PEA502A – Lecture #9

RATIO AND PROPORTION

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Ratio

- ✓ The ratio of two quantities a and b in the same units, is the fraction $\frac{a}{b}$ and we write it as $a : b$.

- ✓ In the ratio $a : b$, we call a as the first term or ***antecedent*** and b, the second term or ***consequent***.

Eg. The ratio 5 : 9 represents antecedent = 5, consequent=9.

Rule : The multiplication or division of each term of a ratio by the same non-zero number does not affect the ratio.

Eg. $4 : 5 = 8 : 10 = 12 : 15$. Also, $4 : 6 = 2 : 3$.

Proportion

✓ The equality of two ratios is called *Proportion*.

If $a : b = c : d$, we write $a : b :: c : d$ and we say that a, b, c, d are in proportion.

Here a and d are called ***extremes***, while b and c are called ***mean*** *terms*.

✓ Product of means = Product of extremes.

Thus, if $a : b :: c : d$ then $(b \times c) = (a \times d)$.

✓ ***Fourth Proportional:***

If $a : b = c : d$, then d is called the fourth proportional to a, b, c.

✓ ***Third Proportional:***

$a : b = c : d$, then c is called the third proportion to a and b.

✓ ***Mean Proportional:***

Mean proportional between a and b is $\sqrt{ab}$.

Duplicate Ratio

- ✓ Duplicate ratio of (a : b) is ($a^2 : b^2$)
- ✓ Sub-duplicate ratio of (a : b) is ($\sqrt{a} : \sqrt{b}$)
- ✓ Triplicate ratio of (a : b) is ($a^3 : b^3$)
- ✓ Sub-triplicate ratio of (a : b) is ($\sqrt[3]{a} : \sqrt[3]{b}$)
- ✓ If $\frac{a}{b} = \frac{c}{d}$ then $\frac{a+b}{a-b} = \frac{c+d}{c-d}$ (Componendo and dividendo)

Question Q9.1

Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:

A. 2 : 5

B. 3 : 5

C. 4 : 5

D. 6 : 7

Answer: Option **C**

Explanation:

Let the third number be x.

Then, first number = 120% of x = $120x/100 = 6x/5$

Second number = 150% of x = $150x/100 = 3x/2$

Ratio of first two numbers = $6x/5 : 3x/2 = 4 : 5$.

Question Q9.2

The sum of three numbers is 98. If the ratio between the first and second number is 2 : 3 and the ratio between second and third number is 5 : 8, find the second number.

A. 20

B. 30

C. 48

D. None of these

Answer: Option B

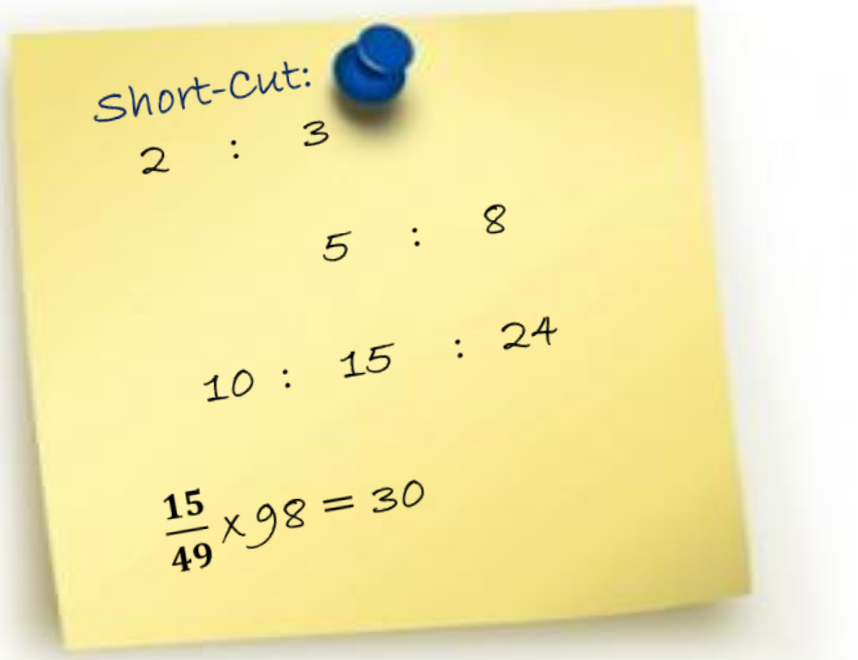
Explanation:

Let 1st number = 2x

So, 2nd number = 3x and 3r

Ratio between 1st and 2nd

Ratio between 2nd and 3rd



1st : 2nd : 3rd = 10x : 15x : 24x or 10 : 15 : 24

So, 2nd number = $\frac{15}{49}$ x 98 = 30

Question Q9.3

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

A. Rs. 500

B. Rs. 1500

C. Rs. 2000

D. None of these

Answer: Option **C**

Explanation:

Let the shares of A, B, C and D be Rs. 5*x*, Rs. 2*x*, Rs. 4*x* and Rs. 3*x* respectively.

Then, 4*x* - 3*x* = 1000

x = 1000.

B's share = Rs. 2*x* = Rs. (2 x 1000) = Rs. 2000.

Question Q9.4

Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?

A. 2 : 3 : 4

B. 6 : 7 : 8

C. 6 : 8 : 9

D. None of these

Answer: Option **A**

Explanation:

Originally, let the number of seats for Mathematics, Physics and Biology be 5*x*, 7*x* and 8*x* respectively.

Number of increased seats are (140% of 5*x*), (150% of 7*x*) and (175% of 8*x*).

140/100 x 5*x* , 150/100 x 7*x* and 175/100 x 8*x*

7*x*, 21*x*/2 and 14*x*.

The required ratio = 7*x* : 21*x*/2 : 14*x*

14*x* : 21*x* : 28*x*

2 : 3 : 4.

Question Q9.5

If 40% of a number is equal to two-third of another number, what is the ratio of first number to the second number?

A. 2 : 5

B. 3 : 7

C. 5 : 3

D. 7 : 3

Answer: Option **C**

Explanation:

Let 40% of A = 2/3 B

Then, 40/100 A = 2/3 B

2/5 A = 2/3 B

A/B = 2/3 x 5/2 = 5/3

A : B = 5 : 3.

Question P9.1

Two number are in the ratio 3 : 5. If 9 is subtracted from each, the new numbers are in the ratio 12 : 23. The smaller number is:

A. 27

B. 33

C. 49

D. 55

Answer: Option **B**

Explanation:

Let the numbers be $3x$ and $5x$.

Then, $3x - 9/5x - 9 = 12/23$

$23(3x - 9) = 12(5x - 9)$

$9x = 99$

$x = 11$.

The smaller number = (3 x 11) = 33.

Question P9.2

In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?

A. 50

B. 100

C. 150

D. 200

Answer: Option **C**

Explanation:

Let the number of 25 p, 10 p and 5 p coins be x, $2x$, $3x$ respectively.

Then, sum of their values

= Rs. $25x/100 + 10 \times 2x/100 + 5 \times 3x/100$ = Rs.30

$60x/100 = 30$

$x = 50$.

Hence, the number of 5 p coins = $(3 \times 50) = 150$.

Next Class: PARTNERSHIP