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APTITUDE MASTERY SERIES

MODULE 2 – RATIO, PROPORTION AND PARTNERSHIP

1. King Bahubali had ordered the distribution of apples according to the following plan: For every 20 apples the elephant gets, the zebra should get 13 apples and the deer should get 8 apples. Now his servant Kattappa is in a fix. Can you help him by telling how much should he give to the elephant if there were 820 apples in total?

(a) 140 (b) 160 (c) 200 **(d) 400**

Solution:

Ratio of distribution = 20 : 13 : 8

So the elephant should get (20/41) x 820 = 400

2. Dheeraj went to a cool corner. He gave the shopkeeper a Rs. 10 note and asked for a coke costing Rs.5. The shopkeeper returned the change to him in the denominations of Re.1, 50 paise and 25 paise. What could be the ratio of number of coins of Re.1, 50 paise and 25 paise respectively?

(a) 2 : 3 : 1 **(b) 1 : 7 : 2** (c) 6 : 1 : 3 (d) 2 : 1 : 2

Solution:

Consider option (a)

2 x 100 + 3 x 50 + 1 x 25 = 375 paise

Its integer multiple cannot give the value equals to 500. So (a) cannot be true

Consider option (b)

1 x 100 + 7 x 50 + 2 x 25 = 500 paise, can be true

But we also check option (c) and (d) now. When you check the choices (c) and (d) you will find them wrong as well

Hence, the correct answer is option **(b)**

3. Four numbers are in proportion. The sum of the squares of the four numbers is 50 and the sum of the means is 5. The ratio of the first two terms is 1: 3. What is the average of the four numbers?

(a) 2 (b) 5 **(c) 3** (d) 6

Solution:

a : b : : c : d

$a^2 + b^2 + c^2 + d^2 = 50$

b + c = 5

and a : b = 1 : 3

If consider a : b = 1 : 3 as it is, then

c = 2 (5 – 3 = 2)

d = 6 (Since, a : b : : c : d)

$a^2 + b^2 + c^2 + d^2 = 1^2 + 3^2 + 2^2 + 6^2 = 50$

Hence, the presumed values are correct.

Thus, the average of a, b, c and d $= \frac{a+b+c+d}{4}$

$= \frac{1+3+2+6}{4}$

= 3

Hence, (c) is correct.

Alternatively:

Assume option (c)

$\frac{a+b+c+d}{4} = 3$

$a + b + c + d = 12$

Now, b + c = 5, a + d = 7

Again, a : b = 1 : 3

c : d = 2 : 6

Now verify that $a^2 + b^2 + c^2 + d^2 = 50$. Since it is correct. Hence, option (c) is correct.

4. The incomes of Ajay, Balu and Chandru are in the ratio of 12 : 9 : 7 and their expenditures are in the ratio 15 : 9 : 8. If Ajay saves 25% of his income, what is the ratio of the savings of Ajay, Balu and Chandru?

(a) 15 : 18 : 11 (b) 16 : 19 : 12 (c) 14 : 17 : 10 (d) 17 : 20 : 13

Solution:

Income = Expenditure + Saving

Ajay → $12x = 15y + 3x$ $(3x = 25\%\ of\ 12x)$

Balu → $9x = 9y + (9x - 9y)$

Chandru → $7x = 8y + (7x - 8y)$

Therefore, $12x - 3x = 15y$

$\frac{x}{y} = \frac{5}{3}$

$y = \frac{3x}{5}$

Therefore, savings = (income – expenditure)

Ajay = $12x - 9x = 3x$

Balu = $9x - \frac{27}{5}x = \frac{18}{5}\ x$

Chandru = $7x - \frac{24}{5}\ x = \frac{11}{5}\ x$

i.e., The ratio of savings of Ajay : Balu : Chandru = $3x : \frac{18}{5}x : \frac{11}{5}\ x$

= 15x : 18x : 11x

= 15 : 18 : 11

5. A cat takes 7 steps for every 5 steps of a dog, but 5 steps of a dog are equal to 6 steps of cat. What is the ratio of speed of the cat to that of dog?

(a) 6 : 5 (b) 5 : 6 (c) 6 : 7 **(d) 7 : 6**

Solution:

	CAT	**DOG**
Given speed	7 steps	5 steps

But the length of 5 steps of dog = length of 6 steps of cat

It means the ratio of length covered by dog is to cat = $\frac{6}{5}$

Therefore, in each step a dog will cover $\frac{6}{5}$ times distance than that of a cat.

Thus the ratio of actual speed of cat is to dog

$$= 7 : 5 \times \frac{6}{5} = 7 : 6$$

Shortcut

$$\text{Actual speed of A : B} = \frac{Given\ speed\ of\ A}{No.of\ steps\ of\ A\ in\ terms\ of\ length} : \frac{Given\ speed\ of\ B}{No.of\ steps\ of\ B\ in\ terms\ of\ length}$$

$$= \text{CAT : DOG}$$

$$= \frac{7}{6} : \frac{5}{5}$$

$$= 7 : 6$$

6. The value of a diamond is directly proportional to the square of its weight. A diamond unfortunately breaks into three pieces with weights in the ratio of 3 : 4 : 5 resulting in a loss of Rs. 9.4 lakhs. What is the actual value of diamond?

(a) 28.8 lakh (b) 13.5 lakh **(c) 14.4 lakh** (d) 18.8 lakh

Solution:

The ratio of broken parts (by weight) = $3x : 4x : 5x$

Therefore value of broken parts of diamond

$$= (3x)^2 + (4x)^2 + (5x)^2 = 50x^2$$

The value of original diamond = $(3x + 4x + 5x)^2 = 144x^2$

Therefore, loss in value = $144x^2 - 50x^2 = 9.4$ lakh

- ➔ $94x^2 = 9.4$ lakh
- ➔ $94x^2 = 940000$
- ➔ $x^2 = 10000$

Hence, the actual value of the diamond = $144x^2$

$$= 144 \times 10000$$

$$= 14.4 \text{ lakh}$$

7. In a zoo, there are rabbits and pigeons. If heads are counted, there are 340 heads and if legs are counted there are 1060 legs. How many pigeons are there?

(a) 120 **(b) 150** (c) 180 (d) 170

Solution:

Suppose there are all the pigeons then total no. of heads are 340 and total no. of legs are 680. Now since 380 (= 1060 – 680) legs are extra, it means there will be 190 (= 380 / 2) rabbits. As we know a rabbit has 2 extra legs than that of a pigeon who has only two legs.

Therefore, number of rabbits = 190

And number of pigeons = 340 – 190 = 150

Alternatively

Go through the options and consider choice (b)

	Pigeons		***Rabbits***	
Heads (340)	150	x 2	190 | 340	x 4
Legs (1060)	300		760 | 1060	

Alternatively

$P + R = 340$

$2P + 4R = 1060$

Solve these two equations and you will get the answer.

Alternatively

It can be solved through allegation rule.

8. Weight of a sumo jointly varies as his height and his age. When height is 1.2 m and age is 20 years his weight is 48 kg. Find the weight of the sumo when his height is 1.5 m and age is 30 years:

(a) 60 kg (b) 72 kg **(c) 90 kg** (d) 58 kg

Solution:

$W \propto HA \rightarrow W = K \times H \times A$

Now, $48 = K \times 1.2 \times 20 \rightarrow K = 2$

Again $W = 2 \times 1.5 \times 30 = 90kg$

9. Rs. 171 is divided among four friends in the ratio of $\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$ What is the amount of the person who got the greatest share?

(a) 14 (b) 40 (c) 36 **(d) 60**

Solution:

$\frac{1}{3} : \frac{1}{4} : \frac{1}{5} : \frac{1}{6}$

➔ $\frac{20}{60} : \frac{15}{60} : \frac{12}{60} : \frac{10}{60}$

➔ 20 : 15 : 12 : 10

Therefore, Largest share = $\frac{20}{(20+15+12+10)}$ x 171

$= \frac{20}{57}$ x 171 = 60

10. The ages of Abhinav, Stephen, Vamsi and Kunal are in arithmetic progression, but not in order. The ratio of ages of Abhinav and Stephen is 6 : 5 and Vamsi to Kunal is 7 : 8. Two years later the age of Stephen and Kunal will be 2 : 3. Find the ratio of ages of Abinav and Vamsi?

(a) 7 : 6 (b) 5 : 8 **(c) 6 : 7** (d) 8 : 9

Solution:

Stephen : Abhinav = 5 : 6 = 5x : 6x

Vamsi : Kunal = 7 : 8 = 7y : 8y

But their ages are in A.P.

Therefore, $6x - 5x = 8y - 7y$

➔ $x = y$

Again, $\frac{5x+2}{8y+2} = \frac{2}{3}$

➔ $\frac{5x+2}{8x+2} = \frac{2}{3}$

➔ $x = 2$

Therefore, the ages of Stephen, Abhinav, Vamsi and Kunal are 10, 12, 14 and 16 years respectively.

Therefore, the ratio of ages of Abhinav and Vamsi = 6 : 7

11. Sanjay and Varun entered into a partnership just 5 months ago. The ratio of profit claimed by Sanjay and Varun is 6 : 17. If Varun had just started his business 12 months ago with Rs. 1275, what is the amount contributed by Sanjay?

(a) Rs. 980 **(b) Rs. 1080** (c) Rs. 1200 (d) Rs. 998

Solution:

$$\frac{\text{Profit of Sanjay}}{\text{Profit of Varun}} = \frac{time\ period\ \text{x}\ amount\ of\ Sanjay\ invested}{time\ period\ \text{x}\ \ amount\ of\ Varun\ invested}$$

$$\frac{6}{17} = \frac{5\ \text{x}\ \text{K}}{12\ \text{x}\ 1275}$$

$$\text{K} = \frac{6\ \text{x}\ 12\ \text{x}\ 1275}{17\ \text{x}\ 5} = 1080$$

12. Apeksha purchased one dozen bangles. One day she slipped on the floor and fell down. What cannot be the ratio of broken to unbroken bangles:

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

Solution:

Since there are 12 bangles, then the no. of broken to unbroken bangles cannot be 2 : 3, since $5x = (2x + 3x)$cannot divide 12 for any integral value of *x. i.e.,* all the sum of ratios which are the factors of 12 can possibly be the ratio of broken to unbroken.

13. The number of apples in three baskets are in the ratio of 3 : 4 : 5. In which ratio the number of apples in first two baskets must be increased so that the new ratio becomes 5 : 4 : 3?

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

Solution:

$B_1 : B_2 : B_3 = 3x : 4x : 5x$

Again, $B_1 : B_2 : B_3 = 5y : 4y : 3y$

Since there is increase in no. of apples in first two basket only, it means the no. of apples remains constant in the third basket

$5x = 3y$

Hence, $3x : 4x : 5x$

➔ $\frac{9y}{5} : \frac{12y}{5} : \frac{15y}{5} = 9y : 12y : 15y$

➔ $5y : 4y : 3y \rightarrow 25y : 20y : 15y$

Therefore, increase in first basket = 16

And increase in second basket = 8

Therefore, the required ratio = 2 : 1

14. Distance covered by a train is directly proportional to the time taken and it also varies directly as the square root of fuel used and varies inversely as the number of wagons attached to it. A train covers 192 km journey in 20 hours when there are 10 wagons attached to it and total fuel consumption was 256 litres of diesel. Find the consumption of fuel per km when a train goes 200 km in 25 hours with 15 wagons attached to it:

(a) 1.5 *l*/km **(b) 2 *l*/km** (c) 2.8 *l*/km (d) 20 *l*/km

Solution:

$D \propto \frac{\sqrt{F}\text{x}\, T}{W}, D \rightarrow Distance, F \rightarrow Fuel, T \rightarrow Time, W \rightarrow No.of\ wagons$

$D \propto k \frac{\sqrt{F}\text{x}\, T}{W}$

$192 \propto k \frac{\sqrt{256}\text{x}\ 20}{10}$

$k = 6$

Again

$200 = \frac{6\ \text{x}\ \sqrt{F}\text{x}\ 25}{15}$

$\sqrt{F}$=20 → F = 400 litre

Therefore, fuel used per km = $\frac{400}{200}$ = 2 *l*/km

15. Rs. 3650 is divided among 4 engineers, 3 MBAs and 5 CAs such that 3 CAs get as much as 2 MBAs and 3 Engineers as much as 2 CAs. Find the share of an MBA?

(a) 300 (b) 350 (c) 475 **(d) 450**

Solution:

4E + 3M + 5C = 3650

Also, 3C = 2M, that is, M = 1.5C

And 3E = 2C that is, E = 0.66C

Thus, 4 x 0.66C + 3 x 1.5C + 5C = 3650

C = 3650 / 12.166

That is, C = 300

Hence, M = 1.5C = 450

HOME WORK

16. A camel pursues an elephant and takes 5 leaps for every 7 leaps of the elephant, but 5 leaps of elephant are equal to 3 leaps of camel. What is the ratio of speeds of camel and elephant?

(a) 24: 22 **(b) 25 : 21** (c) 23 : 19 (d) 22 : 21

Solution:

Ratio of speed of camel and elephant

$= \frac{5}{3} : \frac{7}{5}$

$= \frac{5}{3}$ x 15 : $\frac{7}{5}$ x 15

= 25 : 21

17. A varies directly as B and inversely as C. A is 12 when B is 6 and C is 2. What is the value of A when B is 12 and C is 3?

(a) 16 (b) 17 (c) 18 (d) 19

Solution:

$A \propto B \quad and \quad A \propto \frac{1}{c}$

$A \propto \frac{B}{C} \rightarrow A = k\frac{B}{C}$

When A = 12, B = 6, C = 2, then

$12 = k\frac{6}{2}$ → k = 4

Again, $A = k\frac{B}{C}$ = 4 x $\frac{12}{3}$ = 16

➔ A = 16

18. Akshay started a business by investing Rs. 36000. After 4 months Rakesh joined him with some investment. At the end of the year, the total profit was divided between them in the ratio of 9 : 7. How much capital was invested by Rakesh in the business?

(a) 44000 **(b) 42000** (c) 38000 (d) 36000

Solution:

$$\frac{36000 \text{ x } 12}{x \text{ x } 8} = \frac{9}{7}$$

$x = 42000$

Therefore, Rakesh invested Rs. 42,000 for 8 months only

19. The ratio of work efficiency of A and B is 5 : 3 and the ratio of efficiency of B and C is 5 : 8. Who is most efficient?

(a) A (b) B (c) C (d) Can't be determined

Solution:

A : B = 5 : 3

B : C = 5 : 8

A : B : C = 25 : 15 : 24

So, A is most efficient

20. Devika had only Rs. 16 in her wallet consisting of 10 paise, 20 paise and Re. 1 coins. The ratio of number of coins of 10 paise and 20 paise is 6 : 1. The minimum number of Re. 1 coins is:

(a) 5 (b) 12 **(c) 4** (d) 8

Solution:

$10x + 20y + 100z = 1600$

Again since $x : y = 6 : 1$

$60y + 20y + 100z = 1600$

$80y + 100z = 1600$

$4y + 5z = 80$

Putting z = 1, 2, 3, 4, 5…. we get at z = 4, y = 15 (an integer). Hence, minimum 4 coins of Re. 1 will be there.