



## Master Lesson Plan

For

## Ratio and Proportion

| Board | Standard | Subject     | Chapter              | Language | Reference Link                       | Creation date       |
|-------|----------|-------------|----------------------|----------|--------------------------------------|---------------------|
| CBSE  | STD VI   | Mathematics | Ratio and Proportion | English  | <a href="#">Ratio and Proportion</a> | 2019-10-18 10:05:44 |

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## Ratio and Proportion

### 1. MS\_Objectives\_Ratio and Proportion.

Objectives

**Notes to the teacher:**

This asset lays down the proposed plan for transacting this chapter. It states the asset objectives of the MLP. This asset is for teacher's reference and need not be taught to the students.

Students will be able:

1. To evaluate the comparison of Quantities as Ratio.
2. To describe the concept of Ratio with examples.
3. To explain the conversion of different units of Ratios.
4. To solve the questions and find the answers appropriately.
5. To define the concept of simplest form of Ratios with examples.
6. To apply the concept of ratios and write the equivalent ratios for a given ratio.
7. To show the ratios  $a : b$  is not the same as  $b : a$  and the equivalent ratios through activities..
8. To correlate the real life applications of Ratios and Proportions.
9. To make use of the ratio and find the answer for the given figure.
10. To solve the word problems with proper steps.
11. To self-discipline every activity in a proper proportion.
12. To define the comparison of quantities to the whole.
13. To explain proportion and its rules with examples.
14. To prepare a chart for the given data and answer the questions accordingly.
15. To apply the concept of proportion and find solution to the problems.
16. To explain unitary method with the help of examples.
17. To solve the word problems using the concept of Unitary Method.

| Time to teach | Asset Type  | Theme                | SubTheme |
|---------------|-------------|----------------------|----------|
| 3 Minutes     | Main Script | Comparing Quantities |          |

### 2. IQ\_How to compare Quantities?

Answer the following questions:

1. Why should we compare the prices in different shops before we buy an item?

Ans: We compare the prices in different shops to know the increase or decrease in price of the item.

2. Given a choice between a Rs.2000 dress and a book costing Rs.200, which one would you opt for?

Ans: Since both items are based on the amount of money spent, it is better to spend small amount of money.

3. What is the ratio of water to land in the world?

Ans: Ratio of water to land is 2 : 1.



4. What is the ratio of number of hours you spend in school to the number of hours you are at home?

Ans: The ratio of number of hours spent in school to the number of hours at home is 1:2.

5. If Ramu says, "I felt so hungry today, I ate two chapattis more today than usual", then it is comparison by difference. But if he says, "I felt so hungry today, I ate double the chapattis than normal", this is also comparison. Can you examine the difference between these two statements?

Ans: The first statement speaks about the increase or decrease or more or less but the second statement speaks about how many times or the ratio to the original.

From the questions above, it is clear that two quantities of same kind can be compared and it is represented by ratio.

Image of world earth - <https://pixabay.com/vectors/world-earth-planet-globe-map-1301744/>

| Time to teach | Asset Type            | Theme                | SubTheme                                                               |
|---------------|-----------------------|----------------------|------------------------------------------------------------------------|
| 5 Minutes     | Inquisitive Questions | Comparing Quantities | Condition for comparing quantities, Condition for comparing quantities |

### 3. MS\_What do you mean by Ratio?

In a cricket match, India scored 240 runs and Australia scored 120 runs. We can compare their scores in two ways:

#### Example 1

By Subtraction:

$$\begin{aligned} \text{India's score} - \text{Australia's score} &= 240 - 120 \\ &= 120. \end{aligned}$$

We see that India has scored 120 runs more than Australia

#### Example 2

If Raja is 150 cm tall and Ramani is 120 cm tall, then how do you compare them both?

We can say that Raja is 30 cm taller than Ramani and Ramani is shorter than Raja by 30 cm. i.e., we took the difference between the heights of Raja and Ramani for comparison.

#### Example 3

By Division:

Meena says a cone ice cream costs Rs. 20 and a cup ice cream costs Rs. 10.

We say a cone costs 2 times that of a cup ice cream. We write  $20/10 = 2$ .

$$\frac{\text{India's Score}}{\text{Australia's Score}} = \frac{240}{120} = \frac{2}{1}$$

Similarly, in Example 1 we can find

We see that India has scored twice or 2 times that of Australia.

While comparing by difference, it is not called ratio, because it is only the quality/nature is compared like tall or short, more or less etc.

While comparing by division or multiplication, the quantity is compared and hence, it is called as Ratio.

Hence, when two quantities are compared using division, we call it as "ratio". Therefore, **Ratio is the ordered comparison of two quantities of the same kind.**

#### Properties of Ratio:

- A ratio has no unit. It is a number.
- Each number of Ratio is called a term.
- Order of terms in a ratio cannot be reversed.
- In the ratio  $a : b$ ,  $a$  and  $b$  are called two terms of the ratio where ' $a$ ' is called **antecedent** and ' $b$ ' is called **consequent**.
- If two quantities  $a$  and  $b$  are to be compared then, their ratio is written as  $a/b$  or  $a : b$

The symbol ':' is used to define ratio and is read as 'is to'. Hence  $a : b$  is read as ' $a$  is to  $b$ '

$a$  is to  $b$  is called Written /Verbal notation.

$a : b$  is called Symbolic notation.

$a/b$  is called Fraction notation.

#### Example 1:

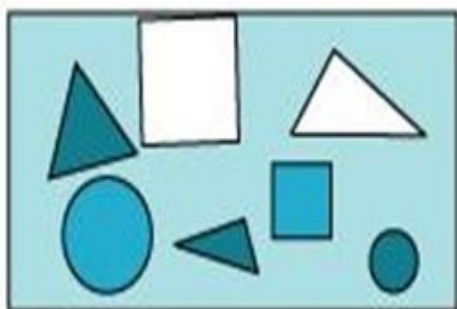
In a bag, there are 25 ladoos and 5 jilabis. We can say that the number of ladoos is 5 times the number of jilabis ( $25/5 = 5$  or  $25 : 5$ )

#### Example 2

I have a class of 25 students. 10 students are boys and 15 are girls. I can compare the number of boys to girls using the ratio  $10/15$  (or  $10:15$ ; or 10 to 15).

#### Example 3

See the figure and find the ratio of



Number of triangles to the number of circles inside the rectangle.(3:2 or 3 is to 2)

Number of squares to all the figures inside the rectangle.(2 : 7 or 2 is to 7)

Number of squares to number of triangles inside the rectangle.( 2 : 3 or 2 is to 3)

#### Example 4

Price of an item can be in rupees or only in paise or combined with both.

Suppose cost of a pencil is 50 paise and cost of a pen is 3 rupees and 75 paise. Now cost of a pencil is in paise and pen is in both rupees and paise.

Now it is easy to convert cost of a pen into paise..

Cost of a pen =  $3 \times 100 + 75$  paise, since 100 paise is 1 rupee  
 $= 300 + 75$  paise = 375 paise

Now both the cost prices are in paise, we can compare cost of a pen to cost of pencil. It is  $375 : 50$  or  $375/50$  or 375 is to 50.

Image Source: Original contribution by girijashankaran@yahoo.com

| Time to teach | Asset Type  | Theme                | SubTheme                                    |
|---------------|-------------|----------------------|---------------------------------------------|
| 15 Minutes    | Main Script | Comparing Quantities | Definition of Ratio,<br>Definition of Ratio |

#### 4. MS\_Conversion of Different units of Ratios

##### Example 1

Length of a pencil is 16 cm and its diameter is 8 mm. What is the ratio of the diameter of the pencil to that of its length?

Length of the pencil - 16 cm

Diameter of the pencil - 8 mm

Do they both have same units? - No, one is in cm and another in mm.

Since the length and diameter of the pencil are given in different units, we first need to convert them both into the same unit.

Length of a pencil = 16 cm =  $16 \times 10$  mm = 160 mm

Diameter of the pencil = 8 mm

Ratio of diameter of pencil to that of the length of the pencil:

$8 : 160 = 1 : 20$

**We conclude:**

**(a) Ratios are unit less when they relate quantities which have units of the same dimension.**

**(b) Ratio is found in the two quantities having the same unit of measurement.**

**(c) If the quantities do not have the same unit, they should be changed to the same unit of measurement.**

##### Example 2:

Ramu reaches school in 30 min whereas Krishna takes 1 hour. Here we are comparing only one thing i.e., the time taken by them. But both are in different units. Time taken by Ramu is in minutes but time taken by Krishna is in hours.

**Can we say that Ramu has taken more time compared to Krishna as 30 more than 1?**

No, we know that 30 min is lesser than 1 hour which is equal to 60 min. That means we understand that we can compare the things which have same units.

The ratio of time taken by Ramu to that of Krishna is  $30 : 60 = 1 : 2$

So, we can say that time taken by Krishna is twice that of Ramu or we can say Ramu covered the same distance in  $\frac{1}{2}$  of the time taken by Krishna.

### Example 3:

Sita bought 200 gm yellow colour powder and  $\frac{1}{2}$  kg green colour powder for rangoli competition.

**Can we say Sita bought more yellow powder as 200 is more than  $\frac{1}{2}$  ?**

No, as both are in different units first we need to convert both into same units to compare them.

1000 gms = 1 kg. Hence  $\frac{1}{2}$  kg =  $\frac{1}{2} \times 1000 = 500$  gms. Yellow powder : green powder = 200 : 500. Sita bought more yellow powder.

Thus, two quantities can be compared when they are in same units.

| Time to teach | Asset Type  | Theme                | SubTheme                                                               |
|---------------|-------------|----------------------|------------------------------------------------------------------------|
| 10 Minutes    | Main Script | Comparing Quantities | Condition for comparing quantities, Condition for comparing quantities |

## 5. QA\_Test on Ratios

1. Write the following ratio as fractions:

(1) 49:175 (2) 64:96 (3) 350:400 (4) 55:100

2) Write the following fractions in their ratio forms.

a)  $\frac{4}{7}$  (b)  $\frac{12}{15}$  (c)  $\frac{48}{52}$  (d)  $\frac{69}{77}$

3) Write the antecedent and the consequent of the following ratios.

1) 88:33 2) 49:245 3) 14:20 4) 12:72

4) Choose the correct answer:-

- a) The ratio 3:7 in fraction form is ----- ( $\frac{3}{7}$ ,  $\frac{7}{3}$ ,  $\frac{3}{10}$ ,  $\frac{7}{10}$ )
- b) The denominator of the fraction written using the ratio 11:27 is ----- (11, 27, 38)
- c) The fraction  $\frac{15}{4}$  can be written as ----- (4:15, 15:4, 19:4, 15:19)

5) Write the following as ratios

- a) 20 cm and 3 m
- b) Paise 35 and Rs.2
- c) 1 hr to 35 mins
- d) 125 days and 1 year

e) 100 gms to 2 kgs

### **Word Problems**

6) There are 52 students in VI standard. 40 of them are boys. (Hint: First find the number of girls)  
Mention the ratio of girls to the total strength.

Mention the ratio of boys to girls.

7) A notebook costs Rs.12 while a pen cost Rs.9. Find the ratio of the cost of the pen to that of the notebook.

8) Raju's height is 135 cm and Rahul's height is 105 cm. Find the ratio of Raju's height to Rahul's.

9) Mohan earns Rs 30,000 every month. He spends Rs 5000 towards education and saves Rs 2000. He spends the remaining money to lead his life. Then find the following

Ratio of savings to income

Ratio of education to expenditure

Ratio of income to expenditure

### **Answers**

1. 49/175, 64/96, 350/400, 55/100

2. 4: 7, 12 : 15, 48 : 52, 69 : 77

3. Antecedent 88,49,14,12  
Consequent 33, 245, 20, 72

4. 3/7, 27, 15:4

5. (a) 20 : 300 (100cm is 1mt), (b) 35 : 200 , (c) (since 60 mins is 1 hr) 60 : 35 (d) 125 : 365 (e) 100 : 2000 (since 1000 gms is 1 kg)

6. The number of girls is  $52 - 40 = 12$  (a) 12 : 52 (b) 40 : 12

7. Cost of pen : cost of a notebook is 9 : 12

8. Raju's height : Rahul's height is 135 : 105

9 (1) Savings to Income is 2000 : 30000 (2) Education to Expenditure is 5000 : 28000 (since education is also expenditure 23000 + 5000) (3) Income to Expenditure is 30000 : 28000

| Time to teach | Asset Type  | Theme                | SubTheme                                    |
|---------------|-------------|----------------------|---------------------------------------------|
| 20 Minutes    | Assessments | Comparing Quantities | Definition of Ratio,<br>Definition of Ratio |

## **6. MS\_Simplest form of Ratios**

### **Definition of Simplest Form**

A ratio is said to be in the simplest form or in the lowest terms when it is written in terms of whole numbers with no common factor other than 1.

**Example:** 2 :3 is already in its simplest form. Since there is no other factor common to 2 and 3 except 1, it is in the simplest form.

To write a ratio in its simplest form, keep dividing both sides by the same number until you can't go any further without going into decimals.

**Example:** Write 160:240 in its simplest form.

160:240

(divide both sides by 10)

16 : 24

(divide both sides by 8)

2 : 3

**Steps to follow to simplify the Ratios in its simplest form:**

- Write the ratio in terms of a fraction.
- Find the greatest common divisor of the numerator and the denominator and divide both numerator and denominator with that factor.
- Then write the ratio in its simplest form.

Note:

While representing a ratio,

Only **like quantities** should be compared and both the quantities must have the same units.

Ratio should be expressed in the simplest form.

**Example 1 :**

Write the ratio 128 : 80 in its simplest form:

$128 : 80 = 128/80$  .

The greatest common divisor is 16.

Then  $128/16 = 8$  and  $80/16 = 5$

Hence, 128: 80 is 8 : 5

**Example 2:**

Write the ratio 12:86 in the simplest form

**Solution:**

Following the steps:

$12:86 = 12/86$

The greatest common divisor of 12 and 86 is 2.

So, we divide the numerator and denominator by 2.

Therefore,  $12:86 = 12/86 = 6:43$ .

Thus, the reduced form of 12:86 is 6:43.

**Example 3:**

Determine the simplest form of the ratio 28:96

**Solution:**

$$28:96 = 28/96$$

= 7/24, by dividing with the greatest common factor, 4, from both the numerator and the denominator.

Hence, the reduced form (simplest form) of 28:96 is 7:24.

| Time to teach | Asset Type  | Theme                | SubTheme |
|---------------|-------------|----------------------|----------|
| 10 Minutes    | Main Script | Comparing Quantities |          |

**7. MS\_Ratios and its Equivalent**

Equivalent ratios are obtained when the numerator and denominator of a ratio are multiplied or divided by the same number. They have a common factor in them.

Steps to be followed in finding equivalent ratios:

- The items should be written as a fraction.
- The same units should be there in the numerator as well as the denominator.
- Ratios must be written in its simplest form.

**Example 1:**

Take the ratio 60: 84

This is written as  $\frac{60}{84}$

This is  $\frac{5 \times 12}{7 \times 12}$

Write 5 equivalent ratios for 5 : 7

$$5 : 7 = \frac{5}{7} \text{ (1) } \frac{5 \times 2}{7 \times 2} = \frac{10}{14}, \text{ (b) } \frac{5 \times 3}{7 \times 3} = \frac{15}{21}, \text{ (c) } \frac{5 \times 4}{7 \times 4} = \frac{20}{28} \text{ (d) } \frac{5 \times 5}{7 \times 5} = \frac{25}{35} \text{ (e) } \frac{5 \times 6}{7 \times 6} = \frac{30}{42}$$

Hence 5 : 7 is equivalent

5 : 7 , 10 : 14 , 15 : 21 , 20 : 28 , 25 : 35, 30 : 42

**Example 2:**

A man buys 1 dozen bananas and 30 oranges. What is the ratio of banana to orange?

Now bananas and oranges are in two different units. So we have to convert them into same units.

Number of bananas = 1 dozen = 12

$$\frac{\text{number of bananas}}{\text{number of oranges}} = \frac{12}{30} = \frac{6 \times 2}{6 \times 5} = \frac{2}{5}$$

**Example 3:**

To find the equivalent ratio by dividing a common factor.

$$36 : 45, \frac{36}{45}. \text{ For 36 and 45, 9 is the common factor. So divide by 9 } = \frac{\frac{36}{9}}{\frac{45}{9}} = \frac{4}{5} = 4 : 5.$$

Hence, equivalent ratios can be found by multiplying or dividing by the same number to the numerator and denominator.

Note: Teacher can show some more examples for both types.

| Time to teach | Asset Type  | Theme                | SubTheme                                |
|---------------|-------------|----------------------|-----------------------------------------|
| 10 Minutes    | Main Script | Comparing Quantities | Equivalent ratios,<br>Equivalent ratios |

**8. SA\_Fun with Ratios****Activity 1: Group****Type of Activity: Group****Setting of Activity: Classroom.**

**Aim:** To understand the meaning of Ratios.

**Materials:** 1 colour chart for each group; 5 red colour stars and 5 green colour stars or (smiley stickers of 2 types)

Each group will be given one chart paper and red and green colour star stickers of 10 each.

**Procedure:**

1. Ask all the students to write their name in the given card.
2. Ask the students bearing the same first letter to make one group.(example Rama, Ravi, Radha etc. to form one group, Sita, Selvi, Sharath, etc. to be next group)
3. After forming the group, write these questions on the board.

Now, write the following questions on the board:

1. How many students are there in your group?
2. How many girls are there in your group?
3. How many boys are there in your group?
4. What is the ratio of boys to girls?
5. What is the ratio of girls to boys?
6. What is the ratio of total students of the group to girls?

7. What is the ratio of total students of the group to boys?

Tell the students to write the answers on a corner of the chart paper.

Then the students are asked to stick the stars on the chart paper forming any shape (like Circle, Square, Triangle etc.) The number of stars used should be equivalent to the number of students in the group. Inside the shape, they should write the answers of the questions 4 and 5. (Each boy being represented as a Red star and each girl, as a green star.) Thus, you will appreciate that **a : b** is not the same thing as **b : a** and also how to write the ratios.

**Conclusion:** The student will understand the meaning of Ratios with concepts like  $a : b \neq b : a$ .

### Activity 2 : Group

**Objective:** Students can recognize equivalent fractions

**Materials required:** Prior preparation – There are 20 different ratios. For each ratio write 4 equivalent ratios. So there will be 100 equivalent ratio cards.

(Example  $2:3 = 2/3 = 4/6 = 6/9 = 8/12 = 10/15$ ,  $3/5 = 6/10 = 9/15 = 12/20 = 15/25$ ...)



### **Procedure:**

- Teacher has to prepare many ratio cards which are either in the form of ratios or fractions.
- The cards should have equivalent ratios.
- Divide the class into groups of 5 students.
- Give each group 25 cards which contain 5 sets of equivalent ratios which are jumbled.
- Ask them to find out each set equivalent ratios and record them.
- The group which arranges first will be the winner.

**Conclusion:** Students will be able to recognize equivalent ratios or fractions.

Image Source: Original contribution by girijashankaran@yahoo.com

| Time to teach | Asset Type         | Theme                | SubTheme                                |
|---------------|--------------------|----------------------|-----------------------------------------|
| 20 Minutes    | Suggested Activity | Comparing Quantities | Equivalent ratios,<br>Equivalent ratios |

## 9. DD\_Ratios and Proportions in Daily Life.

## We should appreciate that Ratios are used in day to day life.

For example, while cooking a dish, all the ingredients are added in certain ratios to each other.

For cooking rice, the ratio of rice to water is 1:3.

All recipes are written to serve a certain number of people or yield a certain amount of food. You might come across a payasam (or Kheer) recipe that makes 3 bowls of payasam. If we require to prepare 6 bowls, then understanding of ratios comes into play. Understanding how to increase or decrease the yield without spoiling the ratio of ingredients is a valuable skill for any cook.

Ratios also find a place in map reading. If we want to scale up a work or scale down a task, we need ratios.

In agriculture, while using chemical manures or fertilizers like nitrogen, potash ratios are used properly. Distance traveled to time, fuel to money are other common ratios that we use in everyday life.



5. Comparing price of vegetables and fruits between themselves (Cost of 1 kg of pomegranate is 3 times cost of 1 kg of cauliflower)



(Note: Teacher can interact with the children to give some more examples used in daily life)

Vegetable: SSSVV Gallery-Keyword-cauliflower

Fruit: SSSVV Gallery-Keyword-pomegranate

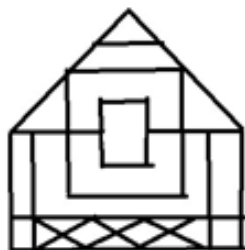
Car: SSSVV Gallery-Keyword-taxi

| Time to teach | Asset Type           | Theme                | SubTheme               |
|---------------|----------------------|----------------------|------------------------|
| 5 Minutes     | Day-to-day Relevance | Comparing Quantities | Proportion, Proportion |

## 10. IA\_Counting the number of straight lines and find its ratio.

Try this interesting puzzle!

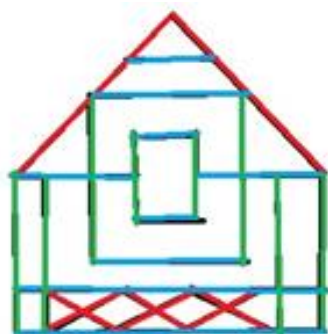
Can you find the ratio of the number of horizontal lines, vertical lines and slanting lines for the figure given below?



| No. of horizontal lines | No. of vertical lines | No. of slanting lines |
|-------------------------|-----------------------|-----------------------|
| 9                       | 8                     | 8                     |

The method to find the number of horizontal lines, vertical lines and slanting lines is

1) From top to bottom or left to right (depending on the figure) make a different colours for the horizontal lines, vertical lines and slanting lines respectively. Then count and write.



The answer for the above figure is 9 : 8 : 8. This is known as continued ratio.  $a : b : c$ . In the above figure No. of horizontal lines : no. of vertical lines: no. of slanting lines.

In this figure the number of vertical lines and slanting lines are equal. So we get  $a : b : c$ . 9:8:8.

If it is not equal then we use a method to find the continued ratio.

Images are original ([girijashankeran@gmail.com](mailto:girijashankeran@gmail.com))

| Time to teach | Asset Type         | Theme                | SubTheme                                    |
|---------------|--------------------|----------------------|---------------------------------------------|
| 5 Minutes     | Interesting Asides | Comparing Quantities | Definition of Ratio,<br>Definition of Ratio |

## 11. QA\_Questions for Ratios

1. There are 20 girls and 15 boys in a class. What is the ratio of number of girls to the number of boys?

(b)What is the ratio of number of girls to the total number of students in the class?

2. Out of 30 students in a class, 6 like football, 12 like cricket and remaining like tennis. Find the ratio of

(a) Number of students who like football to number of students who like tennis.

(b)Number of students who like cricket to total number of students.

3. In a college, the ratio of the number of boys to girls is 8:5. If there are 160 girls, find the total number of students in the college.

4. Two children want to divide 150 marbles in the ratio 1:2 .How many marbles each of them get?

5. The income and savings of a person are in the ratio 3:1. If his expenditure is Rs 4,000, find his income.

### Answers:

(a) 20 : 15 (b) 20 : 35

(a) 6 : 12 (b) 12 : 30

Let the total no of students be X. Out of 13 parts, 5 parts is girls which is equal to 160.

$$\frac{5x}{13} = 160$$

$$\text{Hence, } x = \frac{160 \times 13}{5}$$

$$= 416$$

Total parts is 3. Therefore,  $150/3 = 50$ , one child will get 50 marbles and the other child will get 100 marbles.

Income is 3 parts. Savings is 1 part. Therefore, expenditure is  $3 - 1 = 2$  parts.

Let the income be Rs. X.

$$\text{Therefore, } \frac{2x}{3} = 4000.$$

$$\text{Hence, } x = \frac{4000 \times 3}{2}$$

$$= 6,000.$$

| Time to teach | Asset Type  | Theme                | SubTheme                                                               |
|---------------|-------------|----------------------|------------------------------------------------------------------------|
| 15 Minutes    | Assessments | Comparing Quantities | Condition for comparing quantities, Condition for comparing quantities |

## 12. VC\_Ratio in Every Aspect of Life

### Value Asset

A ratio is a comparison of two or more quantities of the same kind. It can be represented as a fraction. i.e. by seeing how many times one quantity is to the other Quantity. This method is known as comparison by ratio.

In the real world, Ratio & proportion have a great significance. There is a desirable ratio / undesirable ratio for every aspect in the life.

### Quotation

“[The golden proportion] is a scale of proportions which makes the bad difficult [to produce] and the good easy.” — **Albert Einstein**

The great scientist had highlighted the fact that there is a golden proportion in Nature as well as several areas of human activities.

In Nature, arrangement of parts such as leaves and branches along the stems of plants and of veins in leaves.

In Architecture, height & width of buildings have always followed a Golden ratio that gives the building maximum stability as well as aesthetic beauty. Great ancient buildings like Pyramids in Egypt, Pantheon in Greece, Taj Mahal in India are a few examples of such beautiful buildings which stood firm for centuries.

Children, there is a lesson for all of us in Golden ratio. What is it?

In ancient Greek philosophy, especially that of Aristotle, the **golden ratio** is the desirable middle between two extremes, one of excess and the other of shortage.

For example, courage is a virtue but if taken to excess it becomes recklessness, and, in shortage, it becomes cowardice.

In other words, we should not indulge in too much or too less of anything in our life.

By following a Golden ratio in our lives, we shall be able to stay away from anything bad. Like Einstein said, it makes it easy to produce good in our lives & keep us happy.

#### Note to the teacher:

Please make an interactive session with the children by inviting them to think of some other ways in their lives in which they can strike a golden ratio in aspects of their daily lives. Some leads are given below. Let them come up with more ideas.

Study time & play time.

Excessive eating & excessive dieting.

Excessive physical activity and zero physical activity.

| Time to teach | Value Type | Value Sub Type  | Value Attribute  |
|---------------|------------|-----------------|------------------|
| 5 Minutes     | Peace      | Self Discipline | Group Activities |

### 13. MS\_Division of Given Quantity in a given Ratio

#### Example:

There are 5 pups which include 2 are male pups and 3 are female pups.



#### Part-to-Part:

The ratio of male to female is 2:3 or  $\frac{2}{3}$

The ratio of female to male is 3:2 or  $\frac{3}{2}$

#### Part-to-Whole:

The ratio of male to all pups is 2:5 or  $\frac{2}{5}$

The ratio of female to all pups is 3:5 or  $\frac{3}{5}$

**Let us consider an example.****Example 1**

There are 52 students in VI standard - 40 of them are boys.

Mention the ratio of girls to the total strength.

Mention the ratio of boys to girls.

**Solution:** 12:52, 40:12

**Example 2**

The ratio of the income to the expenditure of a family is 9 : 4. Find the income if the saving is Rs. 3600.

**Solution:**

Income is 9 parts. Expenditure is 4 parts.

Hence, savings is  $9 - 4 = 5$  parts.

The savings is given as Rs.3600.

Let the income be Rs.  $x$ .

$$\text{Therefore } \frac{5x}{9} = 3600$$

$$x = \frac{3600 \times 9}{5}$$

$$= \text{Rs. } 6480$$

From the above examples it is clear that we can divide a given number or quantity into a given ratio.

**Algorithm:**

Let the number be  $M$ . It is to be divided into two parts say  $a : b$ .

The two parts are  $x$  and  $y$ .

$$\text{If } x + y = M. \text{--- (1)}$$

$$\frac{x}{y} = \frac{a}{b} = k \text{ --- (2)}$$

$$\text{Then, } x = ak, y = bk$$

$$\text{Substituting in (i), } ak + bk = M$$

$$\Rightarrow (a + b) k = M$$

$$\Rightarrow k = \frac{M}{a+b}$$

$$\text{Therefore, } x = ak = a \frac{M}{a+b}, y = bk = b \frac{M}{a+b}.$$

$$\text{Hence, two parts of } M \text{ in the ratio } a : b \text{ are } \frac{aM}{a+b} \text{ and } \frac{bM}{a+b}$$

**Example 3**

The ratio of the number of girls to the number of boys in a class is 3 : 2. If the number of boys is 36, then find the number of girls.

**Solution:**

Let the total no of students be  $X$ .

$$\text{No of boys is 36. Hence } \frac{2x}{5} = 36$$

$$x = \frac{36 \times 5}{2}$$

$$= 90.$$

Hence total no of students is 90.

No. of boys is 36.

Therefore no. of girls is  $90 - 36 = 54$ .

### Image Source:

Pup: SSSVV Gallery-Keyword-Dog

White pup-SSSVV Gallery-Keyword-Dog

| Time to teach | Asset Type  | Theme                | SubTheme                                |
|---------------|-------------|----------------------|-----------------------------------------|
| 10 Minutes    | Main Script | Comparing Quantities | Equivalent ratios,<br>Equivalent ratios |

## 14. MS\_What is Proportion?

### Consider the situation:

Radha and Maria were friends. Radha had been collecting pictures of flowers from various magazines and so far has collected 150 pictures. On the other hand, Maria had collected 99 tattoos of various cartoon characters. The two friends decided to share their collection to have variety between them.

So, Radha gave 50 flower pictures to Maria and in turn, Maria gave 33 tattoos to Radha.

Radha was not happy about the distribution. Radha felt that she was cheated as she had given 50 pictures and in return she received only 33.

She felt that she had given an additional 17 pictures to Maria.

Radha complained to her mother about the distribution. Radha's mother did a calculation and told that Maria was fair on her part. She explained that, out of 150 pictures, 50 was given to Maria.

Therefore, the ratio of pictures to Maria to total number of pictures = 50:150.

Once simplified, it is 1:3.

Out of 99 Tattoos, Radha received 33 tattoos.

Therefore, the ratio of tattoos given to Radha to total number of tattoos = 33/99.

Once simplified, it is 1:3.

Since both the ratios are same, Radha's mother said the distribution was fair.

When two ratios are equal, they are said to be proportion.

In this example, 50, 150, 33, 99 are in proportion.

We use :: or = to denote proportion. In the above example  $50 : 150 :: 33 : 99$

### Example 1:

Check whether the given ratios are equal?

1.  $2 : 5$  and  $36 : 90$
2.  $2 : 9$  and  $18 : 81$
3.  $15 : 45$  and  $90 : 30$

### Solution:

1.  $2:5$  and  $36:90$

$(18 \times 2 = 36 \text{ } 18 \times 5 = 90)$

$2 : 5 :: 36 : 90$

2.  $2:9$  and  $18:81$

$(2 \times 9 = 18, 9 \times 9 = 81)$

$2 : 9 :: 18 : 81$

3. 15:45 and 90:30

(15 x 2 = 30, 45 x 2 = 90)

15:45 :: 30 : 90 is not equal to 15 : 45 :: 90 : 30

**Note to the teacher:** Note that 3:1 is not the same as 1:3. Thus 15, 45, 90 and 30 are not in proportion. If 2 ratios are not equal, then we say they are not in proportion.

When 4 quantities that are involved in a proportion are placed in order, they are known as respective terms. The first and the 4th terms are known as extremes. The second and the third are called middle terms/means.

Relationship among the 4 terms of a proportion is called the proportionality rule.

If  $a : b = c : d$  then, a, b, c and d are in proportion. They can be written in fraction form as  $a/b = c/d$

Hence  $ad = bc$

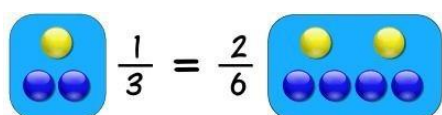
a and d are called **EXTREMES**

and b and c are called **MEANS**

**Product of extremes = Product of means.**

This is called the proportionality law

Proportion means that two ratios (or fractions) are equal



**Note:** Teacher can give some more examples

Image Source: [girijashankeran@yahoo.com](mailto:girijashankeran@yahoo.com)

| Time to teach | Asset Type  | Theme                | SubTheme               |
|---------------|-------------|----------------------|------------------------|
| 15 Minutes    | Main Script | Comparing Quantities | Proportion, Proportion |

## 15. SA\_Activity on Proportions

**Aim** To help the children understand the concept of Proportion.

**Setting of Activity:** Classroom

**Type of Activity 1:** Individual **Material:** 2 A4 sheet and 4 sketch pens.

**Steps:**

**Example:**

20 cookies require 160g flour. 100g butter and 50g sugar. What quantity of flour is required to bake 30 cookies?

If the quantity of flour = x, then  $20 : 30 :: 160 : x$ . Hence  $20x = 30 \times 160$ . Therefore,  $x = 240$  gms.

**Here is a recipe for cookies.**

**Complete the table so that the ratio of ingredients remains the same.**

| No. of Cookies | Flour(gm) | Butter(gm) | Sugar(gm) |
|----------------|-----------|------------|-----------|
| 24             | 200       | 150        | 100       |
| 36             |           |            |           |
| 48             |           |            |           |
| 72             |           |            |           |

## Activity 2

**Aim:** To help the children understand the concept of Proportion.

**Setting of Activity:** Classroom

**Type of Activity:** Individual

**Material required:** Chart, Colour pencils etc.

### Steps:

Let the children draw the circles below and write the answers for the questions given below



1. This circle is divided into \_\_\_\_\_ equal parts. Out of \_\_\_\_\_ parts, \_\_\_\_\_ part is coloured blue, the other is black. The ratio of Blue to the whole is 1:2.



2. Here, the circle is divided into \_\_\_\_\_ equal parts. Out of \_\_\_\_\_ parts, \_\_\_\_\_ parts are coloured blue. The ratio of blue to the whole is \_\_\_\_\_.



3. Here, the circle is divided into \_\_\_\_\_ equal parts. Out of \_\_\_\_\_ parts, \_\_\_\_\_ parts are coloured blue. The ratio of blue to the whole is \_\_\_\_\_.



4. The ratio of blue to the whole is \_\_\_\_\_.

Let the teacher point out that in all the 4 figures, half of the circle is coloured blue and the other half is coloured black. Then, explain to the children that

1) 1:2

2)  $2 : 4 = 1 : 2$

3)  $3 : 6 = 1 : 2$

$$4) 4 : 8 = 1 : 2$$

$$\text{Thus } \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{1}{2}$$

**Conclusion:** If two ratios are equal, we say they are in proportion and use the :: symbol (read as “is as” )  
We say 2, 4, 3, 6 are in proportion which is written 2:4 :: 3:6 (2 is to 4 is as 3 is to 6)

We can also write 2:4 = 3:6.

**Note:** Teacher can ask questions based on the above activities.

Image source: Self drawn [images.girijashankaran@yahoo.com](mailto:images.girijashankaran@yahoo.com)

| Time to teach | Asset Type         | Theme                | SubTheme                 |
|---------------|--------------------|----------------------|--------------------------|
| 20 Minutes    | Suggested Activity | Comparing Quantities | Proportions, Proportions |

## 16. QA\_Questions on Proportion

**Determine whether the following are in proportion and check the proportionality law.**

- 25 cm to 1m and Rs 40 to Rs 160
- 2 kg : 80 kg and 25 gms to 625 gms
- 33 : 44 and 75 : 100
- Are the following in equal proportion? Examine.  
a) 5:2::20:4   b) 4:24::17:28   c) 15:12::90:723   d) 2:5::36:90
- Find the value of K in the following:  
a) 1:3::12:K   b) K :25::10:125
- Find the value of x so that x, 60, 3, 20 are in proportion.
- Find the value of x so that 12 : 15 = x : 45
- Find the value of x so that 5, 15, x, x + 8 are proportional.
- If first three terms of a proportion are 5, 15, 4, find the fourth term.

### Solutions:

**Note :** The teacher should stress the point when comparing that both should be in same units. 1m = 100 cm.

- 25 : 100 which is 1 : 4 .Similarly 40 : 160 is 1 : 4

By Rule 25 : 100 :: 40 : 160 . 25 x 160 = 100 x 40 (4000 = 4000) Product of extremes is equal to Product of means.

- 2 : 80 is 1 : 40 and 25 : 625 is 1 : 25 They are not in proportion. 2 x 625 is not equal to 80 x 25 .

- 3 : 4 and 75 : 100 is 3 : 4 . 33 : 44 :: 75 : 100 ( 33 x 100 = 44 x 75 )They are in proportion.

4. a)  $5 \times 4$  is not equal to  $2 \times 20$  not in proportion (b)  $4 \times 28 = 112$ ,  $24 \times 17 = 408$  they are not in proportion.

(c)  $15 \times 923 = 10845$  is not equal to  $12 \times 90 = 1080$  (d) They are in proportion  $2 \times 90 = 5 \times 36$ .

5. Hint : a)  $1 \times K = 12 \times 3$  (b)  $125 K = 250$  therefore,  $K = 2$ .

6.  $20 \times = 180$  therefore  $x = 180/20 = 9$ .

7.  $15x = 540$  :  $x = 540/15 = 36$ .

8.  $5(x + 8) = 15x$ ,  $5x + 40 = 15x$ , therefore  $10x = 40$ ,  $x = 4$ .

9.  $5 : 15 :: 4 : x$  which is  $5x = 60$ ,  $x = 12$ .

| Time to teach | Asset Type  | Theme                | SubTheme                 |
|---------------|-------------|----------------------|--------------------------|
| 15 Minutes    | Assessments | Comparing Quantities | Proportions, Proportions |

## 17. MS\_ Explain Unitary Method

**Unitary method** is a way of calculating the value of a number of items by first finding the cost of one of them.

Unitary method can be used to calculate cost and measurements like litres and time.

### Example 1 :

The cost of 2 kg of apples is Rs. 240. Find the cost of 6 kg of apples.



Value of one (item) kg of apple = Value of (given quantity of items) 2 kg of apples / (Quantity of items) 2.  
Therefore cost of 1 kg of Apple =  $240/2 = 120$ .

Value of required quantity = Value of 1 item X Required Quantity of items

Now cost of 6 kg of apples = Rs.  $120 \times 6 = \text{RS.}720$

**Unitary Method** comprises the following two steps:-

**Step 1:** Find the value of one unit.

**Step 2:** Then find the value of required units.

### Example 2:

5 buses carry 200 passengers. How many passengers can 20 buses carry?

Solution:

**Step 1:** Find how many passengers 1 bus can carry:

To find this, we have to divide the given number of passengers (200) by given number of buses (5)

5 buses carry passengers = 200

1 bus carry passengers =  $200 \div 5 = 40$

**Step 2:** Find how many passengers 20 bus can carry:

To find this, we have to multiply the required number of buses (20) with number of passengers one bus can carry(40) because more buses will carry more passengers.

1 bus can carry 40 passengers.

Hence, 20 buses can carry =  $40 \times 20 = 800$  passengers.

**Example 3:**

Ekta earns Rs. 1500 in 10 days. How much will she earn in 30 days?

Solution:

Amount earned in 10 days = Rs. 1,500.

Amount earned in one day =  $\frac{1500}{10} = \text{Rs. } 150$ .

Amount earned in 30 days =  $30 \times 150 = \text{Rs. } 4,500$ .

**Example 4:**

The cost of 5 Kg of Wheat is Rs. 30.50

What will be the cost of 8 Kg of Wheat?

What quantity of wheat can be purchased in Rs. 61?

Solution:

Cost of 5kg of wheat = Rs.30.50

Cost of 1 kg of wheat =  $\frac{30.50}{5} = \text{RS. } 6.10$ .

Therefore, cost of 8 kg of wheat =  $8 \times 6.10 = \text{Rs } 48.80$ .

For Rs 1, quantity of wheat purchased =  $\frac{5}{30.50} = \frac{5 \times 100}{30.50 \times 100} = \frac{10}{61}$

Therefore, for RS 61, quantity of wheat purchased is =  $\frac{10}{61} \times 61 = 10$  kgs.

**Alternate Method to solve question (a) using proportion**

We can use product of extremes = product of means

For the above problem  $5 : 8 :: 30.50 : x = 5x = 8 \times 30.50$

Therefore  $x = \frac{8 \times 30.50}{5} = \text{Rs. } 48.80$ .

Similarly, all the above problems can be solved.

Image of Apple: Self clicked- original (girijashankaran@gmail.com)

| Time to teach | Asset Type  | Theme                | SubTheme                       |
|---------------|-------------|----------------------|--------------------------------|
| 20 Minutes    | Main Script | Comparing Quantities | Unitary method, Unitary method |

## 18. QA\_Assessments on Unitary Method

### Questions:

1. If the cost of 7m cloth is Rs. 294, find the cost of 5 m cloth.
2. The weight of 72 books is 9 kg. What is weight of 40 such books?
3. Reshma earns Rs. 1500 in 10 days. How much she will earn in 30 days?
4. If the cost of 6 cans of juice is Rs.210, what will be the cost of 4 cans of juice?
5. Five pens cost Rs. 115. How many pens can you buy with Rs. 207?
6. Cost of 105 envelopes is Rs.35. How many envelopes can be purchased for Rs.10?
7. In a hostel, groceries will cost Rs. 1000 for 5 people. How much will it cost for 2 people?
8. In a recipe, 4 glasses of water is to be added for every one glass of rice. How much rice is to be added for 48 glasses of water?
9. A car travels 80 km in 2 hrs. Find the distance covered by the car in 7 hrs.
10. Raina made 42 runs in 6 overs and Dhoni made 63 runs in 7 overs. Who made more runs per over?

### Answers:

1. Cost of 1 mt cloth =  $294/7 = \text{Rs } 42$ . Cost of 5 mt cloth  $5 \times 42 = \text{Rs. } 210$ .
2. Wt of 1 book =  $9 / 72 = 1/8 \text{ kg}$ . Wt of 40 books =  $1/8 \times 40 = 5 \text{ kg}$ .
3. Reshma earns money in one day =  $1500/30 = \text{RS } 150$ . Money earned in 30 days =  $150 \times 30 = 4500$ .
4. Cost of 1 can of juice =  $210/6 = 35$ . Cost of 4 cans of juice =  $4 \times 35 = \text{Rs } 140$
5. For Re 1, no of pens is  $5 / 115 = 1/23$ . For Rs 207, no of pens is  $1/23 \times 207 = 9$ .
6. For Re 1, no of envelopes is  $105/35 = 3$ . For Rs 10, no of envelopes =  $10 \times 3 = 30$ .
7. Cost of grocery for one person =  $1000/5 = 200$ . Cost of grocery for 2 people =  $200 \times 2 = 400$ .
8. Rice for one glass of water =  $1/4$ . Rice for 48 glasses of water =  $48 \times 1/4 = 12 \text{ glass of rice}$ .
9. Distance covered by car in 1 hr =  $80/2 = 40 \text{ kms}$ . Distance covered by car in 7 hrs =  $40 \times 7 = 280 \text{ kms}$ .
10. Runs per over made by Raina =  $42/6 = 7$  : Runs per over made by Dhoni =  $63/7 = 9$  Hence, Dhoni made more runs per over.

(Note: Teacher can ask the children to solve by alternate method also : Product of Extremes = Product of Means.)

| Time to teach | Asset Type  | Theme                | SubTheme                       |
|---------------|-------------|----------------------|--------------------------------|
| 20 Minutes    | Assessments | Comparing Quantities | Unitary method, Unitary method |

## 19. MS\_Summary\_Ratio and Proportion

- Define ratio as comparison of two quantities of same kind.
- Method of converting different units of ratios and its simplest form of ratios.
- Using the concept of ratios find the equivalent ratios.
- Applications of ratios in everyday life.
- Activities relating to equivalent ratios and the order of ratios.
- Define proportion and the terms of proportion.
- From the aspect of ratio and proportion value of self-discipline is described with the help of quotations from Albert Einstein and Aristotle.
- Formula used to find the proportion Product of Extremes equals Product of Means.
- Ratios and Proportion when compared with the division is taken as a whole quantity.
- Explain unitary method with examples of word problems.
- Word problems and objective questions based on the concepts of ratio, proportion and unitary method.

| Time to teach | Asset Type  | Theme                | SubTheme |
|---------------|-------------|----------------------|----------|
| 5 Minutes     | Main Script | Comparing Quantities |          |