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# RATIOS & PROPORTIONS



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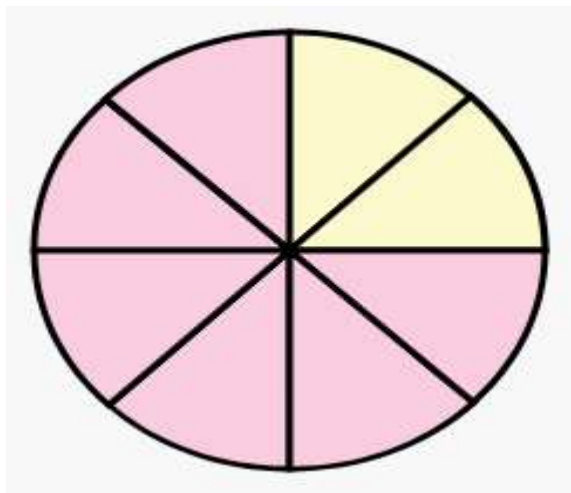
- A ratio is the comparison or simplified form of two quantities of the same kind. This relation indicates how many times one quantity is equal to the other; or in other words, ratio is a number, which expresses one quantity as a fraction of the other. E.g. Ratio of 3 to 4 is 3 : 4.
- The numbers forming the ratio are called terms. The numerator, “3”, in this case, is known as the antecedent and the denominator, “4”, in this case, is known as the consequent.
- Equivalent Ratios Let us divide a Pizza into 8 equal parts and share it between Ram and Sam in the ratio 2:6. The ratio 2:6 can be written as  $\frac{2}{6}$ ;  $\frac{2}{6} = \frac{1}{3}$  We know that  $\frac{2}{6}$  and  $\frac{1}{3}$  are called equivalent fractions. Similarly we call the ratios 2:6 and 1:3 as equivalent ratios. From a given ratio  $x : y$ , we can get equivalent ratios by multiplying the terms ‘x’ and ‘y’ by the same non-zero number.



# RATIOS & PROPORTIONS



*For example*



$$1 : 3 = 2 : 6 = 3 : 9$$

$$4 : 5 = 12 : 15 = 16 : 20$$

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## PROPORTION

Proportion is represented by the symbol '=' or '::'

If the ratio  $a : b$  is equal to the ratio  $c : d$ , then  $a, b, c, d$  are said to be in proportion.

Using symbols we write as  $a : b = c : d$  or  $a : b :: c : d$

- When 4 terms in proportion, then the product of the two extremes (i.e. the first and the fourth value) should be equal to the product of two middle values (i.e. the second and the third value)
- **CONTINUED PROPORTION**  $a, b, c$  are in Continued Proportion if  $a : b = b : c$ . Here  $b$  is called the Mean Proportional and is equal to the square root of the product of  $a$  and  $c$ .  
$$c \cdot b^2 = a \times c \rightarrow b = \sqrt{ac}$$



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- $a/b = b/c = c/d$  etc., then  $a, b, c, d$  are in Geometric Progression.

Let  $a/b = b/c = c/d = k$ , then,  $c = dk$ ;  $b = ck$  and  $a = bk$

Since  $c = dk$ ,  $b = dk \times k = dk^2$  and  $a = bk = dk^2 \times k = dk^3$ , implying they are in Geometric Progression.

If the three ratios,  $a : b, b : c, c : d$  are known, we can find  $a : d$  by multiplying these three ratios

$$a/d = a/b \times b/c \times c/d$$

- If  $a/b = c/d = e/f$ , then each of these ratios is equal to  $(a+c+e)/(b+d+f)$
- If  $a/b = c/d$ , then  $b/a = d/c$  (Invertendo)
- If  $a/b = c/d$ , then  $a/c = b/d$  (Alternendo)
- If  $a/b = c/d$ , then  $(a+b)/b = (c+d)/d$  (Componendo)
- If  $a/b = c/d$ , then  $(a-b)/b = (c-d)/d$  (Dividendo)
- If  $a/b = c/d$ , then  $(a+b)/(a-b) = (c+d)/(c-d)$ , (Componendo & dividendo)

# PROBLEM 1:



The ratio of the present ages of Priya and her mother is 3: 7. The mother's age at the time of Priya's birth was 48 years. Find the mother's present age.

- a) 84 yrs.
- b) 42 yrs.
- c) 36 yrs.
- d) None of these

ANS:A



## PROBLEM 2:



The perimeter of a rectangle is 64 cm. If the ratio of the lengths of two adjacent sides is 7: 9, find the lengths of these sides.

- a) 24 cm, 28 cm
- b) 14 cm, 18 cm
- c) 7 cm, 9 cm
- d) None of these

**ANS:B**





## PROBLEM 3:



The ratio of the length and the breadth of a rectangle is 3 : 5 and its area is  $1.35 \text{ cm}^2$ . Find the length of the rectangle.

- a) 9 cm
- b) 0.9 cm
- c) 0.09 cm
- d) 90 cm

**ANS:B**



## PROBLEM 4:



The ratio of the present ages of John and Jim is 5 : 3. Four years hence it will be 3 : 2. Find the present age of John.

- a) 5 yrs.
- b) 15 yrs.
- c) 10 yrs.
- d) 20 yrs.

ANS:D



## PROBLEM 5:



There are 145 students in the first three standards. The ratio of number of students in the first and the second standards is 2 : 3, while that of students in standards second and third is 4: 3. Find the number of students in 2<sup>nd</sup> standard.

- a) 40 yrs.
- b) 60 yrs.
- c) 45 yrs.
- d) 65 yrs.

**ANS:B**



## PROBLEM 6:



Which number when added to each of the numbers 24, 32 and 42 would make the sums to be in continued proportion?

- a) 4
- b) 5
- c) 6
- d) 8

**ANS:D**



## PROBLEM 7:



The ratio of the measures  $\angle A$  and  $\angle B$  of a triangle ABC is 3 : 2. The ratio of the measures of  $\angle B$  and  $\angle C$  is 4 : 5. Find the measure of largest angle of the triangle ABC.

- a)  $72^\circ$
- b)  $78^\circ$
- c)  $48^\circ$
- d)  $60^\circ$

ANS:A



## PROBLEM 8:



A piece of string 70 cm in length was cut into pieces, the ratio of whose lengths was 3: 7.  
Find the length of longest piece.

- a) 21 cm
- b) 70 cm
- c) 49 cm
- d) 7cm

**ANS:C**



## PROBLEM 9:



The cost of a diamond varies as the square of its weight. A diamond weighing 20 decigrams costs Rs. 4,800. Find the cost of a diamond of the same kind weighing 8 decigrams.

- A. Rs. 762
- B. Rs. 760
- C. Rs. 764
- D. Rs. 768

**ANS:D**



## PROBLEM 10:



The ratio of two numbers is 9 : 5. If 9 is added to the greater number and 5 is subtracted from the smaller number, the greater number becomes thrice the smaller one. Find the numbers.

- A. 72, 40
- B. 18, 10
- C. 36, 20
- D. None of these

ANS:C





## PROBLEM 11:



Find the ratio of the diagonal of a square of side 30 cm, to its side.

- A.  $\sqrt{2}: 3$
- B.  $\sqrt{3}: 4$
- C.  $1 : \sqrt{2}$
- D.  $\sqrt{2}: 1$

ANS:D



## PROBLEM 12:



The ratio of the first and second-class fares between the two stations is 6 : 4 and the number of passengers traveling by first and second-class is 1 : 30. If Rs. 2100 is collected as fare, what is the amount collected from first class passengers?

- A. Rs.250
- B. Rs. 200
- C. Rs. 150
- D. Rs. 100

**ANS:D**



## PROBLEM 13:



The ratio of A's salary to B's was 4 : 5. A's salary is increased by 10% and B's by 20%, what is the ratio of their salaries now?

- A. 14:11
- B. 15:14
- C. 11:15
- D. None of these

**ANS:C**



## PROBLEM 14:



200 g of 25% sulphuric acid solution was added to 300 g of 40% sulphuric acid solution.  
Find the concentration of the acid in the mixture.

- A. 14%
- B. 24%
- C. 44%
- D. 34%

**ANS:D**



## PROBLEM 15:



In one alloy there is 60% gold in its total mass, while in another alloy it is 35%. 12 kg of the first alloy was melted together with 8 kg of the second one to form a third alloy. Find the percentage of gold in the new alloy.

- A. 50%
- B. 49%
- C. 45%
- D. 48%

**ANS:A**



## PROBLEM 16:



300 coins consists of 1 rupee, 50 paisa and 25 paisa coins, their values being in the ratio of 10 : 4 : C. Find the number of coins of each type.

- A. 100, 80, 120
- B. 80, 90, 100
- C. 100, 100, 80
- D. 60, 80, 100

**ANS:A**

