GENERAL APTITUDE

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Progression

- **Arithmetic Progression :**
- If quantities increase or decrease by a common difference then they are said to be in AP e.g. 3, 5, 7, 9,11,….
- If a is first term, d is the common difference, l is the last term then
- General form : a, a+d, a+2d, a+3d,…,a+(n-1)d
- n^{th} term Tn = a + (n-1)d , **n = 1, 2, ..**
- Sum of first n terms $Sn = \frac{n}{2}[2a + (n-1)d]$

$$\mathbf{Sn = \frac{n}{2}(a + l)}$$

Progression

- Prove that the sum Sn of n terms of an Arithmetic Progress (A.P.) whose first term ‘a’ and common difference ‘d’ is
- S = n/2[2a + (n - 1)d]
- Or, S = n/2[a + l], where l = last term = a + (n - 1)d
- **Proof:**
- a , a+d , a+2d , a+3d,…….., a(n-2)d ,a(n-1)d, as l = last term
- a , a+d , a+2d , a+3d,…….., l-d ,l
- S = a + a+d + a+2d + a+3d + …….. + l-d + l ----------1
- Writing equation 1 in reverse order(sum remains same even if we write in reverse order)
- S = l + l-d + l-2d + l-3d + …….. + a+d + a----------2
- Adding equation 1 and 2
- 2S = (a + l) + (a + l) + (a + l) + --------- +(a + l) + (a + l)
- So for n terms,
- 2S = n(a + l)
- S = $\frac{n}{2}$ (a + l)

Progression

Q. The sum of all two digit numbers divisible by 3 is

A. 550 B. 1550 C. 1665 D. 1680

Soln

Two digit numbers divisible by 3 are :

12, 15, 18, 21, ……, 96, 99.

This is an A.P. with a = 12, d = 3, l=99

Let n be the number of terms.

Last term = a + (n-1)d

99 = 12 + (n-1)x3

3n = 90 , n = 30

Sum = n/2 (a + l) = 30/2 x (12+99)

= 1665

Ans: C

Progression

Q. Find the sum of all natural numbers between 10 and 200 which are divisible by 7

A. 2835 B. 2865 C. 2678 D. 2646

Soln:

Two digit numbers divisible by 7 are :

14, 21, 28, 35, ……, , 196.

This is an A.P. with a = 14, d = 7, l=196

Last term = a + (n-1)d

196= 14 + (n-1)x7

196-14 = (n-1)x7

n-1 = 26

n=27

Sum = n/2 (a + l)

= 27/2 x (14+196)

= 27 × 210 /2

= 27 × 105

= 2835

OR

$$n = \frac{\text{LastTerm} - \text{FirstTerm}}{d} + 1$$

Ans: A

Progression(Assignment)

Q. Find the sum of the series 3,8,13,18, ……..,93

A. 912 B. 925 C. 998 D. 936

Ans : A

Progression

- **Geometric Progression** :
- If quantities increase or decrease by a constant factor then they are said to be in GP e.g. 4, 8, 16, 32, …..
- If a is first term, r is the common ratio, then
- General form : a, ar, ar^2, ar^3,……, ar^{n-1}
- n^{th} term Tn = $ar^{(n-1)}$
- Sum of first n terms **Sn** = $\frac{a(r^n - 1)}{(r - 1)}$

Geometric Progression of n terms :

- To prove that the sum of first n terms of the Geometric Progression whose first term ‘a’ and common ratio ‘r’ is given by-
- $S = a + ar + ar^2 + ar^3 + ar^4 + \ldots\ldots\ldots\ldots + ar^{n-1}$ ---------- 1
- Multiply both sides of this equation by r
- $Sr = ar + ar^2 + ar^3 + ar^4 + \ldots\ldots\ldots\ldots + ar^{n-1} + ar^n$ ---------- 2

- - - - - - -

- Eq 2 - Eq 1
- $Sr - S = ar^n - a$
- $S(r - 1) = a(r^n - 1)$
- $S = \frac{a(r^n - 1)}{(r - 1)}$

Geometric Progression

Q. Find the 10^{th} term of the series: 4,16, 64, 256, 1024, ….

A. 4^{10} B. 4^{8} C. 4^{9} D. 1022480

Soln:

The given series is in geometric progression

Where a = 4, r = 4

So $T10 = a \times r^{(10-1)}$

$= 4 \times 4^{(10-1)}$

$= 4^{10}$

Ans: A

Progression

- What is the difference between arithmetic progression and geometric progression?
- A sequence is a set of numbers, called terms, arranged in some particular order. An arithmetic sequence is a sequence with the difference between two consecutive terms constant. The difference is called the common difference. A geometric sequence is a sequence with the ratio between two consecutive terms constant.

Averages

- **Simple Average** :
- An average of a set of values is the sum of values divided by the total number of values.
- Average of ‘n’ values = (Sum of the ‘n’ values)/n
- This is also called as Arithmetic Mean.
- Average (A) = Sum (S)/ Number(n)
- S = A x n
- **Weighted Average** :
- When all values whose average we want to find do not have uniform occurrences we calculate the weighted average.
- If values y1, y2, y3…occur w1, w2, w3… times then
- Weighted Avg $= \frac{(w1y1+w2y2+w3y3+ ..)}{(w1+w2+w3..)}$

Averages

Q. In a class of 50 students, 24 secured 60 in Physics, 16 secured 70 marks and the rest secured 80. What is the average score for Physics in the class?

A.64.8 B. 65.4 C. 67.2 D. 66.7

Soln :-

Students	24	16	10.
Marks	60	70	80

$$\text{Average} = \frac{24\times60 + 16\times70 + 10\times80}{24 + 16 + 10}$$

$$= 3360/50$$

$$= 67.2$$

Ans : C

Averages

- Only For Consecutive Numbers -
- Whenever, we have consecutive numbers or consecutive odd numbers or consecutive even numbers, then always remember the middle number is the Average.
- Examples-
- A. 5,6,7,8,9 → Avg =7
- B. 5,6,7,8 → Avg =6.5
- C. 1,3,5,7,9 → Avg =5
- D. 21,23,25,27 → Avg =24

Averages

Q. The average age of a class of 22 students is 21 years. The average increased by 1 when the teacher's age also included. What is the age of the teacher?

A. 48 B. 45 C. 43 D. 44

Ans: D

Averages

Q. The average age of a class of 22 students is 21 years. The average increased by 1 when the teacher's age also included. What is the age of the teacher?

Solution 1:-

- Before teacher , total age of students = 22x21
- After teacher is added,

Total age of all students + Age of the teacher =23×22

- Age of the teacher =23×22−22×21

=22(23−21)

=22×2

=44 years

Averages

- The average age of a class of 22 students is 21 years. The average increased by 1 when the teacher's age also included. What is the age of the teacher?

- **Solution 2:-**
- New value = old avg + (n $\pm$ 1)(diff)

+ if member added
- If member removed

- Where, n = total no. of students

difference = |Old avg – new avg|

- New value = 21 + (22+1)(1)

  = 21 + 23

  = 44 years

Averages

Q. There are 50 students in a class. Their average weight is 45 kg. When one student leaves the class the average weight reduces by 100 g. What is the weight of the student who left the class ?

A. 45 kg. B. 47.9 kg. C. 49.9 kg. D. 50.1 kg.

Soln:

New value = old avg $\pm$ (n $\mp$ 1)(diff)

= 45 + (50 – 1)(0.1) (as we convert 100g into kg = $\frac{100}{1000}$ = 0.1 kg)

= 45 + 49(0.1)

= 45 + 4.9

= 49.9 kg

Ans: C

Averages

Q. There are 50 students in a class. Their average weight is 45 kg. When one student leaves the class the average weight reduces by 100 g. What is the weight of the student who left the class ?

A. 45 kg. B. 47.9 kg. C. 49.9 kg. D. 50.1 kg.

Soln:

Total weight of 50 students = (45 x 50) kg = 2250 kg

Average weight of 49 students = 45kg -100g = 44.9 kg

So, total weight of 49 students = (44.9 x 49)kg = 2200.1kg

Weight of the students who left the class = 2250 – 2200.1 = 49.9 kg

Ans: C

Averages

Q. The average age of 16 men increases by 3 years when a person 27 years old is replaced by another. How old is the new person?

A.75 B. 30 C. 48 D. 64

Soln:-

Number of men = 16

Let average age be a

→ Total age of 16 men = 16a (Old total)

New average = a+3

→New total age of 16 men = 16 (a+3) = 16a + 48

New Total – Old Total = 48

→ Age of new man = 27 + 48 = 75

Ans : A

Averages

Q. The average age of 16 men increases by 3 years when a person 27 years old is replaced by another. How old is the new person?

A.75 B. 30 C. 48 D. 64

Soln:-

- Average of 16 men increases by 3 years means,
- total age increases by 16 x 3 =48
- If the age of new person same as replaced person then there would have been no change in average.
- But average age of 16 men increased by 3 years
- So, total age of the person replacing another person = 27 + 48 = 75years

Ans : A

Averages

Q. The average age of 8 men is decreased by 2 years when two of them, whose ages are 22 and 28, are replaced by two new men.. What is the average age of two men?

A. 34years B. 30years C. 15years D. 17years

Soln:

- Average of 8 men reduce by 2 years means total age reduces by 16 if two men leave.
- So, the total age of the new men replacing the old men = 22+28–16=34
- => Average = 34/2 = 17 years.

OR

- Total age decreased= (8 * 2) years = 16 years.
- Sum of ages of two new men = (22 + 28 - 16) years = 34 years
- Average age of two new men = (34/2) years = 17 years.
- **Ans: D**

Averages

Q. The average age of students is 7 years and average age of 10 teachers is 50 years. If average age of group of all teachers and students is 8 years. Find the number of students?

A. 420 B. 250 C. 300 D. 270

Soln:

We know, Total = avg x n

	S	T
No.	z	10
Avg	7	50

(student + teacher)x avg = (student) x avg + (teacher) x avg

(z +10) x 8 = (z) x 7 + (10) x 50

8z+80 = 7z + 500

Z= 420 students

Ans :A

Averages(Assignment)

Q. The average weight of 16 boys in a class is 50.25 kg and that of the remaining 8 boys is 45.15 kg. Find the average weights of all the boys in the class.

A. 47.55 kg B. 48 kg C. 48.55 kg D. 49.25 kg

Ans: C

$$\text{Average} = \frac{50.25 \times 16 + 45.15 \times 8}{16+8}$$

$$= (804+361.2)/24$$

$$= 1165.2 /24$$

$$= 48.55$$

Averages(Assignment)

Q. The average age of a class of 39 students is 15 years. If the age of the teacher be included, then the average increases by 3 months. Find the age of the teacher.

A. 20 years B. 25 years C. 30 years D. 27 years

Ans : B

Averages(Assignment)

Q. The average marks of a class of 87 students is 56. When a new student was added and average becomes 56.5. Find marks of new student.

A. 56 B. 44 C. 100 D. 90

Ans: C

Averages(Assignment)

Q. Find the average of first 97 natural numbers.

A. 47 B. 37 C. 48 D. 49 E. 49.5

Ans: D

Averages(Assignment)

Q. The average age of a class of 30 students is 9years. When teacher's age is also added, the average becomes 10. What is the age of the teacher?

A. 41 years B. 40 years C. 39 years D. 42 years

Ans: B

Averages(Assignment)

Q. The average of 50 numbers is 30. If two numbers, 35 and 40 are discarded, then the average of the remaining numbers is nearly:

A. 28.32 B. 29.68 C. 28.78 D. 29.27

Ans: B

Averages(Assignment)

Q. The average age 8 men is increased by 2 years when two of them whose ages are 21 years and 23 years are replaced by two new men . The average age of the two new men is?

A. 22 years B. 24 years C. 28 years D. 30 years

Ans: D

Averages(Assignment)

Q. The average weight of the students of a class is 60 kg. If eight new students of average weight 64 kg join the class, the average weight of the entire class becomes 62 kg. How many students were there in the class initially ?

A. 8 students B. 16 students C.10 students D. 12 students

Ans: A

Averages(Assignment)

Q. The average of ten numbers is 8. If the average of first nine numbers is 7. Find the 10^{th} number?

A. 17 B. 16 C.15 D. 12

Ans: A

Averages(Assignment)

Q. The average marks obtained by 150 students is 30. If the average marks of passed candidates was 40 and that of failed candidates was 20. Find the number of candidates who passed the exam?

A. 25 B. 85 C.75 D. 45

Ans: C

Averages(Assignment)

Q. The average expenditure of a man for the first five months is Rs. 3600 and for next seven months is Rs. 3900, if he saves Rs.8700 during the year, his average income per month is ?

A. Rs.4500 B. Rs.8500 C. Rs.7500 D. Rs.5400

Ans: A

Averages(Assignment)

Q. The average of first five multiples of 3 is:

A. 9 B. 10 C. 8 D. 11

Ans: A

Averages(Assignment)

Q. Find the average of first 100 positive numbers

A. 49.5 B. 50.5 C. 51 D. 100

Ans: B

Averages(Assignment)

Q. The average expenditure of a man for the first five months of a year is Rs. 5000 and for next seven months is Rs. 5400, if he saves Rs.2300 during the year, his average income per month is ?

A. Rs.5425 B. Rs.5446 C. Rs.5500 D. Rs.5600

Ans: A

Ages

Ram is at present some age(x) . Age 15 years ago or future age, then

'n' times of Ram's age means ,
= n x age

Ages

Q. Karan's age after 15years will be 5 times his age 5 years back. What is the present age of Karan?

A. 12 years B. 10 years C. 20 years D. 25 years

Soln:

Present age = x

As given,

Future age = x +15

Old age = x-5

5 times is that n times

So , x + 15 = 5(x-5)

x +15 = 5x -25

x = 10 years(Karan's present age)

Ans: B

Ages

Q. Present age of Sam & Ana are in the ratio 5:4 respectively. Three years hence ,their ratio will become 11:9 respectively. What is Ana's present age?

A. 6 years B. 24 years C. 28years D. 32years

Soln:

Present age –

S -> 5x, A -> 4x

3 years hence means (+) as its future ratio given and so its fraction

$\frac{5x+3}{4x+3} = \frac{11}{9}$

45x+27 = 44x + 33

x = 6 years

For A,

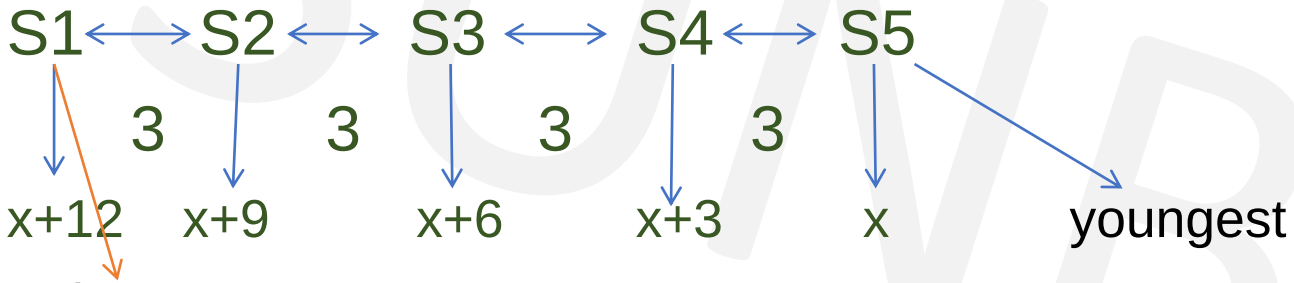
4x = 4 x 6 = 24 years

Ans: B

Ages

Q. Consider 5 siblings born apart by 3 years each. If the sum of the ages of all children is 50years. What is the age of youngest child?

Soln :



Eldest

Given,

Sum of ages = 50 years

x+12+x+9+x+6+x+3+x = 50

5x + 30 = 50

x = 4 years (age of youngest child)

Ages

Q. A mother said to her daughter " I was as old as you are at the time of your birth". If the mother's age is 38 years now. What was the daughter's age 5 years back?

A. 14years B. 19years C. 38years D. None of these

Soln:

	M	D
Present	38	x
At birth time	38-x	0

I was as old as you are at the time of your birth" shows

M D

38-x = x

38 = 2x

x =19 years(present age of daughter)

5years back, 19-5 = 14 years

Mother's age at time of birth = 38 –x

= 38 – 19

Ans: A = 19 years

Ages

Q. A is 2 years old than B who is twice as old as C. The total ages of A,B,C be 27. How old is B?

A. 5 years B. 12 years C. 10 years D. None of these

- **Soln**:
- So, we need to first find x here
- A = 2 + B
- B = 2C
- C = x
- So B becomes, B =2x
- So A becomes,
- A = 2 + B
- A = 2 + 2x

Given, the total age = A +B + C =27
Substitute the values here for A,B,C
2 +2x + 2x + x = 27
5x = 25
x=5years
Age of B = 2x = 2 x 5 =10 years

Ages

Q. A man was asked to state his age in years. His reply was, "Take my age 3 years hence, multiply it by 3 and then subtract 3 times my age 3 years ago and you will know how old I am". What is the age of the man ?

A. 18 years B. 20 years C. 24 years D. 32 years

Soln:

Let the present age of the man be x years

$3(x+3)-3(x-3)=x$

$(3x+9)-(3x-9)=x$

$x=18$

Ans: A

Ages(Assignment)

Q.A man who is 40 years old has three sons, ages 6, 3 and 1. In how many years will the combined age of his three sons equal 80% of his age?

A.5 B. 10 C. 15 D. 20

Soln:

- Let the condition occur after y years.
- After y years
- Man's age = (40+y)
- Son's ages (6+y), (3+y), (1+y)
- Sum of sons' ages = (10+3y)
- (10+3y) = 80/100(40+y)
- 5(10+3y) = 4 (40+y)
- 50 + 15y = 160 + 4y
- 11y = 110
- y = 10

Ans : B

Ages(Assignment)

Q. The ratio of Present age of A and B is 6:7. A is 7 years younger than C. C's age after 8 years will be 51 years. Then what is the difference between the present ages of A and B?

A. 3 Years B. 4 Years C. 5 Years D. 6 Years E. Cannot be determined

Ans : D

Ages(Assignment)

Q. The average age of A, B, C, D and E is 40 years. The average age of A and B is 35 years and the average of C and D is 42 years. Age of E is :

A. 48 years B. 46 years C. 42 years D. 45 years

Ans: B

Ages(Assignment)

Q. 10 years ago, age of father was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:

A. 5:2 B. 7:3 C. 9:2 D. 13:4

Ans : B

Ages(Assignment)

Q. The average age of A, B and C is 28 years, if average age of B and C is 29 years. What is the age of A in years?

A. 24 years B. 26 years C. 28 years D. 30 years

Ans: B

Ages(Assignment)

Q. Sachin is younger than Rahul by 7 years. If their ages are in the respective ratio of 7 : 9, how old is Sachin?

A. 16 years B. 18 years C. 28 years D. 24.5 years E. None of these

Ans: D

Ages(Assignment)

Q. At present, the ratio between the ages of Arun and Deepak is 4 : 3. After 6 years, Arun's age will be 26 years. What is the age of Deepak at present ?

A. 12 years B. 15 years C. 19.5 years D. 21 years E. None of these

Ans: B

Ages(Assignment)

Q. The present ages of three persons in proportions 4 : 7 : 9. Eight years ago, the sum of their ages was 56. Find their present ages (in years).

A. 8, 20, 28 years

B. 16, 28, 36 years

C. 20, 35, 45 years

D. None of these

Ans: B

Ages(Assignment)

Q. The sum of the ages of two brothers 21 years hence will be twice the sum of their ages today. If the difference in their ages is 12 years, how old is the younger brother?

A. 27 years B. 21 years C. 17 years D. 15 years

Ans : D

Soln-

Present age of elder brother = x

Present age of younger brother = y

After 21 years , elder brother = x+21 and younger brother = y+21

As per given condition,

x+21 + y+21 = 2(x + y) ------ (1)

x – y =12 ------(2)

Solving 1 and 2 , we get ,

x = 27 years and y = 15 years

Ratio & Proportion

- **Ratio** : Ratio is a comparison of two numbers (quantities) by division.
- The ratio of a to b is written as
- **a : b = a/b = a ÷ b.**

* Ratio is defined only for two values of same units

  ratio between 20 kg & 50 kg is 2:5

Ratio & Proportion

- **Some Useful Results**
- **If a:b = c:d or a/b = c/d**

1. **a x d = b x c**
2. **b/a = d/c** (Invertendo)
3. **a/c = b/d** (Alternendo)
4. **a+b/b = c+d/d** (By Componendo)
5. **a-b/b = c-d/d** (By Dividendo)
6. **(a+b)/(a-b) = (c+d)/(c-d)** (By Componendo & Dividendo)

Ratio & Proportion

- **Proportion** : A proportion is an expression that states that two ratios are equal.

  i.e. **a : b = c : d** e.g **2 : 3 = 4 : 6** or **2 : 3 :: 4 : 6**

  a, b, c & d are called the 1st, 2nd, 3rd & 4th proportional.

  1st & 4th proportionals are called extreme terms &

  2nd & 3rd proportionals are called mean terms.

  Product of means = Product of extremes. **bc = ad**

- **Continued Proportion**

  Three quantities are said to be in continued proportion if

  a : b = b : c or a/b = b/c

  If a : b :: b : c then $b^2 = ac$ (b is the mean proportion of a & c)

  a : b = b : c = c : d or a/b = b/c = c/d

Ratio & Proportion

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

A. 11 : 17 B. 8 : 27 C. 5 : 9 D. 2 : 9

Soln:

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

$$\frac{A}{D} = \frac{2}{3} \times \frac{4}{5} \times \frac{5}{9}$$

$$\frac{A}{D} = \frac{8}{27}$$

Ans : B

Ratio & Proportion(Assignment)

Q. What is the value of A+B / A-B, if A/B = 7

A. 4/3 B. 2/3 C. 2/6 D. 7/8

Ans : A

A/B = 7/1

A+B/A-B = 7+1/7-1 = 8/6 =4/3

Ratio & Proportion

If X : Y = 3 : 4 and Y : Z = 8 : 9 then X : Z is

A. 3 : 4 B .5 : 4 C. 2 : 3 D. 8 : 9

Soln:

X : Y = 3 : 4

(Inverted N)

Y : Z = 8 : 9

= 3x8 : 8x4 : 4x9

= 24 : 32 : 36

= 6 : 8 : 9

Now, X : Z

6 : 9

2 : 3

Ans: C

$$\frac{X}{Z} = \frac{X}{Y} \times \frac{Y}{Z}$$

$$\frac{X}{Z} = \frac{3}{4} \times \frac{8}{9}$$

$$\frac{X}{Z} = \frac{2}{3}$$

Ratio & Proportion(Assignment)

If A : B = 2 : 3 and B : C = 4 : 5 then A : B : C is

A. 2 : 3 : 5 B .5 : 4 : 6 C. 8 : 12 : 15 D. 6 : 4 : 5

Ans : C

- $\frac{A}{B} = \frac{2}{3}$
- $\frac{B}{c} = \frac{4}{5}$

A : B : C

2 : 3

4 : 5

- A : B : C = 2 × 4 : 3 × 4 : 3 × 5
  = 8 : 12 : 15

Ratio & Proportion

Q. A sum of Rs. 1240 is distributed among A, B and C such that the ratio of amount received by A and B is 6 : 5 and that of B and C is 10 : 9 respectively. Find the share of C ?

A.Rs. 480 B.Rs. 360 C.Rs. 400 D.Rs. 630

- **Soln:**
- Given, A : B = 6 : 5 , B : C = 10 : 9
- A : B : C
- 6 : 5
  10 : 9

---

60 : 50 : 45

12 : 10 : 9

A : B : C = 12 : 10 : 9

12x + 10x + 9x = 1240

x = 40

C's share = 9 × 40 = Rs. 360

Ans : B

Ratio & Proportion

If A : B = 2 : 3, B : C = 4 : 5 and C : D = 6 : 7. Find A:B:C:D

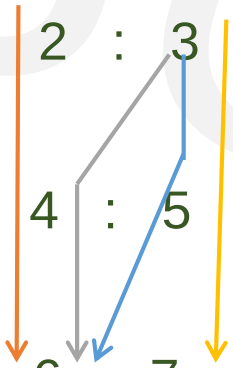
A. 2 : 3 : 4 : 5 B. 2 : 12 : 30 : 7 C. 16 : 24 : 30 : 35 D. 4 : 5 : 6 : 7

Soln:

A : B = 2 : 3

B : C = 4 : 5

C : D = 6 : 7



A	:	B	:	C	:	D
= ABC	:	BBC	:	BCC	:	BCD
= 2X4X6	:	3X4X6	:	3X5X6	:	3X5X7
= 48	:	72	:	90	:	105
= 16	:	24	:	30	:	35

Ans: C

Ratio & Proportion

Dividing a given number in the given Ratio :

Let A be the given number. Let the given ratio be a:b:c

This means A is divided into three parts such that

First Part = A x a/(a+b+c)

Second Part = A x b/(a+b+c)

Third Part = A x c/(a+b+c)

And First Part + Second Part + Third Part = A

Any Part = Total Amount x (Its related ratio term / Sum of Ratio Terms)

Ratio & Proportion

Q. Find B's share in Rs 6,300 if A:B = 2:3, B:C = 4:5, C:D = 3:7

A.Rs 1080 B. Rs 1800 C. Rs 810 D. Rs 1200

Soln:

A/B	B/C	C/D
2/3	4/5	3/7

A : B = 2 : 3

B : C = 4 : 5

C : D = 3 : 7

A : B : C : D

8 : 12 : 15 : 35

So B's share = 6300 x 12/70 = 1080

Ans : A

Ratio & Proportion

Q. A bag contains total 1200 coins of 25 ps, 50 ps and 1 Re coins. If the number of coins are in the ratio 6:5:4 find the total amount in the bag.

A. Rs 200 B. Rs 120 C. Rs 320 D. Rs 640

Soln:

25 ps	**50 ps**	**1 Re**
6	5	4

$6x + 5x + 4x = 1200$

$15x = 1200 \rightarrow x = 80$

6x = 480 coins x ¼ =Rs 120

5x = 400 coins x ½ =Rs 200

4x = 320 coins x 1 =Rs 320

Total =Rs 640

Ans : D

Ratio & Proportion

Q. Divide Rs. 18200 amongst 3 persons such that A gets 5/9th of what B & C together get & B gets 6/7th of what A & C together get. What does C get?

A. Rs. 6500 B. Rs. 3300 C. Rs. 8400 D. Rs. 1400

Soln:

A : (B+C)

5 : 9

A+B+C = 5x+9x =14x

14x = 18200 → x =1300 → A = 5x = 6500

B : (C+A)

6 : 7

A+B+C = 6y + 7y =13y

13y =18200 → y = 1400 → B = 6y = 8400

C= 18200-8400-6500 = 3300

Ans : B

Ratio & Proportion(Assignment)

Q. If A:B =2:3, B:C= 4:5 and C:D =6:7 Find A:D is equal to:

A. 16 : 35 B. 8 : 25 C. 4 : 15 D. 2 : 10

Ans : A

Ratio & Proportion(Assignment)

Q. The difference between two positive numbers is 10 and the ratio between them is 5 : 3. Find the product of the two numbers.

A.375 B.175 C.275 D.125 E.250

Ans : A

Ratio & Proportion(Assignment)

Q. Two numbers are in ratio 4 : 5 and their LCM is 180. The smaller number is

A.9 B.15 C.36 D.45

Ans : C

Ratio & Proportion(Assignment)

Q. A bag contains total of Rs 2400 in the form of 25 ps, 50 ps and 1 Re coins. If the total amounts of each type of coins are in the ratio 3:4:5 find the total no of coins in the bag.

A. 2000coins B. 4000 coins C. 5500 coins D. 5000 coins

Ans : D

Ratio & Proportion(Assignment)

Q. The average income of all employees is Rs. 20000. The average salary of male employees is Rs. 22000. The average salary of female employees is Rs. 15000. What is the ratio of male employees to female employees?

A. 2 : 5 B. 3 : 4 C. 5 : 2 D. 3 : 5

Ans: C

Ratio & Proportion(Assignment)

Q. The sum of 3 numbers is 98. If ratio between first and second numbers be 2 : 3 and between second and third be 5 : 8, then the second number is?

A. 30 B. 40 C. 50 D. 60

Ans: A

Ratio & Proportion(Assignment)

Two numbers are in ratio 7 : 11. If 7 is added to each of the numbers, the ratio becomes 2 : 3. The smaller number is?

A. 39 B. 49 C. 66 D. 77

Ans: B

Let the numbers be 7x and 11x.

$(7x+7)/(11x+7)=2/3$

$22x+14=21x+21$

$x=7$

Smaller number= 7x = 7 x 7 = 49

Ratio & Proportion(Assignment)

Q. What must be added to each of the numbers 7, 11 and 19, so that the resulting numbers may be in continued proportion?

A. -3 B. -4 C. 3 D. 4

Ans: A

Ratio & Proportion(Assignment)

Q. The incomes of A & B are in the ratio 3:2. Their respective expenditures are in the ratio 5:3. If each of them saves Rs. 2000, what is the income of B?

A. Rs 12,000 B. Rs 8,000 C. Rs 16,000 D. Rs 6,000

Ans : B

Ratio & Proportion(Assignment)

Q. When a particular number is subtracted from each of 7, 9, 11 and 15, the resulting numbers are in proportion. The number to be subtracted is -

A. 1 B. 2 C. 3 D. 5

Ans: C

Sol:

- Let the required number be x
- $\frac{7-x}{9-x} = \frac{11-x}{15-x}$
- (7 - x)(15 - x) = (11 - x)(9 - x)
- 105 - 22x + x2 = 99 - 20x + x2
- 2x = 6
- x = 3

Mixtures & Alligation

- **Alligation** : It is the rule which enables us to find the ratio in which two or more ingredients at given prices must be mixed to produce a mixture of a desired price.(mixing / linking)
- **Mean Price** : The cost price of a unit quantity of mixture is called the mean price.
- **Dearer** : The more expensive ingredient

- Note :

Always maintain the order in which problem is given else answer gets changed

Mixtures & Alligation

Type 1 oranges at Rs.60 per kg and Type 2 oranges at Rs.120 per kg and when mixed cost is Rs.75 per kg. Find the ratio in which Type 1 and Type 2 oranges are mixed.

Soln:

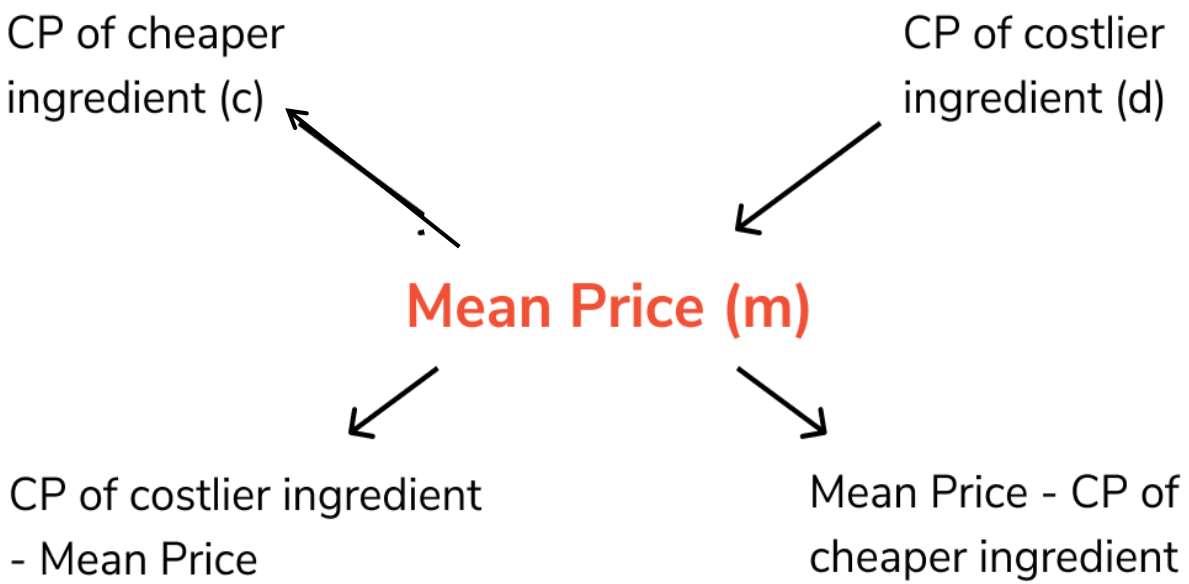
Type 1 60 — Type 2 120

75

x = d-m

y =m-c

$$\frac{x}{y} = \frac{d-m}{m-c} = \frac{120-75}{75-60} = \frac{45}{15} = \frac{3}{1} = 3:1$$



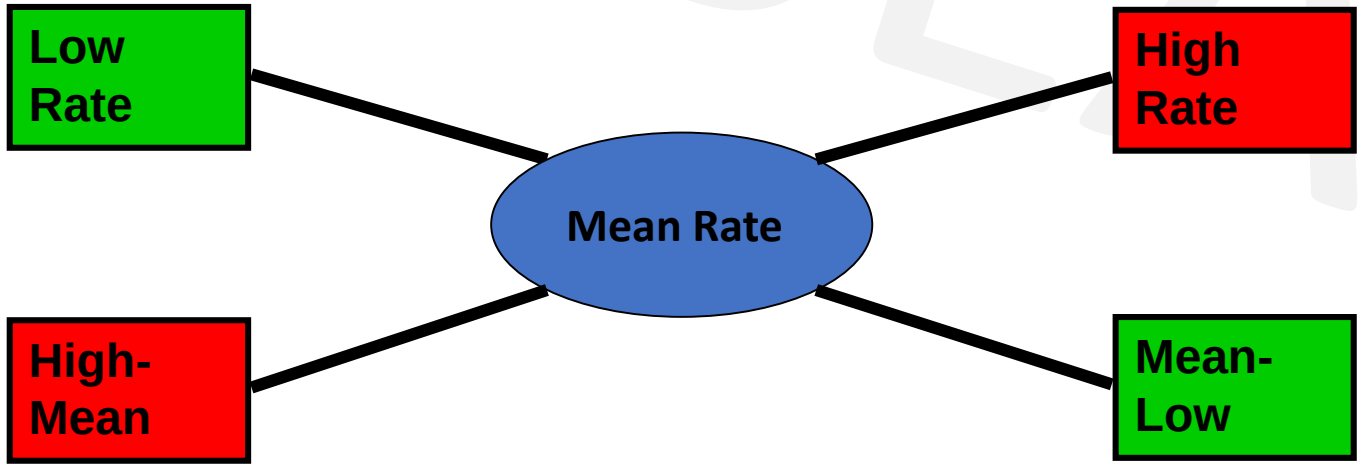
$$\frac{\text{Quantity of cheaper ingredient}}{\text{Quantity of costlier ingredient}} = \frac{d - m}{m - c}$$

Mixtures & Alligation

Quantity of Lower = (C.P. of Higher) – (Mean Price)
Quantity of Higher (Mean Price) – (C.P. of Lower)

$$\frac{\textbf{Q}l}{\textbf{Q}h} = \frac{\textbf{CP}h - \textbf{CP}m}{\textbf{CP}m - \textbf{CP}l}$$

(**Qty** Low) : (**Qty** High) = (**CP**h-**CP**m) : (**CP**m-**CP**l)

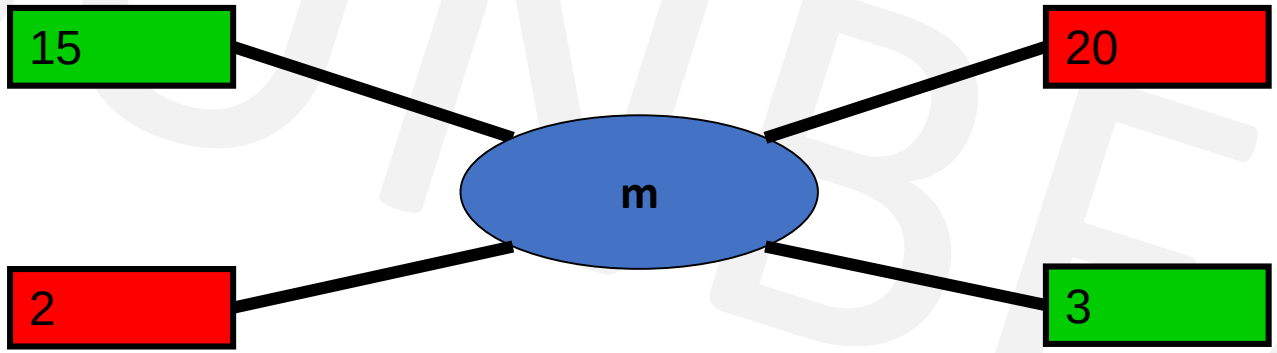


Mixtures & Alligation

Q. CP of rice A is Rs. 15/kg and CP of rice B is Rs.20/kg. If both A and B are mixed in the ratio 2:3. Then find the price per kg of the mixed rice.

A. Rs. 28 B. Rs. 17 C. Rs. 18 D. Rs. 48

Soln:



$$\frac{x}{y} = \frac{d-m}{m-c}$$

$$\frac{2}{3} = \frac{20-m}{m-15}$$

$$m = \frac{90}{5} = \text{Rs.}18$$

Ans: C

Mixtures & Alligation

Q. In what ratio must a grocer mix two varieties of dal worth Rs. 60/kg & Rs. 65/kg, so that selling the mixture at 68.20/kg, he may gain 10%.

Soln:

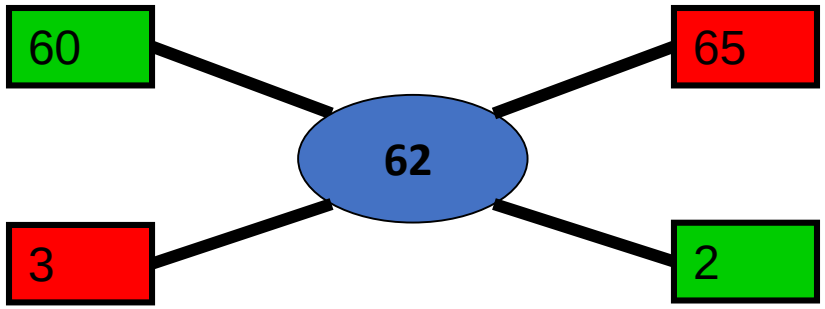
- Mean price is always CP
- Steps-
- 1. m=?
- 2. m = cost price(CP)
- 3. SP = given
- 4. find x/y=?

Mixtures & Alligation

In what ratio must a grocer mix two varieties of dal worth Rs. 60/kg & Rs. 65/kg, so that selling the mixture at 68.20/kg, he may gain 10%.

A. 3:2 B. 2:3 C. 3:4 D. 4:3

- SP of 1 kg of mixture = Rs. 68.20
- Gain =10%
- In case of profit, SP = $\frac{\text{C.P. x (100 +\%gain)}}{100}$
- CP of 1kg of mixture = Rs ($\frac{100}{100+10}$ x 68.2)
- $= \frac{682}{11}$
- Mean price =Rs. 62
- By the rule of alligation, we have :
- C.P. of 1kg dal of 1st kind C.P. of 1kg dal of 2nd kind



x/y = 3/2= 3:2

Ans: A

Mixtures & Alligation

Q. A person blends two varieties of tea, one cost Rs. 160/kg and other cost Rs. 200/kg in the ratio 5 : 4. He sells the blended variety at Rs.192/kg. Find the profit %.

A. 6% B. 8% C. 7% D. 9%

Soln :

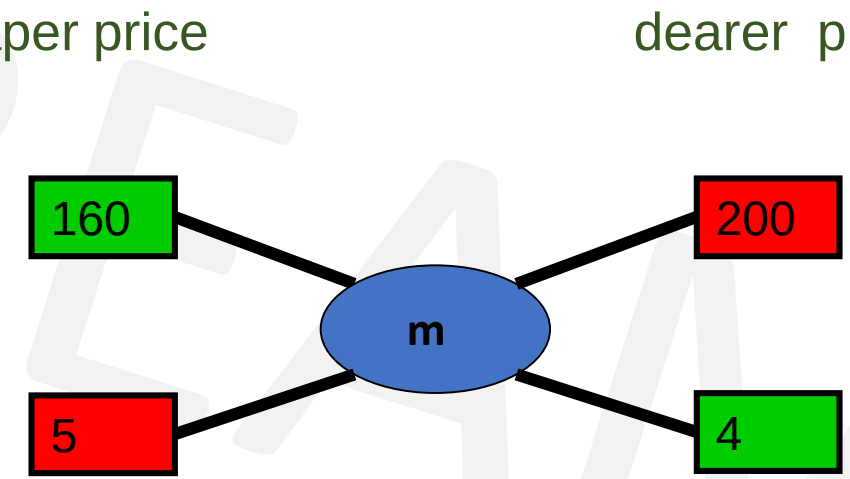
$\frac{x}{y} = \frac{d-m}{m-c}$

$\frac{5}{4} = \frac{200-m}{m-160}$

5m -800 = 800 -4m

9m = 1600

m = $\frac{1600}{9}$



SP=Rs.192(given) , CP =mean price

Profit% = $\frac{SP-CP}{CP}$ x 100

$= \frac{192 - \frac{1600}{9}}{\frac{1600}{9}} = \frac{1728 - 1600}{1600} = \frac{128}{16} = 8\%$ **Ans: B**

Mixtures & Alligation

Q. Two jars A and B contain milk and water in the ratio 7:5 and 17:7 respectively. In what ratio mixtures from two vessels should be mixed to get a new mixture containing milk and water in the ratio 5:3?

A. 2:1 B. 1:2 C. 2:3 D. 3:4

Soln:

For these type of questions consider 1 ingredient out of the two ingredients and represent as fraction of one.

A
m:w
7:5

B
m:w
17:7

C
m:w
5:3

We consider milk here, so fraction of milk,

A
$\frac{7}{7+5} = \frac{7}{12}$

B
$\frac{17}{17+7} = \frac{17}{24}$

C
$\frac{5}{5+3} = \frac{5}{8}$

Ans: A

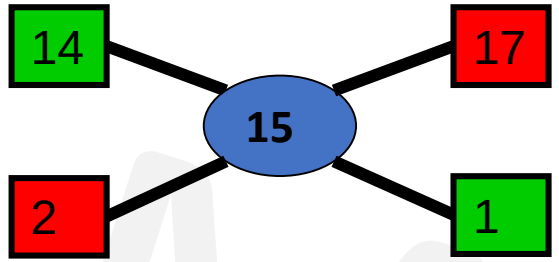
To make calculations easier, convert all denominator into common one

So, find LCM(12,24,8) = 24

A
$\frac{7}{12} \times \frac{2}{2} = \frac{14}{24}$

B
$\frac{17}{24}$

C
$\frac{5}{8} \times \frac{3}{3} = \frac{15}{24}$



2:1

forget denominators,

By rule of Alligation,

Mixtures & Alligation

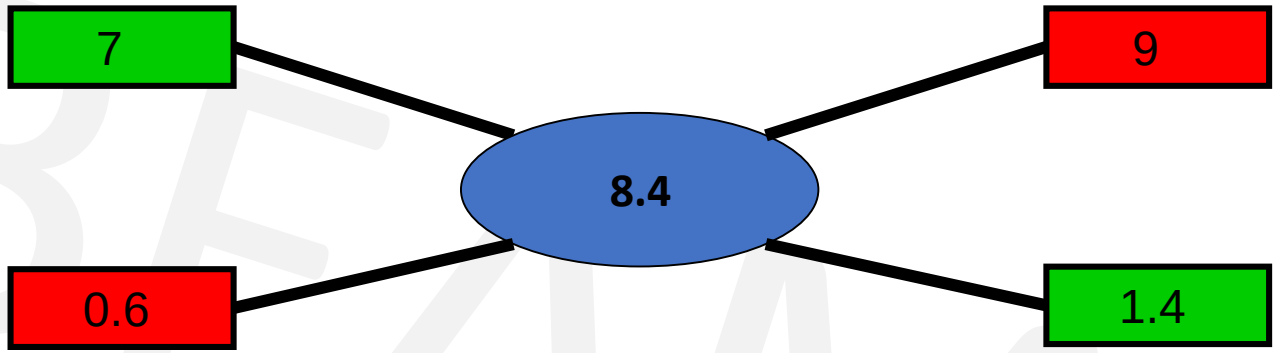
Q. How many kg of sugar costing Rs. 9 per kg must be mixed with 27kg of sugar costing Rs. 7 per kg, so that there maybe a gain of 10% by selling the mix at 9.24 per kg ?

A. 62kg B. 63kg C. 53kg D. 59kg

Soln:

$$SP = \frac{C.P. \times (100 + \%gain)}{100}$$

CP (Mean) = 9.24 x 100/110 = 8.4



- Qty of Low : Qty of High = 0.6/1.4 = 6/14 = 3/7
- 27 / Q_H = 3/7
- Q_H = 27 x 7/3 = 63 kg

Ans: B

Mixtures & Alligation

- **Final concentration = Initial $(1-\frac{R}{Initial})^n$**

- where,
- Final concentration is the amount of concentration remaining after the process
- n is the number of times the process is done and
- R is the replaced quantity.
- Initial is the initial concentration

Mixtures & Alligation

Q. A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

A. 26.34 litres B. 27.36 litres C. 28 litres D. 29.16 litres

Ans: D

- The volume of milk remaining after the three processes is,
- $V=N(1-\frac{R}{N})^n$ where,

N is the original amount of milk,
n is the number of processes and
R is the replaced quantity.

$= 40(1-\frac{4}{40})^3$

$= 40(1-\frac{1}{10})^3$

$= 40(0.729)$

$=29.16$

Mixtures & Alligation(Assignment)

Q. A container contains 100 L of milk. From this container 10 L of milk was taken out and replaced by water. This process was further repeated three times. How much milk does the container have now?

A. 72.9 litres B. 65.61 litres C. 34.39 litres D. 81 litres

Ans: B

Final concentration = Initial concentration (1−Replaced/Initial)n

Mixtures & Alligation(Assignment)

Q. The ratio of milk to water in 80 litres of a mixture is 7 : 3. The water (in litres) to be added to it to make the ratio 2 : 1 is ?

A. 4 litres B. 5 litres C. 6 litres D. 8 litres

Soln:

Mixture = 80 litres

Milk : Water

7 : 3 = 7+3 = 10(total parts of mixture)

Quantity of Milk = $\frac{7}{10}$ x 80 = 56 litres

Quantity of Water = $\frac{3}{10}$ x 80 = 24 litres

Let quantity of water added be 'x' litres

$\frac{56}{24+x} = \frac{2}{1}$ 56 = 48 + 2x

x = 4 litres of water is to be added.

OR

Let, Milk = 7x and Water = 3x

7x + 3x = 80 litres

10x = 80

x = 8litres

Milk = 7x = 7x8 = 56 litres

Water = 3x =3x 8 = 24 litres

$\frac{56}{24+x} = \frac{2}{1}$ 56 = 48 + 2x

x = 4 litres of water is to be added.

Ans : A

Mixtures & Alligation(Assignment)

Q. What quantity of sugar costing Rs 21.20 per kg must be mixed with 144 kg of sugar priced at Rs 26.20 per kg so that 10% may be gained by selling mix at Rs 25.30/kg ?

A. 256 kg B. 265 kg C. 244 kg D. 144 kg

Ans: A

Mixtures & Alligation(Assignment)

Q. Find the ratio in which the contains of 2 jars A & B containing spirit & water in the ratio 1:3 & 3:2 respectively must be mixed so that resulting mixture contains 45% spirit?

A. 2:3 B. 3:5 C. 3:2 D. 3:4

Ans D

Mixtures & Alligation(Assignment)

Q. Two solutions have milk : water ratio of 2:3 and 4:5. In what ratio must they be mixed such that the resultant solution has milk : water ratio of 3:4?

A. 8:3 B. 3:8 C. 5:9 D. 9:5

Ans : C

Mixtures & Alligation(Assignment)

Q. In what ratio rice at Rs. 9.30/kg be mixed with rice at Rs. 10.80/kg. So that the mixture be worth Rs. 10/kg.

A. 6:5 B. 8:7 C. 3:7 D. 6:1

Ans : B

Mixtures & Alligation(Assignment)

Q. The ratio, in which tea costing Rs. 192 per kg is to be mixed with tea costing Rs. 150 per kg so that the mixed tea when sold for Rs. 194.40 per kg, gives a profit of 20%.

A. 2 : 5 B. 3 : 5 C. 5 : 3 D. 5 : 2

Ans : A

Mixtures & Alligation(Assignment)

Q. In what ratio must a mixture of 30% alcohol strength be mixed with that of 50% alcohol strength so as to get a mixture of 45% alcohol strength?

A. 1 : 2 B. 1 : 3 C. 2 : 1 D. 3 : 1

Ans : B

Mixtures & Alligation(Assignment)

Q. A mixture of 70 litres of alcohol and water contains 10% of water. How much water must be added to the above mixture to make the water 12.5% of the resulting mixture?

A. 1 litre B. 1.5 litres C. 2 litres D. 2.5 litres

Ans: C

- Water=10% of 70 lit=7 lit,
- alcohol=90% of 70 lit=63 lit.
- Let, x lit water must be added.
  $\frac{(7+x)}{63} = \frac{12.5\%}{87.5\%}$
- 7 +x = 787.5/87.5
  7 + x = 9
- x=2 litres

Mixtures & Alligation(Assignment)

Q. In what ratio should two qualities of coffee powder having the rates of ₹47 per kg and ₹32 per kg be mixed in order to get a mixture that would have a rate of ₹37 per kg?

A. 1 : 2 B. 4 : 1 C. 1 : 3 D. 3 : 1 E. 1 : 4

Ans: A

Mixtures & Alligation(Assignment)

Q. How many kilograms of tea worth Rs. 3. 60 per kg. must be mixed with 8 kg. of tea worth Rs. 4.20 per kg. so that by selling the mixture at Rs. 4.40 per kg. There may be a of 10%.

A) 4 kg B) 3 kg. C) 6 kg. D) 8 kg.

Ans: A

Mixtures & Alligation(Assignment)

Q. The ratio of milk to water in 20 litres of a mixture is 3 :1. The Milk (in litres) to be added to the mixture so as to have milk and water in the ratio 4 : 1 is ?

A. 7 litres B. 4 litres C. 5 litres D. 6 litres

Ans: C

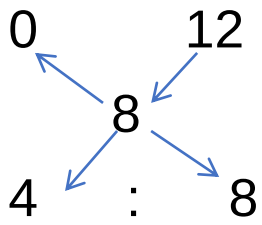
Mixtures & Alligation(Assignment)

Q. In what ratio must water be mixed with milk costing Rs. 12 per litre to obtain a mixture worth of Rs. 8 per litre?

A. 1 : 2 B. 2 : 1 C. 2 : 3 D. 3 : 2

Ans: A

By the rule of alligation :



Ratio of water to milk

= 4 : 8

= 1 : 2

Percentage

- Percentage is a fraction whose denominator is 100(per 100)

Fraction x100	% ÷100	Fraction	%
3/4	75%	5/4	125%
4/5	80%	3/2	150%
2/3	66.66 %	1/16	6.25%
5/6	83.33 %		
6/5	120%		

Fraction	%	Fraction	%	Fraction	%
1/1	100%	1/6	16.66 %	1/11	9.09 %
1/2	50%	1/7	14.28 %	1/12	8.33 %
1/3	33.33 %	1/8	12.5 %	1/13	7.69 %
1/4	25%	1/9	11.11 %	1/14	7.14 %
1/5	20%	1/10	10%	1/15	6.66 %

Percentage

Q. x is 83.33% of y. So y is ____% of x

Solution:

$x = 83.33y$

$x = \frac{5}{6} y$

So, $y = \frac{6}{5} x$

y = 120% (from chart)

Fraction x100	% 100	Fraction	%
3/4	75%	5/4	125%
4/5	80%	3/2	150%
2/3	66.66 %	1/16	6.25%
5/6	83.33 %		
6/5	120%		

Percentage

Q. x is 80% of y. So y is ____% of x

Solution:

$x = 80y$

$x = \frac{4}{5} y$

So, $y = \frac{5}{4} x$

y = 125%

Percentage

Q. A number x is increased by 20% then the number is decreased by 20%. Find the net % change.

- **Soln** :
- If a number is increased / decreased by x% then there is always a loss of $-(x/10)^2$
- Net % Change = $-(20/10)^2$ = -(400/100) = - 4% (loss)
- **OR**
- Let the number be 100
- 100 ↑ by 20% =120
- So 20% ↓ of 120 = 96

- 100 120 96

-4% = net change

Percentage

Q. A number x is increased by 50% then the number is increased by 20% and again by 10%. Find the net % change

Soln:

- Let the number be 100
- 100↑ by 50% =150
- Again, 150↑ by 20% =30, So 150 + 30 = 180
- 10%↑of 180 = 18, So, 180 + 18 = 198

- 100 150 180 198

98% = net change

Percentage

- **Two Step change of Percentage**

  In first step if number is changed by a% and the result is again changed by b% the net percentage change of original number is given by

  Net % Change in Number = a + b + ab/100 (+ve or –ve)

Percentage

Q. If a number is increased by 12 % & then decreased by 18% then the net % change in number is

Soln:

Net % Change in Number = a + b + ab/100 (+ve or –ve)

% Change = 12 – 18 + (12 x -18)/100

= -6 – 2.16

= - 8.16%

Percentage

- **Percentage Change & effect on Product**

  If A x B = Product

  If A is changed by a% & also B is changed by b% then

  Net % Change in Product = $a + b + ab/100$ (+ve or –ve)

Percentage

Q. Find % Change of area of rectangle if length increases by 30% & breadth decreases by 12%

Soln :

Net % Change in Product = a + b + ab/100 (+ve or –ve)

% Change of Area = +30 – 12 + (30 x -12)/100

= 18 – 3.6 = + 14.4%

Percentage

Q. If the radius of a circle is decreased by 50%, find the percentage decrease in its area.

- A. 55% B. 65% C. 75% D. 85%
- **Soln**:
- Area of a circle = πr^2 where r is the radius
  => Area is directly proportional to r^2
- Assume the old radius is = r1=100
- $A_1 = \pi \times 100^2 = 10000\pi$

  Assume the new radius is = r2=50

  $A_2 = \pi \times 50^2 = 2500\pi$

  Decrease in area = $10000\pi - 2500\pi = 7500\pi$

  Percentage decrease in area = $\frac{difference}{old}$ x100 = $\frac{7500\pi}{10000\pi}$ x 100 = 75%
- **Ans : C**

Percentage

- Expenditure = Price x Consumption
- $P \propto \frac{1}{\text{Consumption}}$
- So, for expenditure to remain constant, when one quantity increases the other quantity should decrease proportionally.
- Eg: If the price of a commodity is decreased by 20% and its consumption is increased by 20%, what will be the increase or decrease in expenditure on the commodity?
- Soln:

Net % Change = a + b + ab/100 (+ve or –ve)

% Change = -20 + 20 + (-20 x 20)/100

= 0 -4 = -4%

OR

100 === 20%↓(Decrease in Price) ===> 80 === 20%↑(Increase in Consumption) ===> 96.

Thus, there is a decrement of 4%

Percentage

Q. Two numbers are respectively 40% and 60% more than a third number. The ratio of the two numbers is:

A. 7:8 B. 3 : 5 C. 4 : 5 D. 6 : 7

Soln:-

- Let the third number be 100
- First number = 40% more than 100 = 100 + 40%of 100 = 100+40 = 140
- Second number = 60% more than 100 = 100 + 60%of 100 = 100 + 60 = 160
- Ratio = $\frac{\text{first number}}{\text{second number}} = \frac{140}{160} = \frac{7}{8} = 7 : 8$

Ans: A

Percentage using x

Q. Two numbers are respectively 40% and 60% more than a third number. The ratio of the two numbers is:

A. 7:8 B. 3 : 5 C. 4 : 5 D. 6 : 7

Soln:-

- Let the third number be x.
- First number = 40% more than x = x + 40%of x $= x + \frac{40}{100}x = \frac{100x+40x}{100} = \frac{140x}{100}$
- Second number = 60% more than x = x + 60%of x $= x + \frac{60}{100}x = \frac{100x+60x}{100} = \frac{160x}{100}$
- Ratio = $\frac{\text{first number}}{\text{second number}} = \frac{\frac{7x}{5}}{\frac{8x}{5}} = \frac{7}{8} = 7 : 8$

Ans: A

Percentage(Assignment)

Q. If the price of sugar increases by 25%, by what percent will a housewife have to reduce her consumption to leave total expenditure on sugar unchanged?

A. 25% B. 35% C. 20% D. 15%

Ans: C

Percentage(Assignment)

Q. 1.14 expressed as a per cent of 1.9 is:

A. 6% B. 10% C. 60% D. 90%

Ans: C

Percentage(Assignment)

Q. A number x is increased by 20% then the number is increased by 10% and again by 50%. Find the net % change.

A. 77% B. 75% C. 88% D. 98% E. 99%

Ans : D

Percentage(Assignment)

Q. If the altitude of a triangle increases by 5% and the base of the triangle increases by 7%, by what percent will the area of the triangle increase?

A. 12.25% B. 12.35% C. 6.00% D. 5.25%

Ans B

Percentage(Assignment)

Q. The length and breadth of a room are increased by 25% and 40% respectively. While the height is decreased by 20%.Find % change.

A. 16% B. 40% C. 60% D. 30%

Ans B

Percentage(Assignment)

Q. If the length of a rectangle is increased by 37.5% and its breadth is decreased by 20%, find the change in its area.

A. 15% increase B. 13% decrease C. 10% increase D. 10% decrease

Ans: C

Percentage(Assignment)

Q. The ratio 5 : 4 expressed as a percent equals :

A. 125% B. 80% C. 40% D. 12.5%

Ans: A

Required % = 5/4 × 100 = 125%

Percentage(Assignment)

Q. 12% of 5000 = ?

A. 600 B. 620 C. 680 D. 720

Ans: A


THANK
YOU!