Chapter - 4

Ratio, Proportion and Partnership

Foundation

Solutions

1. (d); Let present ages of Ramu and Somu be R and S respectively.

$$(R-1) : (S-1) \Leftrightarrow 6:7$$

One year ago →   ↑   :   ↑

        R   :   S

        ↓   :   ↓ Four years hence

$$(R+4) : (S+4) \Leftrightarrow 7:8$$

$$\dfrac{R-1}{S-1} = \dfrac{6}{7} \quad \bigg| \quad \dfrac{R+4}{S+4} = \dfrac{7}{8}$$

$$7R - 7 = 6S - 6 \quad \big| \quad 8R + 32 = 7S + 28$$

$$7R - 6S = 1 \quad\quad\quad\big| \quad 8R - 7S = -4$$

$7R - 6S = 1$ ... (i)

$8R - 7S = -4$ ... (ii)

Multiplying equation (i) by 8 and equation (ii) by 7, we get →

$56R - 48S = 8$ ... (iii)

$56R - 49S = -28$ ... (iv)

Subtract (iv) from (iii) : S = 36 years

Shortcut:

One year ago → $R : S \Leftrightarrow 6 : 7 \Rightarrow S = 7$

Only option (d) has a number from which, if we subtract '1', we get a number divisible by 7.

2. (b); 33% of A = $\dfrac{33 \times A}{100} = \dfrac{55 \times B}{100}$ = 55% of B

$$= \dfrac{33 \times A}{100} = \dfrac{55 \times B}{100} \Rightarrow \dfrac{A}{B} = \dfrac{55}{33}$$

$$A : B \Leftrightarrow 5 : 3$$

3. (a); 68% of two fifth of 550

$$= \dfrac{68 \times \left(\dfrac{2}{5} \times 550 \right)}{100} = \dfrac{68 \times 220}{100} = \dfrac{748}{5} = 149.6$$

4. (c); Let, number is 'n'

$$\left(\dfrac{45n}{100} \right) - 24 = 48 \Rightarrow \dfrac{9n}{20} - 24 = 48$$

$$9n - 480 = 48 \times 20 \Rightarrow 9n = 960 + 480$$

$$n = \dfrac{1440}{9} = 160 \Rightarrow \dfrac{3}{8}n = \dfrac{3}{8} \times 160 = 60$$

5. (a); 30% of the number = 190.8

1% of that number = $\dfrac{190.8}{30}$

175% of the number = $\dfrac{1908}{300} \times 175 = 159 \times 7 = 1113$

6. (c); $\dfrac{3}{8} \times 1000 = 375 \Rightarrow$ 32% of $\left(\dfrac{3}{8} \text{th of } 1000 \right)$

$$= 32\% \text{ of } 375 = \dfrac{32 \times 375}{100} = 120$$

7. (c); Let the third number be n.

20% more than n = $n + \dfrac{n}{5} = \dfrac{6n}{5}$

50% more than n = $n + \dfrac{n}{2} = \dfrac{3n}{2}$

Ratio of $\dfrac{6n}{5}$ and $\dfrac{3n}{2} \Rightarrow \dfrac{6n}{5} \times \dfrac{2}{3n} = 4 : 5$

Shortcut

Let the third number be 100

Then the two numbers are,

20% more and 50% more

    ⇓   ⇓

  120   150

Ratio = 120 : 150 = 4 : 5

8. (c); $A : B : C : D \Rightarrow 5 : 2 : 4 : 3$

$\Rightarrow$ C gets 1 unit more than D.

Given, C gets Rs. 1000 more than D.

$\Rightarrow$ 1 unit = Rs, 1000 $\Rightarrow$ B's share = 2 units

$= 2 \times 1000 = $ Rs. 2000

9. (b); 0.75 : x :: 5 : 8

$$\dfrac{0.75}{x} = \dfrac{5}{8} \Rightarrow 5x = 6.00 \Rightarrow x = 1.2$$

Shortcut

$0.75 : x :: 5 : 8 \Rightarrow 0.75 \to 5 \Rightarrow 1 \to 0.15 \Rightarrow 8 \to 1.20$

10. (b); Three numbers = I, II, III

I + II + III = 98, I : II → 2 : 3, II : III → 5 : 8

$10 : 15 \Leftarrow (2 : 3) \times 5 \leftarrow (I : II) \times 5$

$15 : 24 \Leftarrow (5 : 8) \times 3 \leftarrow (II : III) \times 3$

I : II : III, 10 : 15 : 24, 10 + 15 + 24 = 49

Given I + II + III = 98, 98 ÷ 49 = 2

$\Rightarrow$ 1 unit = 2

$\Rightarrow$ Second number = 15 × 2 = 30

11. (c); $\dfrac{1}{2} : \dfrac{2}{3} : \dfrac{3}{4}$

L.C.M. of 2, 3 and 4 = 12

On multiplying by a number throughout, the ratio remains same. Here, we multiply by 12.

$$\dfrac{1}{2} \times 12 : \dfrac{2}{3} \times 12 : \dfrac{3}{4} \times 12$$

$6 : 8 : 9 \Rightarrow 6 + 8 + 9 = 23$

23 units = 872 $\Rightarrow$ 1 unit = 37.91

$\Rightarrow$ 1st part = 6 units = 6 × 37.91 = 227.46

12. (b); Fourth proportional to 5, 8, 15

    5 : 8 :: 15 : ?

    $\dfrac{5}{8} = \dfrac{15}{x} \Rightarrow x = 24$

    Shortcut

    $5 \xrightarrow{\times 3} 15$

    $8 \xrightarrow[\times 3]{} 24$

13. (b); Let the two numbers be a and b

    $\dfrac{a}{b} = \dfrac{3}{5} \Rightarrow 5a = 3b$ ... (i)

    $\dfrac{a-9}{b-9} = \dfrac{12}{23} \Rightarrow 23a - 207 = 12b - 108$

    $\Rightarrow 23a - 12b = 99$ ... (ii)

    $b = \dfrac{5a}{3}$ From (i)   ... (iii)

    Using (ii) and (iii)

    $23a - 12 \times \dfrac{5a}{3} = 99 \Rightarrow 3a = 99 \Rightarrow a = 33$

    Shortcut

    Given = Two numbers are in the ratio

         = 3 : 5

           ↓

    Smaller number must be a multiple of 3

    Only options (a) and (b) have '3' as a factor.

    Given : On subtracting 9 from each, the two numbers are in the ratio 12 : 23

    On subtracting 9 from 27 → option (a),

    We get 18, but the ratio becomes 12 : 23,

    So, option (a) → discarded.

    On subtracting 9 from 33 → option (b),

    We get 24

          ↓

    multiple of 12.

14. (d); Let the two numbers be a and b.

    $a - (40\% \text{ of } a) = \dfrac{2}{3}b$

    $a - \dfrac{40a}{100} = \dfrac{2}{3}b \Rightarrow \dfrac{60a}{100} = \dfrac{2}{3}b$

    $\dfrac{b}{a} = \dfrac{60 \times 3}{2 \times 100} = \dfrac{9}{10}$

    $\Rightarrow$ Ratio of the second number to the first number = 9 : 10

15. (c); $\dfrac{5a + 3b}{2a - 3b} = \dfrac{23}{5}$

    Dividing numerator and denominator by 'b'

    $\dfrac{5\left(\dfrac{a}{b}\right) + 3}{2\left(\dfrac{a}{b}\right) - 3} = \dfrac{23}{5}$

    Let $\dfrac{a}{b} = x \Rightarrow \dfrac{5x + 3}{2x - 3} = \dfrac{23}{5}$

    $25x + 15 = 46x - 69 \Rightarrow 21x = 84$

    $x = 4 \Rightarrow \dfrac{a}{b} = 4 \Rightarrow a : b \Leftrightarrow 4 : 1$

16. (c); P : Q = 8 : 15

    P : Q : R = ?

    Q : R = 3 : 2) × 5 $\Rightarrow$ Q : R = 15 : 10

    P : Q = 8 : 15 $\Rightarrow$ 15 : 10 = Q : R

    P : Q : R = 8 : 15 : 10

17. (a); P : Q = 8 : 15   ... (i)

    Q : R = 5 : 8) × 3 $\Rightarrow$ Q : R = 15 : 24   ... (ii)

    From (1) and (2)

    P : Q : R = 8 : 15 : 24   ... (iii)

    R : S = 4 : 5) × 6 $\Rightarrow$ R : S $\Leftrightarrow$ 24 : 30   ... (iv)

    P : Q : R = 8 : 15 : 24 $\Rightarrow$ 24 : 30 = R : S

    P : Q : R : S = 8 : 15 : 24 : 30 $\Rightarrow$ P : S = 8 : 30 = 4 : 15

18. (a); Let the fourth proportional to 4, 16, 7 be x.

    4 : 16 :: 7 : x

    $\dfrac{4}{16} = \dfrac{7}{x} \Rightarrow 4x = 16 \times 7 \Rightarrow x = 4 \times 7 = 28$

19. (b); Let the mean proportion be = r.

    $9 : r :: r : 64 \Rightarrow \dfrac{9}{r} = \dfrac{r}{64}$

    $r^2 = 9 \times 64 \Rightarrow r = 3 \times 8 = 24$

20. (a); Duplicate ratio = ratio of squares

    Duplicate ratio of

    $2 : 7 = 2^2 : 7^2 = 4 : 49$

21. (c); Sub-duplicate ratio = ratio of square roots

    Sub-duplicate ratio of

    $81 : 64 = \sqrt{81} : \sqrt{64} = 9 : 8$

22. (b); Triplicate ratio = Ratio of cubes.

    Triplicate ratio of

    $7 : 5 = 7^3 : 5^3 = 343 : 125$

23. (a); Inverse ratio of 17 : 19 = 19 : 17

24. (b); Compound ratio of = 2 : 7, 5 : 3 and 4 : 7 will be

    $2 \times 5 \times 4 : 7 \times 3 \times 7 = 40 : 147$

25. (d); B : C = 8 : 9

    A : B = 3 : 4) × 2 $\Rightarrow$ A : B = 6 : 8

    8 : 9 = B : C $\Rightarrow$ A : B : C = 6 : 8 : 9

26. (d); $a : b = 3 : 5) \times 4 \Rightarrow a : b = 12 : 20$
    $b : c = 4 : 7) \times 5 \Rightarrow b : c = 20 : 35$
    $\Rightarrow a : b : c = 12 : 20 : 35 \Rightarrow a : c = 12 : 35$

27. (a); $P : Q : R = 2 : 3 : 4$
    $P \rightarrow 2, \ Q \rightarrow 3, \ R \rightarrow 4$

    $\dfrac{P}{Q} = \dfrac{2}{3}, \dfrac{Q}{R} = \dfrac{3}{4}, \dfrac{R}{P} = \dfrac{4}{2}$

    $\dfrac{P}{Q} : \dfrac{Q}{R} : \dfrac{R}{P} = \dfrac{2}{3} : \dfrac{3}{4} : \dfrac{4}{2} = \left(\dfrac{2}{3} : \dfrac{3}{4} : \dfrac{4}{2}\right) \times 12 = 8 : 9 : 24$

28. (a); $\dfrac{a}{3} = \dfrac{b}{8} \Rightarrow \dfrac{a}{b} = \dfrac{3}{8}$

    $a \rightarrow 3, \ b \rightarrow 8, \ a + 3 \rightarrow 6$

    $b + 8 \rightarrow 16 \Rightarrow \dfrac{a+3}{b+8} = \dfrac{6}{16} = \dfrac{3}{8}$

29. (a); $4^3 : 2^5 = ?$

    $= (2^2)^3 : 2^5$

    $= 2^6 : 2^5 = \dfrac{2^6}{2^5} \Rightarrow 2 : 1$

30. (b); $2 : x :: 5 : 7$

    $\dfrac{2}{x} = \dfrac{5}{7}, x = \dfrac{2 \times 7}{5} \Rightarrow x = 2.80$

31. (c); Ratio of salaries $\rightarrow A : B : C = 2 : 3 : 5$
    $A \rightarrow 2x, \ B \rightarrow 3x, \ C \rightarrow 5x$

    $A + 15\% \text{ of } A = 2x + \dfrac{15 \times 2x}{100} = \dfrac{46x}{20}$

    $B + 10\% \text{ of } B = 3x + \dfrac{3x \times 10}{100} = \dfrac{33x}{10}$

    $C + 20\% \text{ of } C = 5x + \dfrac{5x \times 20}{100} = 6x$

    New ratio of their salaries

    $A : B : C = \dfrac{46x}{20} : \dfrac{33x}{10} : 6x$

    ↓   Multiply by 20
    $46x : 66x : 120x \Rightarrow 23x : 33x : 60x \Rightarrow 23 : 33 : 60$
    Shortcut
    Ratio of salaries of A, B and C $\rightarrow 2 : 3 : 5$
    Let the salaries be

    | 200 | 300 | 500 |
    | ↓ 15% ↑ | ↓ 10% ↑ | ↓ 20% ↑ |
    | 230 | 330 | 600 |

    New ratio = $230 : 330 : 600 = 23 : 33 : 60$

32. (d);
    $\underline{782}$
    ↙ ↓ ↘
    $\dfrac{1}{2} : \dfrac{2}{3} : \dfrac{3}{4}$

    L.C. M. of 2, 3 and 4 = 12

    $\left(\dfrac{1}{2} : \dfrac{2}{3} : \dfrac{3}{4}\right) \times 12 \Rightarrow 6 : 8 : 9 \Rightarrow 6 + 8 + 9 = 23$

    23 units = 782 $\Rightarrow$ 1 unit = $\dfrac{782}{23} = 34$

    First part = 6 units = $6 \times 34 = 204$

33. (c); Let the two numbers be a and b
    $a : b = 1 : 2$

    $\dfrac{a}{b} = \dfrac{1}{2} \Rightarrow 2a = b$ ... (i)

    $\dfrac{a+7}{b+7} = \dfrac{3}{5} \Rightarrow 5a + 35 = 3b + 21$ ... (ii)

    From (i) and (ii)
    $5a + 35 = 3 \times 2a + 21 \Rightarrow 5a + 35 = 6a + 21$
    $a = 14$
    Greatest number = $b = 2a = 28$
    Shortcut:
    On adding 7 to both, ratio changes to 3 : 5
    $\Rightarrow$ On adding 7 to the greatest number, the
    resulting number must be a multiple of 5
    only option (c) has the number 28, in which, if we
    add 7, we get 35, which is a multiple of 5.
    $3 : 5 :: ? : 35$
    ↓
    21
    $\Rightarrow$ Smaller number = 21 – 7 = 14
    $14 : 28 = 1 : 2$

34. (c); Ratio of 3 numbers is 3 : 4 : 5
    Let the numbers be 3x, 4x, 5x
    Sum of their squares = 1250
    $9x^2 + 16x^2 + 25x^2 = 1250 \Rightarrow 50x^2 = 1250$
    $x^2 = 25 \Rightarrow x = 5 \Rightarrow 3x + 4x + 5x = 12x = 60$

35. (c); Let age of Sachin = S
    Age of Rahul = R
    $S = R - 4$ ... (i)

    $\dfrac{S}{R} = \dfrac{7}{9} \Rightarrow 9S = 7R$ ... (ii)

    From (1)
    $9S = 9R - 36 \Rightarrow 9S = 7R \Rightarrow 7R = 9R - 36$
    $2R = 36 \Rightarrow R = 18$
    Age of Sachin = S = R – 4 = 18 – 4 = 14 years

Shortcut:

Sachin   :   Rahul

  S   :   R

  7   :   9

Difference = 2 units = 4 years

$\Rightarrow$ 1 unit = 2 years

Sachin's age = 7 units = 7 × 2 = 14 years

36. (b); Arun : Deepak

A : D = 4 : 3

Let A = 4x $\Rightarrow$ D = 3x

After 6 years, Arun's age = 4x + 6

Deepak's age = 3x + 6

4x + 6 = 26 (given)

4x = 20 $\Rightarrow$ x = 5

Deepak's present age = 3x = 3 × 5 = 15 years.

Shortcut

After 6 years, Arun's age will be 26 years.

$\Rightarrow$ Present age of Arun = 20 years

Ratio of present ages = Arun : Deepak

                   4   :   3

               ↓× 5   ↓× 5

           20 years   15 years

37. (a); Present Ages $\Rightarrow$ X : Y

                    5 : 6

Let the ages be 5x and 6x

          ↓   ↓ 7 yrs. hence

        5x + 7 6x + 7

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

$\Rightarrow$ 35x + 49 = 36x + 42 $\Rightarrow$ x = 7

X's present age = 5x = 5 × 7 = 35 years.

Shortcut

Present ages   5   :   6

             ↓+ 1   ↓+ 1 = 1unit = 7

After 7 years   6   :   7

$\Rightarrow$ X's present age = 7 × 5 = 35 years

38. (a); Ratio of present ages $\rightarrow$ Sameer : Anand

                             5   :   4

Let present ages be 5x and 4x

Three years hence $\rightarrow$ (5x + 3) and (4x + 3)

$$\frac{5x+3}{4x+3} = \frac{11}{9} \Rightarrow 45x + 27 = 44x + 33 \Rightarrow x = 6$$

Anand's present age = 4x = 4 × 6 = 24

Shortcut

Ratio of present age S :   A

                      5 :   4

Anand's present age must be a multiple of 4.

Check option (a) = 24

Sameer   :   Anand

  ↓   ↓

  5   :   4

  ↓ ×6   ↓×6

  30   24

  ↓+3   ↓+3

  33   :   27

        ⇕

  11 : 9   Satisfied

39. (d); Ten years ago, Ratio of ages of Jayant, Prem and Saransh $\rightarrow$ J : P : S

                 2 : 3 : 4

Let the ages be   2x   3x   4x

                   ↓   ↓   ↓

Present ages $\rightarrow$ (2x +10) (3x + 10) (4x + 10)

Total of the present ages = 93 years.

$\Rightarrow$ 2x + 10 + 3x + 10 + 4x + 10 = 93

9x + 30 = 93 $\Rightarrow$ x = 7

$\Rightarrow$ Present age of Saransh = 4x + 10

= 4 × 7 + 10 = 38 years.

Shortcut:

On subtracting 10 from the present age of Saransh, we must get a multiple of 4, because ten years ago, the ratio of ages of Jayant, Prem and Saransh was 2 : 3 : 4.

From the option $\rightarrow$ (a) and (d) can be discarded.

(a) 24 yrs. $\xrightarrow{-10}$ 14 yrs.

    (not a multiple of 4.)

(b) 32 yrs. $\xrightarrow{-10}$ 22 yrs.

    (not a multiple of 4)

Check option (c) 34 yrs.

10 years ago 34 – 10 = 24 yrs.

J   :   P   :   S

2   :   3   :   4

↓×6   ↓×6   ↓×6

12   18   24

↓+10   ↓+10   ↓+10

22   +   28   +   34 ≠ 93

Check (d) 38 yrs.

38 – 10 = 28 yrs.

2   :   3   :   4

↓×7   ↓×7   ↓×7

14   21   28

↓+10   ↓+10   ↓+10

24   +   31   +   38 =93 yrs.

40. (b);   Hitesh   Ronnie
        ↓   ↓
      40 yrs.   60 yrs.

It is clear from option (b) that 10 yrs. ago their ages were 30 yrs. and 50 yrs., i.e., in the ratio 3 : 5

41. (b); Ratio of profits = ratio of investments
= 45000 : 30000 = 45 : 30 = 3 : 2

42. (a); Since the investments were made for the same period of time, ratio of shares of profit = ratio of investments = 60000 : 50000 = 6 : 5

Kishor's share = $\dfrac{5}{11}$ × total profit = $\dfrac{5}{11}$ × 33000

= 5 × 3000 = 15000

43. (d);   Investments
            ↓

Anil Rs. → 3300

Nikhil Rs. → 5000

Ratio of profit shares = ratio of investments = 3300 : 5000

Ratio of profit shares = 33   :   50
                ↓   ↓
             Anil   Nikhil

Profit earned = 1660 Rs.

Anil's share = $\dfrac{33}{83}$ × 1660 = Rs. 660

44. (b); Rahul invested for one year i.e, 12 months. 6 months later, Sanjay joined him. So, Sanjay invested for 6 months only.

	Rahul	Sanjay
(I) Investment →	45000	30000
(T) Time period →	12 months	6 months
Product →	45000 × 12	30000 × 6

Ratio of profits = 45000×12 : 30000×6 = 3 : 1

45. (b); Ratio of investments = Ratio of profit shares
= 6   :   5   :   8
   ↓   ↓   ↓
Anil :   Nikhil :   Sourabh

Profit earned = Rs. 83,600

Saurabh's share = $\dfrac{8}{19}$ × 83600 = 35,200 Rs.

46. (c);

	Ram	Karan	Rohan
Ratio of capitals	2 :	3 :	4
Ratio of time	6 :	4 :	3
Ratio of profits	Ram	Karan	Rohan
	↓	↓	↓
	2 × 6 :	3 × 4 :	4 × 3
	12 :	12 :	12
	1 :	1 :	1

47. (d);

	Ravi	Kavi	
Investments	8000	72000	(Rs.)
$\begin{pmatrix} \text{Ratio of} \\ \text{Investments} \end{pmatrix}$	8 :	72	
	1 :	9	

Ratio of investments = Ratio of profits = 1 : 9

48. (b);

	Srikant	Vividh
Investments	185000	225000
Ratio	185 :	225
	37 :	45

Let the total profit be P

Vividh's share = $\dfrac{45}{45+37}$ × P = 9000

$\dfrac{45}{82}$ × P = 9000

P = $\dfrac{82 \times 9000}{45}$ = 82 × 200 = 16400

49. (d);

	Rajan	Sajan
Investments →	Rs. 14200	Rs. 15600
Ratio →	142 :	156
	↕	
	71 :	78

Total profit = Rs. 74500

Rajan's share = $\dfrac{71}{149}$ × 74500 = 35500

50. (a);

	A	B
Investments →	Rs. 4000	Rs. 16000
	↕	
Ratio of investments	1 :	4
Ratio of times periods	12 months :	9 months
	↕	
	4 :	3
Ratio of profits :	(1 × 4) :	(4 × 3)
	= 4 :	12
	↕	
	1 :	3

Moderate

1. (b); Let the ten's digit and the unit's digit of the number be x and y respectively.

The number is → $10x + y$

on interchanging digits → $10y + x$

$x : y = 1 : 2 \rightarrow y = 2x$

$\left.\begin{array}{l} \Rightarrow 10x + y = 12x \\ \quad 10y + x = 21x \end{array}\right] \rightarrow \left[\text{difference} = 36\,(\text{given})\right]$

$21x - 12x = 36$

$9x = 36 \quad \Rightarrow \quad x = 4$

$\Rightarrow$ The number is 12x

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

on interchanging → $21x = 21 \times 4 = 84$

Sum of digits = $x + y = 12$

difference of digits = $y - x = 4$

difference of sum and difference of digits

$= 12 - 4 = 8$

2. (a);

Maths	Phy.	Bio.
↓	↓	↓
500	700	800

40% inc ↓   ↓ 50% inc   ↓ 75% inc

700	1050	1400

New ratio = $70 : 105 : 140 = 2 : 3 : 4$

3. (b);   60 litres

milk   water   →   3 units = 60 L

$\Rightarrow$ 1 unit = 20 L

40 L   20 L

1 : 3] × 2 (Multiply by 2, to keep milk constant)

↓

2 : 6

↓

6 units = 6 × 20 = 120 L

So, 120 − 20 = 100 L

↓

quantity of water to be added.

4. (c);

Boys	Girls
↓	↓
7	: 8

Let →   700   800

20% inc ↓   ↓ 10% inc

840   880

New ratio = $840 : 880 = 21 : 22$

5. (d);

Ravi	:	Sumit
2	:	3

Let →   2x   ,   3x

+4000 ↓   ↓ +4000

(2x+4000)   (3x+4000)

$\dfrac{2x + 4000}{3x + 4000} = \dfrac{40}{57}$

$114x + 228000 = 120x + 160000$

$6x = 68000 \quad \Rightarrow \quad x = \dfrac{68000}{6}$

Sumits's salary = $3x = 3 \times \dfrac{68000}{6} = $ Rs. 34000

6. (c);

	A	B	C
Ratio of salaries	2 :	3 :	5
Let the salaries be	200	300	500

↓ 15%   ↓ 10%   ↓ 20%

230   330   600

New ratio → $23 : 33 : 60$

7. (d); 25p, 10p and 5p coins are in the ratio of 2 : 3 : 4.

So, number of 25p coins = 2 units

Its value = 25 × 2 = 50 units

number of 10 p coins = 3 units

Its value = 3 × 10 = 30 units

number of 5p coins = 4 units

Its value = 4 × 5 = 20 units

Total value = 50 + 30 + 20 = 100 units = 50 Rs.

1 unit = $\dfrac{1}{2}$ Rs. $\Rightarrow$ 1 unit = 50p

value of 5p coins = 20 units = 20 × 50 p.

$\Rightarrow$ Number of 5p coins = $\dfrac{20 \times 50}{5} = 200$

8. (d);

sum 1   sum 2

C	:	A	:	B	M		N
4	:	5	:	6	1	:	1
4x :		5x :		6x	y		y

$6x - y = 2000$ $4x = ?$

↓

Can't determine x from this equation

9. (b); $A : B : C \Rightarrow 12 : 15 : 25$

Let → 12x, 15x, 25x

Sum = $52x = 364$

$x = \dfrac{364}{52} \quad \Rightarrow \quad x = 7$

$$\begin{array}{ccc} A & B & C \\ \downarrow & \downarrow & \downarrow \\ 12 \times 7 & 15 \times 7 & 25 \times 7 \\ \downarrow & \downarrow & \downarrow \\ 84 & 105 & 175 \end{array}$$

diff   diff

$$21 \quad : \quad 70 = 3 : 10$$
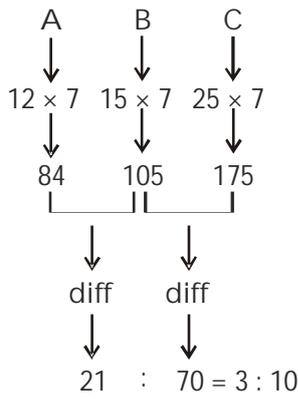
10. (b); $\dfrac{625}{x} = \dfrac{x}{1156}$

$x^2 = 625 \times 1156 \Rightarrow x^2 = (25)^2 \times (34)^2$

$x = 25 \times 34 = 850$

11. (c);

Alcohol : Water

Inital ratio ⟶   4 : 3 ⎤ 2 unit increase = 5 L

New ratio ⟶   4 : 5 ⎦ 1 unit = 2.5 L

Alcohol in initial mixture = 4 units

$= 4 \times 2.5 = 10$ L

12. (c);

$$\begin{array}{ccc} 25p & 10p & 5p \\ 1 & : 2 & : 3 \\ \downarrow & \downarrow & \downarrow \\ 1 \times 25 & 2 \times 10 & 3 \times 5 \\ 25p & 20p & 15p \end{array}$$

Total = 60 units

= 30 Rs = 3000 p
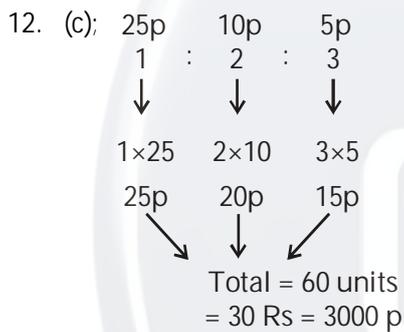
1 unit = 50p

value of 5p coins = 15 units = 750p

Number of 5p coins $= \dfrac{750}{5} = 150$

13. (b); Let C's share be ⟶ C

Then, B's share $= \dfrac{1}{4} C$

A's share $= \dfrac{2}{3} \times \dfrac{1}{4} C = \dfrac{1}{6} C$

Total = Rs. 510 $\Rightarrow \dfrac{C}{6} + \dfrac{C}{4} + C = 510$

$\dfrac{2C + 3C + 12C}{12} = 510 \Rightarrow 17C = 12 \times 510$

$C = 12 \times 30 = 360$

So, C's share = Rs. 360

B's share = Rs. 90

A's share = Rs. 60

Shortcut: only option (b) satisfies the given conditions.

14. (a); Let → A's share be A

B's share be B and C's share be C

$$366 \rightarrow A \quad B \quad C$$

$A + B + C = 336$ ... (i)

$A = \dfrac{1}{2}(B + C)$

$2A = B + C$ ... (ii)

From (1) and (2)

$A + 2A = 366 \Rightarrow A = 122$

A' share = Rs. 122
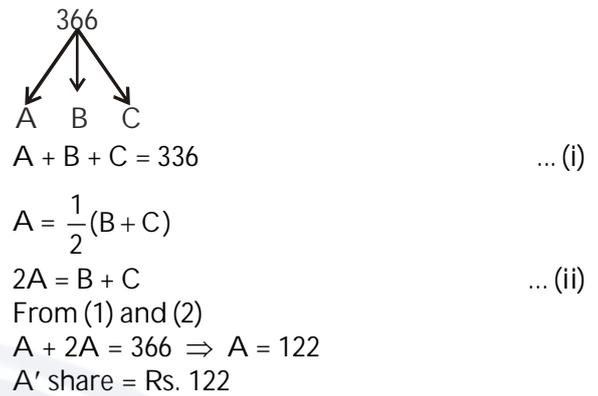
15. (d); Data inadequate

16. (d); Ratio → 1 : 3 : 2

Let ⟶   x   3x   2x

+25   +25   +25

(x + 25)   (3x + 25)   (2x + 25)

$x + 25 + 3x + 25 + 2x + 25 = 735$

$6x + 75 = 735 \Rightarrow 6x = 660 \Rightarrow x = 110$
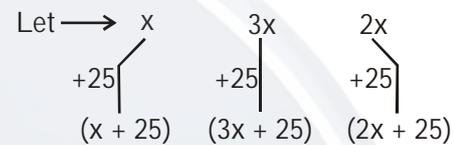
Money received by C = 2x + 25

$= 2 \times 110 + 25 = $ Rs. 245

17. (d); Ratio of remainders   A   B   C

                     3 : 4 : 5

Let →   3x   4x   5x

Sum of original shares → (3x + 5) + (4x + 10) + (5x +15) = 2430 $\Rightarrow$ 12x + 30 = 2430

$12x = 2400 \Rightarrow x = 200$

B's share = 4x + 10 = 810 Rs.

18. (d);

Gold   Copper

19   9

15

6   4

= 3 : 2

19. (b);   15 litres

Alcohol   Water

20%   80%

3 litre   12 litre

              +3 litre

3 litre + 15 litre = 18 litre

alcohol $= \dfrac{3}{18} \times 100 = \dfrac{50}{3}\% = 16\dfrac{2}{3}\%$

20. (a);

$$85\,L$$

milk   water

$27 \quad : \quad 7 \Rightarrow 34 \text{ units} = 85\,L$
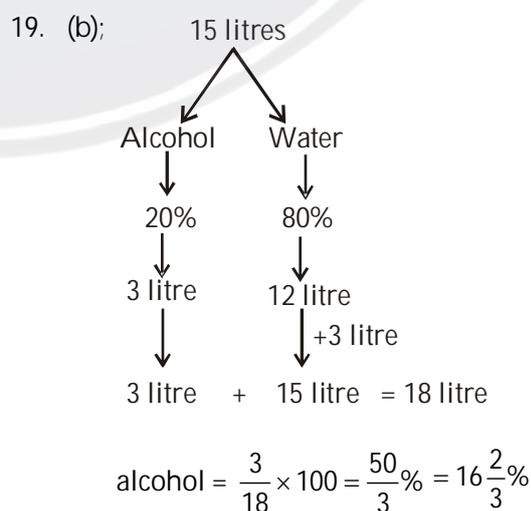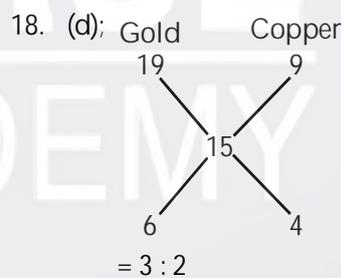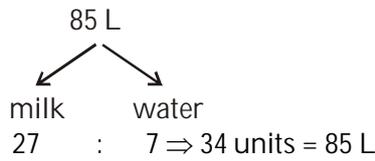
$\Rightarrow \quad 1 \text{ unit} = \dfrac{85}{34}\,L = \dfrac{5}{2}\,L$

New ratio $\to [3:1] \times 9$ [because. water is added]

New ratio $\to 27 : 9$

Milk   Water

$27 \;:\; 7$

$27 \;:\; 9$ 2 units increase
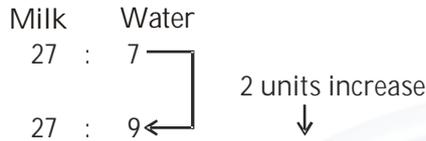
$= 2 \times \dfrac{5}{2} = 5\,L \text{ water}$

21. (b); Ratio of sides $\to \left(\dfrac{1}{2} : \dfrac{1}{3} : \dfrac{1}{4}\right) \times 12 = 6:4:3$

perimeter $= 6 + 4 + 3 = 13 \text{ units} = 104 \text{ cm}$

1 unit = 8 cm

Longest side $\to 6 \text{ units} = 6 \times 8 = 48 \text{ cm}$

22. (c);

	boys	girls
Let $\to$	300	200
scholarship holders $\to$	20%	25%
	60	50
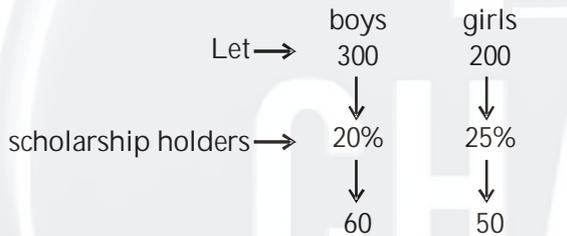
Students who got scholarship $\to 60 + 50 = 110$

students who did not get scholarship

$\to 500 - 110 = 390$

Percentage of student $= \dfrac{390}{500} \times 100 = 78\%$

23. (c); Change the ratios into fractions :

Containers	Milk	Water	Volume of containers
I	$\dfrac{4}{5}$	$\dfrac{1}{5}$	$\dfrac{3}{12} = \dfrac{1}{4}$
II	$\dfrac{3}{4}$	$\dfrac{1}{4}$	$\dfrac{4}{12} = \dfrac{1}{3}$
III	$\dfrac{5}{7}$	$\dfrac{2}{7}$	$\dfrac{5}{12}$

Ratio of milk and water in the fourth container is:

$\dfrac{4}{5} \times \dfrac{1}{4} + \dfrac{3}{4} \times \dfrac{1}{3} + \dfrac{5}{7} \times \dfrac{5}{12} : \dfrac{1}{5} \times \dfrac{1}{4} + \dfrac{1}{4} \times \dfrac{1}{3} + \dfrac{2}{7} \times \dfrac{5}{12}$

$= \dfrac{1}{5} + \dfrac{1}{4} + \dfrac{25}{84} : \dfrac{1}{20} + \dfrac{1}{12} + \dfrac{5}{42} = \dfrac{314}{420} : \dfrac{106}{420}$

$= 314 : 106 = 157 : 53$

24. (d); Let, $x = \dfrac{K}{y^2}$ [K = constant]

$1 = \dfrac{K}{4} \Rightarrow K = 4 \Rightarrow x = \dfrac{4}{y^2}$

$y = 6 \Rightarrow x = \dfrac{4}{36} = \boxed{\dfrac{1}{9}}$

25. (a); Let the fixed amount be Rs. x and the cost of each unit be Rs. y

Then, $500y + x = 1680$ ... (i)

$600y + x = 1980$ ... (ii)

Subtract (i) from (ii)

$100y = 300 \Rightarrow y = 3$

Putting y = 3 in (i)

$1500 + x = 1680 \Rightarrow x = 180$

So, fixed charges = Rs. 180

Charge per unit = Rs. 3.

Total chargers for Consuming 700 units

$= 700 \times 3 + 180 = 2100 + 180 = 2280$

26. (c);

	A	B
Income $\to$	5x	4x
Expenditure $\to$	3y	2y
Saving $\to$	(5x – 3y)	(4x – 2y)

$5x - 3y = 1600) \times 2 \qquad 4x - 2y = 1600) \times 3$

$10x - 6y = 3200 \ (1) \qquad 12x - 6y = 4800 \ (2)$

From (1) and (2) $2x = 1600 \Rightarrow x = 800$

A's income $= 5x = 5 \times 800 = 4000$ Rs.

27. (c); Gold : copper

$A \to 7:2\ ] \times 2$

$A \to 14:4 \to \text{total} = 14 + 4 = 18$

$B \to 7:11 \to \text{total} = 7 + 11 = 18$

18 units of A and 18 units of B are melted to form C

Gold   Copper

$C \to (14 + 7) : (4 + 11)$

     21   :   15
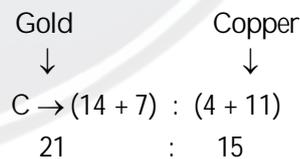
Ratio $\to 7:5$

28. (a); Let present ages be $\to$ P   Q

                      $\to 5x$ 7x

P's age after 6 yrs. $= 5x + 6$

$7x - (5x + 6) = 2 \Rightarrow 2x - 6 = 2$

$2x = 8 \Rightarrow x = 4$

So, present ages of P and Q are 20 years & 28 years respectively.

Total = 48 years

29. (b); Let the present ages be → Father　　　Son
　　　　　　　　　　　　　　　　　　　↓　　　　↓
　　　　　　　　　　　　　　　　　　7x　　　3x
　　7x × 3x = 756　⇒　21x² = 756
　　x² = 36　⇒　x = 6
　　⇒ Present ages → father → 7 × 6 = 42 yrs.
　　　　　　　　　　　　son → 3 × 6 = 18 yrs.
　　　　　　After 6 years → father → 48 years.
　　　　　　　　　　　　son → 24 yrs.
　　Ratio → 48 : 24 = 2 : 1

30. (b); 8 years ago, the sum of their ages was 56 years.
　　So, sum of their present ages = 56 + 24 = 80 years
　　Proportion → 4 : 7 : 9

　　So, the present ages are → $\dfrac{4}{20} \times 80 = 16$ Years

　　　　　　　　　　　　$\dfrac{7}{20} \times 80 = 28$ Years

　　　　　　　　　　　　$\dfrac{9}{20} \times 80 = 36$ Years

31. (c); Ratio of present ages = 4 : 3
　　Let the ages be → man → 4x
　　　　　　　　　　wife → 3x
　　After 4 yrs → man → 4x + 4
　　　　　　　　wife → 3x + 4

　　$\dfrac{4x+4}{3x+4} = \dfrac{9}{7}$

　　28x + 28 = 27x + 36　⇒　x = 8
　　Present ages → man → 32 yrs.
　　　　　　　　wife → 24 yrs.
　　From the option if we check option (c) → 12 yrs.
　　then 12 yrs. ago → man → 20 yrs.
　　　　　　　　　wife → 12 yrs.
　　Ratio → 20 : 12 = 5 : 3
　　So, they were married 12 years. ago.

32. (c);　　　　　　　　　　A　　　　B
　　Present ages →　5x　　　3x
　　A's age 4 yrs. ago = 5x – 4
　　B's age 4 yrs. hence = 3x + 4
　　5x – 4 = 3x + 4　⇒　2x = 8　⇒　x = 4
　　A's age 4 yrs. hence = 5 × 4 + 4 = 24 yrs.
　　B's age 4 yrs. ago = 3 × 4 – 4 = 8 yrs.
　　Ratio → 24 : 8 = 3 : 1

33. (c); Let mother's present age be 'M' years

　　present age of the person = $\dfrac{2}{5}$ M

　　After 8 yrs. → mother's age = M + 8

　　person's age = $\dfrac{2}{5}$ M + 8

　　$\dfrac{2}{5}$ M + 8 = $\dfrac{M}{2}$ + 4,　$\dfrac{M}{10}$ = 4 ⇒ M = 40

34. (d); Let present ages of father and son be f and s respectively.

	Father	Son
Present ages	f	s
4 years ago	(f – 4)	(s – 4)
After 4 years	(f + 4)	(s + 4)

　　f – 4 = 3(s – 4)　　　(f + 4) + (s + 4) = 64
　　f – 4 = 3s – 12　　　f + s = 64 – 8
　　f – 3s = –8 ...(i)　　f + s = 56　...(ii)
　　3f + 3s = 168
　　f – 3s = –8
　　On solving (i) and (ii)
　　4f = 160　⇒　f = 40
　　So, father's age at present = 40 years.

35. (a);　　　　　　　Usha　　　Reena
　　Present ages →　36 yrs.　24 yrs.
　　　　　　　　　　↓–8　　　↓–8　(8 yrs. ago)
　　　　　　　　　28 yrs.　　16 yrs.
　　Ratio →　　　　28 : 16　　(Usha : Reena)
　　= 7 : 4

36. (b); Ratio of present ages
　　　　　　　　　↓
　　　　　　Anil　：　Poorvi
　　　　　　3　：　2
　　Let →　　3x　　　2x
　　　　　　↓　　　　↓
　　After 8 yrs. → (3x + 8)　　(2x + 8)

　　$\dfrac{3x+8}{2x+8} = \dfrac{25}{18}$　⇒　54x + 144 = 50x + 200

　　4x = 56　⇒　x = 14
　　⇒ Poorvi's present age = 2x = 28 yrs.
　　Shortcut :
　　Check → option (b)
　　Poorvi's present age = 28 yrs.

　　⇒　Anil's present age = $\dfrac{3}{2} \times 28$ = 42 yrs.

　　After 8 yrs. →
　　　　Anil → 50 yrs.
　　　　Poorvi → 36 yrs.
　　ratio → Anil : Poorvi
　　　　50 : 36
　　　　25 : 18
　　Hence verified

37. (c); Ratio of ages ┐
　　　　　　　　　　↓
　　　　Meena　：　Seema
　　　　7　：　8
　　　　　　　↓
　　difference = 1 unit = 3 yrs.
　　Sum = 7 + 8 = 15 units = 15 × 3 = 45 years.

38. (a); Rehana's age after 7 yrs. = 85 yrs.
⇒ Rehana's present age = 85 – 7 = 78 yrs.
Wasim is → 12 younger than Rehana
⇒ Wasim's present age = 66 yrs

Ratio of present ages ⌐
     Manoj : Wasim
       3 : 11
       ↓×6   ↓×6
     18 yrs.   66 yrs.
       ↓
     Present age of Manoj's
     father = 18 + 25 = 43 yrs.

39. (b); Ratio of present ages →
     Indira : Lizzy
       3 : 8
Let →   3x   8x

After 8 yrs. →   ↓   ↓

     3x + 8   8x + 8
     3x + 8 = 20 ⇒ 3x = 12 ⇒ x = 4
⇒ Lizzy's present age ⇒ 8x = 8 × 4 = 32 yrs.
⇒ Lizzy's age 5 yrs. ago ⇒ 32 – 5 = 27 yrs.
     Shortcut :
     Indira : Lizzy
       3 : 8
Indira's age after 8 yrs. = 20 yrs.
⇒ Indira's present age = 12 yrs.
3 units → 12 years
⇒ 1 unit = 4 years
Lizzy's present age = 8 units = 8 × 4 = 32 yrs.
Lizzy's age 5 yrs. ago = 32 – 5 = 27 yrs.

40. (d); Let Sarita's present age = s
Kavita's present age = 2s
8 years. hence
Sarita's age = s + 8
Kavita's age = 2s + 8

$\dfrac{2s+8}{s+8} = \dfrac{22}{13}$

26s + 104 = 22s + 176
4s = 72
s = 18 ⇒ Kavita's present age = 2s = 36 years
Shortcut
Check option (d)
Kavita's present age = 36 yr.
Sarita's present age = 18 yrs.
     Sarita   Kavita
      18   36
     ↓ + 8   ↓ + 8
      26   44
Ratio = 13 : 22
Hence verified

41. (c); Age of A and B 10 years ago   A   B
                            13x   17x
Ratio of ages of A and B after 17 years

$\dfrac{13x + 27}{17x + 27} = \dfrac{10}{11}$

143x + 297 = 170x + 270
27x = 27, x = 1
Present age of B = 17x + 10
            = 17 × 1 + 10 = 27 years

42. (d); Can't be determined.

43. (c);   Ram   Sanjay   Aditya
       ↓   ↓   ↓
     45000   60000   90,000
    12 months   9 months   6 months
     Ram   Sanjay   Aditya
     ↓   ↓   ↓
Ratio of Profits →
  45000×12 : 60000×9 : 90000×6
   5400 : 5400 : 5400
     1 : 1 : 1
Net profit = Rs. 16500

Ram's share = $\dfrac{1}{3} \times 16500$ = Rs. 5500

44. (c);   Ram   Anil   Aditya
     ↓   ↓   ↓
    1200   1500   900
  12 months   6 months   9 months
     Ram   Anil   Aditya
     ↓   ↓   ↓
Ratio of profits   14400 : 9000 : 8100
              144 : 90 : 81
                16 : 10 : 9
Total profit = Rs. 2450

Aditya's share = $\dfrac{9}{35} \times 2450$ = Rs. 630

45. (d); Let number of 10-paise coins be 17 k
and number of 25-paise coins be 6 k.
     17 k × 0.10 + 6 k × 0.25 = 112
⇒ 1.7 k + 1.5 k = 112
⇒ 3.2 k = 112
⇒ k = 35
∴ Number of 10-paise coins = 17 × 35 = 595

46. (c);

P	Q	S
↓	↓	↓
(50, 4 months)	(45, 5 months)	(70, 7 months)
(25, 8 months)	(22.5, 7 months)	

P	Q	S
↓	↓	↓

Ratio $(50 \times 4 + 25 \times 8)$: $(45 \times 5 + 22.5 \times 7)$: (70×7)
of profits

400	:	382.5	:	$490 (\times 0.4)$
160	:	153	:	196

Profit at the end of 12 months = Rs 1272.5

S's share = $\dfrac{196}{160 + 153 + 196} \times 1272.5$

= $\dfrac{196}{509} \times 1272.5 = \dfrac{196 \times 12725}{5090} =$ Rs. 490

47. (c); A invests Rs. 12000 for 4 months and Rs. 17000 for 8 months B invests Rs. 16000 for 4 months and Rs. 10000 for 8 months. C invests Rs. 20000 for 6 months.

A → $12000 \times 4 + 17000 \times 8 = 1,84000$
B → $16000 \times 4 + 10000 \times 8 = 1,44000$
C → $20000 \times 6 = 1,20,000$

∴ Ratio of profits = 23 : 18 : 15
Total profit = Rs. 30,100

As share = $\dfrac{23}{(23 + 18 + 15)} \times 30,100 =$ Rs. 12362.5

48. (a);

	P	Q	R
Ratio of investments	8 :	6 :	5
Ratio of profits	1 :	3 :	5

Check option (a) → Ratio of time periods

→ 1 : 4 : 8

Ratio of profits = Ratio of products of corresponding values of investments and time periods

8×1 : 6×4 : 5×8
= 8 : 24 : 40
= 1 : 3 : 5 = Ratio of profits.

49. (d); Total time = 36 months
Let Aditya's time of contribution = t_A
Manish's time = t_M
$300 \times t_A : 500 \times t_M$ = Ratio of their profit shares.
Total profit = Rs 1020
Aditya's share = 495
Manish's share = 1020 − 495 = 525
Ratio of profits = 495 : 525 = 33 : 35 ... (ii)
From (1) and (2)

$\dfrac{300 \times t_A}{500 \times t_M} = \dfrac{33}{35}$ ⟹ $\dfrac{t_A}{t_M} = \dfrac{33 \times 500}{35 \times 300} = \dfrac{11}{7}$
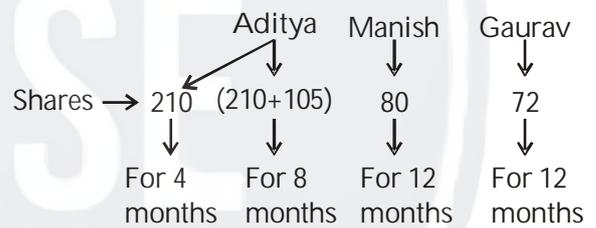
Time period for which Aditya invested

= $\dfrac{11}{18} \times 36$ = 22 months

50. (a);

	Aditya	Manish	Gaurav
Ratio of shares	$\dfrac{7}{2}$:	$\dfrac{4}{3}$:	$\dfrac{6}{5}$
	$\dfrac{7}{2} \times 30$:	$\dfrac{4}{3} \times 30$:	$\dfrac{6}{5} \times 30$

$(105 : 40 : 36) \times 2$
210 : 80 : 72

Let their shares be → 210, 80, 72

	Aditya		Manish	Gaurav
	↓		↓	↓
Shares →	210	(210+105)	80	72
	↓	↓	↓	↓
	For 4 months	For 8 months	For 12 months	For 12 months

Ratio of profit shares →	Aditya	Manish	Gaurav
	↓	↓	↓
	$(210 \times 4 + 315 \times 8)$	(80×12)	(72×12)
	↓	↓	↓
Ratio of profit →	$(840 + 2520)$	960	864
	↓	↓	↓
	3360	960	864

Profit at the end of one year = Rs. 43200

Manish's share = $\dfrac{960}{5184} \times 43200 =$ Rs. 8000