MATHEMATICS

Class-VI

Topic-08

RATIO AND PROPORTION

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CHAPTER 08

RATIO AND PROPORTION

TERMINOLOGIES

Ratio,antecedent, consequent, comparison, equivalent ratio, proportion, continued proportion , mean proportion , unitary method.

INTRODUCTION

Every day in our life we come across many problems where we compare two quantities of the same type.

For example , Ritesh has 8 pieces of chocolates and his sister Simran has 12 pieces of chocolates. Who has more pieces of chocolate ?

We subtract 8 from 12 and get 4 . Then we say Simran has more pieces of chocolates. This is one way of comparing numbers.

Suppose Rahul has 350 apples and Jatin has 50 oranges. It does not look nice to compare these by difference. There is another way of comparing called division method.

Ratio is the way of comparing numbers by division.

8.1 RATIO

Ratio : A comparison by division is called ratio. A ratio is usually denoted by the symbol (:). If **a** and **b** (**b** $\neq$ **0**) are two quantities of the same kind, then the fraction $\frac{a}{b}$ is called the **ratio** of **a** to **b**, we write it as **a : b**.

or $\frac{a}{b} = \frac{a \rightarrow \text{anticedent}}{b \rightarrow \text{consequent}}$

In the ratio **a : b**, the first term is '**a**' and the second term is '**b**'. A ratio is said to be in the simplest form if its two terms have no common factor other than 1.

NOTE

(i) The ratio of two numbers is usually expressed in its simplest form.

(ii) In a ratio, we compare two quantities. The comparison becomes meaningless if the quantities being compared are not of the same kind i.e. they are not measured in the same units.

(iii) It is just meaningless to compare 20 bags with 200 crows. Therefore, to find the ratio of two quantities, they must be expressed in the same units.

(iv) Since the ratio of two quantities of the same kind determines how many times one quantity is contained by the other. So the ratio of any two quantities of the same kind is an abstract quantity. In other words, ratio has no unit or it is independent of the units used in the quantities compared.

(v) The order of the terms in a ratio a : b is very important. The ratio 3 : 2 is different from the ratio 2 : 3.

(vi) We can multiply or divide both the terms of the ratio by a non zero number which doesnot alter the value of the ratio.

(a) Ratio in the Simplest or Lowest form

There are 4 girls and 2 boys

4 : 2 in lowest term **2 : 1**

A ratio $\frac{a}{b}$ or a : b is said to be in its lowest or simplest form if a and b have no common factors except 1.

STEPS :

(a) Write the ratio as a fraction.

(b) Divide the numerator and the denominator by their HCF.

(c) The answer is a fraction in its lowest form ; so change it to ratio , which will be in the lowest form.

For example,

$$40 : 80 = \frac{40 \div 40}{80 \div 40} = \frac{1}{2} = 1 : 2$$

$$10000 : 8000 = \frac{10000 \div 2000}{8000 \div 2000} = \frac{5}{4} = 5 : 4$$

Illustration 8.1

Express the following ratios in their simplest form :

(a) 150 : 400 **(b)** 85 : 225

Sol. **(a)** $150 : 400 = \frac{150 \div 50}{400 \div 50} = \frac{3}{8} = 3 : 8$

(b) $85 : 255 = \frac{85 \div 85}{255 \div 85} = 1 : 3$

Illustration 8.2

Find the ratio of the following :

(a) 36 minutes to 2 hours. **(b)** 50 cm to 5 metres.

(c) 32 g to 3 kg **(d)** 3 days to 1 years.

Sol. **(a)** Change both 36 minutes and 2 hours to the same unit.

Now, 36 minutes = 36 minutes

2 hours = 2 × 60 minutes = 120 minutes

∴ Ratio of 36 minutes to 2 hours

$$36 : 120 = \frac{36 \div 12}{120 \div 12} = \frac{3}{10} = 3 : 10$$

(b) First convert both into numbers with the same unit.

50 cm = 50 cm

5 metres = 500 cm

Hence ratio of 50 cm to 5 metes is

$$= 50 : 500 = \frac{50 \div 50}{500 \div 50} = \frac{1}{10} = 1 : 10$$

(c) First convert both into numbers with the same unit.

32 g = 32 g

3kg = 3000 g

Ratio = 32 : 3000 = $\frac{32 \div 8}{3000 \div 8} = \frac{4}{375}$ = 4 : 375

(d) First , convert both into numbers with the same unit.

3 days = 3days

1 year = 365 days

Ratio = 3 : 365

(b) Comparison of Ratio

1. Write the given ratios as fractions in the simplest form.

2. Find the LCM of the denominators of the fractions.

3. Convert them into like fractions with same denominators.

4. Compare the numerators and arrange the fractions.

5. Then respective ratios are also in the same order.

Illustration 8.3

Compare 5 : 12 and 3 : 8

Sol. 5 : 12 = $\frac{5}{12}$, 3 : 8 = $\frac{3}{8}$

LCM of 8, 12 = 24

5 : 12 = $\frac{5}{12} \times \frac{2}{2} = \frac{10}{24}$

3 : 8 = $\frac{3}{8} \times \frac{3}{3} = \frac{9}{24}$

$\frac{9}{24} < \frac{10}{24}$

$\therefore \frac{3}{8} < \frac{5}{12}$ OR 3 : 8 < 5 : 12

Illustration 8.4

The ratio of the number of girls to the number of boys in a school is 5 : 8. In another school the ratio of the number of girls to the number of boys is 7 : 10. Which school has a higher ratio of girls ?

Sol. The ratios of girls to boys in the two schools are 5 : 8 and 7 : 10. Since the number of girls forms the numerator in both the cases, the school which has a greater ratio has a higher number of girls. We have two fractions $\frac{5}{8}$ and $\frac{7}{10}$. We can compare these fractions by converting both the fractions into fractions with same denominator.

The LCM of 8 and 10 is 40.

$\frac{5}{8} = \frac{5 \times 5}{8 \times 5} = \frac{25}{40}$, $\frac{7}{10} \times \frac{4}{4} = \frac{28}{40}$

$\frac{28}{40} > \frac{25}{40}$

Illustration 8.5

Mr. Harry divided Rs. 84,630 between Shinchan and Nimavari in the ratio 3 : 4. How much did each of them get ?

Sol. Ratio of money between Shinchan and Nimavari = 3 : 4

Sum of the terms of the ratio = 3 + 4 = 7

Shinchan's share = $\frac{3}{7}$ of total money

Nimavari's share = $\frac{4}{7}$ of total money

$\therefore$ The amount of money Shinchan gets = $\frac{3}{7}$ × Rs. 84,630 = Rs. 36,270

The amount of money Nimavari gets = $\frac{4}{7}$ × Rs 84,630 = Rs. 48,360

Illustration 8.6

The number of stamps in the collections of Suniyo, Lobita, and Suzuka are in the ratio 3 : 4 : 5. If lobita has a collection of 108 stamps, find the number of stamps that Suniyo, and Suzuka each has.

Sol. The number of stamps in the collections of Suniyo, Lobita, and Suzuka are in the ratio = 3 : 4 : 5

Sum = 3 + 4 + 5 = 12

Let the number of stamps with Suniyo be 3x. Then Lobita will have 4x stamps and Suzuka will have 5x stamps.

Given that Lobita's 4x = 108 stamps

x = $\frac{108}{4}$ = 27 stamps

Suniyo's 3x = 3 × 27 = 81 stamps

Suzuka's 5x = 5 × 27 = 135 stamps

$\therefore$ Suniyo's has 81 stamps and Suzuka has 135 stamps.

(c) Equivalent Ratio

The two or more ratios are set to be equivalent if their simplest form is same.

e.g. $\frac{21}{35}, \frac{12}{20}$ are equivalent ratios

because simplest form of $\frac{21}{35}, \frac{12}{20}$ is $\frac{3}{5}$

Illustration 8.7

If a : b = 2 : 3 and b : c = 5 : 7, find a : c & a : b : c.

Sol. Given $\frac{a}{b} = \frac{2}{3}$ and $\frac{b}{c}$ = 5 : 7

$\therefore$ $\frac{a}{c} = \left(\frac{a}{b} \times \frac{b}{c}\right) = \left(\frac{2}{3} \times \frac{5}{7}\right) = \frac{10}{21}$

So, a : c = 10 : 21.

Aslo, a : b = 2 : 3 and b : c = $\frac{5}{7}$

LCM of 3 and 5 is 15

$\therefore \quad \frac{a}{b} = \frac{2}{3} \times \frac{5}{5} = \frac{10}{15}$

$\frac{b}{c} = \frac{5}{7} \times \frac{3}{3} = \frac{15}{21}$

$\therefore$ a : b : c = 10 : 15 : 21.

(d) Dividing a whole in a given ratio

Suppose Ankit has Rs. 30. He wants to divide this money between his son and daughter in the ratio 3 : 7. He wants to know the share of each child.

The ratio 3 : 7 shows that for every 3 parts his son gets, the daughter gets 7 parts, so their sum is 3 + 7 or 10 parts.
He should know the value of each part.
Here, 10 parts = Rs. 30

1 part = $\frac{1}{10}$ of Rs, 30 = Rs, 30 $\times$ $\frac{1}{10}$ = Rs. 3

$\therefore$ He should give 3 parts or Rs, 3 $\times$ 3 = Rs 9 to his son and 7 pats or Rs. 3 $\times$ 7 = Rs 21 to his daughter.

Steps to follow

1. Find the sum of the terms of the ratio

2. First share = $\frac{\text{1st term}}{\text{sum}}$ $\times$ number to be divided

3. Second share = $\frac{\text{2nd term}}{\text{sum}}$ $\times$ number to be divided

Illustration 8.8

Divide Rs.4340 between A,B and C so that A 's share : B's share : C' share = $\frac{1}{2} : \frac{1}{3} : \frac{1}{5}$

Sol. A,B and C so that A 's share : B's share : C' share = $\frac{1}{2} : \frac{1}{3} : \frac{1}{5}$

L.C.M. 2, 3, 5 is 30
A,B and C so that A 's share : B's share : C' share

= $\frac{1}{2} : \frac{1}{3} : \frac{1}{5} = \frac{1}{2} \times 30 : \frac{1}{3} \times 30 : \frac{1}{5} \times 30$ = 15 : 10 : 6

A share = $\frac{15}{15+10+6} = \frac{15}{15+10+6} \times 4340$ = 2100 Rs.

B share = $\frac{10}{15+10+6} = \frac{10}{15+10+6} \times 4340$ = 1400 Rs.

C share = $\frac{6}{15+10+6} = \frac{6}{15+10+6} \times 4340$ = 840 Rs.

Ask yourself

1. The number of boys and girls in a school are 1450 and 1050 respectively . Express the ratio of

(a) the number of boys to the number of girls.

(b) the number of boys to the number of students.

(c) the number of girls to the number of boys.

(d) the number of girls to the total number of students.

2. Simplify :

(a) $\frac{3}{4}:\frac{2}{5}$ **(b)** $3\frac{1}{2}:4\frac{1}{3}$ **(c)** 0.026 : 0.052

3. Which ratio is greater, 3:4 or 5:6 ?

4. A camera is sold for Rs 7500 . If the ratio of the selling price to the cost price is 5:4 , what is the cost price of the camera ?

5. Find three equivalent ratio of :

(a) 3:5 **(b)** 7:2

6. If a : b = 3 : 5 and b : c = 7 : 9, find a : c & a : b : c.

Answers

1. **(a)** $\frac{29}{21}$ **(b)** $\frac{29}{50}$ **(c)** $\frac{21}{29}$ **(d)** $\frac{21}{50}$

2. **(a)** $\frac{15}{8}$ **(b)** $\frac{21}{26}$ **(c)** $\frac{1}{2}$ **3.** $\frac{5}{6}$ is greater.

4. Rs.6000 **5.** **(a)** $\frac{6}{10},\frac{9}{15},\frac{12}{20}$ **(b)** $\frac{14}{4},\frac{21}{6},\frac{28}{8}$

6. a : c = 7 : 15, a : b : c = 21 : 35 : 45

8.2 PROPORTION

An equality of two ratios is called a proportion.

For example, 3 : 5 = 9 : 15

The first and the fourth terms are called the extremes or extreme terms. The second and the third terms are called the middle terms or means.

In case of proportion, we can say that the product of the extreme terms = the product of the middle terms.

∴ Product of extremes = product of means

means

$a : b = c : d \rightarrow \frac{a}{b}=\frac{c}{d} \Rightarrow a \times d = b \times c$

extremes

Illustration 8.9

If a : 30 : : 7 : 15, find the value of a.

Sol. Product of the extremes = 15a
product of the means = 30 × 7
Product of the extremes = product of the means
15a = 30 × 7

so a = $\frac{30 \times 7}{15}$ = 14

Illustration 8.10

Are 36, 49, 6, 7 in proportion.

Sol. We have, Product of extremes = 36 × 7 = 252
Product of means= 49 × 6 = 294
Clearly, Product of extremes ≠ Product of means.
Hence, 36, 49, 6, 7 are not in proportion.

Illustration 8.11

80 students consume 720 kg of wheat in a month. How many kilograms of wheat are required in a hostel with 150 students for a month?

Sol. Let the wheat required be x kg.
Students : Students : : Quantity of Wheat : Quantity of wheat
80 : 150 : : 720 : x
Product of extremes = Product of means
80x = 150 × 720

x = $\frac{150 \times 720}{80}$ = 1,350 kg

Illustration 8.12

Rajiv invest Rs. 9500 in a bank and earn interest Rs. 665. If Deepak invests in the same bank, at the same rate of interest, for the same time period, an amount of Rs.7,500, what will be the interest that he will earn?

Sol. Let the interest Deepak earns be Rs x.

$$\begin{pmatrix}\text{Rajiv's}\\ \text{principal}\end{pmatrix} : \begin{pmatrix}\text{Deepak's}\\ \text{principal}\end{pmatrix} :: \begin{pmatrix}\text{Rajiv's}\\ \text{Interest}\end{pmatrix} : \begin{pmatrix}\text{Deepak's}\\ \text{Interest}\end{pmatrix}$$

9500 : 7500 : : 665 : x
9500x = 7500 × 665

x = $\frac{7500 \times 665}{9500}$ = Rs 525

Ask yourself

1. Test whether the given ratios form a proportion :
(a) 2:6 and 7:21 **(b)** 11:31 and 3:9

2. Are 40,30,60,45 in proportion?

3. The first, third and fourth terms of a proportion are 12,8 and 14 respectively. Find the second term.

4. If 18, x, x , 50 are in proportion, find the value of x?

5. The ratio of the length of a school ground to its width is 5:2. Find the length if the width of the ground is 50m.

Answers

1. **(a)** Yes **(b)** No **2.** Yes **3.** x = 21

4. x = 30 **5.** Length = 125m

8.3 UNITARY METHOD

Look at this problem.
If the cost of 3 pens is Rs.12, what will be the cost of 8 pens ?
The cost of 3 pens is Rs.12. So we know that the cost of one pen will be lesser than Rs.12. We can find the cost of one pen by dividing Rs.12 by 3. The cost of one pen is Rs.12 ÷ 3 = Rs.4 . If we have to find the cost of 8 pens, we know that it will be more than the cost of one pen. So we multiply Rs.4 by 8 and we get Rs.32. So the cost of 8 pens is Rs.8 x 4=Rs.32
In the process of our calculation we found out the value of one unit
(in this case cost of one pen)
So this method of solving is called unitary method.
Steps to follow in unitary method

1. Identify the facts given.

2. Identify what is to be found out.

3. Find the value of a unit by dividing.

$$\text{Value of one} = \frac{\text{Given value}}{\text{Number of articles}}$$

4. Multiply this result with the required units. Value of many = value of one × required no of units.

Illustration 8.13

If the cost of 6 chocolates is Rs 210, then find the value of 4 chocolates.

Sol. Cost of 6 chocolates = Rs 210

Cost of 1 chocolate = Rs $\frac{210}{6}$ = Rs. 35

∴ Cost of 4 chocolates = Rs 35 × 4 = Rs. 140
Thus, 4 chocolates cost Rs. 140

Illustration 8.14

A bus travels 240 km in 6 hours. How long will it take to travel 360 km ?

Sol. Time taken for 240 km = 6 hours

Time taken for 1 km = $\frac{6}{240}$ hours = $\frac{1}{40}$ hours

$\therefore$ Time taken for 360 km = $\frac{1}{40} \times 360 = 9$ hours.

Thus, the bus takes 9 hours to travel 360 km.

Illustration 8.15

Raj earns Rs 1500 in 10 days. How much will he earn in 45 days ?

Sol. Earning in 10 days = Rs 1500

Earning in 1 day = $\frac{1500}{10}$ = Rs 150

$\therefore$ Earning in 45 days = Rs 150 × 45
= Rs 6750

Thus, Raj earns Rs. 6750 in 45 days

Illustration 8.16

A family of 8 people is entitled to a ratio of 6,400 grams of sugar. What will be the sugar ratio for a family of 10 people ?

Sol. Quantity of sugar for 8 people = 6400 gms

Quantity of sugar for 1 person = $\frac{6400}{8}$ = 800 gm

$\therefore$ Quantity of sugar for 10 people = 800 × 10 = 8000 gm = 8 kg

Ask yourself

1. The cost of 30m of polyester cloth is Rs450. Find the cost of 16m of cloth.

2. An aeroplane flies 4000 km in 5 hours. How far does it travel in 3 hours?

3. 1 score of pencils cost Rs. 12.50 . How many pencils can be bought for Rs. 15 ?
(1 Score = 20)

4. If 5 bars of soaps cost Rs 31, find the cost of 2 dozen such bars of soaps.

5. 35 inland letters cost Rs 26.25. How many such letters can we buy for Rs 105 ?

Answers

1. Rs 240 **2.** 2400 km **3.** 24 pencils

4. Rs 148.8 **5.** 540

Add your knowledge

(a) Continued Proportion :

Three numbers **a, b, c** are said to be in continued proportion if a, b, b, c, are in proportion.
Thus, if a, b, c are in continued proportion, then

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

$\Rightarrow$ Product of extreme terms = Product of mean terms

$\Rightarrow$ $a \times c = b \times b$

$\Rightarrow$ $ac = b^2$

$\Rightarrow$ $b^2 = ac$.

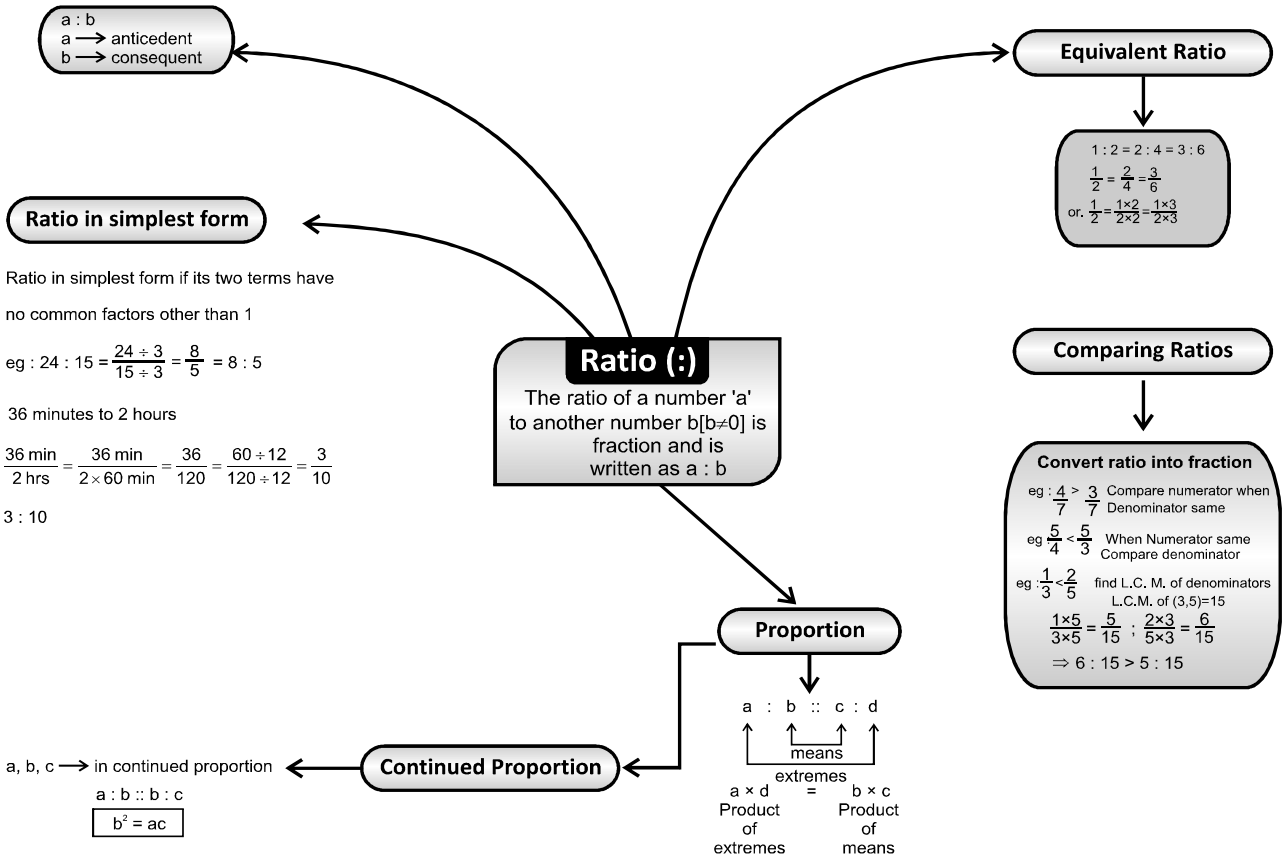
(b) Mean proportion :

If a , b, c are in continued proportion, then b is called the mean proportional between a and c.
Clearly, if b is the mean proportional between a and c, then $b^2 = ac$.

(c) Third proportion :

If a : b = b : c, then c is called the third proportional to a and b.

Concept Map


a : b
a ⟶ anticedent
b ⟶ consequent
Equivalent Ratio
1 : 2 = 2 : 4 = 3 : 6
1/2 = 2/4 = 3/6
or. 1/2 = 1×2/2×2 = 1×3/2×3
Ratio in simplest form
Ratio in simplest form if its two terms have
no common factors other than 1
eg : 24 : 15 = 24 ÷ 3 / 15 ÷ 3 = 8/5 = 8 : 5
36 minutes to 2 hours
36 min / 2 hrs = 36 min / 2 × 60 min = 36/120 = 60 ÷ 12 / 120 ÷ 12 = 3/10
3 : 10
Ratio (:)
The ratio of a number 'a' to another number b[b≠0] is fraction and is written as a : b
Comparing Ratios
Convert ratio into fraction
eg : 4/7 > 3/7 Compare numerator when Denominator same
eg 5/4 < 5/3 When Numerator same Compare denominator
eg 1/3 < 2/5 find L.C. M. of denominators
L.C.M. of (3,5)=15
1×5/3×5 = 5/15 ; 2×3/5×3 = 6/15
⇒ 6 : 15 > 5 : 15
Proportion
a : b :: c : d
means
extremes
a × d = b × c
Product of extremes
Product of means
Continued Proportion
a, b, c ⟶ in continued proportion
a : b :: b : c
b² = ac

Summary

1. The method in which two quantities are compared by division , is called comparison by ratio.
2. For comparison by ratio , the quantities must be in the same units.
3. The ratio of two quantities never has any unit of itself.
4. In the ratio a:b , a is antecedent and b is consequent.
5. Ratio a:b is not equal to ratio b:a.
6. A ratio a:b is said to be in simplest form if a and b has no common factor other than 1.
7. Equality of two ratios is called proportion.
8. If a:b:: c:d , then $a \times d = b \times c$.
9. The method of finding , the value of one quantity from the given quantities and then the value of required quantities is called the unitary method.
10. 1 dozen = 12 and 1 score = 20.

EXERCISE 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

1. The length and breadth of rectangle are 45cm and 30cm find the ratio of breadth to length.
(A) 2 : 3 (B) 3 : 2 (C) 5 : 3 (D) 3 : 5

2. Find the ratio of 5 days to 60 hours.
(A) 1 : 2 (B) 12 : 1 (C) 1 : 12 (D) 2 : 1

3. Which one is not the equivalent ratio of 3 : 5
(A) 6 : 10 (B) 12 : 25 (C) 9 : 15 (D) 15 : 25

4. Ratio 9 : 12 is same as :
(A) 8 : 14 (B) 4 : 3 (C) 3 : 4 (D) 1 : 4

5. The greatest ratio among the following ratios is :
(A) 2 : 3 (B) 40 : 25 (C) 5 : 8 (D) 75 : 21

6. The ratio of 75 paise to Rs. 5 is :
(A) 15 : 1 (B) 1 : 15 (C) 3 : 20 (D) 20 : 3 .

7. There are 18 boys and 14 girls in a class. The ratio of girls to boys is :
(A) 9 : 7 (B) 7 : 9 (C) 9 : 14 (D) 18 : 7

8. The simplest form of 9 : 15 is :
(A) 9 : 5 (B) 15 : 9 (C) 3 : 5 (D) 5 : 3

9. On comparing 7 : 21 and 3 : 5, we find that the smaller ratio is :
(A) 7 : 21 (B) 3 : 1 (C) 1 : 3 (D) (A) and (C) both

10. In a basket containing 40 apples, 15 were found to be rotten . Find the ratio of rotten to fresh apples.
(A) 7 : 3 (B) 3 : 5 (C) 8 : 3 (D) 3 : 8

11. If Rs. 75 is divided in the ratio 2 : 3 between Shinchan and Nimavari, then find Nimavari's share.
(A) Rs. 30 (B) Rs. 45 (C) Rs. 60 (D) Rs. 50

12. If $\frac{x}{y}=\frac{3}{2}$, then $\frac{x+y}{x-y}$ is equal to :
(A) $\frac{4}{3}$ (B) $\frac{1}{2}$ (C) $\frac{5}{4}$ (D) 5

13. If 3 : x : : 12 : 20, find the value of x.
(A) 5 (B) 6 (C) 7 (D) 8

14. Which of the following are in proportion ?
(A) 6,8,2,3 (B) 5,10,2, 4 (C) 9,4,5,3 (D) 8,5,3,6

15. a,b,c,d are said to be in proportion if :
(A) a × c = b × d (B) a × b = c × d (C) a × d = b × c (D) None of these

16. If x : 15 : : 8 : 3, then the value of x :
(A) 8 (B) 32 (C) 40 (D) 20

17. 25, 45, 45, y are in proportion then value of y is :
(A) 225 (B) 5 (C) 81 (D) 45

18. A perpendicular rod of length of 12 cm make 8 cm. long shadow on the ground. At the same time a tower makes 40 meter long shadow on the ground. The height of the tower will be
(A) 60 meter (B) 40 meter (C) 50 meter (D) 30 meter

19. If the cost of 8 Shirts is Rs 4000, then find the cost 3 shirt.
(A) Rs. 1000 (B) Rs. 1200 (C) Rs. 1500 (D) Rs. 500

20. A scooter travels 60 km in 2 hours. How long will it take to travel 300 km ?
(A) 5 hr. (B) 8 hr. (C) 10 hr. (D) 12 hr.

21. If the cost of 12 oranges is Rs 30, then the cost of 6 such oranges is
(A) Rs. 10.50. (B) Rs. 12. (C) Rs. 15. (D) Rs. 20.

22. If the cost of 1 kg packet of tea is Rs 96, then the cost of 6 kg tea packet is
(A) Rs 960. (B) Rs 756. (C) Rs 576. (D) Rs567.

23. If the cost of 5 kg jam bottle is Rs 360, then the cost of a 2 kg jam bottle is
(A) Rs 72. (B) Rs 124. (C) Rs 144. (D) Rs 136.

FILL IN THE BLANKS

1. A comparison by ____ is called a ratio.

2. A ratio has no _____

3. 28 : 40 in simplest form is _____

4. The simplest form of the ratio 12:48 is _____

5. Ratio of 55 paise to 1 rupee is _____

6. If 36 : 81 :: x : 63, then x is _____

7. If 25, 35, x are in proportion , then x is _____

8. If $\frac{14}{21} = \frac{x}{3} = \frac{6}{y}$ then x and y are_____

9. If 9 , x, x, 49 are in proportion , then x =____

10. 7kg:__ = 14m:6m

11. In unitary method, we first find out the value of the .....

12. If 10 bananas cost Rs. 20, then the cost of 7 bananas is _____

13. If the cost of 3 dozens pens is 72, then the cost of 2 dozens is ____

14. A car travels 240 km in 16 litres of petrol then _____ litres of petrol is required to cover 1500 km.

15. If the cost of six soaps is Rs 76.80, then the cost of fifteen such soaps is __

TRUE / FALSE

1. 6 : 8 and 9 : 12 are equivalent ratios of 4: 3

2. 60p : Rs 3 = 1:5.

3. The ratio 4 : 5 is smaller than 3 : 4

4. The ratio 2:5 is the same as the ratio 5:2

5. If we share Rs 30 in the ratio 1:2, the larger share is Rs 18.

6. 30, 40, 45, 60 are in proportion.

7. Is x:6::1:3 , then x = 2

8. If a, b, c are in continued proportion, then $a^2 = bc$.

9. The numbers 8,10,4,5 form a proportion

10. 26kg:39kg :: Rs200 : Rs300

11. If the 8 pens cost Rs 144 then the cost of 14 pens is 252.

12. If the cost of five rolls of camera film is Rs. 500, then the cost of eight such camera rolls is Rs 700

13. If two ratios are equal then they are said to be unit quantity

MATCH THE COLUMN

1.

Column –I		**Column–II**	
(A)	14 : 34	**(p)**	a : c :: b : d
(B)	x : 16 :: 16 : 2	**(q)**	antecedent
(C)	a : b :: c : d	**(r)**	7 : 17
(D)	In a : b, a is	**(s)**	0.225
(E)	Third proportional to 0.9 and 0.45	**(t)**	128

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. Fill the correct numbers in the following equal ratios :

(a) $\frac{4}{5} = \frac{?}{10}$ **(b)** $\frac{4}{5} = \frac{?}{15} = \frac{16}{?}$ **(c)** 2:3 = 8: ?

2. Divide Rs 5600 between Neeraj and Arun in the ratio 3:5.

3. Are 30,40,45 and 60 in proportion.

4. Determine whether the following numbers are in proportion 18, 30, 30, 50.

5. Find the value of x if 5 : 3 :: x : 6

6. Shinchan earns Rs 1000 in 5 days. How much will he earn in 15 days ?

7. 12 apples are shared by 8 persons , how many apple are shared by 2 persons?

SHORT ANSWER TYPE

8. Fill in the missing numbers:

$$\frac{9}{12} = \frac{\quad}{48} = \frac{3}{\quad}$$

9. In a year, Harry earns Rs. 3,00,000 and saves Rs. 1,20,000. Find the ratio of

(a) Money that Harry earn to the money he saves.

(b) Money that he save to the money he spends.

10. In a school , out of 4000 students, 2400 are girls . Find the ratio of

(a) Number of girls to the total number of students.

(b) Number of boys to the number of girls.

11. The angles of a triangle are in the ratio 3 : 2 : 1 . Find the angles .

12. The price ratio of one scooter and one cycle is 9 : 5. If the value of scooter is 4200 Rs. more than cycle, then find the price of cycle.

13. Determine whether the given numbers are in proportion or not.

(a) 4, 6, 8, 12 **(b)** 7, 42, 13, 78 **(c)** 33, 121, 9, 96 **(d)** 22, 33, 42, 63

14. Verify :

(a) 60 : 105 :: 84: 147 **(b)** 91: 104 :: 119 : 136

15. 8 pens cost Rs 144. How much the cost of 14 pens?

16. 1 score of pencils cost Rs. 12.50 . How many pencils can be bought for Rs. 15 ?
(1 Score = 20)

LONG ANSWER TYPE

17. 20 balloons have to be divided between Amit and Anshu in the ratio 2 : 3 . How many does each receive ?

18. A profit of Rs. 3000 is to be divided between three persons A, B and C in the ratio 3 : 4 : 5. Find the share of each.

19. In an election between two candidates A and B, 30,000 votes polled . A won the election with the margin of 400 votes . Find the ratio of votes polled in favour of each candidates.

20. A bullock - cart travels 35 km in 5 hours and a car travels 120 km in 2 hours . Find the ratio of their speeds

21. 4.5 g of an alloy of copper and zinc contains 3.5 g of copper . What weight of copper will be there in 18.9 g of the alloy .

22. Present age of father is 50 years and that of his son is 15 year. Find the ratio of
- **(a)** present age of father to the present age of son.
- **(b)** age of father to the age of son, when son was 10 year old.
- **(c)** age of father after 10 year to the age of son before 10 years.
- **(d)** age of father to the age of son when father was 40 years old.

23. The first, second and third terms of a proportion are 20,18 and 40 respectively. Find the fourth term.

24. If 16, x, x , 36 are in proportion, find the value of x?

25. Shanta bought 72 kg of wheat for Rs.324. How many kilogram of wheat could she have bought if she had spent only Rs. 144.

26. A car can cover a distance of 648 Kms. in 108 litres of petrol. How much petrol will be required by the car to cover a distance of 1746 Kms.?

EXERCISE 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)

MULTIPLE CHOICE QUESTIONS

1. A picture is 60cm wide and 1.8m long. The ratio of its width to its perimeter in lowest form is

(A) 1 :2 (B) 1 :3 (C) 1 :4 (D) 1:8

2. Mathematics textbook for class VI has 320 pages. the chapter ‘symmetry’ runs from page 261 to page 272. The ratio of the number of pages of this chapter to the total number of pages of the book is

(A) 11:320 (B) 3:40 (C) 3:80 (D) 272:320

3. In a box , the ratio of red marbles to blue marbles is 7 :4 . Which of the following could be the total number of marbles in the box ?

(A) 18 (B) 19 (C) 21 (D) 22

4. On a shelf , books with green cover and that with brown cover are in the ratio 2:3 . if there are 18 books with green cover, then the number of books with brown cover is

(A) 12 (B) 24 (C) 27 (D) 36

5. The greatest among the ratios 2:3 ,5:8 ,75:121 and 40:25 is
(A) 2:3 (B) 5:8 (C) 75:121 (D) 40:25

6. If 0.75 :x :: 5:6 , then x is equal to
(A) 1.50 (B) 0.9 (C) 9 (D) 15

7. A pack of pens was shared among anushree , neha and Isha in the ratio 4:2:3 . If there were 108 pens in the pack , how many did Neha get ?
(A) 48 (B) 24 (C) 36 (D) 60

8. If the given ratio of 1 : 6 , add 4 to the antecedent and 2 to the consequent. Then the new ratio is
(A) 5 : 6 (B) 1 : 8 (C) 5 : 8 (D) 8 : 5

9. In an office the working hours are 10.30 AM to 5.30 PM and in between 30 minutes are spend on lunch. Find the ratio of office hours to the time spent for lunch.
(A) 7 : 30 (B) 1 : 14 (C) 14 : 1 (D) 30 : 7

10. To make a cup of tea ratio of water to milk is 3 : 1. So to make 4 cups of tea the ratio of water to milk is
(A) 4 : 3 : 1 (B) 12 : 1 (C) 12 : 4 (C) 4 : 12

11. The condition for two ratios to be equal is
(A) product of means is equal to antecedents
(B) product of extremes is equal to consequents
(C) antecedents are equal to consequents
(D) product of means is equal to product of extremes

12. There are 'b' boys and 'g' girls in a class. The ratio of the number of boys to the total number of students in the class is :
(A) $\frac{b}{b+g}$ (B) $\frac{g}{b+g}$ (C) $\frac{b}{g}$ (D) $\frac{b+g}{b}$

13. If a bus travels 160km in 4 hours and a train travels 320 km in 5 hours at uniform speeds , then the ratio of the distances travelled by them in one hour is
(A) 1:2 (B) 4:5 (C) 5:8 (D) 8:5

14. Mohit enlarges a photograph that is 8cm wide and 6cm high. If the height of the enlarged photograph is 24cm , its width is
(A) 16cm (B) 2cm (C) 32cm (D) 12cm

15. If $\frac{x}{y}=\frac{1}{2}$ find the value of $\frac{2x+3y}{x+4y}$
(A) $\frac{9}{8}$ (B) $\frac{4}{9}$ (C) $\frac{8}{9}$ (D) $\frac{9}{4}$

16. The ratio of number of boys and girls is 4 : 3. If then are 18 girls in a class, find the number of boys in class and the total number of students in the class?
(A) 40, 42 (B) 18, 24 (C) 24, 40 (D) 24, 42

SECTION -B (TECHIE STUFF)

17. If a : b = 5 : 9 and b : c = 4 : 7, then a : b : c is
(A) 5 : 36 : 7 (B) 20 : 36 : 63 (C) 5 : 9 : 63 (D) None of these

18. If 2A = 3B = 4C, then A : B : C is
(A) 6 : 4 : 3 (B) 2 : 3 : 4 (C) 3 : 2 : 1 (D) 3 : 2 : 4

19. If 2A = 3B and 4B = 5C, then A : C is
(A) 15 : 4 (B) 2 : 5 (C) 15 : 8 (D) 8 : 15

20. The fourth proportional to 4, 9, 12 is
(A) 12 (B) 27 (C) 16 (D) 18

21. The third proportional to 16 and 36 is
(A) 27 (B) 16 (C) 81 (D) 36

22. The mean proportional between 0.08 and 0.18 is
(A) 0.08 (B) 0.12 (C) 0.36 (D) None of these

23. A bag contains 50 p, 25 p and 10 p coins in the ratio 5 : 9 : 4, amounting to Rs. 206, the number of 50 p. coins is
(A) 360 (B) 140 (C) 160 (D) 200

EXERCISE 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

1. In the word, "UNIFIED COUNCIL", the ratio of number of consonants to the number of vowels is: **[NSTSE 2010]**
(A) 5:9 (B) 6: 8 (C) 11: 3 (D) 1: 1

2. It takes 90 minutes to wash 20 vehicles at a car wash. At this rate, how many minutes does it take to wash 5 vehicles ? **(IMO-2010)**
(A) 22 mins (B) 14 mins (C) $22\frac{1}{2}$ mins (D) 7mins

3. The weekly milk order of Aryan's shop includes 40 litres of low-fat milk and 15 litres of chocolate milk. What is the ratio of the litres of low-fat milk to chocolate milk in Aryan's weekly milk order? **(IMO-2010)**
(A) 3: 1 (B) 5:1 (C) 5:3 (D) 8:3

4. If the ratio of boys to girls in the sixth-grade is 2 : 3, which of these shows possible number of the boys and girls in the class? **[NSTSE 2011]**
(A) 20 boys, 35 girls (B) 24 boys, 36 girls
(C) 35 boys, 20 girls (D) 36 boys, 24 girls

5. The ratio of the number of big dogs to the number of small dogs at a pet show is 3 : 17. There are 80 dogs, in total, at this pet show. How many big dogs are there? **[NSTSE 2011]**

(A) 12 (B) 20 (C) 24 (D) 6

6. At the store, Mini paid 8.74 for seven oranges. At this rate, how much will she pay for 24 oranges? **(IMO-2012)**

(A) Rs. 32.84 (B) Rs. 29.96 (C) Rs. 19.86 (D) Rs. 24.38

7. Aarav filled his car petrol tank with 30 litres of petrol on Monday. The next day, he filled the tank with 25 litres of petrol. If the petrol costs Rs. 52 per litre, how much did he spend in all on petrol? **(IMO-2012)**

(A) Rs.55 (B) Rs.6820 (C) Rs. 2860 (D) Rs.189

8. The ratio of the volume of water in Bottle P to the volume of water in Bottle Q is 3 : 4. Rajeev drank 40 mL of the water from Bottle P and the ratio then became 13 : 20. How much water was there in bottle P at first? **(IMO-2013)**

(A) 60 mL (B) 80 mL (C) 300 mL (D) 400 mL

9. Cost of a toffee is 50 paise and cost of a chocolate is 10, then the ratio of the cost of toffee to the cost of a chocolate is **(IMO-2013)**

(A) 5 : 1 (B) 1:20 (C) 1 : 5 (D) 20: 1

10. A total of 500 pieces of sweets is to be divided among Radha, Ahmed and Krishna respectively in the ratio of 3 : 8 : 14. How many pieces of sweets will Radha get? **(IMO-2013)**

(A) 60 (B) 80 (C) 160 (D) 280

11. What is the ratio of the least prime number to the least composite number ? **[NSTSE 2014]**

(A) 1:2 (B) 2: 3 (C) 1 :4 (D) 1:3

12. There are 45 cookies in a box. 27 of them have raisins while the rest are plain. What is the ratio of the number of plain cookies to that of raisin cookies in the box? **(IMO-2014)**

(A) 2 : 3 (B) 3 : 2 (C) 3 : 5 (D) 5 : 3

13. An unknown number of apples were distributed amongst Garima and Amit in the ratio 5 : 7. If Amit got 84 apples. Then the difference between the number of apples received by Garima and Amit is_____ **(IMO-2014)**

(A) 46 (B) 32 (C) 20 (D) 24

14. A and B take time in ratio 2 : 3 to complete a work. If they do the work together, they finish it in 10 days. What part of work was done by A? **(IMO-2014)**

(A) $(3/5)^{th}$ (B) $(1/5)^{th}$ (C) $(2/5)^{th}$ (D) $(4/5)^{th}$

15. A vessel has 5 litres 120 millilitres of mango shake. How many glasses each of 40 ml capacity, can be filled with it? **(IMO-2014)**

(A) 122 (B) 130 (C) 118 (D) 128

ANSWER KEY

EXERCISE 01

SECTION -A (FIXED RESPONSE TYPE)

MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	D	B	C	D	C	B	C	D	B	B	D	A	B	C	C	C	A	C	C
Ques.	21	22	23																	
Ans.	C	C	C																	

FILL IN THE BLANKS

1. division **2.** unit **3.** 7 : 10 **4.** 1 : 4

5. 11:20 **6.** 28 **7.** 49 **8.** x = 2 , y = 9

9. 21 **10.** 3kg **11.** Unit Quantity **12.** 14

13. 48 **14.** 100 litres **15.** 192

TRUE / FALSE

1. False **2.** True **3.** False **4.** False

5. False **6.** True **7.** True **8.** False

9. True **10.** True **11.** True **12.** False

13. False

MATCH THE COLUMN

1. A-(r) , B- (t) , C-(p) , D- (q) , E-(s)

SECTION -B (FREE RESPONSE TYPE)

VERY SHORT ANSWER TYPE

1. **(a)** 8 **(b)** 12, 20 **(c)** 12

2. 2100, 3500 **3.** Yes **4.** Yes

5. 3X = 30, x = 10 **6.** Rs 3000 **7.** 3

SHORT ANSWER TYPE

8. $\frac{9}{12}=\frac{9\times4}{12\times4}=\frac{36}{48}$, $\frac{9}{12}=\frac{9\div3}{12\div3}=\frac{3}{4}$ **9.** **(a)** $\frac{5}{2}$ **(b)** $\frac{2}{3}$

10. **(a)** $\frac{3}{5}$ **(b)** $\frac{2}{3}$ **4.** 90°, 60°,30°

12. Rs. 5250

13. **(a)** yes **(b)** yes **(c)** no **(d)** yes

14. **(a)** L.H.S = 60 ×147 = 8820
R.H.S. = 105 ×84 = 8820
L.H.S = R.H.S.

(b) L.H.S = 91 × 136 = 12376
R.H.S. = 104 × 119 =12376
L.H.S = R.H.S.

15. 252 **16.** 24 pencil

LONG ANSWER TYPE

17. 8, 12 **18.** Rs.750 , Rs.1000 Rs.1250 **19.** 38 : 37

20. 7 : 60 **21.** 14.7 gram

22. **(a)** 10:3 **(b)** 9:2 **(c)** 12:1 **(d)** 8:1

23. 36 **24.** 24 **25.** 32 kg **26.** 291 litre

EXERCISE 02

SECTION -A (COMPETITIVE EXAMINATION QUESTION)
MULTIPLE CHOICE QUESTIONS

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	C	C	D	C	D	B	B	C	C	C	D	A	C	C	C	D	B	A	C	B
Ques.	21	22	23																	
Ans.	C	B	D																	

EXERCISE 03

(PREVIOUS YEAR EXAMINATION QUESTIONS)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	D	C	D	B	A	B	C	C	B	A	A	A	D	C	D