



CHAPTER 8 : WORKING WITH FRACTIONS



SUMMARY OF CONCEPTS

1. FRACTION - BASICS

- A fraction represents a part of a whole or a collection.
- A fraction $\frac{a}{b}$ has:
 - a - numerator (top part)
 - b - denominator (bottom part, $b \neq 0$)

Numerator
(How many parts we take)

Denominator
(Total equal parts)

$$\frac{3}{4} = \text{Three-fourths}$$

2. MULTIPLICATION OF FRACTIONS

Rule (Brahmagupta) $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$

Steps

- Multiply the numerators.
- Multiply the denominators.
- Simplify the result (cancel common factors) to lowest form.

Examples

$$\frac{1}{2} \times \frac{1}{4} = \frac{1 \times 1}{2 \times 4} = \frac{1}{8}$$

$$\frac{2}{3} \times \frac{3}{5} = \frac{2 \times 3}{3 \times 5} = \frac{6}{15} = \frac{2}{5}$$

$$3 \times \frac{3}{4} = \frac{3}{1} \times \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$$

- ★ When one of the numbers is 1, the product remains the other number.

3. DIVISION OF FRACTIONS

Rule (Brahmagupta)

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{a \times d}{b \times c}$$

Steps

- Find the reciprocal of the divisor ($\frac{c}{d} \rightarrow \frac{d}{c}$).
- Multiply the dividend by this reciprocal.
- Simplify the result.

Examples

$$1 \div \frac{2}{3} = 1 \times \frac{3}{2} = \frac{3}{2} = 1\frac{1}{2}$$

$$\frac{3}{4} \div \frac{2}{5} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

$$\frac{5}{12} \div \frac{7}{18} = \frac{5}{12} \times \frac{18}{7} = \frac{90}{84} = \frac{15}{14} = 1\frac{1}{14}$$

- ★ **Reciprocal of** $\frac{a}{b}$ is $\frac{b}{a}$.
 $\left(\frac{a}{b}\right) \times \left(\frac{b}{a}\right) = 1$

4. RELATION BETWEEN NUMBERS

Situation	Condition	Product is
1. Both > 1 (e.g., 3×5)	Both numbers greater than 1	Greater than both numbers
2. Both between 0 and 1 (e.g., $\frac{3}{4} \times \frac{2}{5}$)	Both numbers between 0 and 1	Less than both numbers
3. One > 1 , one between 0 and 1 (e.g., $\frac{3}{4} \times 5$)	One number greater than 1 and the other between 0 and 1	Less than the number > 1 but greater than the number between 0 and 1

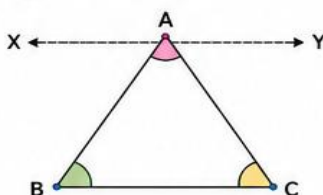
Order of Multiplication

$$\frac{3}{b} \times \frac{c}{d} = \frac{c}{d} \times \frac{a}{b}$$

(Order does not matter)

5. ANGLE SUM PROPERTY

The sum of the interior angles of a triangle is always 180° .

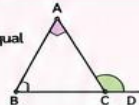


Proof idea:

- Draw a line XY through A parallel to BC.
- By alternate angles,
 $\angle XAB = \angle B$ and $\angle YAC = \angle C$.
- $\angle XAB + \angle BAC + \angle YAC = 180^\circ$
(straight line)
- Hence, $\angle A + \angle B + \angle C = 180^\circ$.

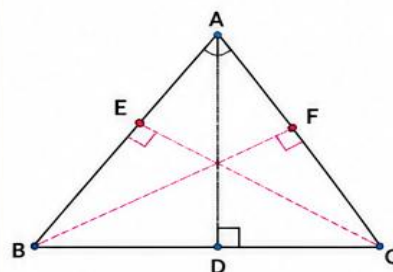
Exterior Angle Property

An exterior angle of a triangle is equal to the sum of the two opposite interior angles.



6. ALTITUDES OF A TRIANGLE

An **altitude** is a perpendicular from a vertex to the opposite side.



- AD, BE and CF are the three altitudes.
- In a right triangle, one side is also an altitude.

7. TYPES OF TRIANGLES

(A) By Sides

Equilateral
(All sides equal)



Isosceles
(Two sides equal)



Scalene
(All sides different)



(B) By Angles

Acute-angled
(All angles $< 90^\circ$)



Right-angled
(One angle = 90°)



Obtuse-angled
(One angle $> 90^\circ$)



All types of triangles satisfy: $\angle A + \angle B + \angle C = 180^\circ$

8. KEY FORMULAS

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

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

$$\rightarrow \text{Reciprocal of } \frac{a}{b} \text{ is } \frac{b}{a}$$

$$\rightarrow \frac{a}{b} \times \frac{b}{a} = 1$$

$$\rightarrow \angle A + \angle B + \angle C = 180^\circ$$

$$\rightarrow \text{Exterior angle} = \text{Sum of two opposite interior angles.}$$

9. IMPORTANT TAKEAWAYS

- ★ Fractions represent equal parts of a whole or a collection.
- ★ Use multiplication to solve problems involving "of", "times", "in".
- ★ To divide fractions, multiply by the reciprocal of the divisor.
- ★ Simplify (cancel common factors) before multiplying.
- ★ Triangle inequality helps to check if a triangle is possible.
- ★ The sum of angles in any triangle is 180° .
- ★ Altitudes help in many constructions and proofs.
- ★ Triangles are classified by sides and by angles.

QUICK TIPS



$1\frac{1}{2}$ Convert mixed fractions to improper fractions before operation.

$\frac{6}{8} = \frac{3}{4}$ Cancel common factors before multiplying to make it easy.

$\frac{a}{b} \div \frac{c}{d}$ Flip the divisor (take reciprocal) while dividing.

Draw diagrams (squares, fraction bars) to understand better.

WORKING WITH FRACTIONS

WORKSHEET-1

Section A: MCQs (PART-1) ($10 \times 1 = 10$ marks)

1. Which of the following is equivalent to $\frac{3}{5}$?

(a) $\frac{6}{15}$

(b) $\frac{9}{15}$

(c) $\frac{12}{25}$

(d) $\frac{15}{20}$

2. What is $\frac{2}{3} + \frac{1}{6}$?

(a) $\frac{3}{9}$

(b) $\frac{5}{6}$

(c) $\frac{1}{2}$

(d) $\frac{4}{6}$

3. Which fraction is the largest?

(a) $\frac{3}{4}$

(b) $\frac{5}{8}$

(c) $\frac{7}{12}$

(d) $\frac{2}{3}$

4. The product of $\frac{4}{7}$ and $\frac{21}{8}$ is:

(a) $\frac{84}{56}$

(b) $\frac{3}{2}$

(c) $\frac{2}{3}$

(d) $\frac{7}{4}$

5. What is $\frac{5}{6} - \frac{1}{4}$?

(a) $\frac{4}{12}$

(b) $\frac{7}{12}$

(c) $\frac{1}{2}$

(d) $\frac{11}{12}$

6. $\frac{3}{5}$ expressed as a decimal is:

(a) 0.35

(b) 0.6

(c) 0.53

(d) 0.06

7. Dividing $\frac{2}{3}$ by $\frac{4}{9}$ gives:

(a) $\frac{8}{27}$

(b) $\frac{3}{2}$

(c) $\frac{6}{12}$

(d) $\frac{2}{3}$

8. Which of the following fractions is in its lowest terms?

(a) $\frac{12}{18}$

(b) $\frac{7}{21}$

(c) $\frac{11}{13}$

(d) $\frac{8}{12}$

9. The product of a fraction and its reciprocal is:

a) 0

b) 1

c) 2

d) Fraction itself

10. The reciprocal of $2\frac{1}{3}$ is:

(a) $\frac{3}{7}$

(b) $\frac{7}{3}$

(c) $\frac{1}{3}$

(d) $\frac{3}{2}$

MCQs (PART-2) ($10 \times 1 = 10$ marks)

11. A cyclist travels 18 km in one hour. How far will the cyclist travel in $\frac{5}{6}$ hour?

- a) 12 km b) 15 km c) 16 km d) 18 km

12. A recipe requires $\frac{3}{5}$ cup of flour for one cake. How much flour is needed for 4 cakes?

- a) $\frac{12}{5}$ cups b) $\frac{7}{5}$ cups c) $\frac{3}{20}$ cups d) $\frac{15}{4}$ cups

13. Which expression correctly represents $\frac{4}{7} \div \frac{2}{3}$?

- a) $\frac{4}{7} \times \frac{2}{3}$ b) $\frac{2}{3} \times \frac{4}{7}$ c) $\frac{4}{7} \times \frac{3}{2}$ d) $\frac{7}{4} \times \frac{2}{3}$

14. A rectangular garden has length $\frac{7}{4}$ m and breadth $\frac{2}{3}$ m. Its area is:

- a) $\frac{14}{12}$ m² b) $\frac{7}{6}$ m² c) $\frac{21}{8}$ m² d) $\frac{9}{7}$ m²

15. Which pair of numbers has a product less than both the numbers?

- a) $\frac{3}{4}$ and $\frac{2}{5}$ b) 3 and 4 c) 2 and $\frac{3}{2}$ d) 5 and $\frac{6}{5}$

16. The reciprocal of $2\frac{1}{4}$ is:

- a) $\frac{9}{4}$ b) $\frac{4}{9}$ c) $\frac{5}{2}$ d) $\frac{2}{5}$

17. A water tank is $\frac{3}{4}$ full. Half of the water is used. What fraction of the tank remains filled?

- a) $\frac{1}{4}$ b) $\frac{3}{8}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

18. If 6 notebooks require $\frac{3}{4}$ metre of ribbon, then ribbon required for one notebook is:

- a) $\frac{1}{8}$ m b) $\frac{1}{12}$ m c) $\frac{1}{4}$ m d) $\frac{3}{8}$ m

19. Which statement is always true?

- a) Multiplying a number by a fraction greater than 1 makes it smaller.
b) Dividing a number by a fraction less than 1 makes it larger.
c) Dividing by 1 changes the number.
d) Multiplying by 0 increases the number.

20. Ravi walks $\frac{2}{3}$ km in $\frac{1}{4}$ hour. His walking speed is:

- a) $\frac{2}{3}$ km/h b) $\frac{3}{8}$ km/h c) $\frac{8}{3}$ km/h d) $\frac{5}{6}$ km/h

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Convert $\frac{7}{4}$ into a mixed fraction and represent it on a number line.

2. Find three equivalent fractions for $\frac{5}{9}$.

3. Compare using $<$, $>$, or $=$: $\frac{4}{7}$ and $\frac{5}{9}$

4. Simplify: $\frac{2}{5} + \frac{3}{10} + \frac{1}{2}$

5. A rope is $\frac{7}{8}$ m long. If $\frac{1}{4}$ m is cut off, what length remains?

6. Find the product: $1\frac{2}{5} \times \frac{5}{7}$

7. Divide: $\frac{9}{10} \div \frac{3}{5}$

8. Express $\frac{17}{5}$ as a mixed number and as a decimal.

9. Which is greater: $\frac{5}{6}$ or 0.85? Show your working.

10. Reduce $\frac{48}{72}$ to its lowest terms.

11. Arrange the following fractions in descending order: $\frac{5}{6}, \frac{7}{9}, \frac{11}{12}, \frac{3}{4}$

Show all steps using LCM.

12. Ravi read $\frac{2}{5}$ of a book on Monday and $\frac{1}{4}$ on Tuesday. What fraction of the book has he read in total? What fraction is still left to read?

13. A farmer has $12\frac{1}{2}$ kg of seeds. He uses $\frac{2}{5}$ of it for planting wheat. How many kilograms of seeds did he use for wheat?

14. Find three fractions between $\frac{1}{3}$ and $\frac{1}{2}$. Explain your method.

15. Simplify and express in lowest terms/mixed fractions: $\frac{5}{8} - \frac{1}{6} + \frac{3}{4}$

16. A tank can hold 60 litres of water. It is $\frac{3}{4}$ full. How much more water is needed to fill it completely? If $\frac{1}{5}$ of the current water is used, how much water remains?

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. (a) Define equivalent fractions with two examples.

(b) A piece of ribbon is $8\frac{3}{4}$ m long. It is cut into pieces, each of length $\frac{5}{8}$ m. How many complete pieces can be cut? What length of ribbon is left over?

18. (a) Represent $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{1}{2}$ on the same number line.

(b) In a class of 50 students, $\frac{2}{5}$ are girls. Of the girls, $\frac{3}{4}$ participate in sports. How many girls participate in sports? How many boys are there in the class?

19. (a) Explain with an example why we take the reciprocal when dividing fractions.

(b) A car travels $45\frac{1}{2}$ km on $3\frac{1}{4}$ litres of petrol. How far can it travel on 1 litre of petrol? How much petrol is needed to travel 84 km?

20. (a) Convert 0.625 and 1.75 into fractions in lowest terms.

(b) Three friends share a pizza. Anil eats $\frac{1}{3}$, Bina eats $\frac{1}{4}$, and Charu eats $\frac{1}{6}$ of the pizza. What fraction did they eat together? What fraction is left? If the pizza cost ₹360, what is the cost of the leftover pizza?

Case Study Based Questions ($2 \times 4 = 8$ marks)

21. Case Study 1: The School Garden Project

Class VII students are developing a rectangular school garden measuring 20 m by 15 m. The garden is divided into sections for different purposes.



- $\frac{2}{5}$ of the garden is for vegetables,
- $\frac{1}{4}$ of the garden is for flowers, $\frac{1}{10}$ of the garden is for a walking path
- The remaining portion is for herbs

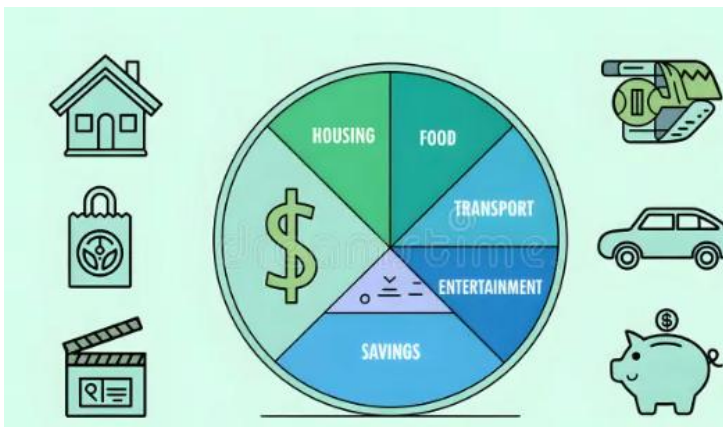
Based on the above information, answer the following:

- What fraction of the garden is used for vegetables and flowers together?
- What fraction of the garden is allocated for herbs?
- Calculate the area (in square metres) of the portion used for the walking path.
- If the cost of planting flowers is ₹25 per square metre, what is the total cost of planting flowers in the flower section?

22. Case Study 2: Meera's Monthly Savings

Meera earns ₹24,000 per month. She plans her expenses carefully:

- $\frac{1}{3}$ on rent
- $\frac{1}{4}$ on food and groceries
- $\frac{1}{8}$ on transportation



- $\frac{1}{12}$ on utilities
- The rest is saved

Based on the above information, answer the following:

- (i) What fraction of her salary does Meera spend on rent and food combined?
- (ii) What fraction of her salary does Meera save each month?
- (iii) How much money (in ₹) does she spend on transportation?
- (iv) Meera wants to save $\frac{1}{3}$ of her salary instead. By what fraction must she reduce her total expenses? How much is this reduction in rupees?

Self Assessment:

I understood all the concepts:

☐ Yes

☐ No

I need more practice:

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts:

☐ Yes

☐ No

He/She needs more practice:

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment:

--

Answers of Worksheet-1:

Q	1	2	3	4	5	6	7	8	9	10
Ans	b	b	a	b	b	b	b	c	b	a
Q	11	12	13	14	15	16	17	18	19	20
Ans	b	a	c	b	a	b	b	a	b	c

Answers of Worksheet-1:

Q	1	2	3	4	5	6
Ans	represent it on number line	And many such fractions	$\frac{4}{7} > \frac{5}{9}$	$1\frac{2}{10}$	$\frac{5}{8}$ m	1
Q	7	8	9	10	11	12
Ans	$\frac{3}{2}$	3.4	0.85	$\frac{2}{3}$	$\frac{11}{12}, \frac{5}{6}, \frac{7}{9}, \frac{3}{4}$	$\frac{13}{20}, \frac{7}{20}$
Q	13	14	15	16	17	18
Ans	5 Kg	Any three fractions between $\frac{1}{3}$ and $\frac{1}{2}$	$1\frac{5}{24}$	15 litres 45litres. 36litres.	(b) 14 and no length of ribbon is left behind.	15, 30
Q	19	20	21	22		
Ans	14 km, 6	$\frac{7}{4}, \frac{3}{4}, \frac{1}{4}$ ₹ 90	$\frac{13}{20}$ $\frac{1}{4}$ 30 m ² ₹ 1875	$\frac{7}{12}$ $\frac{5}{24}$ ₹ 3000 $\frac{3}{24}$ ₹ 3000		