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PREVIOUS EXAMS SOLVED PAPERS

Quantitative Aptitude

• Business Mathematics • Logical Reasoning • Statistics

Key Highlights

- ▶ Coverage of Past Examination Questions Including Sept. 2025 Exam
- ▶ Coverage of Additional Questions for Exam in Selected Chapters
- ▶ Coverage of RTPs & MTPs issued by ICAI
- ▶ Chapter-wise Marks Distribution of Past Exams
- ▶ Chapter-wise Mapping with Study Material of ICAI

Kailash Thakur

Calculator & Shortcut Tricks are given

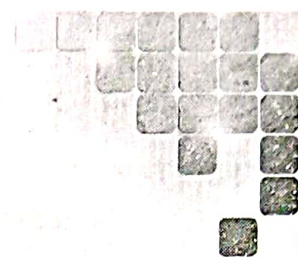
APPLICABLE FOR
JAN./MAY 2026
EXAMS

PAPER-3

15th
Edition



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1

CHAPTER

RATIO & PROPORTION

RATIO

The comparison of two or more things of same kind is called RATIO. If x and y are two values of same kind (in same units), then the ratio of x to y is written as $x : y$ and read as x is to y .

In $\frac{x}{y}$

- ◆ Numerator “ x ” is called **1st term or Antecedent** and
- ◆ Denominator “ y ” is called **2nd term or Consequent**.
- ◆ Antecedent and Consequent must be of **same units**
- ◆ Ratio has no unit.

Remarks:

1. Normally a ratio is expressed in simplest form. As. $10 : 16 = 5 : 8$.
2. The order of the terms in a ratio must be maintained. As $3 : 4$ is not same as $4 : 3$.
3. Ratio exists only with quantities having same unit (kind).
4. (i) If $x > y$, then the ratio $x : y$ is called of **greater inequality**.
(ii) If $x < y$, then the ratio $x : y$ is called of **lesser inequality**.
(iii) If $x = y$, then the ratio $a : b$ is called ratio of **Equal Equality**.
5. (i) **Duplicate ratio** of $a : b$ is $a^2 : b^2$
(ii) **TriPLICATE ratio** of $a : b$ is $a^3 : b^3$
(iii) **Sub-Duplicate ratio** of $a : b$ is $\sqrt{a} : \sqrt{b} = a^{1/2} : b^{1/2}$
(iv) **Sub-Triplicate ratio** of $a : b$ is $\sqrt[3]{a} : \sqrt[3]{b} = a^{1/3} : b^{1/3}$

6. **Inverse ratio** of $x : y$ is $y : x$.

7. (i) **Commensurable**: If the terms of the ratio are **integers**, the ratio is called commensurable.

As. $3 : 2$

(ii) **Incommensurable**: If the terms of the ratio are not **integers**, the ratio is called Incommensurable.

As. $\sqrt{3} : \sqrt{2}$ cannot be expressed in terms of integers. So, it is **Incommensurable**.

8. **Compound/Combined Ratio = Product of all ratios.**

PROPORTION

An equality of two ratios is called **Proportion**. Four quantities a, b, c, d are said to be in proportion if $a : b = c : d$.

It is also written as

$$a : b :: c : d$$

Here a, b, c, d are called 1st; 2nd; 3rd and 4th term of proportionals respectively

$$\text{If, } \frac{a}{b} = \frac{c}{d} \Rightarrow ad = bc.$$

$\therefore$ Product of extreme terms = Product of middle terms.

This rule is called **Cross – Product Rule**.

In $a : b :: c : d$ proportion, unit of a and b should be same and that of c and d should also be same.

As. ₹ 6 : ₹ 8 = 12 toffees : 16 toffees are in proportion.

Let a, b and c are of same kind (in same units).

$$\text{If } \frac{a}{b} = \frac{b}{c} \Rightarrow a : b :: b : c$$

i.e. a, b, c are in proportion.

Then, this proportion is called **continuous proportion**.

Here **a** is 1st proportion **c** is called 3rd proportion and **b** is called mean proportion.

$$\therefore b = \sqrt{ac} = \text{GM of } a \text{ \& } c.$$

Properties of Proportion**1. Cross - Product**

If $a : b :: c : d$.

$$\Rightarrow \frac{a}{b} = \frac{c}{d} \therefore ad = bc.$$

2. Invertendo

If $a : b :: c : d$; Then its inverse

$b : a :: d : c$ also becomes in proportion.

$$\text{i.e. If } \frac{a}{b} = \frac{c}{d} \quad \text{Then, } \frac{b}{a} = \frac{d}{c}.$$

3. Componendo

If $a : b :: c : d$.

Then $a + b : b :: c + d : d$.

$$\text{Proof: } \frac{a}{b} + 1 = \frac{c}{d} + 1 \Rightarrow \frac{a+b}{b} = \frac{c+d}{d}.$$

4. Dividendo

If $a : b = c : d$.

Then $a - b : b = c - d : d$.

$$\text{Proof: } \frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a}{b} - 1 = \frac{c}{d} - 1$$

$$\text{or } \frac{a-b}{b} = \frac{c-d}{d}$$

5. Componendo and Dividendo

If $a : b :: c : d$; Dividing (3) by (4)

$$\text{Then, } \frac{a+b}{a-b} = \frac{c+d}{c-d}.$$

6. Alternendo

If $a : b :: c : d$.

Then $a : c :: b : d$.

i.e. ratio of alternate terms are also in proportion.

7. Addendo

If $a : b = c : d = e : f = \dots\dots\dots$

Then each ratio = $\frac{\text{Sum of antecedents of all ratios}}{\text{Sum of consequents of all ratios}}$

$$\therefore \frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \dots = \frac{a+c+e+\dots}{b+d+f+\dots}$$

8. Subtrahendo

If $\frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \dots$

Then each ratio

$$= \frac{a}{b} = \frac{c}{d} = \frac{e}{f} = \dots = \frac{a-c-e-\dots}{b-d-f-\dots}$$

PAST EXAM QUESTIONS WITH SOLUTIONS (MEMORY BASED)

Q.1. $15(2p^2 - q^2) = 7pq$, where p, q are positive then $p : q$

- (a) 5:6 (b) 5:7
(c) 3:5 (d) 3:7

[June 2015]

Solution: (a) is correct

$$15(2p^2 - q^2) = 7pq$$

Tricks: Go by choices

For (a) put $p = 5$; $q = 6$ we get

$$15(2 \times 5^2 - 6^2) = 7 \times 5 \times 6$$

$$\text{or } 15 \times 14 = 210$$

$$\text{or } 210 = 210$$

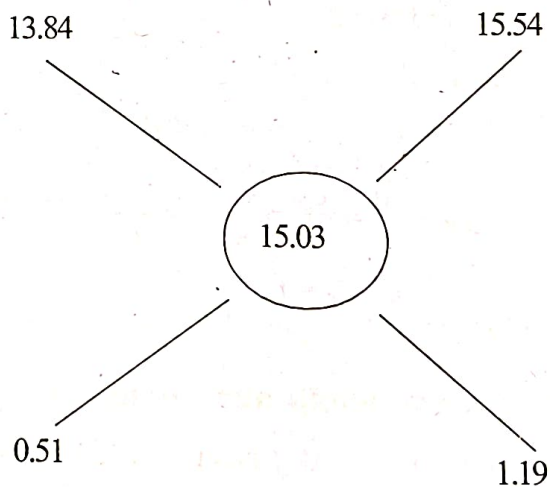
Q.2. If one type of rice of cost ₹13.84 is mixed with another type of rice of cost ₹15.54, the mixture is sold at ₹17.60 with a profit of 14.6% on selling price then in which proportion the two types of rice mixed?

- (a) 3:7 (b) 5:7
(c) 7:9 (d) 9:1

[June 2015]

Solution: Cost of mixture per kg = $17.60 - 14.6\% = 15.0304 = 15.03$ (approx.)

By rules of Alligation



$$51:119 = 3:7$$

Trick: Go by choices

(a) is correct (approx)

Q.3. Find the ratio of third proportional of 12 : 30 and mean proportional of 9 : 25

- (a) 7 : 2 (b) 5 : 1
(c) 9 : 4 (d) None of these

[Dec. 2015]

Solution: 3rd proportional = $\frac{30^2}{12} = 75$

Mean Proportional = $\sqrt{9 \times 25} = 15$

Ratio = $\frac{75}{15} = 5:1$

(b) is correct

Q.4. What must be added to each of the numbers 10, 18, 22, 38 to make them proportional:

- (a) 5 (b) 2
(c) 3 (d) 9

[Dec. 2015]

Solution: (b) is correct

Let x be added.

$$\therefore \frac{10+x}{18+x} = \frac{22+x}{38+x}$$

Trick: Go by choices

$\therefore x = 2$ satisfies it.

Q.5. x, y, z together starts a business, if x invests 3 times as much as y invests and y invests two third of what z invests, then the ratio of capitals of x, y, z is _____

- (a) 3 : 9 : 2 (b) 6 : 3 : 2
(c) 3 : 6 : 2 (d) 6 : 2 : 3

[June 2016]

Solution: (d) is correct

Detail Method:

$$x = 3y \Rightarrow \frac{x}{y} = \frac{3}{1} \Rightarrow x : y = 3 : 1$$

$$\text{and } y = \frac{2}{3}z \Rightarrow y : z = 2 : 3$$

$$x : y = 3 : 1] \times 2$$

$$y : z = 2 : 3$$

$$\Rightarrow x : y = 6 : 2$$

$$y : z = 2 : 3$$

$$x : y : z = 6 : 2 : 3$$

(d) is correct

Trick: Go by choices

$$6 = 3 \times 2 \text{ and } 2 = 3 \times \frac{2}{3}$$

Q.6. A bag contains 23 number of coins in the form of 1 rupee, 2 rupee and 5 rupee coins. The total sum of the coins is ₹43. The ratio between 1 rupee and 2 rupees coins is 3 : 2. Then the number of 1 rupee coins is

- (a) 12 (b) 8
(c) 10 (d) 16

[Dec. 2016]

Solution: (a)

Tricks: Go by choices

Let option (a) is correct.

Let x is common in the ratio.

$$\text{So, ₹1 coins} = 3x = 12 ; \text{ So, } x = 4$$

$$\text{No. of ₹ 2 coins} = 2 \times 4 = 8$$

$$\text{Hence No. of coins of ₹ 5 coins} = 23 - 12 - 8 = 3$$

$$\text{Total money} = 12 \times 1 + 8 \times 2 + 3 \times 5 = ₹ 43 \text{ Satisfied.}$$

So (a) is correct

Detail Method:

Let x is common in the ratio.

$$\therefore \text{No. of ₹ 1 coins \& ₹ 2 coins are } 3x; 2x$$

$$\therefore \text{No. of ₹ 5 coins} = 23 - 3x - 2x = 23 - 5x$$

Total Sum

$$= 3x \times 1 + 2x \times 2 + (23 - 5x) \times 5 = 43$$

$$7x - 25x + 115 = 43$$

$$\text{or } 115 - 43 = 18x$$

$$\text{or } 72 = 18x$$

$$\text{or } x = 4$$

$\therefore$ No. of ₹ 1 coins

$$= 3x$$

$$= 3 \times 4$$

$$= 12$$

Q.7. If $a : b = 2 : 3$, $b : c = 4 : 5$, $c : d = 6 : 7$ then $a : d$ is _____

(a) 24 : 35

(b) 8 : 15

(c) 16 : 35

(d) 7 : 15

[June 2017]

Solution: Option (c) is correct.

Multiply all ratios.

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

$$= \frac{2}{3} \times \frac{4}{5} \times \frac{6}{7} = \frac{16}{35}$$

Q.8. The ratio of the number of five rupee coins to number of ten rupee coins is 8 : 15. If the total value of five rupee coins is 360, then the no. of ten rupee coins is _____

(a) 72

(b) 60

(c) 150

(d) 135

[Dec. 2017]

Solution: Option (d) is correct.

$$\text{Total No. of ₹5 coins} = 360/5 = 72$$

Let x is common in the ratio.

$$\text{So, ₹5 coins} = 8x = 72 ; \text{ So, } x = 9$$

$$\text{No. of ₹ 10 coins} = 15 \times 9 = 135$$

Q.9. If $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{x}$ are in proportion then $x =$

(a) $\frac{15}{2}$

(b) $\frac{3}{15}$

(c) $\frac{2}{15}$

(d) $\frac{1}{15}$

[Dec. 2017; RTP Sep. 2024, Similar]

Solution: Option (a) is correct.

Product of middle two terms

= Product of extremes

$$\text{So, } \frac{1}{2x} = \frac{1}{15} ; x = 15/2$$

Q.10. If $(a + b) : (b + c) : (c + a) = 7 : 8 : 9$ and $a + b + c = 18$ then $a : b : c =$

(a) 5 : 4 : 3

(b) 3 : 4 : 5

(c) 4 : 3 : 5

(d) 4 : 5 : 3

[June 2018]

Solution: (c) is correct.

Tricks: Go by choices

(c) Let $a : b : c = 4 : 3 : 5$

It is in ratio. So, it should must satisfy given ratio $(a + b) : (b + c) : (c + a) = 7 : 8 : 9$ i.e. $(4 + 3) : (3 + 5) : (5 + 4) = 7 : 8 : 9$ (True) Avoid 2nd condition.

In detail method it will take too much time.

Q.11. If $p : q$ is the sub-duplicate ratio of $p - x^2 : q - x^2$, then x^2 is :

- (a) $\frac{p}{p+q}$ (b) $\frac{q}{p+q}$
 (c) $\frac{qp}{p-q}$ (d) None

[May 2018]

Solution: Detail Method:

$$\frac{\sqrt{p-x^2}}{\sqrt{q-x^2}} = \frac{p}{q}$$

Squaring on both side; we get

$$\frac{p-x^2}{q-x^2} = \frac{p^2}{q^2}$$

$$\text{or } pq^2 - q^2x^2 = p^2q - p^2x^2$$

$$\text{or } p^2x^2 - q^2x^2 = p^2q - pq^2$$

$$\text{or } x^2(p^2 - q^2) = Pq(P - q)$$

$$\text{or } x^2(p+q)(p-q) = pq(p-q)$$

$$\text{or } x^2 = \frac{pq}{p+q}$$

$\therefore$ (d) is correct

Trick: Go by choices

Q.12. The mean proportional between 24 and 54 is:

- (a) 33 (b) 34
 (c) 35 (d) 36

[May 2018]

Solution:

$$\text{Mean Proportion of a \& b} = \sqrt{ab}$$

$$(d) = \sqrt{24 \times 54} = 36$$

Q.13. $\frac{3x-2}{5x+6}$ is the duplicate ratio of $\frac{2}{3}$ then find the value of x :

- (a) 6 (b) 2
 (c) 5 (d) 9

[Nov. 2018]

Solution: (a)

$$\text{Given } \frac{3x-2}{5x+6} = \left(\frac{2}{3}\right)^2 = \frac{4}{9}$$

Trick: Go by choices

for option (a) putting $x=6$ in LHS; we get

$$\frac{3 \times 2 - 2}{5 \times 2 + 6} = \frac{4}{9} \text{ (R.H.S.)}$$

$\therefore$ (a) is correct.

Q.14. If $x : y : z = 7 : 4 : 11$ then $\frac{x+y+z}{z}$ is:

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

[Nov. 2018]

Solution: (a) is correct

$$\frac{x+y+z}{z} = \frac{7+4+11}{11} = 2$$

Q.15. If the ratio of two numbers is $7 : 11$. If 7 is added to each number then the new ratio will be $2 : 3$ then the numbers are

- (a) 49, 77 (b) 42, 45
 (c) 43, 42 (d) 39, 40

[June 2019]

Solution:**Trick:** GBC (Go by Choices)

$$(a) \left[\begin{array}{l} 49 \div 7 = 7 \\ 77 \div 11 = 7 \end{array} \right] \text{ both must be equal.}$$

Here it is correct.

Now:

$$\frac{49+7}{77+7} = \frac{56}{84} = \frac{2}{3}$$

Divide 56 by numerator (2) and 84 by Denominator (3) we get same value "28"

Note: No need to solve ; only check.

By Calculator.

Q.16. The two numbers are in ratio 3 : 4. The difference between their squares is 28. Find the greater number

- (a) 12 (b) 8
(c) 16 (d) 10

[Nov. 2019]

Solution: (b) is correct

Let x is common in the ratio.

So, Numbers are 3x & 4x.

From Qts.

$$(4x)^2 - (3x)^2 = 28$$

$$\text{or; } 16x^2 - 9x^2 = 28$$

$$\text{or } 7x^2 = 28 \Rightarrow x^2 = 4$$

$$\therefore x = 2$$

$$\therefore \text{Greater No.} = 4x = 4 \times 2 = 8$$

Q.17. The ratio of No. of boys and the No. of girls in a school is found to be 15 : 32. How many boys and equal No.**of girls should be added to bring the ratio to 2/3?**

- (a) 20 (b) 19
(c) 23 (d) 27

[Dec. 2020]

Solution:**Trick:** GBC

$$(b) \frac{15+19}{32+19} = \frac{34}{51} = \frac{2}{3} \text{ (True)}$$

 $\therefore$ (b) is correct.**Detail Method:**

Let x is added.

$$\therefore \frac{15+x}{32+x} = \frac{2}{3}$$

$$\text{or } 45 + 3x = 64 + 2x$$

$$\text{or } 3x - 2x = 64 - 45$$

$$\text{or } x = 19$$

 $\therefore$ (b) is correct.**Q.18. If a : b = 9:4 then =**

$$\sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = ?$$

- (a) 2/3 (b) 3/2
(c) 6/13 (d) 13/6

[Dec. 2020]

Solution: $\therefore a : b = 9 : 4$

$$\therefore \sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} = \sqrt{\frac{9}{4}} + \sqrt{\frac{4}{9}}$$

$$= \frac{3}{2} + \frac{2}{3} = \frac{9+4}{6} = \frac{13}{6}$$

 $\therefore$ (d) is correct.

Q.19. If $a : b = 3 : 7$ then $3a + 2b : 4a + 5b = ?$

- (a) 27 : 43 (b) 23 : 47
(c) 24 : 51 (d) 29 : 53

[Dec. 2020]

Solution: Putting $a = 3$; $b = 7$

We get

$$\frac{3a + 2b}{4a + 5b} = \frac{3 \times 3 + 2 \times 7}{4 \times 3 + 5 \times 7}$$

$$= \frac{23}{47}$$

$\therefore$ (b) is correct

Q.20. In a certain business A and B received profit in a certain ratio; B and C received profits in the same ratio. If A gets ₹ 1600 and C gets ₹ 2500 then how much does B get?

- (a) ₹ 2,000 (b) ₹ 2,500
(c) ₹ 1,000 (d) ₹ 1,500

[Jan. 2021]

Solution: (a) is given

$$\frac{A}{B} = \frac{B}{C}$$

or, $B^2 = AC$

or $B = \sqrt{AC}$

$$= \sqrt{1600 \times 2500}$$

$$= 40 \times 50$$

$$= ₹ 2000$$

Q.21. The ratio of two quantities is 15 : 17. If the consequent of its inverse ratio is 15, then the antecedent is

- (a) 15 (b) $\sqrt{15}$
(c) 17 (d) 14

[Jan. 2021]

Solution: (c) is correct

After inverting the ratio 15 : 17

We get $\frac{17}{15}$ i.e. 15 as consequent

Clearly its Antecedent = 17

Q.22. The salaries of A, B and C are in the ratio 2 : 3 : 5. If increments of 15%, 10% and 20% are allowed respectively to their salary, then what will be the new ratio of their salaries?

- (a) 3 : 3 : 10
(b) 10 : 11 : 20
(c) 23 : 33 : 60
(d) Cannot be determined

[Jan. 2021 & July 2021]

Solution: (c) is correct

Using Calculator.

New ratio

$$= A : B : C$$

$$= (2 + 15\%) : (3 + 10\%) : (5 + 20\%)$$

$$= 2.3 : 3.3 : 6.0$$

[Note: On calculator type 2 + 15% button; we get 2.3. Similarly do for rest terms]

Multiplying each term by 10; we get

$$= 23 : 33 : 60$$

Q.23. A vessel contained a solution of acid and water in which water was 64%. Four litres of the solution were

taken out of the vessel and the same quantity of water was added. If the resulting solution contains 30% acid, the quantity (in litres) of the solution, in the beginning in the vessel, was

- (a) 12 (b) 36
(c) 24 (d) 27

[July 2021]

Solution: (c) is correct

Let quantity of mixture = x

$$\text{Acid} = x \times (100 - 64)\% = 0.36x$$

Quantity of Acid in 4 litre mixture

$$= 4 \times 36\% = 1.44$$

After reduction of 4 litres of mixture;
remaining Acid = $0.36x - 1.44$

After adding 4 litre water, Total quantity

$$= x - 4 + 4 = x \text{ litre}$$

$\therefore$ Percentage of Acid

$$= \frac{0.36x - 1.44}{x} \times 100 = 30$$

or,

$$0.36x - 1.44 = 0.3x$$

$$\text{or } 0.36x - 0.30x = 1.44$$

$$\text{or } 0.06x = 1.44$$

$$\text{or } x = \frac{1.44}{0.06} = 24 \text{ litres}$$

Q.24. If $A : B = 5 : 3$, $B : C = 6 : 7$ and $C : D = 14 : 9$, then the value of $A : B : C : D$

- (a) 20 : 14 : 12 : 9
(b) 20 : 9 : 12 : 14
(c) 20 : 9 : 14 : 12
(d) 20 : 12 : 14 : 9

[July 2021]

Solution: (d) is correct

Trick: Go by Choices (GBC)

Checking for all ratios, we get

option (a) 20 : 14 : 12 : 9

$$\frac{20}{14} \neq \frac{5}{3} = \frac{A}{B}$$

So (a) False

Doing in this way for rest options

At the end

For option (d) 20 : 12 : 14 : 9

$A : B : C : D$

$$\frac{20}{12} = \frac{5}{3} = \frac{A}{B} \text{ (True)}$$

$$\frac{12}{14} = \frac{6}{7} = \frac{B}{C} \text{ (Also True)}$$

$$\frac{14}{9} = \frac{C}{D} \text{ (True)}$$

Hence (d) is correct

Q.25. Incomes of R and S are in the ratio 7 : 9 and their expenditures are in the ratio 4 : 5. Their total expenditure is equal to income of R. What is the ratio of their savings?

- (a) 23 : 36 (b) 28 : 41
(c) 31 : 43 (d) 35 : 46

[Dec. 2021]

Solution: (d) is correct

Let x is common in the ratio of incomes

$$\therefore \frac{R}{S} = \frac{7x}{9x}$$

and y is common in the ratio of

$$\text{expenditure} = \frac{4y}{5y}$$

From Question

Total expenditure = Income of R

$$\Rightarrow 4y + 5y = 7x$$

$$\text{or } 9y = 7x \Rightarrow y = \frac{7}{9}x$$

$$\text{Ratio of saving} = \frac{7x - 4y}{9x - 5y}$$

$$= \frac{7x - 4 \times \frac{7}{9}x}{9x - 5 \times \frac{7}{9}x} = \frac{\left(\frac{63 - 28}{9}\right)x}{\left(\frac{81 - 35}{9}\right)x} = \frac{35}{46}$$

Q.26. A bag has 105 coins containing some 50 paise, and 25 paise coins. The ratio of the number of these coins is 4 : 3. The total value (in ₹) in the bag is

- (a) 43.25 (b) 41.25
(c) 39.25 (d) 35.25

[Dec. 2021]

Solution: (b) is correct

Total Numbers of 50 paise coins

$$= \frac{105}{4+3} \times 4 = 60$$

$$\text{and 25 paise coins} = \frac{105}{4+3} \times 3 = 45$$

$$\begin{aligned} \text{Total Value} &= 60 \times 0.50 + 45 \times 0.25 \\ &= 30 + 11.25 \\ &= ₹ 41.25 \end{aligned}$$

Q.27. In a department, the number of males and females are in the ratio 3 : 2. If two males and 5 females join department, then the ratio becomes 1 : 1, initially the number of female in the department is

- (a) 9 (b) 6
(c) 3 (d) 8

[Dec. 2021]

Solution: (b) is correct

Let x is common in the ratio

$$\therefore \frac{\text{Males}}{\text{Females}} = \frac{3x}{2x}$$

From Questions

$$\text{Now } \frac{3x+2}{2x+5} = \frac{1}{1} \Rightarrow 3x+2 = 2x+5$$

$$\text{or } x = 5 - 2 = 3$$

$$\therefore \text{Initially No. of Females} = 2x = 2 \times 3 = 6$$

Q.28. A bag contains 25 paise, 10 paise and 5 paise coins in the ratio 3:2:1. The total value is ₹ 40, the number of 5 paise coins is

- (a) 45 (b) 48
(c) 40 (d) 20

[June 2022]

Solution:

Trick: Common Factor

$$\begin{aligned} &= \frac{\text{Total Value}}{\text{Total Value of ratio terms}} \\ &= \frac{40}{3(0.25) + 2(0.10) + 1(0.05)} = 40 \end{aligned}$$

Calculator Trick:

$$\text{Type } 3 \times 0.25 = \text{button press}$$

$$2 \times 0.10 = \text{button press}$$

$$1 \times 0.05 = \text{button press}$$

Then Press GT button then M+ button then type 40 ÷ button

Then MRC button. We get 40

$$\therefore \text{No. of 5 paise coins} = 1 \times 40 = 40$$

(c) is correct

Q.29. If $x:y = 4:6$ and $2:x = 1:2$ the $y =$ _____

(a) 4 (b) 6

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

[June 2022]

Solution:

$$\therefore \frac{2}{x} = \frac{1}{2} \Rightarrow x = 4$$

$$\therefore \frac{x}{y} = \frac{4}{6}$$

$$\text{or } \frac{4}{y} = \frac{4}{6} \therefore y = 6$$

(b) is correct

Q.30. A sum of money is to be distributed among A, B, C, D in the proportion of 5:2:4:3. If C gets ₹ 1000 more than D, what is B's share?

(a) 2000 (b) 1500

(c) 2500 (d) 1000

[Dec. 2022]

Solution:

Let x is common in the ratio

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

Given

$$C - D = 4x - 3x = 1000$$

$$\text{So, } x = 1000$$

$$\therefore \text{B's share} = 2x = 2 \times 1000$$

$$= ₹ 2000$$

$\therefore$ (a) is correct

Q.31. If the four numbers $\frac{1}{4}$, $\frac{1}{6}$, $\frac{1}{10}$ and $\frac{1}{x}$ are in proportional, then what is the value of x ?

(a) 14 (b) 15

(c) 10 (d) $\frac{1}{12}$

[June 2024]

Solution:

$\frac{1}{4}, \frac{1}{6}, \frac{1}{10}$ and $\frac{x}{y}$ are in proportion.

$$\therefore \frac{1}{4} \cdot \frac{1}{x} = \frac{1}{6} \cdot \frac{1}{10}$$

$$\text{or } 4x = 60$$

$$\text{or } x = 15$$

$\therefore$ (b) is correct.

Q.32. The ratio of income of A and B is 5: 4 and their expenditure is 3: 2. If at the end of year each saves ₹ 1,600, then the income of A is:

(a) ₹ 3,600 (b) ₹ 3,400

(c) ₹ 4,000 (d) ₹ 4,400

[Sep. 2024]

Solution: (c) is correct.

Let x is common in the ratio.

$$\therefore \text{Income of A \& B} = 5x \text{ \& } 4x$$

$$\text{Saving of each} = ₹ 1600$$

$$\therefore \frac{5x - 1600}{4x - 1600} = \frac{3}{2}$$

$$\text{or; } 12x - 4800 = 10x - 3200$$

$$\text{or; } 12x - 10x = 4800 - 3200$$

$$\text{or; } 2x = 1600$$

$$\text{or } x = 800$$

$$\therefore \text{Income of A} = 5x = 5 \times 800$$

$$= ₹ 4000$$

Trick: Apply Go by choices.

Q.33. The mean proportional between $12x^2$ and $27y^2$ is:

- (a) $81xy$ (b) $18xy$
(c) $8xy$ (d) $19.5xy$

[Sep. 2024]

Solution: (b) is correct.

$$\begin{aligned}\text{Mean Proportional} &= \sqrt{12x^2 \times 27y^2} \\ &= \sqrt{324x^2y^2} = 18xy\end{aligned}$$

Q.34. Suppose a father had a sum of ₹ 3,600 and he decided to divide this amount among his three sons Anil, Sunil and Nimal in such a way that 3 times Anil's share, 6 times Sunil's share, and 8 times Nimal's share are all equal, Then Anil's share is

- (a) ₹ 1,920 (b) ₹ 960
(c) ₹ 720 (d) ₹ 1,860

[Jan. 2025]

Solution:

Let Anil shares = A

Sunil shares = B

and Nimal shares = C

From Qts

$$3A = 6B = 8C \text{ (Given)}$$

$$\text{Let } 3A = 6B = 8C = x$$

$$\therefore A = \frac{x}{3}; B = \frac{x}{6}; C = \frac{x}{8}$$

$$\therefore A : B : C = \left[\frac{x}{3} : \frac{x}{6} : \frac{x}{8} \right] \div x$$

$$\text{LCM of } 3, 6, 8 = 24$$

$$\text{So } \left[\frac{1}{3} : \frac{1}{6} : \frac{1}{8} \right] \times 24$$

$$A : B : C = 8 : 4 : 3$$

$$\text{Anil's share} = \frac{3600}{8+4+3} \times 8 = 1920$$

(a) is correct.

Q.35. The ratio of age of two sisters is 5 : 7. One is elder to the other by 8 years. Then the ratio of their age after 4 years between older to younger is

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

[Jan. 2025]

Solution:

Let x is a common Factor.

$$\therefore \text{Their Age's} = 5x; 7x.$$

$$7x - 5x = 8 \text{ (Given)}$$

$$2x = 8$$

$$\therefore x = 4$$

$$\therefore \text{Age of younger Sister} = 5x$$

$$= 5 \times 4 = 20 \text{ yrs.}$$

$$\text{Older sister} = 7x = 7 \times 4 = 28 \text{ yrs.}$$

$\therefore$ Ratio of older to younger after 4 years

$$= \frac{28+4}{20+4} = \frac{32}{24} = \frac{4}{3}$$

$$= 4 : 3$$

(b) is correct.

Q.36. Three Employees A, B and C of a firm receive variable incentive money in the ratio 3 : 4 : 5. Then the Management also gave a fixed incentive of ₹ 4,000 to each of them. As a result now the total incentive amount of A, B and C becomes in the ratio 5 : 6 : 7. How much amount did B get as variable incentive?

- (a) ₹ 2,000 (b) ₹ 4,000
(c) ₹ 6,000 (d) ₹ 8,000

[Jan. 2025]

Solution:

Let x is common in variable incentive money ratio $3 : 4 : 5$ and y in Total incentive ratio $5 : 6 : 7$.

So, Variable incentives of A, B & C are $3x$; $4x$ and $5x$ and Total incentives of A, B & C are $5y$; $6y$ and $7y$

From Qts

$$5y - 3x = 4,000 \quad \dots(1)$$

$$6y - 4x = 4,000 \quad \dots(2)$$

$$\text{and } 7y - 5x = 4,000 \quad \dots(3)$$

Solving (1) & (2); we get

$$5y - 3x = 4,000] \times 6$$

$$- 6y + 4x = - 4,000] \times 5$$

$$2x = 4,000$$

$$\therefore x = 2,000$$

$$\therefore \text{Variable incentive of B} = 4x = 4 \times 2,000 = ₹ 8,000$$

Hence (d) is correct.

Q.37. The salaries of A, B and C are of ratio 2:5:5. If the increments of 15% 10% and 20% are done their respective salaries, then find new salaries

(a) $23 : 33 : 60$ (b) $33 : 23 : 60$

(c) $23 : 60 : 33$ (d) $33 : 60 : 23$

[RTP Jan. 2025]

Solution: (a)

Ratio of New Salaries (on calculator)

$$= [2 + 15\%] : [3 + 10\%] : [5 + 20\%]$$

button (Press).

$$= 2.3 : 3.3 : 6.0$$

Q.38. The ratio of prices of two Fans was 16:23 Two years later when the price of first has increased by 10% and that of the second by ₹ 477 the ratio of the price becomes 11:20 Find the original prices of the two Fans.

(a) ₹ 848, ₹ 1,219.

(b) ₹ 838, ₹ 1,119.

(c) ₹ 828, ₹ 1,219.

(d) ₹ 848, ₹ 1,229.

[MTP Jan. 2025]

Solution: (a)

GBC

Calculator Tricks

$$848 + 10\% \div 11 = 84.8$$

$$1219 + 477 \div 20 = 84.8$$

Same factor

Q.39. If $a:b = 3:4$ the value of $(2a+3b)$ $(3a+4b)$ is

(a) $54:25$

(b) $8:25$

(c) $17:24$

(d) $18:25$

[MTP Jan. 2025]

Solution: (d)

Put

$$A = 3 \text{ \&}$$

$$b = 4$$

$$\frac{2 \times 3 + 3 \times 4}{3 \times 3 + 4 \times 4} = \frac{18}{25}$$

Q.40. The third proportional to 49 and 21 is:

(a) 6

(b) 9

(c) 12

(d) 28

[MTP Jan. 2025]

Solution: (b)

Let third proportion is X

$$49x = 21^2$$

$$x = \frac{21^2}{49} = 9$$

Q.41. The sum of three numbers is 98. If the ratio of the first to second number is 2 : 3 and that of the second to third is 5 : 8, then the second number is:

- (a) 20 (b) 30
(c) 48 (d) 58

[May 2025]

Solution: (b)

Let Three Numbers are A, B & C.

Given That

$$A : B = 2 : 3 \text{ and}$$

$$B : C = 5 : 8.$$

and $A + B + C = 98$; Then $B = ?$

For continued Ratio

$$A : B = 2 \times 5 : 3 \times 5] \times 5$$

$$B : C = 3 \times 5 : 8 \times 3] \times 3$$

$$A : B : C = 10 : 15 : 24$$

Note: Common term "B" must be equal in both ratio.

$$\therefore B = \frac{98}{10+15+24} \times 15 = 30$$

(b) is correct.

Q.42. A startup business was initiated by an entrepreneur by investing ₹ 1,40,000. His friend joined him after six months with an amount of

₹ 2,10,000. Thereafter an angel investor joined them with ₹ 2,80,000 after another six months. What should be the ratio of distribution of total earnings, three years since beginning of business among entrepreneur, his friend and angel investor?

- (a) 7 : 6 : 10 (b) 12 : 15 : 16
(c) 42 : 45 : 56 (d) 2 : 3 : 4

[May 2025]

Solution: (b)

Ratio of their Distribution for 3yrs

$$= (\text{Investment Money}) \times$$

(Duration in Which Money remain in business)

$$= 140,000 \times 3 : 210,000 \times 2.5 : 2,80,000 \times 2$$

$$= 14 \times 3 : 21 \times 2.5 : 28 \times 2$$

$$= 42.0 : 52.5 : 56.0$$

$$= [420 : 525 : 560] \div 35$$

$$= 12 : 15 : 16$$

(b) is correct.

Trick:

GBC

(b) Common Factor must be equal.

$$\therefore \frac{140,000 \times 3}{12} = \frac{2,10,000 \times 2.5}{15}$$

$$= \frac{280,000 \times 2}{16}$$

$$= 35000 \text{ (Equal)}$$

So (b) is correct.

[Note: Do it on calculator]

2

CHAPTER

INDICES

If a number x is multiplied 5 times written as.

$$x \cdot x \cdot x \cdot x \cdot x = x^5.$$

Here “ x ” is called BASE and 5 is called Power or INDEX.

Some Related Formulae:

1. $a^m = a \times a \times a \times \dots$ to m times.
2. $a^0 = 1$ where $a \neq 0; \infty$
3. $a^{-1} = \frac{1}{a}$
4. $a^{-m} = \frac{1}{a^m}$
5. (i) $a^m \times a^n = a^{m+n}$
(ii) $a^m \times a^n \times a^r \times \dots = a^{m+n+r+\dots}$
6. (i) $\frac{a^m}{a^n} = a^{m-n}$
(ii) $\frac{a^m}{a^n} = \frac{1}{a^{n-m}}$
7. (i) $(a^m)^n = a^{mn}$
(ii) $a^{m^n} \neq a^{mn}$
8. (i) If $a^m = b^m$ Then $a = b$
(ii) If $a^m = a^n$ Then $m = n$
9. (i) $\sqrt[n]{a^m} = a^{\frac{m}{n}}$