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f}$, then each of

these ratios is equal to $\dfrac{a+c+e}{b+d+f}$

Here,

$\dfrac{p}{q} = \dfrac{r}{s} = \dfrac{t}{u} = \dfrac{2}{3}$

$\Rightarrow \dfrac{mp}{mq} = \dfrac{nr}{ns} = \dfrac{ot}{ou} = \dfrac{2}{3}$

$\Rightarrow \dfrac{mp+nr+ot}{mq+ns+ou} = \dfrac{2}{3}$ or 2 : 3

4. (4) Using Rule 33,

$\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = \dfrac{1}{2}$

$\Rightarrow \dfrac{pa}{pb} = \dfrac{qc}{qd} = \dfrac{re}{rf} = \dfrac{1}{2}$

$\Rightarrow \dfrac{pa+qc+re}{pb+qd+rf} = \dfrac{1}{2}$ or 1 : 2

5. (1) Using Rule 13,

$\dfrac{x}{y} = \dfrac{3}{1} \Rightarrow \dfrac{x^3}{y^3} = \dfrac{27}{1}$

$\Rightarrow \dfrac{x^3 - y^3}{x^3 - y^3} = \dfrac{27-1}{27+1}$

[By componendo and dividendo]

$= \dfrac{26}{28} = \dfrac{13}{14}$ = 13 : 14

6. (3) Let the fourth proportional be x

Then, $\dfrac{0.12}{0.21} = \dfrac{8}{x}$

or $x = 8 \times \dfrac{0.21}{0.12}$

or $x = 8 \times \dfrac{21}{12}$

or x = 14

Aliter : Using Rule 16,

Fourth proportion = $\dfrac{bc}{a}$

$= \dfrac{0.21 \times 18}{0.12}$ = 14

7. (1) Required ratio $= \dfrac{2^{1.5}}{2^{0.5}}$

$= \dfrac{2^{1.5-0.5}}{1}$

$\dfrac{2}{1}$ = 2 : 1

8. (3) $\dfrac{m}{n} = \dfrac{3}{2}$ (Given)

$\therefore \dfrac{4m+5n}{4m-5n} = \dfrac{4\left(\dfrac{m}{n}\right)+5}{4\left(\dfrac{m}{n}\right)-5}$

$= \dfrac{4 \times \dfrac{3}{2} + 5}{4 \times \dfrac{3}{2} - 5} = \dfrac{6+5}{6-5} = 11:1$

9. (4) $A : D = \dfrac{A}{D} = \dfrac{A}{B} \times \dfrac{B}{C} \times \dfrac{C}{D}$

$= \dfrac{3}{4} \times \dfrac{5}{7} \times \dfrac{8}{9} = \dfrac{10}{21}$ = 10 : 21

Aliter : Using Rule 19,

A : D = xpm : yqn

= 3 × 5 × 8 : 4 × 7 × 9

= 10 : 21

10. (2) Using Rule 19 (ii),

$a : b = \dfrac{2}{9} : \dfrac{1}{3}$ = 2 : 3

$b : c = \dfrac{2}{7} : \dfrac{5}{14}$ = 4 : 5

$d : c = \dfrac{7}{10} : \dfrac{3}{5}$ = 7 : 6

$\Rightarrow c : d = 6 : 7$

Thus,

$a : b =$ 2 : 3
$b : c =$ 4 : 5
$c : d =$ 6 : 7

$a : b : c : d = 2 \times 4 \times 6 : 3 \times 4 \times 6 :$
        $3 \times 5 \times 6 : 3 \times 5 \times 7$

= 16 : 24 : 30 : 35

11. (4) Since *b* is the mean proportional of *a* and *c*.

$\therefore \dfrac{a}{b} = \dfrac{b}{c} = k$ (Suppose)

∴ $a = bk$, $b = ck$

$\therefore \dfrac{(a-b)^3}{(b-c)^3} = \dfrac{(bk-b)^3}{(ck-c)^3}$

$= \dfrac{b^3(k-1)^3}{c^3(k-1)^3} = \dfrac{b^3}{c^3} = \dfrac{a^3}{b^3}$

12. (1) Ratio $= \dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{5}$

$= \dfrac{1}{2} \times 30 : \dfrac{1}{3} \times 30 : \dfrac{1}{5} \times 30$

= 15 : 10 : 6

Sum of the ratios

= 15 + 10 + 6 = 31

∴ First part = ₹ $\dfrac{15}{31} \times 6200$

= ₹ 3000

Second part = ₹. $\dfrac{10}{31} \times 6200$

= ₹ 2000

Third part = ₹ $\dfrac{6}{31} \times 6200$

= ₹ 1200

13. (1) First part = *x* and second part = 94 − *x*

$\therefore \dfrac{\dfrac{x}{5}}{\dfrac{94-x}{8}} = \dfrac{3}{4}$

$\Rightarrow \dfrac{x}{5} \times \dfrac{8}{(94-x)} = \dfrac{3}{4}$

$\Rightarrow 32 x = 15 \times 94 - 15x$

$\Rightarrow 47 x = 15 \times 94$

$\Rightarrow x = \dfrac{15 \times 94}{47} = 30$

14. (2) $\dfrac{a}{b} = \dfrac{5}{7}, \dfrac{c}{d} = \dfrac{2a}{3b}$

$\Rightarrow \dfrac{a}{b} \times \dfrac{c}{d} = \dfrac{5}{7} \times \dfrac{2a}{3b}$

$\Rightarrow \dfrac{ac}{bd} = \dfrac{10}{21} \times \dfrac{5}{7} = \dfrac{50}{147}$

= 50 : 147

15. (3) $x : y = 3 : 2$

$\Rightarrow x^2 : y^2 = 9 : 4$

$$\therefore \frac{2x^2 + 3y^2}{3x^2 - 2y^2} = \frac{2\dfrac{x^2}{y^2} + 3}{3\dfrac{x^2}{y^2} - 2}$$

$$= \frac{2 \times \dfrac{9}{4} + 3}{3 \times \dfrac{9}{4} - 2} = \frac{\dfrac{18 + 12}{4}}{\dfrac{27 - 8}{4}}$$

$= 30 : 19$

16. (2) $\dfrac{a}{b} = \dfrac{b}{c}$

$\Rightarrow b^2 = ac \Rightarrow b^4 = a^2 c^2$

$$\therefore \frac{a^4}{b^4} = \frac{a^4}{a^2 c^2} = \frac{a^2}{c^2}$$

17. (3) $A : B = \dfrac{1}{2} : \dfrac{3}{8} = 4 : 3 = 8 : 6$

$B : C = \dfrac{1}{3} : \dfrac{5}{9} = 3 : 5 = 6 : 10$

$C : D = \dfrac{5}{6} : \dfrac{3}{4} = 10 : 9$

$\therefore A : B : C : D = 8 : 6 : 10 : 9$

18. (3) $A : B : C = 2 : 3 : 4$

$\therefore \dfrac{A}{B} = \dfrac{2}{3}, \dfrac{B}{C} = \dfrac{3}{4}, \dfrac{C}{A} = \dfrac{4}{2} = 2$

$\therefore \dfrac{A}{B} : \dfrac{B}{C} : \dfrac{C}{A} = \dfrac{2}{3} : \dfrac{3}{4} : \dfrac{2}{1}$

$= 8 : 9 : 24$

19. (4) $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = \dfrac{1}{2}$

$\therefore \dfrac{3a}{3b} = \dfrac{5c}{5d} = \dfrac{7e}{7f} = \dfrac{1}{2}$

$\therefore \dfrac{3a + 5c + 7e}{3b + 5d + 7f} = \dfrac{1}{2} = 1 : 2$

20. (1) $a : (b+c) = 1 : 3$

$\Rightarrow \dfrac{b+c}{a} = \dfrac{3}{1} \Rightarrow \dfrac{b+c}{a} + 1 = \dfrac{3}{1} + 1$

$\Rightarrow \dfrac{a + b + c}{a} = \dfrac{3 + 1}{1} = \dfrac{4}{1} \ldots..$ (i)

Similarly,

$\dfrac{a + b}{c} = \dfrac{7}{5}$

$\Rightarrow \dfrac{a + b + c}{c} = \dfrac{12}{5} \ldots..$ (ii)

On dividing (i) by (ii),

$\dfrac{c}{a} = \dfrac{4 \times 5}{12} = \dfrac{5}{3} = k \ldots..$ (iii)

From equation (i), b = 4k

$\therefore \dfrac{b}{a+c} = \dfrac{4k}{3k + 5k} = 1 : 2$

21. (3) $\dfrac{p}{1} = \dfrac{q}{2} = \dfrac{r}{4} = k$ (let)

$\Rightarrow p = k, q = 2k, r = 4k$

$\therefore \sqrt{5p^2 + q^2 + r^2}$

$= \sqrt{5k^2 + 4k^2 + 16k^2} = \sqrt{25k^2}$

$= 5k = 5p$

22. (2) Using Rule 14,
Mean proportional

$= \sqrt{\left(3 + \sqrt{2}\right)\left(12 - \sqrt{32}\right)}$

$= \sqrt{\left(3 + \sqrt{2}\right)4\left(3 - \sqrt{2}\right)}$

$= 2\sqrt{9 - 2} = 2\sqrt{7}$

23. (2) Given, $\dfrac{x}{y} = \dfrac{2}{3} \ldots..$ (i)

Expression $= \dfrac{3x + 2y}{9x + 5y}$

$= \dfrac{3 . \dfrac{x}{y} + 2}{9 \dfrac{x}{y} + 5} = \dfrac{3 \times \dfrac{2}{3} + 2}{9 \times \dfrac{2}{3} + 5}$ [from (i)]

$= \dfrac{2 + 2}{11} = \dfrac{4}{11}$

24. (2) We can write $a : c$ by compounding $a : b$ and $b : c$

$\dfrac{a}{c} = \dfrac{a}{b} \times \dfrac{b}{c}, \dfrac{a}{c} = \dfrac{3}{4} \times \dfrac{8}{9}, \dfrac{a}{c} = \dfrac{2}{3}$

$\Rightarrow a : c = 2 : 3$

Aliter : Using Rule 18 (i),

A : C = xp : yq

$= 3 \times 8 : 4 \times 9 = 2 : 3$

25. (3) $a : b : c = 2 : 3 : 4$

$\therefore \dfrac{a}{2} = \dfrac{b}{3} = \dfrac{c}{4} = k$ (let)

$\Rightarrow a = 2k, b = 3k,$ and $c = 4k$

Given $2a - 3b + 4c = 33$

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

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

$\Rightarrow 11k = 33 \Rightarrow k = \dfrac{33}{11} = 3$

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

26. (3) $a : b = c : d$

$\Rightarrow \dfrac{a}{b} = \dfrac{c}{d} = \dfrac{ma}{mb} = \dfrac{nc}{nd}$

$\Rightarrow \dfrac{a + c}{b + d} = \dfrac{ma + nc}{mb + nd}$

27. (3) $A : B = 4 : 5$

$B : C = 2 : 3$

$\therefore A : B : C = 4 \times 2 : 5 \times 2 : 5 \times 3$

$= 8 : 10 : 15$

If A equals 800, then C equals 1500.

28. (4) $a : b : c = 7 : 3 : 5$

$\Rightarrow \dfrac{a}{7} = \dfrac{b}{3} = \dfrac{c}{5} = k$ (let)

$\Rightarrow a = 7k, b = 3k, c = 5k$

Now $(a + b + c) : (2a + b - c)$

$= (7k + 3k + 5k) : (2 \times 7k + 3k - 5k)$

$= 15k : 12k = 5 : 4$

29. (4) Using Rule 18(ii),

A : B = 2 : 3

B : C = 4 : 5

$\therefore A : B : C = 2 \times 4 : 3 \times 4 : 3 \times 5$

$= 8 : 12 : 15$

30. (4) According to the question,

$2A = 3B \Rightarrow B = \dfrac{2}{3} A$

and $2A = 4C \Rightarrow C = \dfrac{1}{2} A$

$\therefore A : B : C = A : \dfrac{2}{3} A : \dfrac{1}{2} A$

$= 1 : \dfrac{2}{3} : \dfrac{1}{2} = 6 : 4 : 3$

31. (1) $\dfrac{A}{B} \times \dfrac{B}{C} \times \dfrac{C}{D} = \dfrac{2}{3} \times \dfrac{2}{4} \times \dfrac{2}{5}$

$\Rightarrow \dfrac{A}{D} = \dfrac{2}{15} = 2 : 15$

Aliter : Using Rule 19(i),

A : D = xpm : yqn

$= 2 \times 2 \times 2 : 3 \times 4 \times 5$

$= 2 : 15$

32. (1) $\dfrac{a}{3} = \dfrac{b}{4} = \dfrac{c}{7} = k$

$\Rightarrow a = 3k, b = 4k$ and $c = 7k$

$\Rightarrow \dfrac{a + b + c}{c} = \dfrac{3k + 4k + 7k}{7k}$

$= \dfrac{14k}{7k} = \dfrac{2}{1} = 2 : 1$

33. (2) A : B = 3 : 4 = 9 : 12
B : C = 12 : 13
∴ A : B : C = 9 : 12 : 13
⇒ A : C = 9 : 13
Aliter : Using Rule 18 (i),
A : C = xp : yq
$\qquad$ = 3 × 12 : 4 × 13
$\qquad$ = 9 : 13

34. (4) A : B = 3 : 2
B : C = 3 : 4
∴ A : B : C = 3 × 3 : 2 × 3 : 2 × 4
= 9 : 6 : 8
∴ A : C = 9 : 8
Aliter : Using Rule 18(i),
A : C = xp : yq
$\qquad$ = 3 × 3 : 2 × 4 = 9 : 8

35. (1) Here, $\dfrac{x}{y} = \dfrac{2}{1} \Rightarrow \dfrac{x^2}{y^2} = \dfrac{4}{1}$

$\therefore \dfrac{x^2 - y^2}{x^2 + y^2} = \dfrac{\dfrac{x^2}{y^2} - 1}{\dfrac{x^2}{y^2} + 1}$

$\quad = \dfrac{4 - 1}{4 + 1} = \dfrac{3}{5}$ = 3 : 5

36. (3) A's share

$= ₹ \left(\dfrac{3}{5} \times 1000 \right) = ₹ 600$

Aliter : Using Rule 22,

Part of A = $\dfrac{m}{m+n} \times R$

$= \dfrac{3}{3+2} \times 1000$

= ₹ 600

37. (1) $\boxed{\text{Tricky Approach}}$

$\dfrac{W_1}{W_2} = \dfrac{2}{3}$

$\Rightarrow \dfrac{W_2}{W_1} = \dfrac{3}{2}$ and $\dfrac{W_1}{W_3} = \dfrac{1}{2}$

$\therefore \dfrac{W_2}{W_1} \times \dfrac{W_1}{W_3} = \dfrac{W_2}{W_3} = \dfrac{3}{2} \times \dfrac{1}{2} = \dfrac{3}{4}$

= 3 : 4

38. (2) $3x = 5y = 4z$
LCM of 3, 5 and 4 = 60

$\therefore \dfrac{3x}{60} = \dfrac{5y}{60} = \dfrac{4z}{60}$

$\Rightarrow \dfrac{x}{20} = \dfrac{y}{12} = \dfrac{z}{15}$

$\therefore x : y : z = 20 : 12 : 15$

39. (3) $\dfrac{A}{B} \times \dfrac{B}{C} = \dfrac{3}{4} \times \dfrac{6}{5}$

$\Rightarrow \dfrac{A}{C} = \dfrac{9}{10} \Rightarrow \dfrac{C}{A} = \dfrac{10}{9}$

$\Rightarrow \dfrac{C}{A} + 1 = \dfrac{10}{9} + 1$

$= \dfrac{C + A}{A} = \dfrac{10 + 9}{9} = \dfrac{19}{9}$

$\Rightarrow A : (A + C) = 9 : 19$

40. (2) $a + b\sqrt{3}$

$= \dfrac{1}{2 - \sqrt{3}} = 2 + \sqrt{3}$

(After rationalising)
$\Rightarrow a = 2$ and $b = 1$
$\therefore a : b = 2 : 1$

41. (3) A : B = 3 : 4 = 6 : 8
B : C = 8 : 9
∴ A : B : C = 6 : 8 : 9
Aliter : Using Rule 18(ii),
A : B : C = xp : yp : qy
$\qquad$ = 3 × 8 : 4 × 8 : 9 × 4
$\qquad$ = 24 : 32 : 36
$\qquad$ = 6 : 8 : 9

42. (3) Ratio = $1 : \dfrac{1}{3} : \dfrac{1}{6}$

= 6 : 2 : 1
Sum of the ratios = 6 + 2 + 1 = 9

$\therefore$ Middle part = $\dfrac{2}{9} \times 78$

$= \dfrac{52}{3} = 17\dfrac{1}{3}$

43. (3) $\dfrac{x}{y} = \dfrac{4}{5}$

$\therefore \dfrac{3x + y}{5x + 3y} = \dfrac{3\left(\dfrac{x}{y}\right) + 1}{5\left(\dfrac{x}{y}\right) + 3}$

$= \dfrac{3 \times \dfrac{4}{5} + 1}{5 \times \dfrac{4}{5} + 3} = \dfrac{\dfrac{12 + 5}{5}}{7}$

$= \dfrac{17}{35} = 17 : 35$

44. (3) $\dfrac{x}{y} = \dfrac{5}{6}$

$\therefore \dfrac{3x^2 - 2y^2}{y^2 - x^2} = \dfrac{3.\dfrac{x^2}{y^2} - 2}{1 - \dfrac{x^2}{y^2}}$

$= \dfrac{3 \times \dfrac{25}{36} - 2}{1 - \dfrac{25}{36}} = \dfrac{75 - 72}{36 - 25} = \dfrac{3}{11}$

= 3 : 11

45. (2) $\dfrac{x}{y} = \dfrac{3}{4}$ (Given)

$\therefore \dfrac{4x + 5y}{5x - 2y} = \dfrac{4\dfrac{x}{y} + 5}{5\dfrac{x}{y} - 2}$

$= \dfrac{4 \times \dfrac{3}{4} + 5}{5 \times \dfrac{3}{4} - 2} = \dfrac{8}{\dfrac{15 - 8}{4}}$

$= \dfrac{8 \times 4}{7} = \dfrac{32}{7}$

46. (3) A : B = 2 : 3 = 4 : 6
B : C = 6 : 11
∴ A : B : C = 4 : 6 : 11
Aliter : Using Rule 18 (ii),
A : B : C = xp : yp : qy
$\qquad$ = 2 × 6 : 3 × 6 : 3 × 11
$\qquad$ = 12 : 18 : 33
$\qquad$ = 4 : 6 : 11

47. (2) $A \times \dfrac{2}{3} = B \times \dfrac{4}{5}$

$\Rightarrow \dfrac{A}{B} = \dfrac{4}{5} \times \dfrac{3}{2} = 6 : 5$

48. (4) According to the question,

$A \times \dfrac{2}{3} = B \times \dfrac{75}{100} = C \times \dfrac{6}{10}$

$\Rightarrow A \times \dfrac{2}{3} = B \times \dfrac{3}{4} = C \times \dfrac{3}{5}$

Now, $A \times \dfrac{2}{3} = B \times \dfrac{3}{4}$

$\Rightarrow \dfrac{A}{B} = \dfrac{3}{4} \times \dfrac{3}{2} = \dfrac{9}{8} \Rightarrow A : B = 9 : 8$

and $B \times \dfrac{3}{4} = C \times \dfrac{3}{5}$

$\Rightarrow \dfrac{B}{C} = \dfrac{3}{5} \times \dfrac{4}{3} = \dfrac{4}{5} = \dfrac{8}{10}$

= B : C = 8 : 10

∴ A : B : C = 9 : 8 : 10

49. (1) A : B = 3 : 7

B : C = 6 : 5

A : B : C = 3×6 : 7×6 : 7×5

= 18 : 42 : 35

Sum of the ratios

= 18 + 42 + 35 = 95

∴ B's share

$= ₹\left(\dfrac{42}{95} \times 33630\right) = ₹14868$

50. (4) A : B = 3 : 5 = 12 : 20

B : C = 4 : 7 = 20 : 35

∴ A : B : C = 12 : 20 : 35

Aliter : Using Rule 18 (ii),

A : B : C = xp : yp : qy

= 3 × 4 : 5 × 4 : 5 × 7

= 12 : 20 : 35

51. (2) $\dfrac{A}{B} = \dfrac{4}{5}$; $\dfrac{B}{C} = \dfrac{5}{2}$

$\therefore \dfrac{A}{C} = \dfrac{A}{B} \times \dfrac{B}{C} = \dfrac{4}{5} \times \dfrac{5}{2} = 2{:}1$

Aliter : Using Rule 18 (i),

A : B = 4 : 5, B : C = 5 : 2

A : C = 4 × 5 : 5 × 2

= 20 : 10 = 2 : 1

52. (3) $A = \dfrac{1}{4} B$

$\Rightarrow$ A : B = 1 : 4

B : C = 1 : 2 = 4 : 8

∴ A : B : C = 1:4: 8

Aliter : Using Rule 18(ii),

A : B= 1 : 4, B : C = 1 : 2

A : B : C= 1 × 1 : 4 × 1 : 4 × 2

= 1 : 4 : 8

53. (3) 2A = 3B = 4C

$\Rightarrow \dfrac{2A}{12} = \dfrac{3B}{12} = \dfrac{4C}{12}$

$\Rightarrow \dfrac{A}{6} = \dfrac{B}{4} = \dfrac{C}{3}$

$\Rightarrow$ A : B : C = 6 : 4 : 3

54. (1) $4^{3.5} : 2^5 = 4^3 \times 4^{0.5} : 32$

= 64 × 2 : 32 = 4 : 1

55. (4) Using Rule 20,

A : B = 1 : 2 = 3 : 6

B : C = 3 : 4 = 6 : 8

C : D = 6 : 9 = 2 : 3 = 8 : 12

D : E = 12 : 16

∴ A : B : C : D : E

= 3 : 6 : 8 : 12 : 16

56. (4) $\dfrac{x}{y} = \dfrac{2}{5}$ (Given)

$\therefore \dfrac{5x + 3y}{5x - 3y} = \dfrac{5\left(\dfrac{x}{y}\right) + 3}{5\left(\dfrac{x}{y}\right) - 3}$

(Dividing numerator and denominator by *y*)

$= \dfrac{5 \times \dfrac{2}{5} + 3}{5 \times \dfrac{2}{5} - 3} = \dfrac{2 + 3}{2 - 3} = -5$

Aliter : Using Rule 23,

Marks of Q = $\dfrac{n}{m} \times R$

(Where m = 2, n = 5, R = 120)

$= \dfrac{5}{2} \times 120 = 300$

57. (4) *a* : *b* = 2 : 3

b : *c* = 4 : 5

∴ *a* : *b* : *c* = 2 × 4 : 3 × 4 : 3 × 5

= 8 : 12 : 15

$\therefore \dfrac{a+b}{b+c} = \dfrac{8+12}{12+15} = \dfrac{20}{27}$

= 20 : 27

58. (3) Marks of Q $= \dfrac{5}{2} \times 120 = 300$

59. (3) A : B = 4 : 9

A : C = 2 : 3 = 4 : 6

$\therefore \dfrac{A+B}{A+C} = \dfrac{4+9}{4+6} = \dfrac{13}{10}$

60. (1) If the third proportional be *x*, then

0.8 : 0.2 :: 0.2 : *x*

$\Rightarrow$ 0.8 × *x* = 0.2 × 0.2

$\Rightarrow x = \dfrac{0.2 \times 0.2}{0.8} = \dfrac{4}{80} = 0.05$

Aliter :

Third proportion

$= \dfrac{b^2}{a} = \dfrac{(0.2)^2}{0.8}$

$= \dfrac{0.04}{0.8} = 0.05$

61. (3) $\dfrac{x}{y} = \dfrac{3}{4}$ (Given)

$\therefore \dfrac{5x - 2y}{7x + 2y} = \dfrac{5\dfrac{x}{y} - 2}{7\dfrac{x}{y} + 2}$

$= \dfrac{5 \times \dfrac{3}{4} - 2}{7 \times \dfrac{3}{4} + 2} = \dfrac{\dfrac{15-8}{4}}{\dfrac{21+8}{4}} = \dfrac{7}{29}$

62. (3) As given,

2A = 3B

$\Rightarrow$ A : B = 3 : 2

and, 4B = 5C

$\Rightarrow$ B : C = 5 : 4

∴ A : B : C

= 3 × 5 : 2 × 5 : 2 × 4

= 15 : 10 : 8

∴ A : C = 15 : 8

Aliter : Using Rule 18 (i),

Here, 2A = 3B i,eA : B = 3 : 2

4B = 5C i,e B : C = 5 : 4

A : C = xp : yq

= 3 × 5 : 2 × 4

= 15 : 8

63. (1) Number of students in class A = *x*

Number of students in class B = *y*

∴ 25*x* + 40*y* = 30(*x* + *y*)

$\Rightarrow$ 25*x* + 40*y* = 30*x* + 30*y*

$\Rightarrow$ 30x – 25x = 40*y* – 30*y*

$\Rightarrow$ 5*x* = 10*y*

$\Rightarrow \dfrac{x}{y} = \dfrac{10}{5}$ = 2 : 1

64. (3) Ratio of values

= 15 × 3 : 10 × 2 : 5 × 5

= 45 : 20 : 25

∴ Required average cost

$= \dfrac{45 + 20 + 25}{10} = \dfrac{90}{10} = ₹\ 9$

65. (1) Boys : Girls

= 4 : 3 = 32 : 24

Girls : Teachers

= 8 : 1 = 24 : 3

∴ Boys : Girls : Teachers

= 32 : 24 : 3

∴ Required ratio

= (32 + 24) : 3 = 56 : 3

66. (2) $\dfrac{3x + 5}{5x - 2} = \dfrac{2}{3}$

$\Rightarrow$ 10*x* – 4 = 9*x* + 15

$\Rightarrow$ 10*x* – 9*x* = 15 + 4 = 19

$\Rightarrow x$ = 19

67. (4) A : B = 5 : 3

B : C = 4 : 5

∴ A : B : C

= 5 × 4 : 3 × 4 : 3 × 5

= 20 : 12 : 15

Sum of ratios

= 20 + 12 + 15 = 47

∴ Runs scored by B

$= \dfrac{12}{47} \times 564 = 144$

68. (1) $\dfrac{a+b}{6} = \dfrac{b+c}{7} = \dfrac{c+a}{8} = k$

$\Rightarrow a + b = 6k;\ b + c = 7k;$
$c + a = 8k$

$\therefore a + b + b + c + c + a$
$= 6k + 7k + 8k$

$\Rightarrow 2\,(a + b + c) = 21k$

$\Rightarrow 2 \times 14 = 21k \Rightarrow k = \dfrac{4}{3}$

$\therefore c = (a + b + c) - (a + b)$

$= 14 - 6 \times \dfrac{4}{3} = 14 - 8 = 6$

69. (3) $a \times 5.5 = b \times 0.65$

$\Rightarrow \dfrac{a}{b} = \dfrac{0.65}{5.5} = \dfrac{65}{550} = \dfrac{13}{110}$

70. (3) Original number of boys
$= 5x$
Original number of girls $= 3x$

$\therefore \dfrac{5x - 50}{3x + 50} = \dfrac{9}{7}$

$\Rightarrow 35x - 350 = 27x + 450$
$\Rightarrow 35x - 27x = 350 + 450$
$\Rightarrow 8x = 800$
$\Rightarrow x = 100$
Number of boys $= 5x$
$= 5 \times 100 = 500$

71. (1) A : B : C

$= \dfrac{1}{3} : \dfrac{1}{4} : \dfrac{1}{5} : \dfrac{1}{6}$

$= \dfrac{1}{3} \times 60 : \dfrac{1}{4} \times 60 : \dfrac{1}{5} \times 60 : \dfrac{1}{6} \times 60$

[LCM of 3, 4, 5 & 6 = 60]
$= 20 : 15 : 12 : 10$
$\therefore$ Minimum number of pens
$= 20 + 15 + 12 + 10 = 57$

72. (4) $A = B \times \dfrac{2}{3}$

$\Rightarrow A : B = 2 : 3 = 8 : 12$

$B = C \times \dfrac{4}{5}$

$\Rightarrow B : C = 4 : 5 = 12 : 15$
$\therefore A : B : C = 8 : 12 : 15$
Aliter : Using Rule 18 (ii),
Here, A : B = 2 : 3, B : C = 4 : 5
A : B : C = xp : yp : qy
$= 2 \times 4 : 3 \times 4 : 5 \times 3$
$= 8 : 12 : 15$

73. (4) $25^{2.5} : 5^3$
$= (5^2)^{2.5} : 5^3$
$= 5^5 : 5^3$
$= 5^2 : 1$
$= 25 : 1$

74. (3) Third proportional of 12 and
$18 = x$
$\therefore 12 : 18 = 18 : x$

$\Rightarrow x = \dfrac{18 \times 18}{12} = 27$

Aliter : Using Rule 15,

Third proportion $= \dfrac{b^2}{a} = \dfrac{18^2}{12}$

$= \dfrac{18 \times 18}{12} = 27$

75. (2) $x : y = 3 : 2 = 9 : 6$
$y : z = 3 : 2 = 6 : 4$
$\therefore x : y : z = 9 : 6 : 4$
$\therefore 9a + 6a + 4a = 342$
$\Rightarrow 19a = 342$
$\Rightarrow a = 342 \div 19 = 18$
$\therefore A \Rightarrow 18 \times 9 = 162$
$B \Rightarrow 18 \times 6 = 108$
$C \Rightarrow 18 \times 4 = 72$

76. (1) $\dfrac{A}{B} = \dfrac{3}{4}, \dfrac{B}{C} = \dfrac{6}{5}$

$\Rightarrow \dfrac{A}{B} \times \dfrac{B}{C} = \dfrac{3}{4} \times \dfrac{6}{5} = \dfrac{9}{10}$

$\Rightarrow \dfrac{A}{C} = \dfrac{9}{10} \Rightarrow \dfrac{C}{A} = \dfrac{10}{9}$

Aliter : Using Rule 18(i),
A : C $= xp : yq$
$= 3 \times 6 : 4 \times 5$
$= 18 : 20$
A : C $= 9 : 10$
$\therefore$ C : A = 10 : 9

77. (1) $\dfrac{2}{x} = \dfrac{y}{54}$

$\Rightarrow xy = 2 \times 54 = 6 \times 18$

78. (1) $\dfrac{12}{9} = \dfrac{16}{12}$

$\Rightarrow 12 \times 12 = 9 \times 16$
$\Rightarrow 144 = 144.$

79. (1) $\dfrac{18}{x} = \dfrac{x}{50}$

$\Rightarrow x^2 = 18 \times 50$
$= 900$
$\Rightarrow x = \sqrt{900} = 30$

80. (3) A : B = 7 : 9
B : C = 3 : 5
$\therefore$ A : B : C
$= 7 \times 3 : 9 \times 3 : 9 \times 5$
$= 7 : 9 : 15$
Aliter : Using Rule 18(ii),

A : B : C = xp : py : qy
$= 7 \times 3 : 9 \times 3 : 5 \times 9$
$= 21 : 27 : 45$
$= 7 : 9 : 15$

81. (3) $\dfrac{x}{y} = \dfrac{5}{2}$ (Given)

Expression $= \dfrac{8x + 9y}{8x + 2y}$

$= \dfrac{\dfrac{8x + 9y}{y}}{\dfrac{8x + 2y}{y}}$

$= \dfrac{8\dfrac{x}{y} + 9}{8\dfrac{x}{y} + 2} = \dfrac{8 \times \dfrac{5}{2} + 9}{8 \times \dfrac{5}{2} + 2}$

$= \dfrac{20 + 9}{20 + 2} = \dfrac{29}{22} = 29 : 22$

82. (2) Length : breadth $= 5 : 2$
Breadth $= 40$ metre

$\therefore$ Length $= \dfrac{5}{2} \times 40 = 100$ metre

83. (1) $\dfrac{2}{x} = \dfrac{4}{8} \Rightarrow 4x = 2 \times 8$

$\Rightarrow x = \dfrac{2 \times 8}{4} = 4$

$\therefore \dfrac{x}{y} = \dfrac{2}{3}$

$\Rightarrow \dfrac{4}{y} = \dfrac{2}{3}$

$\Rightarrow 2y = 4 \times 3$

$\Rightarrow y = \dfrac{4 \times 3}{2} = 6$

84. (1) $\dfrac{a + b}{\sqrt{ab}} = \dfrac{4}{1} \Rightarrow \dfrac{a + b}{2\sqrt{ab}} = \dfrac{2}{1}$

By componendo and dividendo,

$\dfrac{a + b + 2\sqrt{ab}}{a + b - 2\sqrt{ab}} = \dfrac{3}{1}$

$\Rightarrow \dfrac{\left(\sqrt{a} + \sqrt{b}\right)^2}{\left(\sqrt{a} - \sqrt{b}\right)^2} = \dfrac{\left(\sqrt{3}\right)^2}{(1)^2}$

$\Rightarrow \dfrac{\sqrt{a} + \sqrt{b}}{\sqrt{a} - \sqrt{b}} = \dfrac{\sqrt{3}}{1}$

Again using componendo and dividendo,

$$\frac{2\sqrt{a}}{2\sqrt{b}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$$

$$\Rightarrow \frac{\sqrt{a}}{\sqrt{b}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$$

On squaring both sides

$$\frac{a}{b} = \left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)^2 = \frac{3+1+2\sqrt{3}}{3+1-2\sqrt{3}}$$

$$= \frac{4+2\sqrt{3}}{4-2\sqrt{3}} = \frac{2+\sqrt{3}}{2-\sqrt{3}}$$

$$= 2+\sqrt{3} : 2-\sqrt{3}$$

85. (2)

Monkey	Banana	Time
12 ↑	12 ↓	12 ↓
4	4 ↓	x ↓

$$\therefore \left.\begin{array}{r} 4:12 \\ 12:4 \end{array}\right\} :: 12 : x$$

$$\Rightarrow 4 \times 12 \times x = 12 \times 12 \times 4$$

$$\Rightarrow x = \frac{12 \times 12 \times 4}{4 \times 12}$$

= 12 minutes

86. (3) Let x be added to each term. According to the question,

$$\frac{2+x}{5+x} = \frac{5}{6}$$

$$\Rightarrow 12 + 6x = 25 + 5x$$
$$\Rightarrow 6x - 5x = 25 - 12$$
$$\Rightarrow x = 13$$

87. (3) A : B = 2 : 3
B : C = 3 : 7
∴ A : B : C = 2 : 3 : 7
∴ A = 2k, B = 3k, C = 7k
∴ A + B = 5k; B + C = 10k,
C + A = 9k
∴ Required ratio = 5k : 10k : 9k
= 5 : 10 : 9

88. (1) $\dfrac{x^3 - y^3}{x^2 + xy + y^2} = \dfrac{5}{1}$

$$\Rightarrow \frac{(x-y)(x^2+xy+y^2)}{x^2+xy+y^2} = 5$$

$$\Rightarrow x - y = 5 \qquad ....(i)$$

Again,

$$\frac{x^2 - y^2}{x-y} = 7$$

$$\Rightarrow \frac{(x+y)(x-y)}{x-y} = 7$$

$$\Rightarrow x + y = 7 \qquad ....(ii)$$

On adding equations (i) and (ii),
$2x = 12 \Rightarrow x = 6$
From equation (ii),
$x + y = 7 \Rightarrow y = 7 - 6 = 1$

$$\therefore \frac{2x}{3y} = \frac{2 \times 6}{3 \times 1} = 4 : 1$$

89. (4) A : B = 2 : 1
A : C = 1 : 3 = 2 : 6
∴ A : B : C = 2 : 1 : 6

90. (2) $\dfrac{1 \cdot 21}{x} = \dfrac{x}{0.09}$

Where = x = mean Proportion

$$\Rightarrow x^2 = 1.21 \times 0.09$$

$$\Rightarrow x^2 = 1.1 \times 1.1 \times 0.3 \times 0.3$$

$$\Rightarrow x = 1.1 \times 0.3 = 0.33$$

91. (3) According to the question,
$x = 2k$
$y = 3k$
$z = 5k$
∵ $x + y + z = 80$
$\Rightarrow 2k + 3k + 5k = 80$
$\Rightarrow 10k = 80$

$$\Rightarrow k = \frac{80}{10} = 8$$

∴ $x = 2 \times 8 = 16$
$y = 3 \times 8 = 24$
$z = 5 \times 8 = 40$
∴ $z = ax - 8$
$\Rightarrow 40 = a \times 16 - 8$
$\Rightarrow 16a = 40 + 8 = 48$

$$\Rightarrow a = \frac{48}{16} = 3$$

92. (2) A : B = 5 : 4 = 45 : 36
B : C = 9 : 10 = 36 : 40
∴ A : B : C = 45 : 36 : 40
Sum of the terms of ratio
= 45 + 36 + 40 = 121

$$\therefore \text{ C's share} = \text{Rs.} \left(\frac{40}{121} \times 2420\right)$$

= Rs. 800

93. (4) Successful students

$$\Rightarrow \frac{9}{11} \times 132 = 108$$

Unsuccessful students

$$\Rightarrow \frac{2}{11} \times 132 = 24$$

When 4 more students succeed,
Required ratio
= (108 + 4) : (24 − 4)
= 112 : 20 = 28 : 5

94. (3) Before battle,
Officers ⇒ 3x
Soldiers ⇒ 31x

According to the question,
After battle,

$$\frac{3x-6}{31x-22} = \frac{1}{13}$$

$\Rightarrow 39x - 78 = 31x - 22$
$\Rightarrow 39x - 31x = 78 - 22$
$\Rightarrow 8x = 56$

$$\Rightarrow x = \frac{56}{8} = 7$$

∴ Required number of officers
= 3 × 7 = 21

95. (2) Boys : Girls = 7 : 5

Number of boys = $\dfrac{7}{12} \times 720$

= 420

Number of girls = $\dfrac{5}{12} \times 720$

= 300
Let x girls be admitted.
According to the question,
420 = 300 + x
$\Rightarrow x = 420 - 300 = 120$

96. (3) Boys : Girls = 5 : 6
Sum of the terms of ratio
= 5 + 6 = 11
∴ Number of girls

$$= \frac{6}{11} \times 55 = 30$$

97. (2) Boys : Girls = 9 : 7,
Sum of the terms of the ratio = 9 + 7 = 16
Number of students = 256
∴ Number of girls

$$= \frac{256 \times 7}{16} = 112$$

98. (2) Let the numbers be x and y.
According to the question,
$x + y = 3(x - y)$
$\Rightarrow x + y = 3x - 3y$
$\Rightarrow 3x - x = y + 3y$
$\Rightarrow 2x = 4y$
$\Rightarrow x = 2y$

$$\Rightarrow \frac{x}{y} = \frac{2}{1}$$

99. (2) Reciprocal ratio

$$= \frac{yz}{x} : \frac{zx}{y} : \frac{xy}{z}$$

Their compound ratio

$$= \frac{yz.zx.xy}{xyz} = xyz : 1$$

100. (2) According to the question,

$$\frac{x + \dfrac{1}{x}}{x - \dfrac{1}{x}} = \frac{5}{3}$$

$\Rightarrow 5x - \dfrac{5}{x} = 3x + \dfrac{3}{x}$

$\Rightarrow 5x - 3x = \dfrac{5}{x} + \dfrac{3}{x}$

$\Rightarrow 2x = \dfrac{8}{x}$

$\Rightarrow x^2 = \dfrac{8}{2} = 4$

$\Rightarrow x = \sqrt{4} = \pm 2$

101. (2) Let the numbers be $3x$, $2x$ and $5x$.
According to the question,
$(3x)^2 + (2x)^2 + (5x)^2 = 1862$
$\Rightarrow 9x^2 + 4x^2 + 25x^2 = 1862$
$\Rightarrow 38x^2 = 1862$

$\Rightarrow x^2 = \dfrac{1862}{38} = 49 = 5 : 2$

$\therefore \ x = \sqrt{49} = 7$
$\therefore$ Number in the middle
$= 2x = 14$

102. (3) $2r = h + \sqrt{r^2 + h^2}$

$\Rightarrow 2r - h = \sqrt{r^2 + h^2}$

On squaring both sides,
$4r^2 + h^2 - 4rh = r^2 + h^2$
$\Rightarrow 3r^2 = 4rh$
$\Rightarrow 3r = 4h$

$\Rightarrow \dfrac{r}{h} = \dfrac{4}{3} = 4 : 3$

103. (2) Let the number of sweets be x.
A : B = 3 : 4
Sum of the terms of ratio
$= 3 + 4 = 7$

$\therefore$ A's share $= \dfrac{3x}{7}$

$\therefore \ \dfrac{3x}{7} = 36$

$\Rightarrow 3x = 36 \times 7$

$\Rightarrow x = \dfrac{36 \times 7}{3} = 84$

104. (2) In the college union,

Number of boys $= \dfrac{5}{8} \times 48 = 30$

Number of girls $= \dfrac{3}{8} \times 48 = 18$

Let the number of girls added be x.

$\therefore \ \dfrac{30}{18 + x} = \dfrac{6}{5}$

$\Rightarrow 108 + 6x = 150$
$\Rightarrow 6x = 150 - 108 = 42$

$\Rightarrow x = \dfrac{42}{6} = 7$

105. (3) In coloured picture,

Blue part $= \dfrac{4}{7}$

Yellow part $= \dfrac{3}{7}$

In upper half,

Blue part $= \dfrac{2}{5 \times 2} = \dfrac{1}{5}$

Yellow part $= \dfrac{3}{5 \times 2} = \dfrac{3}{10}$

In lower half,

Blue part $= \dfrac{4}{7} - \dfrac{1}{5} = \dfrac{20 - 7}{35}$

$= \dfrac{13}{35}$

Yellow part $= \dfrac{3}{7} - \dfrac{3}{10} = \dfrac{30 - 21}{70}$

$= \dfrac{9}{70}$

$\therefore$ Required ratio $= \dfrac{13}{35} : \dfrac{9}{70}$

$= 26 : 9$

TYPE-II

1. (2) Let the number to be added be z.

$\therefore \ \dfrac{x + z}{y + z} = \dfrac{p}{q}$

$\Rightarrow qx + zq = py + zp$
$\Rightarrow zp - zq = qx - py$
$\Rightarrow z(p - q) = qx - py$

$\Rightarrow z = \dfrac{qx - py}{p - q}$

2. (1) $\dfrac{x}{y} = \dfrac{3}{4}$

$\therefore \ \dfrac{4x - y}{2x + 3y} = \dfrac{4\dfrac{x}{y} - 1}{2\dfrac{x}{y} + 3}$

$= \dfrac{4 \times \dfrac{3}{4} - 1}{2 \times \dfrac{3}{4} + 3}$

$= \dfrac{2}{\dfrac{3}{2} + 3} = \dfrac{2 \times 2}{9} = 4 : 9$

3. (4) $x : y = 3 : 4 = 9 : 12$
$y : z = 3 : 4 = 12 : 16$
$\therefore \ x : y : z = 9 : 12 : 16$

$\therefore \ \dfrac{x + y + z}{3z} = \dfrac{9k + 12k + 16k}{3 \times 16k}$

$= \dfrac{37}{48}$

4. (3) $A : B = \dfrac{1}{2} : \dfrac{1}{3} = 3 : 2$

$B : C = \dfrac{1}{5} : \dfrac{1}{3} = 3 : 5$

$\dfrac{A}{B} = \dfrac{3}{2}$

$\Rightarrow \dfrac{A + B}{B} = \dfrac{3 + 2}{2} = \dfrac{5}{2}$

$\dfrac{B}{C} = 3 : 5 \Rightarrow \dfrac{C}{B} = \dfrac{5}{3}$

$\Rightarrow \dfrac{C + B}{B} = \dfrac{5}{3} + 1 = \dfrac{8}{3}$

$\therefore \ \dfrac{A + B}{C + B} = \dfrac{5}{2} \div \dfrac{8}{3}$

$= \dfrac{5}{2} \times \dfrac{3}{8} = \dfrac{15}{16} = 15 : 16$

5. (4) $\dfrac{x}{y} = \dfrac{3}{4}$ (Given)

$\therefore \ \dfrac{2x + 3y}{3y - 2x} = \dfrac{2\dfrac{x}{y} + \dfrac{3y}{y}}{\dfrac{3y}{y} - \dfrac{2x}{y}}$

(Dividing numerator and denominator by y)

$= \dfrac{2 . \dfrac{x}{y} + 3}{3 - 2 . \dfrac{x}{y}} = \dfrac{2 \times \dfrac{3}{4} + 3}{3 - 2 \times \dfrac{3}{4}}$

$= \dfrac{\dfrac{3}{2} + 3}{3 - \dfrac{3}{2}}$

$= \dfrac{3 + 6}{6 - 3} = \dfrac{9}{3} = 3 : 1$

6. (3) First number $= \dfrac{3x}{2}$ and

second number $= \dfrac{8x}{3}$

According to the question,

$$\frac{\frac{3x}{2}+15}{\frac{8x}{3}+15} = \frac{\frac{5}{3}}{\frac{5}{2}}$$

$$\Rightarrow \frac{\frac{3x+30}{2}}{\frac{8x+45}{3}} = \frac{5}{3} \times \frac{2}{5} = \frac{2}{3}$$

$$\Rightarrow \frac{(3x+30)\times 3}{(8x+45)\times 2} = \frac{2}{3}$$

$\Rightarrow 32x + 180 = 27x + 270$

$\Rightarrow 32x - 27x = 270 - 180$

$\Rightarrow 5x = 90$

$$\Rightarrow x = \frac{90}{5} = 18$$

$\therefore$ Larger number $= \dfrac{8x}{3}$

$$= \frac{8 \times 18}{3} = 48$$

7. (4) Ratio of division

$$= \frac{1}{2} : \frac{2}{3} : \frac{4}{5}$$

$$= \frac{1}{2} \times 30 : \frac{2}{3} \times 30 : \frac{4}{5} \times 30$$

[LCM of 2, 3 and 5 = 30]

= 15 : 20 : 24

$\therefore$ Sum of the terms of ratio

= 15 + 20 + 24 = 59

$\therefore$ Second part

$$= \text{Rs. } \left(\frac{20}{59} \times 177\right) = \text{Rs. } 60$$

8. (1) According to the question,

$$\frac{5A}{19} = \frac{2B}{5}$$

$$\Rightarrow 5A = \frac{19 \times 2\,B}{5}$$

$$\Rightarrow A = \frac{38 \times B}{5 \times 5}$$

$\Rightarrow A : B = 38 : 25$

Sum of the terms of ratio

= 38 + 25 = 63

$$\Rightarrow \text{B's share} = \text{Rs. } \left(\frac{25}{63} \times 6300\right)$$

= Rs. 2500

9. (2) Let the required fraction be x.

According to the question,

$$x : \frac{1}{27} = \frac{3}{7} : \frac{5}{9}$$

$$\Rightarrow x \times \frac{5}{9} = \frac{1}{27} \times \frac{3}{7} = \frac{1}{63}$$

$$\Rightarrow x = \frac{1}{63} \times \frac{9}{5} = \frac{1}{35}$$

10. (2) A : B : C $= \dfrac{1}{2} : \dfrac{2}{3} : \dfrac{3}{4}$

$$= \left(\frac{1}{2} \times 12\right) : \left(\frac{2}{3} \times 12\right) : \left(\frac{3}{4} \times 12\right)$$

= 6 : 8 : 9

Sum of the terms of ratio

= 6 + 8 + 9 = 23

$\therefore$ First part

$$= \text{Rs. } \left(\frac{6}{23} \times 782\right)$$

= Rs. 204

11. (1) Ratio of the squares of $\dfrac{3}{2}$ and

$$\frac{4}{3}$$

$$= \frac{9}{4} : \frac{16}{9}$$

Ratio of their reciprocals

$$= \frac{4}{9} : \frac{9}{16}$$

= 64 : 81

TYPE-III

1. (1) Let numbers = $5x$ and $4x$

$$\therefore 5x \times \frac{40}{100} = 12$$

$\Rightarrow 2x = 12 \Rightarrow x = 6$ and

Second number = 6 × 4 = 24

$$\therefore 50\% \text{ of } 24 = 24 \times \frac{50}{100} = 12$$

2. (1) Milk : Water = K : 1

$\therefore$ S.P. = (K + 1) × 9

C.P. = 10K

Gain = 9 – K

$$\text{Gain } \% = \frac{9-K}{10K} \times 100$$

$$\Rightarrow \frac{9-K}{10K} \times 100 = 20$$

$\Rightarrow 90 - 10K = 20K$

$\Rightarrow 30K = 90 \Rightarrow K = 3$

$\therefore$ Ratio = 3 : 1

3. (2) Number of brown socks = x

Price of brown socks = ₹ y per pair

Price of black socks = ₹ $2y$ per pair

$\therefore$ 4y + x × 2y

$$= \frac{150}{100}(4 \times 2y + xy)$$

$$\Rightarrow 4 + 2x = \frac{3}{2}(8 + x)$$

$\Rightarrow 8 + 4x = 24 + 3x$

$\Rightarrow x = 24 - 8 = 16$

$\therefore$ Required ratio = 4 : 16

= 1 : 4

4. (1) Number of boys = $8x$

Number of girls = $12x$

Students who do not get scholarships :

Boys $\Rightarrow 4x$

Girls $\Rightarrow 12x \times \dfrac{75}{100} = 9x$

Their sum $= 4x + 9x = 13x$

$\therefore$ Required percent

$$= \frac{13x}{20x} \times 100$$

= 65%

5. (1) Gold : Copper = 3 : 2

Sum of the terms of ratio

= 3 + 2 = 5

$\therefore$ Percentage of gold $= \dfrac{3}{5} \times 100$

= 60%

TYPE-IV

1. (2) Let their age be $3x$ and $2x$ years.

$\therefore 3x - 2x = 5$

$\Rightarrow x = 5$

$\therefore$ Younger student's age

= $2x$ = 2 × 5 = 10 years

2. (3) Let the present age of brothers be x and $2x$ years.

Then, 5 years ago,

$$\frac{x-5}{2x-5} = \frac{1}{3}$$

$\Rightarrow 3x - 15 = 2x - 5$

$\Rightarrow x = 15 - 5 = 10$

$\therefore$ Age of elder brother

= 10 × 2 = 20

$\therefore$ Required ratio

$$= \frac{10+5}{20+5} = \frac{15}{25} = 3:5$$

3. (1) 5 years ago, let the age of father = $2x$ years (let)

Then, Age of son = x years

∴ $2x + 5 + x + 5 = 100$

⇒ $3x = 100 - 10 = 90$

⇒ $x = \dfrac{90}{3} = 30$

∴ Father's present age

= $2x + 5 = 60 + 5 = 65$ years

Son's present age = $x + 5$

= $30 + 5$

= 35 years.

After 10 years,

Ratio = $\dfrac{65+10}{35+10} = \dfrac{75}{45} = \dfrac{5}{3}$ = 5 : 3

4. (1) Let the age of A and B four years ago be $11x$ and $14x$ years respectively.

According to the question,

After 4 years from now,

$\dfrac{11x+8}{14x+8} = \dfrac{13}{16}$

⇒ $176x + 128 = 182x + 104$

⇒ $182x - 176x = 128 - 104$

⇒ $6x = 24 ⇒ x = \dfrac{24}{6} = 4$

∴ A's present age = $(11x + 4)$ years

= $11 × 4 + 4 = 48$ years

5. (3) Let Maya's present age be $6x$ years and Chhaya's present age be $5x$ years.

After 15 years,

$\dfrac{6x+15}{5x+15} = \dfrac{9}{8}$

⇒ $48x + 120 = 45x + 135$

⇒ $48x - 45x = 135 - 120$

⇒ $3x = 15 ⇒ x = 5$

∴ Maya's present age = $6x$

= $6 × 5 = 30$ years

6. (2) Let the age of Ram and Rahim 10 years ago be x and $3x$ years respectively.

After 5 years from now,

$\dfrac{x+15}{3x+15} = \dfrac{2}{3}$

⇒ $6x + 30 = 3x + 45$

⇒ $3x = 45 - 30 = 15$

⇒ $x = 5$

∴ Ratio of their present age

= $(x + 10) : (3x + 10)$

= $15 : 25 = 3 : 5$

7. (2) Let father's age be $5x$ years.

Son's age = $2x$ years

∴ $5x × 2x = 1000$

⇒ $x^2 = 100 ⇒ x = 10$

∴ Father's age after 10 years

= $5x + 10$

= $5 × 10 + 10 = 60$ years

8. (4) Sumit's present age

= $2x$ years

Prakash's present age

= $3x$ years

∴ $3x - 2x = 6$

$x = 6$

∴ Required ratio

= $(2 × 6 + 6) : (3 × 6 + 6)$

= $18 : 24 = 3 : 4$

9. (1) Let x years ago the ratio of their age was 3 : 5

∴ According to the question

$\dfrac{40-x}{60-x} = \dfrac{3}{5}$

⇒ $200 - 5x = 180 - 3x$

⇒ $2x = 20$

∴ $x = 10$ years

10. (3) Let the present age of two brothers be x and 2x years.

Now, $\dfrac{x-5}{2x-5} = \dfrac{1}{3}$

⇒ $3x - 15 = 2x - 5$

⇒ $3x - 2x = 15 - 5$

⇒ $x = 10$

∴ Their present age

= 10 and 20 years

After 5 years their required ratio

= $\dfrac{15}{25} = \dfrac{3}{5}$ = 3 : 5

11. (4) Four years ago let the age of A and B be 2x and 3x years respectively.

According to the question

$\dfrac{2x+4+4}{3x+4+4} = \dfrac{5}{7}$

⇒ $\dfrac{2x+8}{3x+8} = \dfrac{5}{7}$

⇒ $14x + 56 = 15x + 40$

⇒ $x = 16$

Present age of A = $2x + 4$

= $2 × 16 + 4 = 36$ years

Present age of B

= $3x + 4 = 3 × 16 + 4$

= 52 years

12. (3) Boys in class = $\dfrac{4}{5} × 50 = 40$

Girls = $\dfrac{1}{5} × 50 = 10$

Average age of boys = $10 × 2$

= 20 years

∴ Total age of boys = $20 × 40$

= 800 years

13. (3) The present age of boys are $5x$ and $6x$ years respectively.

After 2 years,

$\dfrac{5x+2}{6x+2} = \dfrac{7}{8} ⇒ 42x + 14 = 40x + 16$

⇒ $2x = 2 ⇒ x = 1$

Ratio after 12 years

⇒ $5x + 12 : 6x + 12 = 17 : 18$

14. (2) Let the present age of Puneet and Appu be $2x$ and $3x$ years respectively.

After 3 years,

$\dfrac{2x+3}{3x+3} = \dfrac{3}{4}$

⇒ $9x + 9 = 8x + 12$

⇒ $x = 3$

∴ Present age of Puneet

= $2x = 2 × 3$ = 6 years

15. (1) Let the age of father 10 years hence is $5x$ years, then age of son 10 years hence will be $3x$ years.

According to the question,

$\dfrac{5x-10-10}{3x-10-10} = \dfrac{3}{1}$

⇒ $\dfrac{5x-20}{3x-20} = \dfrac{3}{1}$

⇒ $5x - 20 = 9x - 60$

⇒ $4x = 40$ or $x = 10$

∴ Required ratio

= $(3x - 10) : (5x - 10)$

= $20 : 40 = 1 : 2$

16. (3) Let the present age of Rahul and Rashmi be $2x$ and x years respectively.

After 30 years,

$\dfrac{2x+30}{x+30} = \dfrac{7}{6}$

⇒ $12x + 180 = 7x + 210$

⇒ $12x - 7x = 210 - 180$

⇒ $5x = 30 ⇒ x = \dfrac{30}{5} = 6$

∴ Rahul's present age

= $2x = 2 × 6 = 12$ years

17. (2) Let the present age of A and B be $4x$ and $5x$ years respectively, According to the question,

$$\frac{4x+5}{5x+5} = \frac{5}{6}$$

$\Rightarrow 25x + 25 = 24x + 30$

$\Rightarrow x = 30 - 25 = 5$

$\therefore$ A's present age

$= 4x = 4 \times 5 = 20$ years

18. (3) $\dfrac{36+n}{50+n} = \dfrac{3}{4}$

$\Rightarrow 144 + 4n = 150 + 3n$

$\Rightarrow 4n - 3n = 150 - 144$

$\Rightarrow n = 6$

19. (4) Sumit's present age

$= 2x$ years

Prakash's present age

$= 3x$ years

$\therefore 3x - 2x = 6$

$x = 6$

$\therefore$ Required ratio

$= (2 \times 6 + 6) : (3 \times 6 + 6)$

$= 18 : 24 = 3 : 4$

20. (1) Ages of the persons $= 4x$ and $7x$ years.

$\therefore 7x - 4x = 30 \Rightarrow 3x = 30$

$\Rightarrow x = 10$

$\therefore$ Sum of their ages $= 4x + 7x$

$= 11x$ years

$= 11 \times 10 = 110$ years

21. (4) 16 years ago,

My age $= x$ years

My grandfather's age $= 9x$ years

After 8 years from the present,

$9x + 16 + 8 = 3(x + 8 + 16)$

$\Rightarrow 9x + 24 = 3x + 24 + 48$

$\Rightarrow 9x + 24 = 3x + 72$

$\Rightarrow 9x - 3x = 72 - 24 \Rightarrow 6x = 48$

$\Rightarrow x = \dfrac{48}{6} = 8$

Required ratio 8 years ago,

$= (x + 8) : (9x + 8)$

$= (8 + 8) : (9 \times 8 + 8)$

$= 16 : 80 = 1 : 5$

22. (3) A's present age $= 3x$ years

B's present age $= x$ years

4 years ago,

$\dfrac{3x-4}{x-4} = \dfrac{4}{1}$

$\Rightarrow 4x - 16 = 3x - 4$

$\Rightarrow 4x - 3x = 16 - 4$

$\Rightarrow x = 12$

$\therefore$ A's present age

$= 3x = 3 \times 12 = 36$ years

23. (3) 18 years ago,

A's age $= 8x$ years

B's age $= 13x$ years

$\therefore$ At present,

$\dfrac{8x+18}{13x+18} = \dfrac{5}{7}$

$\Rightarrow 56x + 126 = 65x + 90$

$\Rightarrow 65x - 56x = 126 - 90$

$\Rightarrow 9x = 36 \Rightarrow x = \dfrac{36}{9} = 4$

$\therefore$ A's present age $= 8x + 18$

$= 8 \times 4 + 18 = 50$ years

24. (2) Age of first person $= 5x$ years

Age of second person

$= 9x$ years

According to the question,

$9x - 5x = 40 \Rightarrow 4x = 40$

$\Rightarrow x = 10$

$\therefore$ Sum of their ages

$= 5x + 9x = 14x$

$= 14 \times 10 = 140$ years

25. (3) Sonali's present age

$= 5x$ years

Monali's present age $= 3x$ years

According to the question,

After 5 years,

$\dfrac{5x+5}{3x+5} = \dfrac{10}{7}$

$\Rightarrow \dfrac{x+1}{3x+5} = \dfrac{2}{7}$

$\Rightarrow 7x + 7 = 6x + 10$

$\Rightarrow 7x - 6x = 10 - 7$

$\Rightarrow x = 3$

$\therefore$ Monali's present age $= 3x$

$= 9$ years

26. (2) 4 years ago,

P's age $= 5x$ years

Q's age $= 6x$ years

According to the question,

$5x + 4 + 6x + 4 = 52$

$\Rightarrow 11x = 52 - 8 = 44$

$\Rightarrow x = \dfrac{44}{11} = 4$

$\therefore$ Required ratio

$= (5x + 4) : (6x + 4)$

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

$= 24 : 28 = 6 : 7$

27. (1) A's present age $= 5x$ years

B's present age $= 6x$ years

According to the question,

After 7 years,

$\dfrac{5x+7}{6x+7} = \dfrac{6}{7}$

$\Rightarrow 36x + 42 = 35x + 49$

$\Rightarrow 36x - 35x = 49 - 42$

$\Rightarrow x = 7$

A's present age $= 5x = 35$ years

28. (4) Let the ages of boys be $3x$ and $4x$ years respectively.

According to the question,

After 3 years

$\dfrac{3x+3}{4x+3} = \dfrac{4}{5}$

$\Rightarrow 16x + 12 = 15x + 15$

$\Rightarrow 16x - 15x = 15 - 12$

$\Rightarrow x = 3$

$\therefore$ Required ratio after 21 years

$= \dfrac{3x+21}{4x+21}$

$= \dfrac{3 \times 3 + 21}{4 \times 3 + 21} = \dfrac{9+21}{12+21}$

$= \dfrac{30}{33} = \dfrac{10}{11}$

29. (4) A's present age

$= 4x$ years (let).

According to the question,

$4x + 6 = 26$

$\Rightarrow 4x = 26 - 6 = 20$

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

$\therefore$ B's present age $= 3x = 3 \times 5$

$= 15$ years

30. (1) A's present age $= 3x$ years (let)

B's present age $= 4x$ years

According to the question,

10 years ago,

$\dfrac{3x-10}{4x-10} = \dfrac{4}{7}$

$\Rightarrow 21x - 70 = 16x - 40$

$\Rightarrow 21x - 16x = 70 - 40$

$\Rightarrow 5x = 30$

$\Rightarrow x = \dfrac{30}{5} = 6$

$\therefore$ A's present age

$= 3x = 3 \times 6 = 18$ years

B's present age

$= 4x = 4 \times 6 = 24$ years

TYPE-V

1. (3) Let the numbers be 3x and 8x.

∴ 8x – 3x = 115

⇒ 5x = 115 ⇒ x = $\frac{115}{5}$ = 23

∴ The smaller number

= 3x = 3 × 23 = 69

2. (2) x + 2x + 3x + 4x = 16

∴ x = $\frac{16}{10}$ = 1.6

∴ Sum = 1.6 + 6.4 = 8

3. (3) Let the two numbers be x and y.

∴ According to question,

x + y = 40   .....(i)

x – y = 4   ....(ii)

From equation (i) and (ii), we get

x = 22 and y = 18

∴ Required ratio

= $\frac{22}{18} = \frac{11}{9}$ = 11 : 9

4. (1) Let the nos. be 10x & 7 x

then, 10 x – 7x = 105

⇒ 3x = 105 ⇒ x = 35

∴ Sum = 10x + 7x = 17x

= 17 × 35 = 595

5. (2) Let the integers be $9x$ and $7x$ respectively.

According to the question,

$9x \times 7x$ = 1575

⇒ x^2 = $\frac{1575}{63}$

⇒ x^2 = 25

⇒ x = 5

[x being positive (+ve) integer]

∴ Smaller integer

= $7x$ = 7 × 5 = 35

6. (3) Let the numbers be 3x, 2x and 5x respectively.

Now, $(3x)^2 + (2x)^2 + (5x)^2$

= 1862

⇒ $9x^2 + 4x^2 + 25x^2$ = 1862

⇒ $38x^2$ = 1862

⇒ x² = $\frac{1862}{38}$ = 49

⇒ x = $\sqrt{49}$ = 7

∴ The smallest number

= 2x = 2 × 7 = 14

7. (4)

Number	II		III		I
	9	:	16		
			4	:	1
	36	:	64	:	16
	9	:	16	:	4

Therefore, second number

= $\frac{9}{9+16+4} \times 116$ = $\frac{9}{29} \times 116$

= 36

8. (3) Let the numbers be x, y and z. Then

$x : y$ = 2 : 3 ; $y : z$ = 5 : 8

∴ $x : y : z$ = 2 × 5 : 3 × 5 : 3 × 8

= 10 : 15 : 24

Sum of the ratios

= 10 + 15 + 24 = 49

∴ The second number

= $\frac{15}{49}$ × 98 = 30

9. (4) Quantity of milk in 45 litres

= $\frac{2}{3}$ × 45 = 30 litres.

∴ Water = (45 – 15)

= 15 litres

Let x litres of water be added.

∴ $\frac{30}{15+x} = \frac{1}{2}$

⇒ 15 + x = 60

⇒ x = 60 – 15 = 45 litres.

10. (1) Let the numbers be a, b and c.

Now, $a : b$ = 8 : 9

$b : c$ = 3 : 4

∴ $a : b : c$

= 8 × 3 : 9 × 3 : 9 × 4

= 24 : 27 : 36 = 8 : 9 : 12

∴ $\frac{a}{8} = \frac{b}{9} = \frac{c}{12} = k$

⇒ a = 8k, b = 9k, c = 12k

According to the question,

8k × 12k = 2400

⇒ k^2 = $\frac{2400}{8 \times 12}$ = 25

⇒ k = 5

∴ Second number

= 9k = 9 × 5 = 45

11. (1) Let the number be 2x and 3x. Then.

$\frac{2x-2}{3x+2} = \frac{1}{2}$

⇒ 4x – 4 = 3x + 2

⇒ x = 6

∴ Sum of numbers = 5x

= 5 × 6 = 30

12. (4) Ratio of numbers

= $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$

= $\frac{1}{2}$ × 12 : $\frac{2}{3}$ × 12 : $\frac{3}{4}$ × 12

= 6 : 8 : 9

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

Now, 9x – 6x = 36

⇒ x = 12

∴ Numbers are

72, 96 and 108.

13. (1) Let the numbers be a, b and c. Then

$a : b$ = 2 : 3

$b : c$ = 5 : 3

∴ $a : b : c$ = 2×5 : 3×5 : 3×3

= 10 : 15 : 9

Let the numbers now be 10x, 15x and 9x

∴ 10 x + 15x + 9x = 68

⇒ 34x = 68 ⇒ $x = \frac{68}{34} = 2$

∴ Second number = 15 x

= 15 × 2 = 30

14. (3) Let the number to be subtracted be x.

According to the question,

$\frac{7-x}{9-x} = \frac{11-x}{15-x}$

Now, check through options

Clearly, putting x = 3,

Each ratio = $\frac{2}{3}$.

Note : Solve such questions orally by mental exercise.

Aliter : Using Rule 32,

The number will be x

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

= $\frac{7 \times 15 - 9 \times 11}{(7+15)-(9+11)}$

= $\frac{105-99}{22-20}$

= $\frac{6}{2}$ = 3

15. (2) Let the numbers be 2x and 3x.

∴ 2x × 3x = 96

⇒ x^2 = $\frac{96}{6} = 16$

∴ x = $\sqrt{16}$ = 4

∴ Sum = 2x + 3x = 5x

= 5 × 4 = 20

16. (3) Let the numbers be $3x$ and $4x$.

$\therefore \dfrac{3x+6}{4x+6} = \dfrac{4}{5}$

$\Rightarrow 16x + 24 = 15x + 30$

$\Rightarrow x = 30 - 24 = 6$

$\therefore$ Required difference = 6

Aliter : Using Rule 34,

Here, a = 3, b= 4, x = 6

c = 4, d = 5

The numbers are = $\dfrac{xa(c-d)}{ad-bc}$

$= \dfrac{6.3(4-5)}{3\times 5 - 4\times 4}$

$= \dfrac{18\times -1}{15-16} = 18$

$= \dfrac{xb(c-d)}{ad-bc}$

$= \dfrac{6\times 4(4-5)}{3\times 5 - 4\times 4}$

$= \dfrac{24\times(-1)}{15-16} = 24$

Numbers are 24 and 18.

Their difference = 24 – 18 = 6

17. (4) Let the two numbers are x and y.

According to the question,

$\dfrac{x}{y} = \dfrac{5}{7}$

7x = 5y

7x – 5y = 0   …(I)

Again, $\dfrac{x-40}{y-40} = \dfrac{17}{27}$

$\Rightarrow 27x - 1080 = 17y - 680$

$\Rightarrow 27x - 17y = 1080 - 680$

$\Rightarrow 27x - 17y = 400$ …(II)

From (I) × 17 – (II) × 5, we have

119x – 85y = 0

135x – 85y = 2000

–   +   –

——————————

– 16x = – 2000

$\therefore$ x = 125

Putting the value of x in equation (I)

7 × 125 = 5y

$\therefore y = \dfrac{7\times 125}{5} = 175$

$\therefore$ Difference of the numbers

= 175 – 125 = 50

Aliter : Using Rule 35,

Here, a = 5, b = 7, x = 40

c = 17, d = 27

The two numbers are

$= \dfrac{xa(d-c)}{ad-bc}$

$= \dfrac{40\times 5(27-17)}{5\times 27 - 7\times 17}$

$= \dfrac{200\times 10}{135-119}$

$= \dfrac{2000}{16} = \dfrac{500}{4}$

1st Number = 125

And $= \dfrac{xb(d-c)}{ad-bc}$

$= \dfrac{40\times 7(27-17)}{5\times 27 - 7\times 17}$

$= \dfrac{280\times 10}{135-119}$

$= \dfrac{2800}{16} = \dfrac{700}{4}$

2nd Number = 175

Their difference= 175 – 125 = 50

18. (3) Let the numbers be $5x$, $6x$ and $7x$ respectively.

$\therefore 5x \times 6x \times 7x = 5670$

$\Rightarrow x^3 = \dfrac{5670}{5\times 6\times 7} = 27$

$\therefore x = \sqrt[3]{27} = 3$

$\therefore$ The greatest number = $7x$

= 7 × 3 = 21

19. (1) Let the numbers be $3x$ and x, Then, $3x + x = 240$

$\Rightarrow 4x = 240$

$\Rightarrow x = \dfrac{240}{4} = 60$

$\therefore$ Difference = $3x - x = 2x$

= 2 × 60 = 120

20. (3) $x + y = 3(x - y)$

$\Rightarrow x + y = 3x - 3y \Rightarrow 2x = 4y$

$\Rightarrow \dfrac{x}{y} = \dfrac{2}{1} \Rightarrow x : y = 2 : 1$

21. (3) Let the numbers be $3x$, $4x$ and $5x$.

$\therefore 5x + 3x = 4x + 52$

$\Rightarrow 4x = 52 \Rightarrow x = 13$

$\therefore$ The smallest number

= $3x = 3 \times 13 = 39$

22. (4) Let required number be x.

$\therefore \dfrac{6+x}{7+x} = \dfrac{15+x}{17+x}$

$\Rightarrow 102 + 17x + 6x + x^2$

$= 105 + 7x + 15x + x^2$

$\Rightarrow 23x - 22x = 105 - 102$

$\Rightarrow x = 3$

Note : It is convenient to solve it orally using options

$\dfrac{6+3}{7+3} = \dfrac{15+3}{17+3} \Rightarrow \dfrac{9}{10} = \dfrac{18}{20}$

Aliter : Using Rule 32,

Required Number

$= \dfrac{bc-ad}{(a+d)-(b+c)}$

Where a = 6, b = 7, c = 15, d = 17

$= \dfrac{7\times 15 - 6\times 17}{(6+17)-(7+15)}$

$= \dfrac{105-102}{23-22} = 3$

23. (2) $\dfrac{6+x}{14+x} = \dfrac{18+x}{38+x}$

From the given alternatives

$\dfrac{6+2}{14+2} = \dfrac{18+2}{38+2}$

$\Rightarrow \dfrac{1}{2} = \dfrac{1}{2}$

Aliter : Using Rule 32,

Here, a = 6, b = 14, c = 18, d = 38

Required number x

$= \dfrac{bc-ad}{(a+d)-(b+c)}$

$= \dfrac{14\times 18 - 6\times 38}{(6+38)-(14+18)}$

$= \dfrac{252-228}{44-32} = \dfrac{24}{12} = 2$

24. (1) A : B = 8 : 9
B : C = 3 : 4 = 9 : 12
∴ A : B : C = 8 : 9 : 12
∴ Numbers = $8x$, $9x$ and $12x$
∴ $8x \times 12x = 2400$

$\Rightarrow x^2 = \dfrac{2400}{8 \times 12} = 25$

∴ $x = \sqrt{25} = 5$
∴ A + B + C = $8x + 9x + 12x$
= $29x$
= 29 × 5 = 145

25. (3) Check through options
Number = 36
3 + 6 = 9; 6 – 3 = 3
and 36 : 9 = 4 : 1
Otherwise– $10x + y : x + y = 4 : 1$
$\Rightarrow 10x + (x + 3) : x + (x + 3) = 4 : 1$

$\Rightarrow \dfrac{11x + 3}{2x + 3} = \dfrac{4}{1}$

$\Rightarrow 11x + 3 = 8x + 12$
$\Rightarrow 3x = 9 \Rightarrow x = 3$ and $y = 6$
Then the number is 36.

26. (2) Number of balls in bag x and y respectively = $2a$ and $3a$
∴ $3a – 5 = 2a + 3$
$\Rightarrow a = 5 + 3 = 8$
∴ Total number of balls
= $5a = 40$
∴ Balls in each bag = 20

27. (3) $(x + y)^2 = 4xy$

$\Rightarrow x^2 + y^2 + 2xy – 4xy = 0$

$\Rightarrow (x – y)^2 = 0 \Rightarrow x = y$

$\Rightarrow x : y = 1 : 1$

28. (2) Numbers = $2x$, $3x$ and $4x$
∴ $(2x)^2 + (3x)^2 + (4x)^2 = 1856$
$\Rightarrow 4x^2 + 9x^2 + 16x^2 = 1856$
$\Rightarrow 29x^2 = 1856$
$\Rightarrow x^2 = 1856 \div 29 = 64$
∴ $x = \sqrt{64} = 8$
∴ Numbers = 16, 24 and 32

29. (3) From the given options number
= 5, because

$\dfrac{7 + 5}{16 + 5} = \dfrac{43 + 5}{79 + 5}$

$\Rightarrow \dfrac{12}{21} = \dfrac{48}{84}$

[check other options likewise]
Aliter : Using Rule 32,
Here, a = 7, b=16, c = 43, d= 79
Required number x

$= \dfrac{bc - ad}{(a + d) - (b + c)}$

$= \dfrac{16 \times 43 - 7 \times 79}{(7 + 79) - (16 + 43)}$

$= \dfrac{688 - 553}{86 - 79} = \dfrac{35}{7} = 5$

30. (4) Average of two no's = 62
∴ Sum of the numbers
= 62 × 2 = 124
Sum of the numbers = 124
If the larger number be x, then smaller number = $124 – x$

∴ $\dfrac{124 - x + 2}{x} = \dfrac{1}{2}$

$\Rightarrow 252 – 2x = x$
$\Rightarrow 3x = 252 \Rightarrow x = 84$
∴ Smaller number
= 124 – 84 = 40
∴ Difference = 84 – 40 = 44

31. (4) Let x be subtracted from each
term of $\dfrac{15}{19}$.

∴ $\dfrac{15 - x}{19 - x} = \dfrac{3}{4}$

$\Rightarrow 57 – 3x = 60 – 4x$
$\Rightarrow x = 3$

32. (1) Numbers are x and y
∴ $x + y = 25$
$x - y = 20$
On adding,
$2x = 45$

$\Rightarrow x = \dfrac{45}{2} = 22.5$

From equation (i),
22.5 + y = 25
$\Rightarrow y$ = 25 - 22.5 = 2.5
∴ Required ratio = 22.5 : 2.5
= 9 : 1

33. (1) ∴ Ratio of numbers = 2 : 3
Sum of ratios = 2 + 3 = 5

∴ First number = $\dfrac{2}{5} \times 125 = 50$

Second number = $\dfrac{3}{5} \times 125 = 75$

34. (3) Numbers = $2x$, $3x$ and $5x$,
According to question,
$(2x)^2 + (3x)^2 + (5x)^2 = 608$
$\Rightarrow 4x^2 + 9x^2 + 25x^2 = 608$
$\Rightarrow 38x^2 = 608$

$\Rightarrow x^2 = \dfrac{608}{38} = 16$

$\Rightarrow x = \sqrt{16} = 4$
∴ Numbers $\Rightarrow 2x = 2 \times 4 = 8$
$3x = 3 \times 4 = 12$
$5x = 5 \times 4 = 20$

35. (1) Numbers = $7x$ and $9x$ (let)
According to the question,
$7x \times 9x = 1575$

$\Rightarrow x^2 = \dfrac{1575}{7 \times 9} = 25$

$\Rightarrow x = \sqrt{25} = 5$

∴ Larger number = $9x$
= 9 × 5 = 45

36. (2) Let A = $4x$ and B = $5x$.
According to the question,
$(5x)^2 – (4x)^2 = 81$
$\Rightarrow 25x^2 – 16x^2 = 81$
$\Rightarrow 9x^2 = 81 \Rightarrow x^2 = 9$

$\Rightarrow x = \sqrt{9} = 3$

∴ A = $4x = 4 \times 3 = 12$

37. (3) Let the numbers be $2x$ and $3x$ respectively.
According to the question,

$\dfrac{2x + 8}{3x + 8} = \dfrac{3}{4}$

$\Rightarrow 9x + 24 = 8x + 32$
$\Rightarrow 9x – 8x = 32 – 24 = 8$
$\Rightarrow x = 8$
∴ Sum of numbers = $2x + 3x$
= $5x$
= 5 × 8 = 40
Aliter : Using Rule 34,
Here, a = 2, b = 3, x= 8, c = 3, d = 4

1st Number = $\dfrac{xa(c - d)}{ad - bc}$

$= \dfrac{8 \times 2(3 - 4)}{2 \times 4 - 3 \times 3}$

$= \dfrac{-16}{-1} = 16$

2nd Number = $\dfrac{xb(c - d)}{ad - bc}$

$= \dfrac{8 \times 3(3 - 4)}{2 \times 4 - 3 \times 3}$

$= \dfrac{-24}{-1} = 24$

Sum of numbers = 16 + 24 = 40

38. (1) Numbers = $5x$ and $8x$

According to the question,

$8x - 5x = 48$

$\Rightarrow 3x = 48 \Rightarrow x = 16$

$\therefore$ Smaller number = $5x$

= $5 \times 16 = 80$

39. (2) Let the numbers be $5x$, $7x$ and $12x$.

According to the question,

$5x + 12x = 7x + 50$

$\Rightarrow 17x - 7x = 50$

$\Rightarrow 10x = 50$

$\Rightarrow x = \dfrac{50}{10} = 5$

$\therefore$ Required sum

= $5x + 7x + 12x = 24x$

= $24 \times 5 = 120$

40. (4) According to the question,
The number 84 must be a multiple of sum of the terms of ratio.
For ratio 3 : 2,
Sum of the terms of ratio
= 3 + 2 = 5 which is not a factor of 84.

41. (4) Let the numbers be $3x$ and $5x$.

According to the question,

$\dfrac{3x+6}{5x+6} = \dfrac{2}{3}$

$\Rightarrow 10x + 12 = 9x + 18$

$\Rightarrow 10x - 9x = 18 - 12$

$\Rightarrow x = 6$

Numbers are :

$3x = 3 \times 6 = 18$ and

$5x = 5 \times 6 = 30$

42. (1) Let three numbers be a, b and c respectively.

According to the question,

$a + b + c = 540$

and $b : c = 9 : 13$

$a : c = 2 : 7$

$\therefore \dfrac{a}{c} \times \dfrac{c}{b} = \dfrac{2}{7} \times \dfrac{13}{9}$

$\Rightarrow \dfrac{a}{b} = \dfrac{26}{63}$

$\therefore b : c = 9 : 13 = 63 : 91$

$\therefore a : b : c = 26 : 63 : 91$

Sum of the terms of ratio

= 26 + 63 + 91 = 180

$\therefore c = \dfrac{91}{180} \times 540 = 273$

TYPE-VI

1. (3) Let the numbers be $4x$ and $5x$.
Their LCM = $20x$
According to the question,
$20x = 180$

$\Rightarrow x = \dfrac{180}{20} = 9$

$\therefore$ Smaller number

= $4x = 4 \times 9 = 36$

2. (4) If the numbers be $3x$ and $4x$, then their LCM = $12x$

$\therefore 12x = 180 \Rightarrow x = \dfrac{180}{12} = 15$

$\therefore$ First number = $3x = 45$

3. (1) Let the numbers be $3x$ and $5x$.

$\therefore$ LCM = $15x$

$\therefore 15x = 225 \Rightarrow x = \dfrac{225}{15} = 15$

$\therefore$ Smaller number

= $3x = 3 \times 15 = 45$

4. (2) Let the numbers be $3x$ and $4x$.

$\therefore$ LCM = $12x$

$\therefore 12x = 48 \Rightarrow x = 4$

$\therefore$ Sum of numbers = $7x$

= $7 \times 4 = 28$

5. (3) Numbers are : $3x$ and $4x$
Their LCM = $12x$

$\therefore 12x = 120$

$\Rightarrow x = \dfrac{120}{12} = 10$

$\therefore$ Sum of numbers = $3x + 4x$

= $7x = 7 \times 10 = 70$

6. (1) Let the numbers be $3x$ and $4x$.
Their HCF = $x = 15$

$\therefore$ Sum of numbers = $3x + 4x = 7x = 15 \times 7 = 105$

TYPE-VII

1. (3) Let A and B have ₹ $2x$ and ₹ x initially.

$\therefore 2x - 2 = x + 2$

$\Rightarrow x = 4$

$\therefore$ Initial amount with A = ₹ 8

$\therefore$ Initial amount with B = ₹ 4.

2. (1) Total numbers of girls in the school

= $504 \times \dfrac{11}{13+11}$

= $504 \times \dfrac{11}{24} = 231$

Total numbers of boys in the school

= $504 \times \dfrac{13}{13+11}$

= $504 \times \dfrac{13}{29} = 273$

Now, total no. of girls when 12 more girls are admitted

= 231 + 12 = 243

$\therefore$ Required ratio

= 273 : 243 = 91 : 81

3. (3) Let the numbers be $\dfrac{3}{2}x$ and $\dfrac{8}{3}x$

According to question,

$\dfrac{\dfrac{3}{2}x+15}{\dfrac{8x}{3}+15} = \dfrac{\dfrac{5}{3}}{\dfrac{5}{2}}$

$\Rightarrow \dfrac{\dfrac{3x+30}{2}}{\dfrac{8x+45}{3}} = \dfrac{2}{3}$

$\Rightarrow \dfrac{3(3x+30)}{2(8x+45)} = \dfrac{2}{3}$

$\Rightarrow \dfrac{9x+90}{16x+90} = \dfrac{2}{3}$

$\Rightarrow 27x + 270 = 32x + 180$

$\Rightarrow 32x - 27x = 270 - 180 = 90$

$\Rightarrow 5x = 90 \Rightarrow x = 18$

$\therefore$ The greater number

= $\dfrac{8}{3}x = \dfrac{8}{3} \times 18 = 48$

4. (3) Let the number of students in three classes be 2x, 3x and 5x respectively.
Due to increase of 40 students in each class, we have

$\dfrac{2x+40}{3x+40} = \dfrac{4}{5}$

$\Rightarrow 10x + 200 = 12x + 160$

$\Rightarrow 2x = 200 - 160 \Rightarrow 2x = 40$

$\Rightarrow x = 20$

$\therefore$ Original strength

= 10x = 10 × 20 = 200

5. (2) Let the numbers be 5x and 7x.

Now, $\dfrac{5x-9}{7x-9} = \dfrac{7}{11}$

$\Rightarrow 11(5x - 9) = 7(7x - 9)$

$\Rightarrow 55x - 99 = 49x - 63$

$\Rightarrow 55x - 49x = 99 - 63$

$\Rightarrow 6x = 36$

$\Rightarrow x = 6$

∴ Required difference

$= 7x - 5x = 2x = 2 \times 6 = 12$

Aliter : Using Rule 35,

Here, a = 5, b = 7,

x = 9, c = 7, d = 11

1st Number $= \dfrac{xa(d-c)}{ad-bc}$

$= \dfrac{9 \times 5(11-7)}{5 \times 11 - 7 \times 7}$

$= \dfrac{45 \times 4}{55-49}$

$= \dfrac{45 \times 4}{6} = 30$

2nd Number $= \dfrac{xb(d-c)}{ad-bc}$

$= \dfrac{9 \times 7(11-7)}{5 \times 11 - 7 \times 7}$

$= \dfrac{63 \times 4}{55-49}$

$= \dfrac{63 \times 4}{6} = 42$

Their difference = 42 – 30 = 12

6. (2) Let the numbers be $3x$ and $5x$.

∴ $\dfrac{3x-9}{5x-9} = \dfrac{12}{23}$

$\Rightarrow 69x - 60x = 207 - 108$

$\Rightarrow x = \dfrac{99}{9} = 11$

∴ The smaller number

$= 3x = 33$

Aliter : Using Rule 35,

Here, a = 3, b = 5, x= 9, c = 12, d = 23

1st Number $= \dfrac{xa(d-c)}{ad-bc}$

$= \dfrac{9 \times 3(23-12)}{3 \times 23 - 5 \times 12}$

$= \dfrac{27 \times 11}{69-60}$

$\dfrac{27 \times 11}{9} = 33$

2nd Number $= \dfrac{xb(d-c)}{ad-bc}$

$= \dfrac{9 \times 5(23-12)}{3 \times 23 - 5 \times 12}$

$= \dfrac{45 \times 11}{69-60}$

$= \dfrac{45 \times 11}{9} = 55$

∴ Smallest number = 33

7. (3) Let the original number of boys and girls be x and y respectively.

Then

$\dfrac{x}{y-15} = \dfrac{2}{1}$

$\Rightarrow x = 2y - 30$ ....(i)

Again, $\dfrac{x-45}{y-15} = \dfrac{1}{5}$

$\Rightarrow 5x - 225 = y - 15$

$\Rightarrow 5x = y - 15 + 225$

$\Rightarrow 5 (2y-30) = y + 210$ [From equation (i)]

$\Rightarrow 10y - 150 = y + 210$

$\Rightarrow 10y - y = 210 + 150$

$\Rightarrow 9y = 360$

$\Rightarrow y = \dfrac{360}{9} = 40$

8. (3) Let the original number of students in three classes be $2x$, $3x$ and $5x$ respectively.

As given,

$\dfrac{2x+20}{3x+20} = \dfrac{4}{5}$

$\Rightarrow 10x + 100 = 12x + 80$

$\Rightarrow 12x - 10x = 100 - 80$

$\Rightarrow 2x = 20$

$\Rightarrow x = \dfrac{20}{2} = 10$

∴ Total number of students originally

$= 2x + 3x + 5x = 10x$

$= 10 \times 10 = 100$

9. (1) Using Rule 21,

Number of boys

$= \dfrac{13}{13+11} \times 504$

$= \dfrac{13}{24} \times 504 = 273$

Number of girls

= 504–273 = 231

3 girls are admitted.

∴ Required ratio = 273 : 234

= 7 : 6

10. (3) Let the number of ladies and gents be $3x$ and $2x$ respectively. According to the question,

$\dfrac{3x}{2x+20} = \dfrac{2}{3}$

$\Rightarrow 9x = 4x + 40 \Rightarrow 5x = 40$

$\Rightarrow x = 8$

∴ Number of ladies = $3x$

= 3 × 8 = 24

11. (4) Using Rule 21,

Initially number of boys

$= \dfrac{8}{8+5} \times 286 = \dfrac{8}{13} \times 286 = 176$

∴ Number of girls

$= \dfrac{5}{13} \times 286 = 110$

22 more girls get admitted.

∴ Required ratio

$= \dfrac{176}{110+22} = \dfrac{176}{132} = \dfrac{4}{3} = 4 : 3$

12. (1) Let the original number of students be $2x$, $3x$ and $4x$ in three class.

According to the question,

$\dfrac{2x+12}{3x+12} = \dfrac{8}{11}$

$\Rightarrow 24x + 96 = 22x + 132$

$\Rightarrow 2x = 132 - 96 = 36$

$\Rightarrow x = \dfrac{36}{2} = 18$

∴ Original number of students

$= 2x + 3x + 4x$

$= 9x = 9 \times 18 = 162$

13. (4) Let the required number be x.

∴ $\dfrac{7+x}{11+x} = \dfrac{3}{4}$

$\Rightarrow 28 + 4x = 33 + 3x$

$\Rightarrow x = 33 - 28 = 5$

14. (2) Let the numbers be $7x$ and $11x$ respectively.

∴ $\dfrac{7x+7}{11x+7} = \dfrac{2}{3}$

∴ $22x + 14 = 21x + 21$

$\Rightarrow x = 7$

∴ Smaller number

$= 7x = 7 \times 7 = 49$

Aliter : Using Rule 34,

Here, a = 7, b = 11,

$x = 7$, c= 2, d = 3

1st Number $= \dfrac{xa(c-d)}{ad-bc}$

$= \dfrac{7 \times 7\,(2-3)}{7 \times 3 - 11 \times 2}$

$= \dfrac{49 \times -1}{21-22} = 49$

2nd Number $= \dfrac{xb(c-d)}{ad-bc}$

$= \dfrac{7 \times 11\,(2-3)}{7 \times 3 - 11 \times 2}$

$= \dfrac{77 \times -1}{21-22} = 77$

$\therefore$ Smallest number = 49

15. (3) Let the numbers be $3x$ and $5x$.

$\therefore \dfrac{3x+10}{5x+10} = \dfrac{5}{7}$

$\Rightarrow 25x + 50 = 21x + 70$

$\Rightarrow 4x = 20$

$\Rightarrow x = 5$

$\therefore$ Smaller number $= 3x$

$= 3 \times 5 = 15$

Aliter : Using Rule 34,

Here, a = 3, b = 5, c = 5, d = 7, x = 10

$\therefore$ Smallest number

$= \dfrac{xa(c-d)}{ad-bc} \quad \because \ a < b$

$= \dfrac{10 \times 3\,(5-7)}{3 \times 7 - 5 \times 5}$

$= \dfrac{-60}{21-25}$

$= \dfrac{60}{4} = 15$

16. (1) Let the numbers be $2x$ and $3x$.

$\therefore \dfrac{2x+4}{3x+4} = \dfrac{5}{7}$

$\therefore 15x + 20 = 14x + 28$

$\Rightarrow x = 28 - 20 = 8$

= Required difference

Aliter : Using Rule 34,

Here, a = 2, b = 3, c = 5, d = 7 and x = 4

1st Number $= \dfrac{xa(c-d)}{ad-bc}$

$= \dfrac{4 \times 2\,(5-7)}{2 \times 7 - 5 \times 3}$

$= \dfrac{8 \times -2}{14-15} = 16$

2nd Number $= \dfrac{xb(c-d)}{ad-bc}$

$= \dfrac{4 \times 3\,(5-7)}{2 \times 7 - 5 \times 3}$

$= \dfrac{4 \times 3\,(-2)}{14-15} = 24$

Difference of numbers

= 24 − 16 = 8

17. (4) Let the number x be added.

$\therefore \dfrac{17+x}{24+x} = \dfrac{1}{2}$

$\Rightarrow 34 + 2x = 24 + x$

$\Rightarrow 2x - x = 24 - 34$

$\Rightarrow x = -10$

Hence, 10 should be subtracted.

18. (3) Let the numbers be $4x$ and $7x$.

$\therefore \dfrac{4x+4}{7x+4} = \dfrac{3}{5}$

$\Rightarrow 21x + 12 = 20x + 20$

$\Rightarrow 21x - 20x = 20 - 12$

$\Rightarrow x = 8$

$\therefore$ Larger number

$= 7x = 7 \times 8 = 56$

Aliter : Using Rule 34,

a = 4, b = 7, c = 3, d = 5, x = 4

Larger number $= \dfrac{xb(c-d)}{ad-bc}$

$= \dfrac{4 \times 7\,(3-5)}{4 \times 5 - 3 \times 7}$

$= \dfrac{4 \times 7 \times (-2)}{20-21} = 56$

19. (2) Let the original number of students be $4x$, $6x$ and $9x$.

$\therefore \dfrac{4x+12}{6x+12} = \dfrac{7}{9}$

$\Rightarrow 42x + 84 = 36x + 108$

$\Rightarrow 42x - 36x = 108 - 84$

$\Rightarrow 6x = 24$

$\Rightarrow x = 4$

$\therefore$ Required number of students

$= 19x = 19 \times 4 = 76$

20. (3) In the first case,

Boys $= 660 \times \dfrac{13}{22} = 390$

Girls $= 660 \times \dfrac{9}{22} = 270$

If x boys leave the school, then

$\dfrac{390-x}{270+30} = \dfrac{6}{5}$

$\Rightarrow 390 - x = 360$

$\Rightarrow x = 390 - 360 = 30$

21. (1) $\boxed{\text{Tricky Approach}}$

Required ratio

$= 15 \times 22 : 11 \times 25 = 6 : 5$

22. (3) According to the question,

$\dfrac{3x-9}{5x-9} = \dfrac{12}{23}$

(Numbers = $3x$ and $5x$)

$\Rightarrow 69x - 207 = 60x - 108$

$\Rightarrow 9x = 207 - 108 = 99$

$\Rightarrow x = 11$

$\therefore$ Required numbers $\Rightarrow 3 \times 11$

= 33 and 5 × 11 = 55

Aliter : Using Rule 35,

Here, a = 3, b = 5,

c = 12, d = 23, x = 9

1st Number $= \dfrac{xa(d-c)}{ad-bc}$

$= \dfrac{9 \times 3\,(23-12)}{3 \times 23 - 5 \times 12}$

$= \dfrac{27 \times 11}{69-60}$

$= \dfrac{27 \times 11}{9} = 33$

2nd Number $= \dfrac{xb(d-c)}{ad-bc}$

$= \dfrac{9 \times 5\,(23-12)}{3 \times 23 - 5 \times 12}$

$= \dfrac{45 \times 11}{69-60}$

$= \dfrac{45 \times 11}{9} = 55$

Numbers are 33, 55

23. (4) Numbers = x,
2x and 3x

$$\therefore \frac{x+5}{2x+5} = \frac{2}{3}$$

$\Rightarrow 4x + 10$
$= 3x + 15$
$\Rightarrow x = 5$
$\Rightarrow$ Numbers = 5,
10 and 15

24. (1) Marks in English = 2x
Marks in Maths = 3x
Marks in Science = x
$\therefore x + 2x + 3x = 180$
$\Rightarrow 6x = 180 \Rightarrow x = 30$

25. (2) Required number = x

$$\therefore \frac{11-x}{15-x} = \frac{2}{3}$$

$\Rightarrow 33 - 3x = 30 - 2x$
$\Rightarrow 3x - 2x = 33 - 30$
$\Rightarrow x = 3$

26. (2) Numbers = 3x and 5x (let)
According to question,

$$\frac{3x-9}{5x-9} = \frac{12}{23}$$

$\Rightarrow 69x - 207 = 60x - 108$
$\Rightarrow 69x - 60x = 207 - 108$

$$\Rightarrow 9x = 99 \Rightarrow x = \frac{99}{9} = 11$$

$\therefore$ Smaller number = 3x

$= 3 \times 11 = 33$

27. (4) According to the question,

Sum of remaining two numbers
$= 11 \times 36 - 9 \times 34$
$= 396 - 306 = 90$
Ratio of the remaining two numbers = 2 : 3

$\therefore$ Smaller number

$$= \frac{2}{5} \times 90 = 36$$

28. (3) Original number of boys in

school $= \frac{5}{9} \times 432 = 240$

Number of girls = 432 – 240
= 192
Let the new number of girls be x.
According to the question,

$$\frac{240+12}{192+x} = \frac{7}{6}$$

$$\Rightarrow \frac{252}{192+x} = \frac{7}{6}$$

$\Rightarrow 192 \times 7 + 7x = 252 \times 6$
$\Rightarrow 1344 + 7x = 1512$
$\Rightarrow 7x = 1512 - 1344 = 168$

$$\Rightarrow x = \frac{168}{7} = 24$$

29. (3) Let the numbers be x and 5x.
According to the question,
$x \times 5x = 320$
$\Rightarrow 5x^2 = 320$

$$\Rightarrow x^2 = \frac{320}{5} = 64$$

$$\Rightarrow x = \sqrt{64} = 8$$

$\therefore$ Required difference
$= (5x)^2 - x^2$
$= 25x^2 - x^2 = 24x^2$
$= 24 \times 8 \times 8 = 1536$

30. (1) Let two positive numbers be
3x and 4x.
According to the question,
$(3x)^2 + (4x)^2 = 400$
$\Rightarrow 9x^2 + 16x^2 = 400$
$\Rightarrow 25x^2 = 400$

$$\Rightarrow x^2 = \frac{400}{25} = 16$$

$$\Rightarrow x = \sqrt{16} = 4$$

$\therefore$ Sum of numbers
$= 3x + 4x = 7x$
$= 7 \times 4 = 28$

31. (2) Let the numbers be x, 2x and 3x.
According to the question,
$x^3 + (2x)^3 + (3x)^3 = 4500$
$\Rightarrow x^3 + 8x^3 + 27x^3 = 4500$
$\Rightarrow 36x^3 = 4500$

$$\Rightarrow x^3 = \frac{4500}{36} = 125$$

$\therefore x = \sqrt[3]{125}$
= 5 = smallest number

TYPE-VIII

1. (1) Weight of zinc

$$= 200 \times \frac{5}{8} = 125 \text{ gram}$$

Weight of copper

$$= 200 \times \frac{3}{8} = 75 \text{ gram.}$$

Let the ratio of 125 gram zinc and x gram copper be 3 : 5

$$\therefore \frac{125}{x} = \frac{3}{5}$$

$$\therefore x = \frac{125 \times 5}{3} = \frac{625}{3} \text{ gram}$$

$\therefore$ Addition of copper in mixture

$$= \frac{625}{3} - 75 = \frac{625-225}{3}$$

$$= \frac{400}{3} = 133\frac{1}{3} \text{ gram.}$$

2. (3) $\because$ In 20 gm of brass, quantity
of zinc = 7gm
$\therefore$ In 100 gm of brass, quantity
of zinc = 7 × 5 = 35 gm.

3. (4) In 30 litres of mixture,

Acid $= \frac{2}{5} \times 30 = 12$ litres

Water $= \frac{3}{5} \times 100 = 18$ litres

$$\therefore \frac{12}{18+x} = \frac{2}{5}$$

$\Rightarrow 60 = 36 + 2x$
$\Rightarrow 2x = 60 - 36 = 24$
$\Rightarrow x = 12$ litres of water.

4. (1) Weight of copper in 17kg 500
gm i.e. 17500 gm of alloy

$$= \frac{5}{7} \times 17500 = 12500 \text{ gm}$$

Weight of zinc = (17500 – 12500)
= 5000 gm
1250 gm of zinc is mixed in alloy.
$\therefore$ Total weight of zinc
= 1250 + 5000 = 6250 gm.
$\therefore$ Required ratio
= 12500 : 6250 = 2 : 1

5. (1) In the new vessel, we have.
Sulphuric acid

$$= \frac{3}{5} + \frac{7}{10} + \frac{11}{15}$$

$$= \frac{18+21+22}{30} = \frac{61}{30}$$

Water $= \frac{2}{5} + \frac{3}{10} + \frac{4}{15}$

$$= \frac{12+9+8}{30} = \frac{29}{30}$$

$\therefore$ Sulphuric acid : Water

$$= \frac{61}{30} : \frac{29}{30} = 61 : 29$$

6. (2) Let the quantity of additional
milk added = x litres
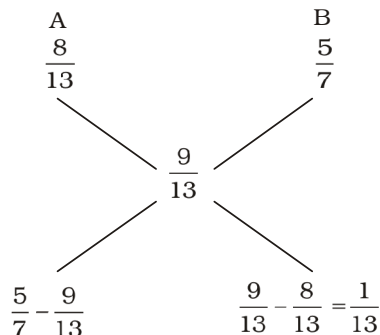In the mixture of 200 litres,

Quantity of milk $= \frac{17}{20} \times 200$

= 170 litres

Quantity of water = 30 litres

According to the question,

$\dfrac{170+x}{30} = \dfrac{7}{1}$

$\Rightarrow\ 170 + x = 210$

$\Rightarrow\ x = 210 - 170$

$= 40$ litres

7. (3) Let A = $7x$ litre, B = $5x$ litre

In 9 litres of mixture,

A = $\dfrac{7x}{12x} \times 9 = \dfrac{21}{4}$ litres

B = $\dfrac{5x}{12x} \times 9 = \dfrac{15}{4}$ litres

In new situation,

$\dfrac{7x - \dfrac{21}{4}}{5x - \dfrac{15}{4} + 9} = \dfrac{7}{9}$

$\Rightarrow \dfrac{28x - 21}{20x - 15 + 36} = \dfrac{7}{9}$

$\Rightarrow 252x - 189 = 140x + 147$

$\Rightarrow 112x = 336 \Rightarrow x = 3$

$\therefore$ Initial quantity of liquid A

$= 7x = 7 \times 3 = 21$ litres

8. (3) Let Liquid A = $7x$ litres

Liquid B = $5x$ litres

In 9 litres,

A = $\dfrac{7}{12} \times 9 = \dfrac{21}{4}$ litres

B = $\dfrac{5}{12} \times 9 = \dfrac{15}{4}$ litres

$\therefore\ 7x - \dfrac{21}{4} = 5x - \dfrac{15}{4} + 9$

$\Rightarrow 2x = \dfrac{21}{4} - \dfrac{15}{4} + 9$

$\Rightarrow 2x = \dfrac{21 - 15 + 36}{4} = \dfrac{42}{4}$

$\Rightarrow x = \dfrac{21}{4}$

$\therefore$ Liquid A = $7 \times \dfrac{21}{4}$

$= \dfrac{147}{4} = 36\dfrac{3}{4}$ litre

9. (1) Gold = $\dfrac{7}{9} : \dfrac{7}{18} = \dfrac{14}{18} : \dfrac{7}{18}$

$\therefore$ Gold in new mixture

$= 14 + 7 = 21$

and copper = $18 \times 2 - 21$

$= 36 - 21 = 15$

$\therefore$ Required ratio

$= 21 : 15 = 7 : 5$

10. (4)

Type-I   Type-II

10.20   14.40

12.60

14.40 −12.60 = 1.8   12.60 −10.20 = 2.4

$\therefore$ Required ratio = 1.8 : 2.4

$= 18 : 24 = 3 : 4$

11. (4) Let the amount of water be x litres.

Then, $\dfrac{x+3}{x} = \dfrac{3}{2}$

or $2x + 6 = 3x$

or $x = 6$

$\therefore$ The quantity of spirit in the mixture = $x + 3 = 6 + 3 = 9$ litres

12. (3)

$\dfrac{3}{8}$ 1

$\dfrac{1}{2}$

$1 - \dfrac{1}{2} = \dfrac{1}{2}$ $\dfrac{1}{2} - \dfrac{3}{8} = \dfrac{1}{8}$

Ratio = 4 : 1

$\therefore$ Required quantity = $\dfrac{1}{5}$

13. (1)

Mixture -I   Mixture – II

$\dfrac{4}{7}$ $\dfrac{2}{5}$

$\dfrac{1}{2}$

$\dfrac{1}{2} - \dfrac{2}{5} = \dfrac{1}{10}$ $\dfrac{4}{7} - \dfrac{1}{2} = \dfrac{1}{14}$

$\therefore$ Required ratio

$= \dfrac{1}{10} : \dfrac{1}{14} = 7 : 5$

14. (3) Amount of milk left

= Initial amount ×

$\left(1 - \dfrac{\text{Amount taken out in each operation}}{\text{Initial amount}}\right)^3$

$= 60\left(1 - \dfrac{6}{60}\right)^3$

$= 60\left(1 - \dfrac{1}{10}\right)^3$

$= 60 \times \dfrac{9}{10} \times \dfrac{9}{10} \times \dfrac{9}{10}$

$= 43.74$ kg.

15. (2) Required ratio

$= \left(\dfrac{2}{3} + \dfrac{3}{5} + \dfrac{5}{8}\right) : \left(\dfrac{1}{3} + \dfrac{2}{5} + \dfrac{3}{8}\right)$

$= \left(\dfrac{80 + 72 + 75}{120}\right) :$

$\left(\dfrac{40 + 48 + 45}{120}\right)$

$= 227 : 133$

16. (2) By rule of alligation,

Alloy-I (copper)   Alloy-II (Copper)

$\dfrac{1}{4}$ $\dfrac{2}{7}$

$\dfrac{3}{11}$

$\dfrac{2}{7} - \dfrac{3}{11}$ $\dfrac{3}{11} - \dfrac{1}{4}$

$= \dfrac{22-21}{77} = \dfrac{1}{77}$ $= \dfrac{12-11}{44} = \dfrac{1}{44}$

Required ratio

$= \dfrac{1}{77} : \dfrac{1}{44} = 4 : 7$

17. (4) In original mixture,

Alcohol = $4x$ litres

Water = $3x$ litres

On adding 5 litres of water,

$\dfrac{4x}{3x + 5} = \dfrac{4}{5}$

$\Rightarrow 20x = 12x + 20$

$\Rightarrow 8x = 20$

$\Rightarrow x = \dfrac{20}{8} = \dfrac{5}{2}$

$\Rightarrow$ Quantity of alcohol

$= 4x = 4 \times \dfrac{5}{2}$

$= 10$ litres

18. (4) In 7 kg of alloy A,
Zinc = 5 kg, Tin = 2 kg
In 21 kg of alloy B

Zinc = $\dfrac{21 \times 3}{7} = 9$ kg

Tin = $\dfrac{21 \times 4}{7} = 12$ kg

∴ Required ratio
= (5 + 9) : (2 + 12) = 14 : 14
or 1 : 1

19. (1) In 400 gm of alloy,

Zinc = $\dfrac{5}{8} \times 400 = 250$ gm.

Copper = $\dfrac{3}{8} \times 400 = 150$ gm.

If x gm of copper be mixed, then

$\dfrac{250}{150 + x} = \dfrac{5}{4}$

⇒ 750 + 5x = 1000
⇒ 5x = 1000 – 750 = 250
⇒ x = 50 gm.

20. (4) Milk in the resulting mixture

= $\dfrac{9}{13}$

```
         A                    B
         8                    5
        ──                   ──
        13                    7
              \          /
                 9
                ──
                13
              /          \
   5    9                9    8     1
   ─  - ──               ── - ── = ──
   7    13               13   13   13
```

= $\dfrac{65 - 63}{7 \times 13} = \dfrac{2}{7 \times 13}$

∴ Required ratio

= $\dfrac{2}{7 \times 13} : \dfrac{1}{13}$

= 2 : 7

21. (1) Quantity of milk in 30 litre mixture = $\dfrac{30}{10} \times 7 = 21$ litres

Quantity of water

= $\dfrac{30}{10} \times 3 = 9$ litres

Suppose x litres more water is added.

According to question,

$\dfrac{21}{9 + x} = \dfrac{3}{7}$

⇒ 9 + x = 49
⇒ x = 40 litres

22. (2) Let the barrel contain 4 litres of mixture.
∴ Wine = 3 litres
Water = 1 litre
Let x litre mixture is taken out.
∴ Wine in (4 – x) litres mixture

= $\dfrac{3}{4}(4 - x)$

On adding x litres water, water in mixture

= $(4 - x) \times \dfrac{1}{4} + x$

= $1 - \dfrac{x}{4} + x$

= $\dfrac{4 - x + 4x}{4} = \dfrac{4 + 3x}{4}$

∴ $\dfrac{3}{4}(4 - x) = \dfrac{4 + 3x}{4}$

⇒ $3 - \dfrac{3x}{4} = 1 + \dfrac{3x}{4}$

⇒ $2 = \dfrac{6x}{4}$

⇒ $x = \dfrac{2 \times 4}{6} = \dfrac{4}{3}$

∴ Required answer

= $\dfrac{\frac{4}{3}}{4} = \dfrac{1}{3}$

23. (4) Quantity of milk in the last

= $81\left(1 - \dfrac{27}{81}\right)^2 = 81\left(1 - \dfrac{1}{3}\right)^2$

= $81 \times \dfrac{2}{3} \times \dfrac{2}{3} = 36$

Quantity of water in the last
= 81 – 36 = 45

∴ Ratio = $\dfrac{36}{45} = \dfrac{4}{5} = 4 : 5$

24. (4) Quantity of milk

= $\dfrac{7}{10} \times 80 = 56$ litres

Quantity of water

= $\dfrac{3}{10} \times 80 = 24$ litres

Let x litre water be added

Then, $\dfrac{56}{24 + x} = \dfrac{2}{1}$

⇒ 24 + x = 28

x = 4 litres

25. (3) First of all we write the fraction of milk present in three mixtures.

In A; $\dfrac{4}{9}$ and In B; $\dfrac{5}{6}$

In combination of A and B; $\dfrac{5}{9}$

From alligation rule,

```
        A                       B
        4                       5
        ─                       ─
        9                       6
          \                  /
             \   (A, B)    /
                  5
                  ─
                  9
             /            \
        5                      1
       ──                      ─
       18                      9
```
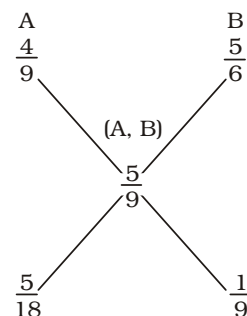
= $\dfrac{5}{18} : \dfrac{1}{9}$

⇒ $\dfrac{5}{18} : \dfrac{2}{18} \Rightarrow 5 : 2$

So, ratio of
A : B = 5 : 2

26. (2) Let the quantity of milk in the mixture = 7x litres and that of water = 5x litres.
According to the question,

$\dfrac{7x}{5x + 15} = \dfrac{7}{8}$

⇒ 56x = 35x + 105
⇒ 56 x – 35 x = 105
⇒ 21x = 105

⇒ $x = \dfrac{105}{21} = 5$

∴ Required quantity of water
= (5x + 15) litres
= 5 × 5 + 15 = 40 litres

27. (1) Quantity of milk in 729 litres of mixture

= $\dfrac{7}{9} \times 729$ = 567 litres

∴ Quantity of water
= (729 – 567) litres = 162 litres.

Let x litres of water is mixed to get the required ratio of 7 : 3

$\therefore \dfrac{567}{162+x} = \dfrac{7}{3}$

$\Rightarrow 7x + 1134 = 1701$

$\Rightarrow 7x = 1701 - 1134 = 567$

$\Rightarrow x = \dfrac{567}{7} = 81$ litres

28. (3) In 40 litres mixture,
Quantity of milk

$= \dfrac{7}{8} \times 40 = 35$ litres

Quantity of water = 5 litres
Let x litres of water be mixed

$\therefore \dfrac{35}{5+x} = \dfrac{3}{1}$

$\Rightarrow 3x + 15 = 35$

$\Rightarrow 3x = 20$

$\Rightarrow x = \dfrac{20}{3} = 6\dfrac{2}{3}$ litres

29. (4) Let the initial quantity of liquids A and B in the jar be $4x$ and x litres respectively.
After taking out 10 litres of the mixture,
Liquid A

$= 4x - \dfrac{4}{5} \times 10 = (4x - 8)$ litres

Liquid B

$= 4x - \dfrac{1}{5} \times 10 = (4x - 2)$ litres

After pouring 10 litres of liquid B,

$\dfrac{4x-8}{4x-2+10} = \dfrac{2}{3}$

$\Rightarrow 12x - 24 = 8x + 16$

$\Rightarrow 4x = 40$

$\Rightarrow x = \dfrac{40}{4} = 10$

$\therefore$ Quantity of liquid A = $4x$
= 4 × 10 = 40 litres

30. (3) In 75 litres of the mixture,

Milk $= \dfrac{2}{3} \times 75 = 50$ litres

Water $= \dfrac{1}{3} \times 75 = 25$ litres

Let x litres of water be added. Then,

$\dfrac{50}{x+25} = \dfrac{1}{2}$

$\Rightarrow x + 25 = 100$

$\Rightarrow x = 75$ litres

31. (3) Let 1 kg of each of the alloys A and B be mixed together.
In alloy A,

Quantity of gold $= \dfrac{5}{8}$ kg.

Quantity of copper $= \dfrac{3}{8}$ kg.

In alloy B,

Quantity of gold $= \dfrac{5}{16}$ kg.

Quantity of copper $= \dfrac{11}{16}$ kg.

$\therefore$ Required ratio

$= \left(\dfrac{5}{8} + \dfrac{5}{16}\right) : \left(\dfrac{3}{8} + \dfrac{11}{16}\right)$

$= \dfrac{15}{16} : \dfrac{17}{16} = 15 : 17$

32. (1) By the rule of alligation,

I   II

$\dfrac{3}{5}$ $\dfrac{4}{9}$

$\dfrac{1}{2}$

$\dfrac{1}{2} - \dfrac{4}{9} = \dfrac{1}{18}$ $\dfrac{3}{5} - \dfrac{1}{2} = \dfrac{6-5}{10} = \dfrac{1}{10}$

$\therefore$ Required ratio $= \dfrac{1}{18} : \dfrac{1}{10} = 5 : 9$

$= 3 : \dfrac{9}{5} \times 3 = 3 : 5\dfrac{2}{5}$

$\therefore 5\dfrac{2}{5}$ litre must be added

33. (2) In the original mixture,
water = 60 cc
Glycerine = 180 cc
Let x cc of water be mixed.

$\therefore \dfrac{60+x}{180} = \dfrac{2}{3}$

$\Rightarrow 180 + 3x = 360$

$\Rightarrow 3x = 360 - 180 = 180$

$\therefore x = \dfrac{180}{3} = 60$ cc

34. (4) Let the quantity of acid in original mixture be x litre and that of water be $3x$ litres.

$\therefore \dfrac{x+5}{3x} = \dfrac{1}{2}$

$\Rightarrow 2x + 10 = 3x$

$\Rightarrow x = 10$

$\therefore$ Quantity of new mixture
= $4x + 5 = 45$ litres

35. (1) In 25 litres of mixture,

Acid $= \dfrac{4}{5} \times 25 = 20$ litres

Water = 5 litres.
After adding 3 litres of water, quantity becomes 8 litres
$\therefore$ New ratio = 20 : 8 = 5 : 2

36. (4) Let the capacity of each vessel = 1 litre
In First Vessel

Water $= \dfrac{3}{7}$ litre

Milk $= \dfrac{4}{7}$ litre

In Second Vessel

Water $= \dfrac{5}{8}$ litre

Milk $= \dfrac{3}{8}$ litre

In 2 litres of mixture,
Water : milk

$= \dfrac{3}{7} + \dfrac{5}{8} : \dfrac{4}{7} + \dfrac{3}{8}$

$= \dfrac{24+35}{56} : \dfrac{32+21}{56} = 59 : 53$

37. (1) Quantity of gold in 1 kg of alloy 'A' $= \dfrac{7}{29}$

Quantity of gold in 1kg of alloy 'B'

$= \dfrac{21}{58}$

Quantity of gold in 1 kg of alloy 'C' $= \dfrac{25}{87}$

$\therefore$ Required ratio

$= \left(\dfrac{21}{58} - \dfrac{25}{87}\right) : \left(\dfrac{25}{87} - \dfrac{7}{29}\right)$

$= \dfrac{63-50}{174} : \dfrac{25-21}{87}$

$= \dfrac{13}{174} : \dfrac{4}{87} = 13 : 8$

38. (1) In glass I

Milk $= \dfrac{3}{8}$, water $= \dfrac{5}{8}$

In glass II,

Milk = $\dfrac{6}{7}$, water = $\dfrac{1}{7}$

By Alligation rule,

$$\dfrac{3}{8} \qquad \dfrac{6}{7}$$
$$\dfrac{1}{2}$$
$$\dfrac{6}{7}-\dfrac{1}{2}=\dfrac{5}{14} \qquad \dfrac{1}{2}-\dfrac{3}{8}=\dfrac{1}{8}$$

∴ Required ratio

$= \dfrac{5}{14} : \dfrac{1}{8} = 20 : 7$

39. (4) In original mixture,
Milk = 40 litres
Water = 20 litres
If x litres of water is mixed,

$\dfrac{40}{20+x} = \dfrac{1}{2}$

$\Rightarrow 20 + x = 80 \Rightarrow x = 60$ litres

40. (2) By alligation rule
Mixture -I   Mixture – II

Acid = $\dfrac{4}{7}$ Acid = $\dfrac{5}{8}$

$$\dfrac{3}{5}$$
$$\dfrac{5}{8}-\dfrac{3}{5}=\dfrac{1}{40} \qquad \dfrac{3}{5}-\dfrac{4}{7}=\dfrac{1}{35}$$

∴ Required ratio

$= \dfrac{1}{40} : \dfrac{1}{35} = 7 : 8$

41. (1) Solution -I   Solution - II

Acid = $\dfrac{3}{4}$ Acid $\dfrac{5}{8}$

$$\dfrac{2}{3}$$
$$\dfrac{2}{3}-\dfrac{5}{8} \qquad \dfrac{3}{4}-\dfrac{2}{3}$$
$$=\dfrac{16-15}{24}=\dfrac{1}{24} \qquad =\dfrac{9-8}{12}=\dfrac{1}{12}$$

∴ Required ratio

$= \dfrac{1}{24} : \dfrac{1}{12} = 1 : 2$

42. (2) By alligation rule,
Mixture-I   Mixture-II

Acid = $\dfrac{5}{7}$ Acid = $\dfrac{8}{13}$

$$\dfrac{9}{13}$$
$$\dfrac{5}{7}-\dfrac{9}{13} \qquad \dfrac{9}{13}-\dfrac{8}{13}=\dfrac{1}{13}$$
$$=\dfrac{65-63}{91}=\dfrac{2}{91}$$

∴ Required ratio

$= \dfrac{2}{91} : \dfrac{1}{13} = 2 : 7$

43. (3) In 20 litres of mixture,

Spirit = $\dfrac{3}{10} \times 20 = 6$ litres,

Water = 14 litres
In 36 litres of mixture

Spirit = $\dfrac{7}{12} \times 36 = 21$ litres

Water = 15 litres
∴ Required ratio
= (21 + 6) : (14 + 15) = 27 : 29

44. (2) By Alligation Rule
Mixture-I   Mixture II

Alcohol = $\dfrac{5}{8}$ Alcohol = $\dfrac{5}{9}$

$$\dfrac{7}{12}$$
$$\dfrac{7}{12}-\dfrac{5}{9} \qquad \dfrac{5}{8}-\dfrac{7}{12}$$
$$=\dfrac{21-20}{36} \qquad =\dfrac{15-14}{24}$$
$$=\dfrac{1}{36} \qquad =\dfrac{1}{24}$$

∴ Ratio = $\dfrac{1}{36} : \dfrac{1}{24} = 3 : 2$

45. (2) By Alligation Rule
Milk-I   Milk-II

$$\dfrac{3}{5} \qquad \dfrac{7}{10}$$
$$\dfrac{2}{3}$$
$$\dfrac{7}{10}-\dfrac{2}{3} \qquad \dfrac{2}{3}-\dfrac{3}{5}=\dfrac{1}{15}$$
$$=\dfrac{21-20}{30} \qquad =\dfrac{10-9}{15}$$
$$=\dfrac{1}{30} \qquad =\dfrac{1}{15}$$

∴ Required ratio = $\dfrac{1}{30} : \dfrac{1}{15}$

= 1 : 2

46. (3) By Alligation Rule

Stainless Steel   I   II   III

Chromium $\dfrac{2}{13}$ $\dfrac{5}{26}$ $\dfrac{7}{39}$

By Alligation Rule,

$$\dfrac{2}{13} \qquad \dfrac{5}{26}$$
$$\dfrac{7}{39}$$
$$\dfrac{5}{26}-\dfrac{7}{39} \qquad \dfrac{7}{39}-\dfrac{2}{13}$$
$$=\dfrac{15-14}{78}=\dfrac{1}{78} \qquad =\dfrac{7-6}{39}=\dfrac{1}{39}$$

∴ Required ratio = 1 : 2

47. (4) 1 kg of each mixture is taken.
A $\Rightarrow$ 7 : 2 = 14 : 4

Gold = $\dfrac{14}{18}$; Copper = $\dfrac{4}{18}$

B $\Rightarrow$ 7 : 11

Gold = $\dfrac{7}{18}$; Copper = $\dfrac{11}{18}$

∴ Required ratio

$= \left(\dfrac{14}{18}+\dfrac{7}{18}\right):\left(\dfrac{4}{18}+\dfrac{11}{18}\right)$

= 21 : 15 = 7 : 5

48. (3) Let the original quantity be $12x$ litres.

In 9 litres of the mixture,

Liquid A $= \dfrac{7}{12} \times 9 = \dfrac{21}{4}$ litres

Liquid B $= \dfrac{5}{12} \times 9 = \dfrac{15}{4}$ litres

According to question,

$\dfrac{7x - \dfrac{21}{4}}{5x - \dfrac{15}{4} + 9} = \dfrac{7}{9}$

$\Rightarrow \dfrac{28x - 21}{20x - 15 + 36} = \dfrac{7}{9}$

$\Rightarrow \dfrac{28x - 21}{20x + 21} = \dfrac{7}{9}$

$\Rightarrow \dfrac{4x - 3}{20x + 21} = \dfrac{1}{9}$

$\Rightarrow 36x - 27 = 20x + 21$

$\Rightarrow 36x - 20x = 21 + 27$

$\Rightarrow 16x = 48$

$\Rightarrow x = 3$

Original quantity of liquid A

$= 7x = 7 \times 3 = 21$ litres

49. (3) Milk in first vessel

$= \dfrac{5}{8} = 0.625$

Milk in second vessel

$= \dfrac{2}{3} = 0.66$

Milk in third vessel $= \dfrac{3}{5} = 0.6$

Milk in fourth vessel

$= \dfrac{7}{11} = 0.636$

50. (2) Let x kg of nickel be mixed.

$\therefore \dfrac{20 + x}{100 + x} = \dfrac{3}{11}$

$\Rightarrow 220 + 11x = 300 + 3x$

$\Rightarrow 11x - 3x = 300 - 220$

$\Rightarrow 8x = 80$

$\Rightarrow x = 10$ kg.

51. (1) In first alloy, zinc $= \dfrac{1}{3}$

In second alloy, zinc $= \dfrac{2}{5}$

In the new alloy, zinc $= \dfrac{5}{13}$

By the rule of Alligation,

$\begin{array}{ccc} A & & B \\ \dfrac{1}{3} & & \dfrac{2}{5} \\ & \dfrac{5}{13} & \\ \dfrac{2}{5} - \dfrac{5}{13} & & \dfrac{5}{13} - \dfrac{1}{3} \end{array}$
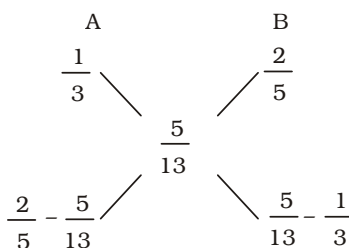
$\therefore$ Required ratio

$= \left(\dfrac{2}{5} - \dfrac{5}{13}\right) : \left(\dfrac{5}{13} - \dfrac{1}{3}\right)$

$= \dfrac{26 - 25}{65} : \dfrac{15 - 13}{39}$

$= \dfrac{1}{65} : \dfrac{2}{39} = \dfrac{1}{5} : \dfrac{2}{3} = 3 : 10$

52. (4) Let x litres of liquid P be mixed to 7 litres of liquid Q.

According to the question,

$x \times \dfrac{10}{7} + \dfrac{5}{7} \times 7 = x + 7$

$\Rightarrow \dfrac{10x}{7} + 5 = x + 7$

$\Rightarrow 10x + 35 = 7x + 49$

$\Rightarrow 10x - 7x = 49 - 35$

$\Rightarrow 3x = 14$

$\Rightarrow x = \dfrac{14}{3} = 4\dfrac{2}{3}$ litres

53. (1) By the rule of alligation,

$\begin{array}{cc} \text{Milk in vessel A} & \text{Milk in vessel B} \\ = \dfrac{4}{7} \text{ litre} & = \dfrac{2}{5} \text{ litre} \\ & \dfrac{1}{2} \\ \dfrac{1}{2} - \dfrac{2}{5} = \dfrac{5-4}{10} = \dfrac{1}{10} \quad & \quad \dfrac{4}{7} - \dfrac{1}{2} = \dfrac{8-7}{14} = \dfrac{1}{14} \end{array}$
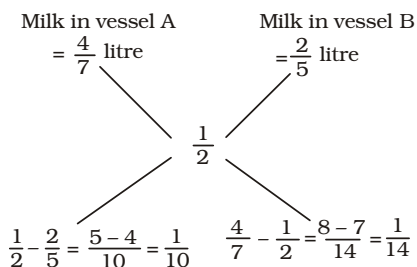
$\therefore$ Required ratio $= \dfrac{1}{10} : \dfrac{1}{14}$

$= 14 : 10 = 7 : 5$

54. (4) Capacity of each container

$= x$ litre (let)

In first container,

Milk $= \dfrac{3x}{4}$ litres,

Water $= \dfrac{x}{4}$ litres

In second container,

Milk $= \dfrac{5x}{7}$ litres,

Water $= \dfrac{2x}{7}$ litres

On mixing both,

Quantity of milk $= \dfrac{3x}{4} + \dfrac{5x}{7}$

$= \dfrac{21x + 20x}{28} = \dfrac{41x}{28}$ litres

Quantity of water $= \dfrac{x}{4} + \dfrac{2x}{7}$

$= \dfrac{7x + 8x}{28}$ litres $= \dfrac{15x}{28}$ litres

$\therefore$ Required ratio

$= \dfrac{41x}{28} : \dfrac{15x}{28} = 41 : 15$

55. (4) Let the volume of each glass be $= x$ litres.

$\therefore$ Required ratio

$=$ Alcohal : water

$= \left(\dfrac{2x}{3} + \dfrac{3x}{5}\right) : \left(\dfrac{x}{3} + \dfrac{2x}{5}\right)$

$= \left(\dfrac{10x + 9x}{15}\right) : \left(\dfrac{5x + 6x}{15}\right)$

$= 19 : 11$

56. (4) Quantity of remaining acid
$=$ Initial quantitiy

$\left(1 - \dfrac{\text{Quantity taken out}}{\text{Total initial quantity}}\right)^n$

$= 10\left(1 - \dfrac{2}{10}\right)^2 = 10 \times \left(\dfrac{4}{5}\right)^2$

$= 10 \times \dfrac{4}{5} \times \dfrac{4}{5} = \dfrac{32}{5}$ litres

Required ratio $= \dfrac{32}{5} : 10$

$= 32 : 50$

$= 16 : 25$

57. (4) G $= 19$W and C $= 9$W

Let 1 gm of gold is mixed with x gm of copper such that $(x + 1)$ gm of alloy is formed.

$\therefore 19$W $+ 9$W$x = (x + 1) \times 15$W

$\Rightarrow 19 + 9x = 15x + 15$

$\Rightarrow 15x - 9x = 19 - 15 \Rightarrow 6x = 4$

$\Rightarrow x = \dfrac{2}{3}$

$\therefore$ Gold : Copper $= 1 : \dfrac{2}{3}$

$= 3 : 2$

58. (2) In 80 litres of mixture,
Milk : Water = 27 : 5

$\therefore$ Milk $\Rightarrow \dfrac{27}{32} \times 80$

= 67.5 litres
Water $\Rightarrow 80 - 67.5$
= 12.5 litres
Let x litres of water is mixed.
According to question,

$\dfrac{67.5}{12.5 + x} = \dfrac{3}{1}$

$\Rightarrow 37.5 + 3x = 67.5$

$\Rightarrow 3x = 67.5 - 37.5 = 30$

$\Rightarrow x = 10$ litres

59. (3) By the rule of alligation

liquid I In mixture I,　　liquid I In mixture II,

$\dfrac{3}{8}$　　　　　　　$\dfrac{6}{7}$

$\dfrac{7}{10}$

$\dfrac{6}{7} - \dfrac{7}{10}$　　　　$\dfrac{7}{10} - \dfrac{3}{8}$

$= \dfrac{60 - 49}{70} = \dfrac{11}{70}$　　$= \dfrac{28 - 15}{40} = \dfrac{13}{40}$

$\therefore$ Required ratio $= \dfrac{11}{70} : \dfrac{13}{4}$

$= 11 \times 4 : 13 \times 7$
$= 44 : 91$

60. (3) Remaining acid
= Initial quantity

$\left(1 - \dfrac{\text{quantity taken out}}{\text{Original quantity}}\right)$

$= 20 \left(1 - \dfrac{4}{20}\right)^2$

$= 20 \left(1 - \dfrac{1}{5}\right)^2$

$= 20 \times \dfrac{4}{5} \times \dfrac{4}{5}$

= 12. 8 litres

$\therefore$ Required ratio = 12.8 : 20

$= 128 : 200 = 16 : 25$

61. (1) By the rule of alligation,
Mixture I　　　　Mixture II
Darjeeling tea　　Darjeeling tea

$\dfrac{4}{11}$　　　　　　$\dfrac{2}{7}$

$\dfrac{6}{19}$

$\dfrac{6}{19} - \dfrac{2}{7}$　　　　$\dfrac{4}{11} - \dfrac{6}{19}$

$= \dfrac{42 - 38}{19 \times 7}$　　　$= \dfrac{76 - 66}{11 \times 19}$

$= \dfrac{4}{19 \times 7}$　　　　$= \dfrac{10}{11 \times 19}$

$\therefore$ Required ratio

$= \dfrac{4}{19 \times 7} : \dfrac{10}{11 \times 19}$

$= \dfrac{4}{7} : \dfrac{10}{11}$

$= 44 : 70 = 22 : 35$

62. (2) Let quantity of first variety of
tea = $4x$ kg.
Quantity of second variety of tea
= $5x$ kg.
Quantity of third variety of tea =
$8x$ kg.
Let y kg of third variety of tea be
mixed.
$\therefore$ Resultant ratio = $(4x + 5)$: $(5x + 10)$: $(8x + y)$

$\therefore \dfrac{4x + 5}{5x + 10} = \dfrac{5}{7}$

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

$\Rightarrow 28x - 25x = 50 - 35$

$\Rightarrow 3x = 15 \Rightarrow x = \dfrac{15}{3} = 5$

$\therefore \dfrac{5x + 10}{8x + y} = \dfrac{7}{9}$

$\Rightarrow \dfrac{5 \times 5 + 10}{8 \times 5 + y} = \dfrac{7}{9}$

$\Rightarrow \dfrac{35}{40 + y} = \dfrac{7}{9}$

$\Rightarrow 40 + y = 9 \times 5$

$\Rightarrow y = 45 - 40 = 5$ kg.

$\therefore$ Required quantity of third variety of tea

$= 8x + y = 8 \times 5 + 5 = 45$ kg.

63. (4) Let there be 3 litres, 2 litres
and 1 litre of mixtures in three
vessels respectively.
Vessel I
In 1 litre of mixture,

Milk $= \dfrac{5}{7}$ litre, water $= \dfrac{2}{7}$ litre

Vessel II
In 1 litre of mixture,

Milk $= \dfrac{4}{5}$ litre, water $= \dfrac{1}{5}$ litre

Vessel III

In $\dfrac{1}{7}$ litre of mixture,

Milk $= \dfrac{4}{5} \times \dfrac{1}{7} = \dfrac{4}{35}$ litre

Water $= \dfrac{1}{35}$ litre

In new vessel,

Mixture $= 1 + 1 + \dfrac{1}{7}$

$= 2 + \dfrac{1}{7} = \dfrac{14 + 1}{7} = \dfrac{15}{7}$ litres

Water $= \dfrac{2}{7} + \dfrac{1}{5} + \dfrac{1}{35}$

$= \dfrac{10 + 7 + 1}{35} = \dfrac{18}{35}$ litre

Required percentage

$= \dfrac{\dfrac{18}{35}}{\dfrac{15}{7}} \times 100$

$= \dfrac{18}{35} \times \dfrac{7}{15} \times 100 = 24\%$

64. (1) In 729 ml of mixture,

Milk = $\dfrac{7}{9}$ × 729 = 567 ml

Water = $\dfrac{2}{9}$ × 729 = 162 ml.

Let x ml of water be mixed.

∴ $\dfrac{567}{162+x} = \dfrac{7}{3}$

⇒ 162 × 7 + 7x = 567 × 3

⇒ 1134 + 7x = 1701

⇒ 7x = 1701 – 1134 = 567

⇒ $x = \dfrac{567}{7}$ = 81 ml.

65. (2) Let 3kg of first alloy and 4 kg of second alloy be mixed together.

∴ In 3 kg of mixture,
Tin = 1 kg.
Iron = 2 kg.
In 4 kg of mixture,

Tin = $\dfrac{2}{5} \times 4 = \dfrac{8}{5}$ = 1.6 kg.

Iron = $\dfrac{3}{5} \times 4 = \dfrac{12}{5}$ = 2.4 kg.

∴ Required ratio
= (1 + 1.6) : (2 + 2.4) = 2.6 : 4.4
= 13 : 22

66. (2) Let each vessel contain 1 litre of mixture.

∴ Total quantity of milk

= $\dfrac{6}{7} + \dfrac{5}{7} + \dfrac{3}{4}$

= $\dfrac{24+20+21}{28} = \dfrac{65}{28}$ litre

Total quantity of water

= $\dfrac{1}{7} + \dfrac{2}{7} + \dfrac{1}{4}$

= $\dfrac{4+8+7}{28} = \dfrac{19}{28}$ litre

∴ Required ratio = $\dfrac{65}{28} : \dfrac{19}{28}$

= 65 : 19

67. (2) In 60 kg of alloy A,

Lead = $\dfrac{3}{5}$ × 60 = 36 kg.

Tin = $\dfrac{2}{5}$ × 60 = 24 kg.

In 100 kg of alloy B,

Tin = $\dfrac{1}{5}$ × 100 = 20 kg.

In 160 kg of new alloy,
Tin = 24 + 20 = 44 kg.

68. (2) Let the capacity of each glass be 1 litre.

On mixing all three mixtures together,

Acid ⇒ $\dfrac{2}{5} + \dfrac{3}{7} + \dfrac{4}{9}$

= $\dfrac{126+135+140}{315}$

= $\dfrac{401}{315}$ litre

Water ⇒ $\dfrac{3}{5} + \dfrac{4}{7} + \dfrac{5}{9}$

= $\dfrac{189+180+175}{315} = \dfrac{544}{315}$

∴ Required ratio

= $\dfrac{401}{315} : \dfrac{544}{315}$ = 401 : 544

69. (3) Let 5 kg of mixture be prepared.

∴ C.P. of 5 kg of mixture
= Rs. (2 × 35 + 3 × 40)
= Rs. (70 + 120)
= Rs. 190
Total S.P. of this mixture
= Rs. (46 + 4 × 55)
= Rs. (46 + 220) = Rs. 266
∴ Profit per cent

= $\left(\dfrac{266-190}{190}\right)$ × 100

= $\dfrac{7600}{190}$ = 40%

70. (3) In 20 litres of mixture,

Milk ⇒ $\dfrac{3}{4}$ × 20 = 15 litres

Water ⇒ $\dfrac{1}{4}$ × 20 = 5 litres

Let the quantity of milk added be x litres.
According to the question,

$\dfrac{15+x}{5} = \dfrac{4}{1}$

⇒ 15 + x = 4 × 5
⇒ x = 20 – 15 = 5 litres

71. (1) Quantity of milk in the mixture = 5x litres
Quantity of water = x litres
According to the question,
On adding 5 litres of water,

$\dfrac{5x}{x+5} = \dfrac{5}{2}$

⇒ 10x = 5x + 25
⇒ 5x = 25 ⇒ x = 5
∴ Required quantity of milk
= 5 × 5 = 25 litres

72. (2) Remaining amount of milk = Initial quantity

$\left(1 - \dfrac{\text{quantity taken out}}{\text{Initial quantity}}\right)^n$

= $60\left(1 - \dfrac{12}{60}\right)^2$

= $60\left(1 - \dfrac{1}{5}\right)^2$

= $60 \times \dfrac{4}{5} \times \dfrac{4}{5}$ = 38.4 litres

Quantity of water = 60 – 38.4
= 21.6 litres
∴ Required ratio
= 38.4 : 21.6 = 16 : 9

73. (3) Let the quantity of spirit in the mixture be x litres.
∴ Quantity of water
= (x – 3) litres
According to the question,

$\dfrac{x}{x-3} = \dfrac{3}{2}$

⇒ 3x – 9 = 2x
⇒ 3x – 2x = 9
⇒ x = 9 litres

74. (2) In 49 kg. of mixture,

Tea of Assam ⇒ $\left(\dfrac{5}{7} \times 49\right)$ kg.

= 35 kg.
Tea of Darjeeling ⇒ (49 – 35) kg.
= 14 kg.
Let x kg. of Darjeeling tea be added.

∴ $\dfrac{35}{14+x} = \dfrac{2}{1}$

⇒ 28 + 2x = 35
⇒ 2x = 35 – 28 = 7

⇒ $x = \dfrac{7}{2}$ = 3.5 kg.

75. (3) Let the volumes of three containers be 3 litres, 4 litres and 5 litres respectively.

Container–I

Milk = $\dfrac{4 \times 3}{5} = \dfrac{12}{5}$ litres,

Water = $\dfrac{3}{5}$ litre

Container–II

Milk = $\dfrac{4 \times 3}{4}$ = 3 litres,

Water = 1 litre

Container–III

Milk = $\dfrac{5 \times 5}{7} = \dfrac{25}{7}$ litres

Water = $\dfrac{10}{7}$ litres

∴ Required ratio in container–IV

$= \left(\dfrac{12}{5} + 3 + \dfrac{25}{7}\right) : \left(\dfrac{3}{5} + 1 + \dfrac{10}{7}\right)$

$= \left(\dfrac{84 + 105 + 125}{35}\right) : \left(\dfrac{21 + 35 + 50}{35}\right)$

$= \dfrac{314}{35} : \dfrac{106}{35}$

= 157 : 53

76. (2) By the rule of alligation,

Variety–I   Variety–II
Rs. 12   Rs. 7

Rs. 8

8 – 7 = 1   12 – 8 = 4

∴ Required ratio = 1 : 4

77. (2) In original mixture,

Milk = $\dfrac{3}{4} \times 36$ = 27 litres

Water = $\dfrac{1}{4} \times 36$ = 9 litres

On adding 15 litres of milk,

Required ratio = (27 + 15) : 9

= 42 : 9 = 14 : 3

78. (2) In 25 litres of mixture,

Quantity of milk = $\dfrac{4}{5} \times 25$

= 20 litres

Quantity of water = 5 litres
On adding 3 litres of water,
Required ratio = 20 : 8 = 5 : 2

79. (2) In 2 litres of first container,

Spirit = $\dfrac{8}{5}$ litre, Water = $\dfrac{2}{5}$ litre

In 3 litres of second container,

Spirit = $3 \times \dfrac{11}{15} = \dfrac{11}{5}$ litres

Water = $3 \times \dfrac{4}{15} = \dfrac{4}{5}$ litre

In 4 litres of third container,

Spirit = $4 \times \dfrac{7}{10} = \dfrac{14}{5}$ litres

Water = $4 \times \dfrac{3}{10} = \dfrac{6}{5}$ litres

∴ Required ratio

$= \left(\dfrac{8}{5} + \dfrac{11}{5} + \dfrac{14}{5}\right) : \left(\dfrac{2}{5} + \dfrac{4}{5} + \dfrac{6}{5}\right)$

$= \dfrac{33}{5} : \dfrac{12}{5}$ = 33 : 12 = 11 : 4

80. (1) In 1 litre of first bottle,

Quantity of acid = $\dfrac{2}{5}$ litre

Quantity of water = $\dfrac{3}{5}$ litre

In 3 litres of second bottle,

Quantity of acid = $\dfrac{3}{3}$ = 1 litre

Quantity of water = 2 litres
In the resulting mixture,
Acid : Water

$= \left(\dfrac{2}{5} + 1\right) : \left(\dfrac{3}{5} + 2\right)$

$= \dfrac{2 + 5}{5} : \dfrac{3 + 10}{5}$

= 7 : 13

81. (4)

Type–I   Type–II
Copper $\Rightarrow \dfrac{8}{11}$ Copper $\Rightarrow \dfrac{15}{22}$

$\dfrac{5}{7}$

$\dfrac{5}{7} - \dfrac{15}{22}$ $\dfrac{8}{11} - \dfrac{5}{7}$

$= \dfrac{110 - 105}{154} = \dfrac{5}{154}$ $= \dfrac{56 - 55}{77} = \dfrac{1}{77}$

∴ Required ratio = $\dfrac{5}{154} : \dfrac{1}{77}$

= 5 : 2

TYPE-IX

1. (1) Let the income of A, B and C be ₹ 3x, ₹ 7x and ₹ 4x respectively and their expenses be ₹ 4y, ₹ 3y and ₹ 5y respectively.

∴ 3x = 2400

⇒ x = 800

∴ 4y = 2400 – 300 = 2100

⇒ y = 525

∴ B's saving = (7x – 3y)

= ₹ (7 × 800 – 3 × 525)

= ₹ (5600 – 1575)

= ₹ 4025

and C's savings = ₹ (4x – 5y)

= ₹ (3200 – 2625) = ₹ 575

2. (4) Income in the second year
= ₹ 45000
Income in the first year
= ₹ 30000
Expense in the first year
= ₹ 25000
Expense in the second year
= ₹ 45000
∴ Total saving
= 75000 – 70000 = ₹ 5000

3. (4) Given

$\dfrac{\text{Monthly income of A}}{\text{Monthly income of B}} = \dfrac{5}{6}$

∴ Monthly income of A
= 5x
and that of B = 6x (x is a constant)
According to the question

$\dfrac{5x - 1800}{6x - 1600} = \dfrac{3}{4}$

20x – 7200 = 18x – 4800

2x = 2400

∴ x = 1200

∴ Monthly income of B
= 1200 × 6 = ₹ 7200

4. (1) Let income of two persons be 5x and 3x.
and their expenses be 9y and 5y respectively.
Then, 5x – 9y = 1300   ..(i)
and 3x – 5y = 900   ..(ii)
By 9 × (ii) – 5 × (i), we get
27x – 45y = 8100
25x – 45y = 6500
–   +   –
―――――――――
2x   = 1600

⇒ x = 800

Now, income of first person
= 5x = 5 × 800 = ₹ 4000
and that of second person
= 3x = 3 × 800 = ₹ 2400

5. (4) Let the annual income of A and B be ₹ 4x and 3x respectively. Also let their annual expenditures be ₹ 3y and 2y respectively According to question,

$4x - 3y = 600$ ...(i)
$3x - 2y = 600$ ...(ii)
From equation (i) and (ii)
$4x - 3y = 3x - 2y \Rightarrow x = y$
From equation (i)
$4x - 3x = 600 \Rightarrow x = 600$
Annual income of A
= $4x = 4 × 600 = ₹ 2400$

6. (1) Income of A = ₹ 7x ;
B = ₹ 9x and C = ₹ 12x
Expenses of A = ₹ 8y ;
B = ₹ 9y and C = ₹ 15y

$\therefore 7x - 8y = \dfrac{1}{4} × 7x$

$\Rightarrow 7x - \dfrac{7x}{4} = 8y$

$\Rightarrow \dfrac{21x}{4} = 8y \Rightarrow 21x = 32y.$

$\therefore$ A's saving = $\dfrac{1}{4} × 7x$

$= \dfrac{1}{4} × \dfrac{32}{3}y = \dfrac{8}{3}y$

B's saving = $9x - 9y$

$= 9 × \dfrac{32}{21}y - 9y$

$= \dfrac{96y - 63y}{7}$

$= \dfrac{33y}{7}$

C's saving = $12x - 15y$

$= 12 × \dfrac{32}{21}y - 15y$

$= \dfrac{128y - 105y}{7}$

$= \dfrac{23y}{7}$

$\therefore$ Required ratio

$= \dfrac{8}{3}y : \dfrac{33}{7}y : \dfrac{23}{7}y$

= 56 : 99 : 69

7. (3) Let the income of P and Q be ₹ 3x and 4x respectively. Again, let their expenditures be

₹ 2y and 3y respectively. According to the question.

$3x - 2y = 6000$ ...(i)
and $4x - 3y = 6000$ ...(ii)
From equations (i) and (ii)
$3x - 2y = 4x - 3y$
or, $4x - 3x = 3y - 2y$
or, $x = y$
From equation (i),
$\Rightarrow 3x - 2x = 6000$
$x = 6000$
The income of P = ₹ 3x
= ₹ (3 × 6000) = ₹ 18000

8. (3) Let his expenditures be ₹ 26x and savings be ₹ 3x.

$\therefore 26x + 3x = 7250$
$\Rightarrow 29x = 7250$

$\Rightarrow x = \dfrac{7250}{29} = 250$

$\therefore$ Savings = 3x = ₹ 750

9. (2) Let the monthly salary of A, B & C be 2x, 3x and 5x
now, $5x - 2x = 12,000$
$\Rightarrow 3x = 12000$ or $x = 4000$
$\therefore$ Monthly salary of B = 3 × 4000
= 12,000
$\Rightarrow$ Annual salary of B
= 12000 × 12 = ₹ 144000

10. (1) Let the income of two persons be ₹ 5x and ₹ 3x respectively and their expenditures be ₹ 9y and 5y respectively.
As given,
$5x - 9y = 2600$ ...(i)
$3x - 5y = 1800$ ...(ii)
By 5 × (i) – 9 × (ii) we get
$25x - 27x = 13000 - 16200$
$\Rightarrow -2x = -3200$

$\Rightarrow x = \dfrac{3200}{2} = 1600$

$\therefore$ First person's income
= ₹(1600 × 5) = ₹ 8000
Second person's income
= 3x = ₹ (1600 × 3)
= ₹ 4800

11. (3) Let the income of two persons (A and B) be ₹ 2x and ₹ 3x respectively. Again let the expenditures of A and B be ₹ 5y and ₹ 9y respectively.
$\therefore 2x - 5y = 600$ ...(i)
$3x - 9y = 600$ ...(ii)
From equations (i) and (ii),
$2x - 5y = 3x - 9y$
$\Rightarrow x = 4y$
From equation (i),
$2 × 4y - 5y = 600$
$\Rightarrow 3y = 600$

= y = 200
$\therefore x = 4 × 200 = 800$
$\therefore$ A's income = 2x = 2 × 800
= ₹ 1600
B's income = 3x = 3 × 800
= ₹ 2400

12. (3) Rice : Wheat
= 4 × 5 : 3 × 6
= 20 : 18 = 10 : 9
$\therefore$ Total cost of rice

$= \dfrac{10}{19} × 380 = ₹ 200$

13. (2) Let the income of A be ₹ 5x and that of B be ₹ 6x.
According to the question,
$6x - 5x = 1100$
$\Rightarrow x = 1100$
$\therefore$ Total income = 5x + 6x
= ₹ 11x
= ₹ (11×1100) = ₹ 12100

14. (1) Let the income of A and B be ₹ 5x and ₹ 3x respectively. Let the expenses of A, B and C be ₹ 8y, Rs. 5y and ₹ 2y respectively. Then,
$2y = 2000$

$\Rightarrow y = \dfrac{2000}{2} = 1000$

B saves = ₹ 700
$\therefore 3x - 5y = 700$
$\Rightarrow 3x - 5 × 1000 = 700$
$\Rightarrow 3x = 700 + 5000 = 5700$

$\Rightarrow x = \dfrac{5700}{3} = 1900$

$\therefore$ A's saving = ₹ (5x – 8y)
= ₹ (5×1900 – 8×1000)
= ₹ (9500 – 8000) = ₹ 1500

15. (4) Let the income of man be ₹ = 11x and his expenditure be ₹ 10x.
$\therefore$ Savings = x = ₹ 9000
$\therefore$ Monthly income of man

$= \dfrac{11 × 9000}{12} = ₹ 8250$

16. (1) Income of the family

$= \dfrac{10}{7} × 10500 = ₹ 15000$

Savings = 15000 – 10500
= ₹ 4500

17. (2) Let the monthly income of A and B be ₹ 4x and ₹ 3x respectively and their expenditures be ₹ 3y and Rs. 2y respectively.
$\therefore 4x - 3y = 6000$
and $3x - 2y = 6000$
$\Rightarrow 4x - 3y = 3x - 2y$

$\Rightarrow x = y$

$\therefore 4x - 3y = 6000$

$\Rightarrow x = 6000$

$\Rightarrow$ A's monthly income = $4x$

= ₹ 24000

18. (2) Let A's and B's weekly income be ₹ $9x$ and ₹ $7x$ and their expenditures be ₹ $4y$ and $3y$ respectively.

Then, $9x - 4y = 200$ ...(i)

and $7x - 3y = 200$ ...(ii)

$\Rightarrow 9x - 4y = 7x - 3y$

$\Rightarrow 9x - 7x = 4y - 3y$

$\Rightarrow 2x = y$ ...(iii)

From equation (i),

$9x - 4y = 200$

$\Rightarrow 9x - 8x = 200$

$\Rightarrow x = 200$

$\therefore$ Sum of their weekly income

= $16x = 16 \times 200$ = ₹ 3200

19. (1) A : B = 3 : 2 = 9 : 6

B : C = 3 : 2 = 6 : 4

$\therefore$ A : B : C = 9 : 6 : 4

$\therefore \dfrac{9x}{3} - \dfrac{4x}{4} = 1000$

$\Rightarrow 3x - x = 1000$

$\Rightarrow 2x = 1000$

$\Rightarrow x = 500$

$\therefore$ B's income = $6x = 6 \times 500$

= ₹ 3000

20. (4) Let the income of A and B be ₹ $2x$ and ₹ $3x$. and their expenditures be ₹ y and ₹ $2y$ respectively.

$\therefore 2x - y = 24000$ ...(i)

and $3x - 2y = 24000$ ...(ii)

By equation (i) × 2 – (ii),

$4x - 2y - 3x + 2y = 24000$

$\Rightarrow x = 24000$

$\therefore$ A's income = 2×24000

= ₹ 48000

21. (3) Let the annual income of A and B be ₹ $4x$ and ₹ $3x$ and their income be Rs. $3y$ and Rs. $2y$. respectively.

$\therefore 4x - 3y = 60000$ ...(i)

and $3x - 2y = 60000$ ...(ii)

Clearly, $4x - 3y = 3x - 2y$

$\Rightarrow x = y$

From equation (i),

$x = 60000$

$\therefore$ A's annual income

= $4x = 4 \times 60000$

= ₹ 240000

22. (3) If the ratio of the income of A and B be $a : b$ and that of their expenses be $c : d$ and each saves ₹ x, then,

A's income = $\dfrac{ax(d-c)}{ad - bc}$

= $\dfrac{9 \times 500(7-8)}{9 \times 7 - 8 \times 8}$

= 9×500 = ₹ 4500

23. (2) Let Annual Income of A, B and C be x, $3x$ and $7x$

$x + 7x = 800000$

$\Rightarrow 8x = 800000$

$\Rightarrow x = 100000$

$\therefore$ B's monthly income

= $\dfrac{100000 \times 3}{12}$ = ₹ 25000

24. (4) Amit's income = ₹ $3x$ and his expenditure = ₹ $5y$

Veeri's income = ₹ $2x$ and his expenditure = ₹ $3y$

$\therefore 3x - 5y = 2x - 3y$

$\Rightarrow x = 2y$

$\therefore 3x - 5y = 1000$

$\Rightarrow 6y - 5y = 1000 \Rightarrow y = 1000$

$\therefore x = 2000$

$\therefore$ Amit's income

= $3x = 3 \times 2000$ = ₹ 6000

25. (3) Income of A and B

= ₹ $6x$ and $5x$

Expenses of A and B

= ₹ $4y$ and $3y$

$\therefore 6x - 4y = 400$ ...(i)

$5x - 3y = 400$ ...(ii)

By equation (i)× 3 – (ii) × 4

$\Rightarrow 18x - 12y - 20x + 12y$

= $1200 - 1600$

$\Rightarrow 2x = 400 \Rightarrow x = 200$

$\therefore$ Total income

= $6x + 5x = 11x$ = ₹ 2200

26. (1) x's income = Rs. $4a$

y's income = Rs. $3a$

x's expenditure = Rs. $12b$

y's expenditure = Rs. $7b$

$\therefore 4a - 12b = 3200$

$\Rightarrow a - 3b = 800$ ...(i)

Again, $3a - 7b = 3200$ ...(ii)

By equation (i) × 7 – (ii) × 3,

$7a - 21b = 5600$
$9a - 21b = 9600$
$\underline{- \quad + \qquad -}$
$\quad - 2a = - 4000$

$\Rightarrow a = 2000$

$\Rightarrow x$'s income = $4a$

= 4×2000 = Rs. 8000

27. (1) Let incomes of A and B be Rs. $3x$ and Rs. $2x$ respectively. Let the expenditures of A and B be Rs. $5y$ and Rs. $3y$ respectively. According to the question,

$3x - 5y$ = Rs. 1000 .... (i)

$2x - 3y$ = Rs. 1000 .... (ii)

By equation (i) × 2 – (ii) × 3,

$6x - 10y = 2000$

$6x - 9y = 3000$

$\underline{\quad - \quad + \qquad -}$

$\qquad - y = - 1000$

$\therefore y = 1000$

From equation (i),

$3x - 5 \times 1000 = 1000$

$\Rightarrow 3x = 1000 + 5000 = $ Rs. 6000

= A's income

28. (2) A's monthly income = Rs. $8x$

A's monthly expenditure = Rs. $5y$

B's monthly income = Rs. $5x$

B's monthly expenditure = Rs. $3y$

According to the question,

$8x - 5y = 12000$ ....(i)

$5x - 3y = 10000$ ....(ii)

By equation (i) × 3 – (ii) × 5,

$24x - 15y = 36000$

$25x - 15y = 50000$

$\underline{- \qquad + \qquad -}$

$\quad -x = -14000$

$\Rightarrow x = 14000$

Difference between monthly incomes of A and B = $8x - 5x$

= Rs. $3x$ = Rs. (3 × 14000)

= Rs. 42000

29. (4) Expenditure : Savings

= 61 : 6

Sum of the terms of ratio

= 61 + 6 = 67

Total monthly salary

= Rs. 8710

$\therefore$ Monthly savings

= Rs. $\left(\dfrac{6}{67} \times 8710 \right)$

= Rs. 780

30. (3) Let A's income be Rs. $2x$.

$\therefore$ B's income = Rs. $(2x - 140)$

C's income = Rs. $3x$

$\therefore$ D's income = Rs. $(3x - 80)$

According to the question,

B : D = 1 : 2

$\therefore 2(2x - 140) = 3x - 80$

$\Rightarrow 4x - 280 = 3x - 80$

$\Rightarrow 4x - 3x = 280 - 80$

$\Rightarrow x = $ Rs. 200

$\therefore$ A's income = Rs. (2 × 200) = Rs. 400

B's income = Rs. (400 – 140) = Rs. 260

C's income = Rs. (3 × 200) = Rs. 600

D's income = Rs. (600 – 80) = Rs. 520

TYPE-X

1. (2) Using Rule1,

Ratio of the values

$= 2 : \dfrac{3}{2} : \dfrac{4}{4}$

$= 4 : 3 : 2$

∴ Value of 50 paise coins

$= \dfrac{3}{9} \times 180$ = ₹ 60

Numbers of 50 paise coins
= 120.

2. (1) The ratio of values of rupee, 50 paise and 25 paise coins = 13 : 11 : 7

∴ Ratio of their numbers
= 13 × 1 : 11 × 2 : 7 × 4
= 13 : 22 : 28

Sum of the ratios
= 13 + 22 + 28 = 63

∴ Required number of 50 paise

coins = $\dfrac{22}{63} \times 378$ = 132

3. (2) Ratio of values of 50 paise, 25 paise and 10 paise coins

$= \dfrac{2}{2} : \dfrac{3}{4} : \dfrac{5}{10} = 1 : \dfrac{3}{4} : \dfrac{1}{2}$

$= 4 : 3 : 2$

Sum of the ratios = 4 + 3 + 2 = 9

Value of 25 paise coins

$= \dfrac{3}{9} \times 90$ = ₹ 30

Number of 25 paise coins
= 30 × 4 = 120

4. (3) Ratio of the number of coins
= 8 : 5 :3

Ratio of their values

$= 8 : \dfrac{5}{2} : \dfrac{3}{4}$ = 32 : 10 : 3

Sum of the ratios
= 32 + 10 + 3 = 45

∴ Value of one rupee coins

$= \dfrac{32}{45} \times 225$ = ₹ 160

∴ Number of one rupee coins
= 160

5. (2) Ratio of number of 1 rupee, 50-paise and 25 paise coins
= 8 : 5 : 3

Ratio of their respective values

$= 8 : \dfrac{5}{2} : \dfrac{3}{4} = 32 : 10 : 3$

Sum of the ratios
= 32 + 10 + 3 = 45

Value of 50 paise coins

$= ₹ \left(\dfrac{10}{45} \times 112.5 \right) = ₹ 25$

∴ Number of 50 paise coins
= 25 × 2 = 50

6. (2) Ratio of the number of coins of Re. 1, 50 paise and 25 paise
= 3 : 8 : 20

Ratio of the values of these coins

$= 3 : \dfrac{8}{2} : \dfrac{20}{4} = 3 : 4 : 5$

∴ Value of 1 rupee coins

$= \dfrac{3}{12} \times 372 = ₹ 93$

Value of 50 paise coins

$= \dfrac{4}{12} \times 372 = ₹ 124$

Value of 25 paise coins

$= \dfrac{5}{12} \times 372 = ₹ 155$

∴ Number of coins
= 93 + 124 × 2 + 155 × 4
= 93 + 248 + 620 = 961

7. (4) Respective ratio of the number of coins
= 13 : 11 × 2 = 13 : 22

∴ Number of 1 rupee coins

$= \dfrac{13}{13 + 22} \times 210$

$= \dfrac{13}{35} \times 210 = 78$

8. (3) Ratio of the value of coins

$= \dfrac{1}{2} : \dfrac{2}{4} : \dfrac{3}{10}$ = 5 : 5 : 3

∴ Value of the 10-paise coins

$= ₹ \left(\dfrac{3}{13} \times 6.50 \right) = ₹ 1.5$

∴ Number of 10-paise coins
= 1.5 × 10 = 15

9. (2) Let the number of each type of notes be x

∴ x + 5x + 10 x = 640

⇒ 16 x = 640 ⇒ x = 40

∴ Total number of notes
= 3 × 40 = 120

10. (1) Let the number of coins of 1-rupee coin be x.

Total value of the coins of each kind is same, then the number of 50 paisa coins = 2x and the number of 25 paisa coins = 4x.

According to the question.

x + 2x + 4x = 175

7x = 175 ∴ $x = \dfrac{175}{7} = 25$

∴ Total amount in bag
= 25 + 25 + 25 = ₹ 75

11. (3) Ratio of values = 5 : 3 : 1

Ratio of their numbers
= 10 : 12 : 10 = 5 : 6 : 5

∴ Number of 50 paise coins

$= \dfrac{5}{16} \times 480 = 150$

Number of 25 paise coins

$= \dfrac{6}{16} \times 480 = 180$

Number of 10 paise coins

$= \dfrac{5}{16} \times 480 = 150$

12. (4) Ratio of their values =13:11:7

Ratio of their numbers
= 13 : 22 : 35

∴ 13x + 22x + 35x = 420

⇒ 70x = 420 ⇒ x = 6

∴ Number of 50 paise coins
= 22x = 22 × 6 = 132

13. (2) Number of 1-rupee coins = x

Number of 50 paise coins = 4x

Number of 25 paise coins = 2x

∴ Ratio of their values

$= x : \dfrac{4x}{2} : \dfrac{2x}{4} = 2 : 4 : 1$

∴ Value of 50-paise coins

$= \dfrac{4}{7} \times 56 = ₹ 32$

∴ Their number = 32 × 2 = 64

Aliter :

$(x)(1) + (4x)\left(\dfrac{1}{2}\right) + (2x)\left(\dfrac{1}{4}\right) = 56$

$x + 2x + \dfrac{1}{2}x = 56$

$\Rightarrow x = 56 \times \dfrac{2}{7} = 16$

⇒ No. of 50p coins = 4 × 16 = 64.

14. (3) Let the initial salaries of A, B and C be ₹ x, ₹ $3x$ and ₹ $4x$ respectively.

Respective ratio after corresponding increase

$= \dfrac{x \times 105}{100} : \dfrac{3x \times 110}{100} : \dfrac{4x \times 115}{100}$

$= 105 : 330 : 460$

$= 21 : 66 : 92$

15. (2) If the salaries of A, B and C be ₹ x, ₹ y and ₹ z respectively, then

$\dfrac{x \times 20}{100} : \dfrac{y \times 15}{100} : \dfrac{z \times 25}{100}$

$\Rightarrow \dfrac{x}{5} : \dfrac{3y}{20} : \dfrac{z}{4} = 8 : 9 : 20$

$\Rightarrow x : y : z = 40 : 60 : 80$

$= 2 : 3 : 4$

$\therefore$ A's salary $= \dfrac{2}{9} \times 72000$

$= ₹ 16000$

16. (3) Ratio of the values of one rupee, 50 paise and 25 paise coins
$= 8 : 4 : 3$

Ratio of their number
$= 8 : 4 \times 2 : 3 \times 4 = 2 : 2 : 3$

Sum of ratios $= 2 + 2 + 3 = 7$

$\therefore$ Number of 50-paise coins

$= \dfrac{2}{7} \times 280 = 80$

TYPE-XI

1. (4) Orginal ratio of A, B and C

$= \dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{4} = 6 : 4 : 3$

$\therefore$ Share of A

$= \dfrac{6}{13} \times 117 = ₹ 54$

Share of B

$= \dfrac{4}{13} \times 117 = ₹ 36$

and share of C

$= \dfrac{3}{13} \times 117 = ₹ 27$

The ratio of A, B and C by mistake $= 2 : 3 : 4$

$\therefore$ Share of A $= \dfrac{2}{9} \times 117 = ₹ 26$

Share of B $= \dfrac{3}{9} \times 117 = ₹ 39$

Share of C $= \dfrac{4}{9} \times 117 = ₹ 52$

Therefore, it is clear from above calculation that C gains maximum i.e. ₹ 25.

2. (3) According to question,
A : B = 2 : 1
B : C = 4 : 1
$\therefore$ A : B : C = 8 : 4 : 1

3. (1) A : B = 5 : 2
B : C = 7 : 13
$\therefore$ A : B : C
$= 5 \times 7 : 2 \times 7 : 2 \times 13$
$= 35 : 14 : 26$
Sum of the ratios
$= 35 + 14 + 26 = 75$
Total amount = ₹ 7500

$\therefore$ B's share $= ₹ \dfrac{14}{75} \times 7500$

$= ₹ 1400$

4. (2) A : B = 6 : 5, B : C = 10 : 9
  A : B = 6 : 5
           10 : 9
  ───────────────
   60 : 50 : 45
  =12 : 10 : 9
According to the question
(12 + 10 + 9) units $\Rightarrow$ 1240

9 units $= \dfrac{1240}{31} \times 9$

$\Rightarrow ₹ 360$

5. (1)
A : B   = 2 : 3
  B : C   =   4 : 3
     C : D =   2 : 3
─────────────────────────────
A : B : C : D = 2×4×2 : 3×4×2 : 3×3×2 : 3×3×3
or, A : B : C : D = 16 : 24 : 18 : 27
Sum of the ratios
$= 16 + 24 + 18 + 27 = 85$

B's share $= ₹ \dfrac{24}{85} \times 3400$

$= ₹ 960$

D's share $= ₹ \dfrac{27}{85} \times 3400$

$= ₹ 1080$
The required sum
$= ₹ (1080 + 960) = ₹ 2040$

6. (1) A : B = 5 : 2
      B : C = 7 : 13
  ──────────────────────
   A : B : C = 5×7 : 7×2 : 2×13
            = 35 : 14 : 26
Sum of the ratios
$= 35 + 14 + 26 = 75$

A's share $= ₹ \dfrac{35}{75} \times 750$

$= ₹ 350$

---

7. (4) Ratio $= \dfrac{1}{2} : \dfrac{1}{4} : \dfrac{5}{16}$

$= 8 : 4 : 5$
Sum of ratios $= 8 + 4 + 5 = 17$
$\therefore$ Required answer

$= ₹ \left(\dfrac{8-4}{17} \right) \times 68000$

$= ₹ \dfrac{4}{17} \times 68000$

$= ₹ 16000$

8. (4) Ratio $= \dfrac{3}{5} : 2 : \dfrac{5}{3}$

$= 9 : 30 : 25$
Sum of ratios $= 9 + 30 + 25$
$= 64$
$\therefore$ Share of second worker

$= \dfrac{30}{64} \times 6400 = ₹ 3000$

9. (2) A $= B \times \dfrac{2}{9} = \dfrac{2B}{9}$

$C = \dfrac{3A}{4}$; A $= \dfrac{4}{3} C$

$\therefore$ Ratio of A : B : C = 4 : 18 : 3

Share of A $= \dfrac{4}{25} \times 1250 = ₹ 200$

Share of B $= \dfrac{18}{25} \times 1250 = ₹ 900$

Share of C $= \dfrac{3}{25} \times 1250 = ₹ 150$

10. (4) A's share $= 9000 \times \dfrac{4}{15}$

$= 600 \times 4 = ₹ 2400$

C's share $= 9000 \times \dfrac{6}{15}$

$= 600 \times 6 = ₹ 3600$
$\therefore$ Difference = 3600 – 2400
$= ₹ 1200$

11. (4) A : B = 3 : 4
       B : C =   3 : 4
  ─────────────────────────
  A : B : C = 9 : 12 : 16

$\therefore$ A's share $= \dfrac{9}{9+12+16} \times ₹ 370$

$= ₹ 90$

12. (4) Let the amount to be distributed be ₹ x.
P : Q : R = 2 : 7 : 9
Sum of the ratios = 2 + 7 + 9 = 18

$\therefore$ P $= \dfrac{2}{18} \times x = \dfrac{x}{9}$

$Q = \dfrac{7}{18}x$

$R = \dfrac{9x}{18} = \dfrac{x}{2}$

As given,

$\dfrac{x}{9} + \dfrac{7x}{18} = \dfrac{x}{2}$

Thus, we get no conclusion. Amount should necessarily be known.

13. (4) According to the question,
A : B = 5 : 12 = 10 : 24
B : C = 4 : 5.50 = 24 : 33
∴ A : B : C = 10 : 24 : 33
Sum of the ratios
= 10 + 24 + 33 = 67
Difference between the shares of C and B

$= ₹ \left(\dfrac{33-24}{67} \times 2010 \right)$

$= ₹ \left(\dfrac{9}{67} \times 2010 \right) = ₹\ 270$

14. (3) $\dfrac{2}{5}A + 40 = \dfrac{2}{7}B + 20$

$= \dfrac{9}{17}C + 10 = x$

∴ $A = \dfrac{5}{2}(x-40), B = \dfrac{7}{2}(x-20)$

and, $C = \dfrac{17}{9}(x-10)$

∴ $\dfrac{5}{2}(x-40) + \dfrac{7}{2}(x-20) + \dfrac{17}{9}(x-10)$
= 600
⇒ x = 100

∴ A's share $= ₹\ \dfrac{5}{2}(100-40)$

$= ₹\ 150$

15. (2) When A gets 100 paise, B gets 90 Paise
When B gets 100 paise, C gets 110 paise
∴ When B gets 90 paise, C gets

$\dfrac{110}{100} \times 90$ = 99 paise

∴ A : B : C = 100 : 90 : 99
Sum of the ratios
= 100 + 90 + 99 = 289

∴ B' share $= \left(\dfrac{90}{289} \times 86700 \right)$

$= ₹\ 27000$

16. (1) A : B = 2 : 3
B : C = 4 : 5
∴ A : B : C = 8 : 12 : 15

∴ B's share $= \dfrac{12}{35} \times 7000$

$= ₹\ 2400$

17. (3) Suppose amount received by men = 5x.
and amount received by women = 4x
According to question
5x + 4x = 180
⇒ 9x = 180 ⇒ x = 20
∴ Amount received by men
$= ₹\ 100$
Amount received by women= ₹ 80
Suppose the number of men be y and that of women be (66 − y).
According to question

$\dfrac{\dfrac{100}{y}}{\dfrac{80}{66-y}} = \dfrac{3}{2}$

$\Rightarrow \dfrac{100}{y} \times \dfrac{66-y}{80} = \dfrac{3}{2}$

$\Rightarrow \dfrac{5(66-y)}{4y} = \dfrac{3}{2}$

⇒ 660 − 10y = 12y
⇒ 22y = 660 ⇒ y = 30

18. (2) B's share

$= \dfrac{3}{(2+3+4)} \times 738$

$= \dfrac{3}{9} \times 738 = ₹\ 246$

19. (4) A × 0.5 = B × 0.6 = C × 0.75

$\Rightarrow \dfrac{A \times 5}{10} = \dfrac{B \times 6}{10} = C \times \dfrac{75}{100}$

$\Rightarrow \dfrac{A}{2} = \dfrac{B}{\dfrac{5}{3}} = \dfrac{C}{\dfrac{4}{3}}$

∴ A : B : C = $2 : \dfrac{5}{3} : \dfrac{4}{3}$

= 6 : 5 : 4
∴ C's share

$= \dfrac{4}{15} \times 1740 = ₹\ 464$

20. (2) Amount received by y
$= ₹\ 100$.
Amount received by x = ₹ 125.
Amount received by z

$= \dfrac{100 \times 100}{75} = ₹\ \dfrac{400}{3}$

∴ Required ratio

$= 125 : 100 : \dfrac{400}{3}$

= 5 : 4 : $\dfrac{16}{3}$ = 15 : 12 : 16

21. (2) B = C + 8
A = C + 8 + 7 = C + 15
∴ C + 15 + C + 8 + C = 53
⇒ 3C + 23 = 53
⇒ 3C = 53 − 23 = 30
⇒ C = ₹ 10
∴ B = C + 8 = 10 + 8 = ₹ 18
A = C + 15 = 10 + 15
= ₹ 25
∴ A : B : C = 25 : 18 : 10

22. (2) A : B = 2 : 3 = 8 : 12
B : C = 4 : 5 = 12 : 15
∴ A : B : C = 8 : 12 : 15
Sum of ratios = 35

∴ A's share $= \dfrac{8}{35} \times 700$

$= ₹\ 160$

B's share $= \dfrac{12}{35} \times 700$

$= ₹\ 240$

C's share $= \dfrac{15}{35} \times 700$

$= ₹\ 300$

23. (2) A : B : C $= \dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{4}$

$= \dfrac{1}{2} \times 12 : \dfrac{1}{3} \times 12 : \dfrac{1}{4} \times 12$

[LCM of 2, 3 and 4 = 12]
= 6 : 4 : 3

A's share $= \dfrac{6}{13} \times 2600$

$= ₹\ 1200$

B's share $= \dfrac{4}{13} \times 2600$

$= ₹\ 800$

C's share $= \dfrac{3}{13} \times 2600 = ₹\ 600$

24. (2) According to question,
P + Q + R = ₹ 300
Now, Q = P + 30
R = Q + 60
= P + 30 + 60 = P + 90
Hence, P + Q + R = ₹ 300
⇒ P + P + 30 + P + 90 = 300
⇒ 3P + 120 = 300

$\Rightarrow P = \dfrac{180}{3} = 60$

∴ Share of P = ₹ 60, Q = ₹ 90
R = ₹ 150
⇒ P : Q : R = 60 : 90 : 150
= 6 : 9 : 15
= 2 : 3 : 5 :

25. (3) $A \times \dfrac{1}{2} = B \times \dfrac{1}{3} = C \times \dfrac{1}{4}$

$\Rightarrow \dfrac{A}{2} = \dfrac{B}{3} = \dfrac{C}{4}$

$\therefore$ A : B : C = 2 : 3 : 4

$\therefore$ A $\Rightarrow \dfrac{2}{9} \times 900$ = ₹ 200

B $\Rightarrow \dfrac{3}{9} \times 900$ = ₹ 300

C $\Rightarrow \dfrac{4}{9} \times 900$ = ₹ 400

26. (3) A : B : C = 2 : 5 : 4
Sum of ratios = 2 + 5 + 4 = 11
Difference

$= \left(\dfrac{5}{11} - \dfrac{2}{11} \right) \times 126.50$

$= \dfrac{3}{11} \times 126.50$ = ₹ 34.50

27. (2) B's share = Rs. b
A's share = Rs. (b + 7)
C's Share = Rs.(b – 6)
$\therefore$ $b + b + 7 + b - 6 = 76$
$\Rightarrow 3b = 76 - 1 = 75$
$\Rightarrow b$ = Rs. 25
$\therefore$ A's share = 25 + 7 = Rs. 32
C's share = 25 – 6 = Rs. 19
$\therefore$ Required ratio = 32 : 25 : 19

28. (4) A = $\dfrac{1}{3}$ (B + C)

$\Rightarrow$ 3A = B + C ...(i)

B = $\dfrac{2}{3}$ (A + C)

$\Rightarrow$ 3B = 2A + 2C ...(ii)
From equation (i),
3A = B + C
$\Rightarrow$ 9A = 3B + 3C
$\Rightarrow$ 9A = 2A + 2C + 3C
$\Rightarrow$ 7A = 5C ...(iii)
From equation (ii),

3B = $2\left(\dfrac{5C}{7} \right)$ + 2C

$\Rightarrow$ 21B = 10C + 14C
$\Rightarrow$ 21B = 24C
$\Rightarrow$ 7B = 8C ...(iv)
From equations (iii) and (iv),

C = $\dfrac{7A}{5} = \dfrac{7B}{8}$

$\therefore \dfrac{A}{5} = \dfrac{B}{8} = \dfrac{C}{7}$

C's share = $\dfrac{7}{(5 + 8 + 7)} \times 3000$

= ₹ $\left(\dfrac{7}{20} \times 3000 \right)$ = ₹ 1050

29. (1) **Case I**

A : B : C = $\dfrac{1}{4}$: $\dfrac{1}{5}$: $\dfrac{1}{6}$

= $\dfrac{1}{4}$ × 60 : $\dfrac{1}{5}$ × 60 : $\dfrac{1}{6}$ × 60

[LCM of 4, 5 and 6 = 60]
= 15 : 12 : 10
Sum of ratios = 15 + 12 + 10
= 37

$\therefore$ C's share = $\dfrac{10}{37}$ × 555

= ₹ 150

Case II
A : B : C = 4 : 5 : 6
Sum of ratios = 4 + 5 + 6 = 15

$\therefore$ C's share = $\dfrac{6}{15}$ × 555

= ₹ 222
$\therefore$ Required answer
= ₹ (222 – 150) = ₹ 72

30. (1) Son : wife = 3 : 1 = 9 : 3
Wife : daughter = 3 : 1
$\therefore$ Son : wife : daughter
= 9 : 3 : 1
Sum of ratios = 9 + 3 + 1 = 13
If total wealth be ₹ x, then
Son's share – daughter's share
= ₹ 10,000

$\Rightarrow \dfrac{9x}{13} - \dfrac{x}{13} = 10,000$

$\Rightarrow \dfrac{9x - x}{13} = 10,000$

$\Rightarrow 8x = 13,00,00$

$\Rightarrow x = \dfrac{13,00,00}{8}$ = ₹ 16250

31. (2) A : B = 3 : 4
B : C = 3.5 : 3 = 7 : 6
$\therefore$ A : B : C = (3 × 7) : (4 × 7) : (4 × 6)
= 21 : 28 : 24
Sum of ratios = 21+28 + 24 = 73
$\therefore$ Difference between the shares of B and C

= $\left(\dfrac{28 - 24}{73} \right) \times 730$

= 4 × 10 = Rs. 40

32. (3) A : B : C : D = 7 : 6 : 3 : 5
Sum of ratios = 7+ 6 + 3 + 5 = 21
$\therefore$ Difference of shares of B and C
= Rs. 270
If the total amount be Rs. x, then

$\left(\dfrac{6 - 3}{21} \right)x$ = 270

$\Rightarrow 3x = 21 \times 270$

$\Rightarrow x = \dfrac{21 \times 270}{3}$ = Rs. 1890

$\therefore$ D's share = $\dfrac{5}{21}$ × 1890

= Rs. 450

33. (4) B's capital = Rs. x
$\therefore$ A's capital = Rs. 2x.
Ratio of equivalent capitals of A and B for 1 month

= $\left(2x \times 10 + \dfrac{3x}{2} \times 2 \right)$:

$\left(x \times 8 + \dfrac{x}{2} \times 4 \right)$

= (20x + 3x) : (8x + 2x)
= 23x : 10x = 23 : 10

34. (1) A's investment = Rs. 3x
B's investment = Rs. 5x
C's investment = Rs. 5x
Ratio of the equivalent capitals of A, B and C for 1 month
= (3x × 12) : (5x × 12) : (5x × 6)
= 36x : 60x : 30x
= 6 : 10 : 5

35. (3) Ratio of equivalent capitals of A, B and C for 1 month
= (16000 × 3 + 11000 × 9) : (12000 × 3 + 17000 × 9) : (21000 × 6)
= (48000 + 99000) : (36000 + 153000) : 126000
= 147000 : 189000 : 126000
= 49 : 63 : 42
= 7 : 9 : 6
Sum of ratios = 7 + 9 + 6 = 22
$\therefore$ Required difference

= Rs. $\left(\dfrac{9 - 6}{22} \times 26400 \right)$

= Rs. $\dfrac{3 \times 26400}{22}$ = Rs. 3600

36. (4) A : C = 2 : 1 = 6 : 3
A : B = 3 : 2 = 6 : 4
$\therefore$ A : B : C = 6 : 4 : 3
$\therefore$ Sum of the terms of ratio
= 6 + 4 + 3 = 13
$\therefore$ B's share

= Rs. $\left(\dfrac{4}{13} \times 157300 \right)$

= Rs. 48400

37. (1) Ratio = 8 : 4 : 7
Sum of the terms of ratio
= 8 + 4 + 7 = 19
$\therefore$ Share of 4 women

= Rs. $\left(\dfrac{7}{19} \times 380\right)$

= Rs.140

1 women's share = $\dfrac{140}{4}$

= Rs. 35

38. (2) Let the total amount be Rs. x.
It is given that,
A : B : C = 5 : 6 : 9
Sum of the terms of ratio
= 5 + 6 + 9 = 20

∴ A's share = Rs. $\dfrac{5x}{20}$

= Rs. $\dfrac{x}{4}$

∴ $\dfrac{x}{4}$ = Rs. 450

⇒ x = Rs. (4 × 450)
= Rs. 1800

39. (1) According to the question,

A = $\dfrac{B}{2}$ = 3C ⇒ $\dfrac{A}{1} = \dfrac{B}{2} = \dfrac{C}{\dfrac{1}{3}}$

∴ A : B : C = 1 : 2 : $\dfrac{1}{3}$

= 3 : 6 : 1
Sum of the terms of ratio
= 3 + 6 + 1 = 10

∴ C's share = Rs. $\left(\dfrac{1}{10} \times 490\right)$

= Rs. 49

40. (4) A : B = $\dfrac{1}{3}$: $\dfrac{1}{5}$ = 5 : 3

Sum of the terms of ratio
= 5 + 3 = 8
Total profit = Rs. 960

∴ Difference between their shares

= $\left(\dfrac{5}{8} - \dfrac{3}{8}\right)$ of 960

= $960 \times \dfrac{1}{4}$ = Rs. 240

41. (2) Let the shares of three brothers be Rs. a, Rs. b and Rs. c respectively.
According to the question,

$b = \dfrac{-5}{13}$ $(a + c)$

⇒ $\dfrac{13b}{5}$ = $a + c$ ..... (i)

∴ $a + b + c$ = 1620

⇒ $\dfrac{13b}{5} + b$ = 1620

⇒ $\dfrac{13b + 5b}{5}$ = 1620

⇒ 18b = 1620 × 5

⇒ $b = \dfrac{1620 \times 5}{18}$ = Rs. 450

42. (3) Let total amount be Rs. x.
According to the question,

$\dfrac{x}{2} + \dfrac{x}{3} + 1200 = x$

⇒ $x - \dfrac{x}{2} - \dfrac{x}{3}$ = 1200

⇒ $\dfrac{6x - 3x - 2x}{6}$ = 1200

⇒ $\dfrac{x}{6}$ = 1200 ⇒ x = 1200 × 6
= Rs. 7200

∴ A's share = Rs. $\left(\dfrac{7200}{2}\right)$

= Rs. 3600

43. (4) According to the question,
3A = 4B

⇒ $\dfrac{A}{4} = \dfrac{B}{3}$ ⇒ A : B = 4 : 3

B's capital is twice C's capital.

∴ $\dfrac{B}{C} = \dfrac{2}{1}$

B : C = 2 : 1
∴ A : B : C = 4 × 2 : 3 × 2 : 3 × 1
= 8 : 6 : 3

44. (1) A's share = $\dfrac{2}{9}$ of (B + C)'s

share

∴ (B + C)'s share = $\dfrac{9}{2}$ A's share

According to the question,

A + $\dfrac{9A}{2}$ = 770

⇒ $\dfrac{2A + 9A}{2}$ = 770

⇒ $\dfrac{11A}{2}$ = 770

⇒ A = $\dfrac{770 \times 2}{11}$ = Rs. 140

45. (2) According to the question,
A : B = 3 : 4
B : C = 3.5 : 3
= 7 : 6
∴ A : B : C
= 3 × 7 : 4 × 7 : 4 × 6
= 21 : 28 : 24

Sum of the terms of ratio
= 21 + 28 + 24 = 73
∴ Difference between the shares of B and C

= Rs. $\left(\dfrac{28 - 24}{73}\right) \times 730$

= Rs. 40

46. (3) Ratio of the equivalent capitals of A and B for 1 month
= (4000 × 8 + 6000 × 4) : (5000 × 9 + 3000 × 3)
= (32000 + 24000) : (45000 + 9000)
= 56000 : 54000 = 28 : 27
Sum of the terms of ratio
= 28 + 27 = 55
A is an active partner.
Allowance got by A in 1 year
= Rs. 1200
Remaining profit
= Rs. (6700 − 1200) = Rs. 5500

∴ B's share = Rs.$\left(\dfrac{27}{55} \times 5500\right)$

= Rs. 2700

47. (3) According to the question,
Amount to be distributed in the ratio 7 : 10 : 13
= Rs. (15525 − 22 − 35 − 45)
= Rs. 15420
Sum of the terms of ratio
= 7 + 10 + 13 = 30

Sunil's share= Rs. $\left(\dfrac{7}{30} \times 15420\right)$

= Rs. 3598
Anil's share

= Rs. $\left(\dfrac{10}{30} \times 15420\right)$

= Rs. 5140
Jamil's share

= Rs. $\left(\dfrac{13}{30} \times 15420\right)$

= Rs. 6682
Ratio after respective increase in each share
= (3598 + 22 + 16) : (5140 + 35 + 77) : (6682 + 48 + 37)
= 3636 : 5252 : 6767
= 36 : 52 : 67

48. (1) According to the question,

$\dfrac{A}{2} = \dfrac{B}{3} = \dfrac{C}{6}$

∴ A : B : C = 2 : 3 : 6
Sum of the terms of ratio
= 2 + 3 + 6 = 11
Total amount = Rs. 1980

∴ B's share = Rs. $\left(\dfrac{3}{11} \times 1980\right)$

= Rs. 450

49. (1) Ratio of the equivalent capitals of A, B and C for 1 month

= 13000 × 12 : 17000 × 12 : 5000 × 12

= 13 : 17 : 5

Sum of the terms of ratio

= 13 + 17 + 5 = 35

Total profit = Rs. 1400

∴ B's share = Rs. $\left(\dfrac{17}{35} \times 1400\right)$

= Rs. 680

50. (1) According to the question,

A + B + C = 600 .... (i)

and

$\dfrac{2A}{5} + 40 = \dfrac{2B}{7} + 20$

$= \dfrac{9C}{17} + 10$

∴ $\dfrac{2A}{5} + 40 = \dfrac{2B}{7} + 20$

$= \dfrac{2A}{5} + 20 = \dfrac{2}{7}B$

∴ B $= \dfrac{7}{2}\left(\dfrac{2A}{5} + 20\right) = \dfrac{7A}{5} + 70$

Again, $\dfrac{2A}{5} + 40 = \dfrac{9C}{17} + 10$

$\Rightarrow \dfrac{9C}{17} = \dfrac{2A}{5} + 30$

$\Rightarrow$ C $= \dfrac{17}{9}\left(\dfrac{2A}{5} + 30\right)$

$= \dfrac{34A}{45} + \dfrac{170}{3}$

∴ A $+ \dfrac{7A}{5} + 70 + \dfrac{34A}{45} + \dfrac{170}{3}$ = 600

$\Rightarrow$ A $+ \dfrac{7A}{5} + \dfrac{34A}{45} = 600 - 70 - \dfrac{170}{3}$

$\Rightarrow \dfrac{45A + 63A + 34A}{45}$

$= 530 - \dfrac{170}{3}$

$\Rightarrow \dfrac{142A}{45} = \dfrac{1590 - 170}{3} = \dfrac{1420}{3}$

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

TYPE-XII

1. (3) Let interior angle = I and exterior angle = E

According to questions,

$\dfrac{I}{E} = \dfrac{2}{1} \Rightarrow 2E = I.1$ or, E $= \dfrac{I}{2}$

But I + E = 180°

$I + \dfrac{I}{2} = 180$

$\dfrac{3}{2}I = 180$

$I = \dfrac{2}{3} \times 180$

I = 120°

We know that each interior angle of a regular polygon of n sides is given by

$I = \dfrac{n-2}{n} \times 180°$

$120° = \dfrac{n-2}{n} \times 180°$

$\Rightarrow \dfrac{n-2}{n} = \dfrac{120°}{180°} = \dfrac{2}{3}$

$\Rightarrow 3n - 6 = 2n \Rightarrow n = 6$

2. (3) Required answer

$\dfrac{6-x}{7-x} < \dfrac{16}{21}$

Check through options

$= \dfrac{6-3}{7-3} = \dfrac{3}{4} < \dfrac{16}{21}$

3. (3) Let the numbers be 17x and 45x respectively.

According to the question,

$\dfrac{1}{5}$ of 45x $- \dfrac{1}{3}$ of 17x = 15

$\Rightarrow 9x - \dfrac{17x}{3} = 15$

$\Rightarrow \dfrac{27x - 17x}{3} = 15$

$\Rightarrow 10x = 15 \times 3$

$\Rightarrow$ x $= \dfrac{15 \times 3}{10} = \dfrac{9}{2}$

∴ The required number

$= 17x = \dfrac{17 \times 9}{2} = \dfrac{153}{2} = 76\dfrac{1}{2}$

4. (1) Price of the third variety = x per kg.

∴ 126 + 135 + 2x = 4 × 153

$\Rightarrow$ 261 + 2x = 612

$\Rightarrow$ 2x = 612 - 261 = 351

$\Rightarrow$ x $= \dfrac{351}{2}$ = ₹ 175.5

5. (4) Given ratio is total members : absentees = 5 : 3 i.e. $\dfrac{3}{5}$

Hence, Number of persons absent

$= \dfrac{3}{5} \times 15 = 9$

6. (3) **Case I,**

P : Q : R $= \dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{4}$

= 6 : 4 : 3

Case II,

P : Q : R = 2 : 3 : 4

Clearly, R will gain.

7. (1) Ratio of first and second class fares = 3 : 1

Ratio of number of passengers = 1 : 50

∴ Ratio of total amount

= 3 × 1 : 1 × 50 = 3 : 50

∴ Amount collected from second class passengers

$= ₹ \left(\dfrac{50}{53} \times 1325\right)$ = ₹ 1250

8. (1) A : B = 3 : 2 = 9 : 6

B : C = 3 : 2 = 6 : 4

∴ A : B : C = 9 : 6 : 4

Total runs = 361

∴ Number of runs scored by A

$= \dfrac{9}{(9+6+4)} \times 361$

$= \dfrac{9}{19} \times 361 = 171$

9. (1) Let the number of failures = 4x and that of passers = 25 x

∴ Total number of students = 4x + 25x = 29 x

In case II

Number of students = 29x + 5

Number of failures = 4 x – 2

∴ Number of passers

= 29x + 5 – 4x + 2 = 25x +7

∴ According to the question,

$\dfrac{25x + 7}{4x - 2} = \dfrac{22}{3}$

$\Rightarrow$ 88x – 44 = 75x +21

$\Rightarrow$ 88x –75x = 44 +21

$\Rightarrow$ 13x = 65

$\Rightarrow$ x $= \dfrac{65}{13}$ = 5

∴ Total number of students

= 29x = 29 × 5 = 145

10. (1) Sachin : Sourav = 3 : 2
Sourav : Vinod = 3 : 2
Ratio of the runs scored by Sachin, Sourav and Vinod respectively = $3 \times 3 : 2 \times 3 : 2 \times 2$
= 9 : 6 : 4
∴ Runs scored by Sachin
= $\dfrac{9}{19} \times 285 = 135$

11. (3) According to the question,
E + M = 170 ....(i)
E – M = 10 ....(ii)
Adding both the equations,
2E = 180 ⇒ E = 90
From equation (i),
M = 170 – 90 = 80
∴ $\dfrac{E}{M} = \dfrac{9}{8} = 9 : 8$

12. (2) Let the initial weights of Mr. Gupta and Mrs. Gupta be $7x$ and $8x$ kg respectively.
∴ $7x + 8x = 120$
⇒ $15x = 120$
⇒ $x = \dfrac{120}{15} = 8$
∴ Mr. Gupta's weight = 7×8
= 56 kg
Mrs. Gupta's weight
= $8 \times 8 = 64$ kg
Let Mrs. Gupta reduce her weight by y kg.
∴ $\dfrac{56 - 6}{64 - y} = \dfrac{5}{6}$
⇒ $\dfrac{50}{64 - y} = \dfrac{5}{6}$
⇒ $64 - y = 60$
⇒ $y = 64 - 60 = 4$ kg

13. (4) Let the original number of boys and girls be $5x$ and $3x$ respectively and that of new boys and girls be $5y$ and $7y$ respectively.
∴ $5x + 3x + 5y + 7y = 1200$
⇒ $2x + 3y = 300$ ....(i)
and, $\dfrac{5x + 5y}{3x + 7y} = \dfrac{7}{5}$
⇒ $25x + 25y = 21x + 49y$
⇒ $4x = 24y$
⇒ $x = 6y$ .... (ii)
From equation (i),
$4x + 6y = 600$
⇒ $5x = 600 \Rightarrow x = 120$
∴ Original number of students
= $8x = 960$

14. (3) CP of refrigerator = ₹ $5x$
CP of television = ₹ $3x$
∴ $2x = 5500$
⇒ $x = \dfrac{5500}{2} = 2750$
∴ CP of refrigerator
= $5 \times 2750 = ₹\ 13750$

15. (3) According to question,
Son : Daughter : Nephew
= 5x : 4x : x
But 5 sons : 4 daughters : 2 nephews
= 25x : 16x : 2x
and 25x + 16x + 2x = ₹ 8600
43x = ₹ 8600
x = ₹ 200
∴ Required answer
= $4 \times 200 = ₹\ 800$

16. (2) A + B = 158
C = 158 – 101 = 57
Also B = 57 + 23 = 80
∴ The amount with A
= ₹ (158 – 80) = ₹ 78

17. (1) L = N + 5.72
M = L + 2.24
= N + 5.72 + 2.24
M = N + 7.96
L + M + N = 340.68
N + 5.72 + N + 7.96 + N
= 340.68 ⇒ 3N = 327
⇒ N = $\dfrac{327}{3}$ = ₹ 109

18. (4) Ratio of the first and second class fares (total)
= $1 \times 4 : 1 \times 40$
= 4 : 40 = 1 : 10
∴ Amount collected from the first class passengers
= $\dfrac{1}{11} \times 1100 = ₹100$

19. (3) Time taken is inversely proportional to relevant speeds.
∴ Required ratio = $\dfrac{1}{4} : \dfrac{1}{3} : \dfrac{1}{5}$
= $\dfrac{1}{4} \times 60 : \dfrac{1}{3} \times 60 : \dfrac{1}{5} \times 60$
= 15 : 20 : 12

20. (3) let the numbers be x and y where $x > y$.
∴ $x - \dfrac{y}{2} = 5\left(y - \dfrac{y}{2}\right) = \dfrac{5y}{2}$
⇒ $x = \dfrac{y}{2} + \dfrac{5y}{2} = 3y \Rightarrow \dfrac{x}{y} = \dfrac{3}{1}$

21. (2) Let the number of shirts of brand B be x.
Let the cost of a shirt of brand B be ₹ 1.
∴ Original cost = $4 \times 2 + x$
= ₹ (8 + x)
In case II,
$4 + 2x = (8 + x) \times \dfrac{140}{100} = (8 + x)\dfrac{7}{5}$
⇒ $20 + 10x = 56 + 7x$
⇒ $10x - 7x = 56 - 20 = 36$
⇒ $3x = 36 \Rightarrow x = 12$
∴ Required ratio
= 4 : 12 = 1 : 3

22. (1) Total students
= $6x + x = 7x$
∴ $\dfrac{6x + 6}{x - 6} = \dfrac{9}{1}$
⇒ $6x + 6 = 9x - 54$
⇒ $9x - 6x = 54 + 6 = 60$
⇒ $3x = 60 \Rightarrow x = 20$
∴ Total number of students
= $7 \times 20 = 140$

23. (4) Weight of paper bundles
= $\left(\dfrac{22}{25} \times 36\right)$ kg
= $\left(\dfrac{22 \times 36 \times 1000}{25}\right)$ gm
= 31680 gm

24. (2) Numbers = $3x$ and $4x$
∴ $(4x)^2 = 8 \times (3x)^2 - 224$
⇒ $16x^2 = 72x^2 - 224$
⇒ $72x^2 - 16x^2 = 224$
⇒ $56x^2 = 224 \Rightarrow x^2 = \dfrac{224}{56} = 4$
⇒ $x = \sqrt{4} = 2$
∴ Numbers = 6 and 8

25. (2) If boys = x and girls = y, then
$y \times \dfrac{10}{100} = \dfrac{x}{20} \Rightarrow \dfrac{y}{10} = \dfrac{x}{20}$
⇒ $\dfrac{x}{y} = \dfrac{20}{10} = \dfrac{2}{1} = 2 : 1$

26. (3) 5 steps of policeman = 7 steps of thief
∴ 8 steps of policeman = $\dfrac{7}{5} \times 8$
= $\dfrac{56}{5}$ steps of thief
∴ Required ratio = $\dfrac{56}{5} : 10$
= 56 : 50
= 28 : 25

27. (3) Marks obtained by A in English = $2x$ (let)

Marks obtained in Maths = $3x$

Marks obtained in Science = x

According to the question,

$2x + 3x + x = 180$

$\Rightarrow 6x = 180$

$\Rightarrow x = \dfrac{180}{6} = 30$

= Marks obtained in science

28. (4) 7 jumps of Tom ≡ 5 jumps of Jerry

$\therefore$ 8 jumps of Tom ≡ $\dfrac{5}{7} \times 8$

$= \dfrac{40}{7}$ jumps of Jerry

$\therefore$ Required ratio = $\dfrac{40}{7} : 6$

$= 40 : 42 = 20 : 21$

29. (1) Story books ⇒ 1512

Other books ⇒ $\dfrac{2}{7} \times 1512$

$= 432$

Additional story books = x

$\therefore \quad \dfrac{1512 + x}{432} = \dfrac{15}{4}$

$\Rightarrow 6048 + 4x = 432 \times 15 = 6480$

$\Rightarrow 4x = 6480 - 6048 = 432$

$\Rightarrow x = \dfrac{432}{4} = 108$

30. (2) Time taken by P in covering 300 metre

$= \dfrac{300}{3} = 100$ seconds

Distance covered by Q in 100 seconds

$= 5 \times 100 = 500$ metre

So, both reach at the same time.

31. (1) In the school,

Boys ⇒ $\dfrac{4}{7} \times 1554 = 888$

Girls ⇒ $\dfrac{3}{7} \times 1554 = 666$

After 30 days,

Girls = 666 + 30 = 696

If x boys leave the school, then,

According to the question,

$\dfrac{888 - x}{696} = \dfrac{7}{6}$

$\Rightarrow \dfrac{888 - x}{116} = 7$

$\Rightarrow 888 - x = 116 \times 7 = 812$

$\Rightarrow x = 888 - 812 = 76$

32. (2) $\dfrac{r_1}{r_2} = \dfrac{2}{3}$ and $\dfrac{h_1}{h_2} = \dfrac{5}{3}$

$\therefore$ Ratio of volumes of cylinders

$= \dfrac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$

$= \left(\dfrac{r_1}{r_2}\right)^2 \times \dfrac{h_1}{h_2}$

$= \left(\dfrac{2}{3}\right)^2 \times \dfrac{5}{3} = \dfrac{20}{27}$

33. (3) Tickets of type A ⇒ $3x$

Tickets of type B ⇒ $2x$

Tickets of type C ⇒ $5x$

According to the question,

$(3x \times 1000 + 2x \times 500 + 5x \times 200)$

$= 2.5 \times 10000000$

$\Rightarrow 30x + 10x + 10x = 250000$

$\Rightarrow 50x = 250000$

$\Rightarrow x = 5000$

Total number of tickets sold = $10x$

$= 10 \times 5000 = 50000$

34. (2) Total working hours of office = From 10 a.m. to 5 p.m.

= 7 hours

Lunch interval = 30 minutes

$\therefore$ Required ratio = 30 minutes : 7 hours

= 30 minutes : (7 × 60) minutes

= 1 : 14

35. (3) Ratio of the railway fares of airconditioned and ordinary sleeper classes = 4 : 1

Ratio of the corresponding number of passengers = 3 : 25

Corresponding compound ratio = $4 \times 3 : 1 \times 25$

= 12 : 25

Sum of the terms of ratio

= 12 + 25 = 37

$\therefore$ Total fare of the passengers of airconditioned sleeper classes = Rs. $\left(\dfrac{12}{37} \times 37000\right)$

= Rs. 12000

36. (1) According to the question,

$\dfrac{(x - 1)(x + 1)}{(x + 1)(x + 2)} = \dfrac{5}{6}$

$\Rightarrow \dfrac{x - 1}{x + 2} = \dfrac{5}{6}$

$\Rightarrow 6x - 6 = 5x + 10$

$\Rightarrow 6x - 5x = 10 + 6$

$\Rightarrow x = 16$

37. (4) Let the C.P. be Rs. $4x$.

Its S.P. = Rs. $5x$.

Profit = Rs. $(5x - 4x)$ = Rs. x.

$\therefore$ Profit per cent = $\dfrac{x}{4x} \times 100$

= 25%

38. (3) Let the C.P. of article be Rs. x and marked price be Rs. y.

According to the question,

80% of y = 115% of x

$\Rightarrow y \times \dfrac{80}{100} = \dfrac{x \times 115}{100}$

$\Rightarrow 80y = 115x$

$\Rightarrow \dfrac{x}{y} = \dfrac{80}{115} = \dfrac{16}{23}$

39. (3) Rate of working

$\times \dfrac{1}{\text{Time taken}}$

$\therefore$ Ratio of days taken

$= \dfrac{1}{2} : \dfrac{1}{3} = 3 : 2$

40. (1) In selection process,

Selected candidates = $3x$

Unselected candidates = x

According to the question,

In case II,

Total applicants = $4x - 80$

Selected candidates = $3x - 40$

Unselected candidates

$= (4x - 80) - (3x - 40)$

$= 4x - 80 - 3x + 40$

$= x - 40$

$\therefore \dfrac{3x - 40}{x - 40} = \dfrac{4}{1}$

$\Rightarrow 4x - 160 = 3x - 40$

$\Rightarrow 4x - 3x = 160 - 40$

$\Rightarrow x = 120$

$\therefore$ Required total applicants

$= 4x = 4 \times 120 = 480$

41. (1) Let the number of the selected candidates be $4x$

Unselected candidates = x

According to the question,

Total new applicants = $5x - 90$

Selected candidates = $4x - 20$

Unselected candidates

$= 5x - 90 - 4x + 20$

$= x - 70$

$\therefore \dfrac{4x - 20}{x - 70} = \dfrac{5}{1}$

$\Rightarrow 5x - 350 = 4x - 20$

$\Rightarrow 5x - 4x = 350 - 20$

$\Rightarrow x = 330$

$\therefore$ Required number of total original applicants

$= 5x = 5 \times 330 = 1650$

❑❑❑