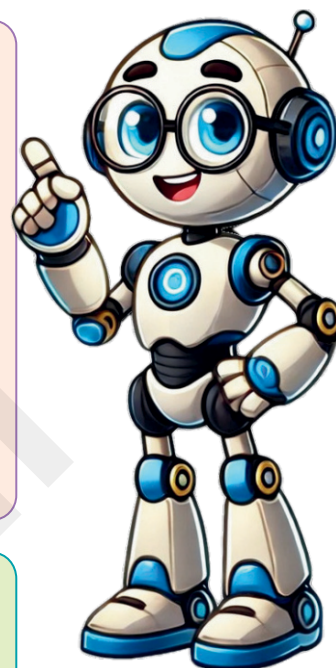# 5 Fractions

We'll cover the following key points:

→ Fractions and its types
→ Addition of Fractions
→ Addition of Whole Numbers and Fractions
→ Subtraction of Unlike Fractions
→ Subtraction of a Fraction from a Whole Number

→ Mixed Problems on Addition and Subtraction
→ Word Problems
→ Multiplication of Fractions
→ Problems on Multiplication
→ Division of Fractions

Do you Remember fundamental concept in previous class.
In class 4ᵗʰ we learnt

→ What are Fractional Numbers?
→ Types of Fractions and Their Conversion
→ Addition of Fractional Numbers (Same Denominator)
→ Subtraction of Fractions (Same Denominator)

EeeBee

Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Understand the concept of fractions as parts of a whole or a collection.
- Identify and differentiate between proper, improper, and mixed fractions.
- Represent fractions on a number line.
- Simplify fractions to their lowest terms using the concept of common factors.
- Compare and order fractions with like and unlike denominators.
- Perform basic operations (addition, subtraction, multiplication, and division) on fractions.
- Convert improper fractions to mixed fractions and vice versa.
- Solve real-life problems involving fractions, such as dividing quantities into parts.
- Understand the concept of equivalent fractions and create equivalent fractions for a given fraction.

Warm Up

Tick (✓) the correct answer.

1. $\frac{3}{4}$ of a dozen

   (a) 8 ☐   (b) 9 ☐   (c) 6 ☐

2. $\frac{1}{2}$ of a century

   (a) 50 ☐   (b) 25 ☐   (c) 75 ☐

3. $1\frac{1}{2}$ m

   (a) 124 cm ☐   (b) 100 cm ☐   (c) 150 cm ☐

4. $1\frac{1}{4}$ is half of

   (a) 3 ☐   (b) $2\frac{1}{2}$ ☐   (c) $2\frac{3}{4}$ ☐

5. $\frac{1}{4}$ of a year

   (a) 4 months ☐   (b) 3 months ☐   (c) 6 months ☐

6. $\frac{4}{5}$ of a rupee

   (a) 90 p ☐   (b) 60 p ☐   (c) 80 p ☐

7. $\frac{1}{4}$ of a minute

   (a) 15 sec ☐   (b) 18 sec ☐   (c) 20 sec ☐

8. $\frac{1}{3}$ of a day

   (a) 18 hours ☐   (b) 10 hours ☐   (c) 8 hours ☐

Fractions and its types

You have learnt about fractions in your previous classes.

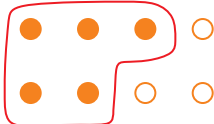▸ A **fraction** means represents an equal part of a whole.

▸ A proper fraction has a numerator less than the denominator.

For example : $\dfrac{2}{3}, \dfrac{7}{9}, \dfrac{15}{29}, \dfrac{51}{63}, \dfrac{111}{425}$, etc.

▸ An improper fraction has a numerator greater than the denominator.

For example : $\dfrac{5}{4}, \dfrac{7}{3}, \dfrac{45}{8}, \dfrac{123}{77}, \dfrac{561}{193}$, etc.

▸ A fraction can also represent part of a set.

For example : $\dfrac{5}{8}$

▸ **Like fractions** have the same denominators.

For example : $\dfrac{5}{8}, \dfrac{1}{8}$ and $\dfrac{7}{8}$ are like fractions

▸ **Unlike fractions** have different denominators.

For example : $\dfrac{4}{5}, \dfrac{2}{7}$ and $\dfrac{1}{2}$ are unlike fractions.

▸ Unit Fractions have only the digit 1 as the numerator.

For example : $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{6}$ and $\dfrac{1}{8}$ are unit fractions.

▸ Equivalent Fractions have the same value even though the numerators and denominators are different.

For Example : $\dfrac{1}{2}$ and $\dfrac{4}{8}$ are equivalent fractions.

▸ A **mixture fraction** is a combination of a whole number and a proper fraction.

For example: 2 and $\dfrac{2}{5}$ is $2\dfrac{2}{5}$; i.e; mixed fraction.

Addition of Fractions

Addition of Like Fractions

Let us know how to add like fractions i.e. $\dfrac{2}{7}$ and $\dfrac{3}{7}$.

We have, $\dfrac{2}{7} + \dfrac{3}{7} = \dfrac{2+3}{7} = \dfrac{5}{7}$

Example 1 : Add $\dfrac{1}{23}, \dfrac{3}{23}$ and $\dfrac{9}{23}$

Solution : $\dfrac{1}{23} + \dfrac{3}{23} + \dfrac{9}{23} = \dfrac{1+3+9}{23} = \dfrac{13}{23}$

Take a Task

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Addition of Unlike Fractions

Example 2 : Find the sum of $\dfrac{1}{8}$ and $\dfrac{3}{5}$.

Solution : Denominators are different. For adding these fractions, make their denominators same. To get the common denominators, find the LCM of 5 and 8.

LCM of 5 and 8 = 2 × 2 × 5 × 2 = 40.

Now, $\quad \dfrac{1}{8} = \dfrac{1 \times 5}{8 \times 5} = \dfrac{5}{40}$ $\qquad$ (Since 40 ÷ 8 = 5)

$\qquad\quad \dfrac{3}{5} = \dfrac{3 \times 8}{5 \times 8} = \dfrac{24}{40}$ $\qquad$ (Since 40 ÷ 5 = 8)

Hence, $\dfrac{1}{8} + \dfrac{3}{5} = \dfrac{5}{40} + \dfrac{24}{40} = \dfrac{5+24}{40} = \dfrac{29}{40}$

Example 3 : Find the sum of $\dfrac{5}{8}, \dfrac{1}{6}$ and $\dfrac{2}{3}$.

Solution : To get common denominator, we have to find out the LCM of 8, 6 and 3.

Now, $\quad \dfrac{5}{8} = \dfrac{5 \times 3}{8 \times 3} = \dfrac{15}{24}$ $\qquad$ (Since 24 ÷ 8 = 3)

$\qquad\quad \dfrac{1}{6} = \dfrac{1 \times 4}{6 \times 4} = \dfrac{4}{24}$ $\qquad$ (Since 24 ÷ 6 = 4)

Hence, $\quad \dfrac{2}{3} = \dfrac{2 \times 8}{3 \times 8} = \dfrac{16}{24}$ $\qquad$ (Since 24 ÷ 3 = 8)

Addition of Whole Numbers and Fractions

Example 4 : Add $\dfrac{4}{9}, 5$ and $\dfrac{2}{3}$.

Solution : We have $\dfrac{4}{9} + 5 + \dfrac{2}{3} = \dfrac{4}{9} + \dfrac{5}{1} + \dfrac{2}{3}$ $\left(\text{Since } 5 = \dfrac{5}{1}\right)$

Now the LCM of 9, 1 and 3 is 9.

So, $\quad \dfrac{4}{9} = \dfrac{4 \times 1}{9 \times 1} = \dfrac{4}{9}$ $\qquad$ (Since 9 ÷ 9 = 1)

$\qquad\quad \dfrac{5}{1} = \dfrac{5 \times 9}{1 \times 9} = \dfrac{45}{9}$ $\qquad$ (Since 9 ÷ 1 = 9)

$\qquad\quad \dfrac{2}{3} = \dfrac{2 \times 3}{3 \times 3} = \dfrac{6}{9}$ $\qquad$ (Since 9 ÷ 3 = 3)

Now, $\dfrac{4}{9} + \dfrac{5}{1} + \dfrac{2}{3} = \dfrac{4}{9} + \dfrac{45}{9} + \dfrac{6}{9} = \dfrac{4+45+6}{9} = \dfrac{55}{9}$

$\qquad\qquad\qquad\qquad = 6\dfrac{1}{9}$

Working

$$\begin{array}{c|cc} 2 & 5 & 8 \\ \hline 2 & 5 & 4 \\ \hline & 5 & 2 \end{array}$$

Working

$$\begin{array}{c|ccc} 2 & 8 & 6 & 3 \\ \hline 2 & 4 & 3 & 3 \\ \hline 2 & 2 & 3 & 3 \\ \hline 3 & 1 & 3 & 3 \\ \hline & 1 & 1 & 1 \end{array}$$

Working

$$\dfrac{35}{24} = 1 \sqrt{\begin{array}{r} 3\ 5 \\ -2\ 4 \\ \hline 1\ 1 \end{array}}$$

Take a Task

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Working

$$\dfrac{55}{9} = 6 \sqrt{\begin{array}{r} 5\ 5 \\ -5\ 4 \\ \hline 1 \end{array}}$$

(Changing into mixed fraction)

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Example 5 : Find the sum of $5\dfrac{2}{7}$ and $2\dfrac{3}{4}$.

Solution : First, we change the mixed fractions into improper fractions.

$$5\dfrac{2}{7} = \dfrac{(5 \times 7) + 2}{7} = \dfrac{35 + 2}{7} = \dfrac{37}{7}$$

$$2\dfrac{3}{4} = \dfrac{(2 \times 4) + 3}{4} = \dfrac{8 + 3}{4} = \dfrac{11}{4}$$

So, $5\dfrac{2}{7} + 2\dfrac{3}{4} = \dfrac{37}{7} + \dfrac{11}{4}$

LCM of 7 and 4 is 28.

So, $\dfrac{37}{7} = \dfrac{37 \times 4}{7 \times 4} = \dfrac{148}{28}$ (As $28 \div 7 = 4$)

$\dfrac{11}{4} = \dfrac{11 \times 7}{4 \times 7} = \dfrac{77}{28}$ (As $28 \div 4 = 7$)

Working

$$28 \,\overline{)\,225\,}\;\;8$$
$$-224$$
$$\overline{1}$$

Now, $5\dfrac{2}{7} + 2\dfrac{3}{4} = \dfrac{37}{7} + \dfrac{11}{4} = \dfrac{148}{28} + \dfrac{77}{28} = \dfrac{148 + 77}{28} = \dfrac{225}{28}$

$$= 8\dfrac{1}{28}$$ (Changing into a mixed fraction)

Alternate Method

$$5\dfrac{2}{7} + 2\dfrac{3}{4} = (5 + 2) + \left(\dfrac{2}{7} + \dfrac{5}{1}\right)$$ (Changing into equivalent fractions

$$= 7 + \left(\dfrac{8}{28} + \dfrac{21}{28}\right)$$ having same denominators)

$$= 7 + \dfrac{29}{28} = 7 + 1\dfrac{1}{28} = 8\dfrac{1}{28}$$ (Changing into a mixed fraction)

Example 6 : Find the sum of $3\dfrac{1}{5}$, $2\dfrac{3}{4}$ and $\dfrac{3}{10}$.

Solution : First, change the mixed fractions into improper fractions.

So, $3\dfrac{1}{5} + 2\dfrac{3}{4} + \dfrac{3}{10} = \dfrac{16}{5} + \dfrac{11}{4} + \dfrac{3}{10}$

LCM of 5, 4 and 10 is 20.

Now, $\dfrac{16}{5} + \dfrac{11}{4} + \dfrac{3}{10} = \dfrac{16 \times 4}{5 \times 4} + \dfrac{11 \times 5}{4 \times 5} + \dfrac{3 \times 2}{10 \times 2}$

$$= \dfrac{64}{20} + \dfrac{55}{20} + \dfrac{6}{20} = \dfrac{16 + 55 + 6}{20} = \dfrac{125}{20}$$ (Since the LCM of 5, 4 and 10 is 20.)

$$= 6\dfrac{5}{20} = 6\dfrac{1}{4}$$ $\left(\text{Since } \dfrac{\cancel{5}^{1}}{\cancel{20}_{4}} = \dfrac{1}{4}\right)$

Example 7 : Add $2\dfrac{3}{4}$ and $1\dfrac{5}{8}$.

Solution : **Step 1 :** Add the whole numbers.

$$2 + 1 = 3$$

Step 2 : Find the LCM of the denominators.

LCM of 4 and 8 is 8.

Step 3 : Find the equivalent fractions with LCM as denominator.

$$\frac{3}{4} \times \frac{2}{2} = \frac{6}{8} \text{ and } \frac{5}{8} \times \frac{1}{1} = \frac{5}{8}$$

Step 4 : Add the numerators.

$$\frac{6}{8} + \frac{5}{8} = \frac{11}{8}$$

Step 5 : Simplify $\frac{11}{8} = 1\frac{3}{8}$

Step 6 : Add the whole number and mixed number.

$$3 + 1\frac{3}{8} = 4\frac{3}{8}$$

📖 Exercise 5.1

1. Add the following:

(a) $\frac{3}{11} + \frac{1}{11}$

(b) $\frac{5}{17} + \frac{2}{17}$

(c) $\frac{6}{19} + \frac{2}{19} + \frac{1}{19}$

(d) $\frac{12}{49} + \frac{3}{49}$

(e) $\frac{3}{19} + \frac{8}{19} + \frac{2}{19}$

(f) $\frac{3}{4} + \frac{2}{5}$

(g) $\frac{3}{8} + \frac{3}{7}$

(h) $\frac{4}{11} + \frac{3}{22}$

(i) $\frac{1}{4} + \frac{3}{6}$

(j) $\frac{4}{5} + \frac{5}{6} + \frac{2}{15}$

(k) $\frac{2}{3} + \frac{1}{6} + \frac{7}{8}$

(l) $\frac{1}{4} + \frac{1}{5} + \frac{1}{2}$

2. Find the sum:

(a) $3 + \frac{2}{3}$

(b) $6 + \frac{1}{13}$

(c) $4 + \frac{2}{5}$

(d) $\frac{3}{11} + 5$

(e) $2\frac{1}{2} + 5\frac{3}{4}$

(f) $7\frac{2}{3} + 2\frac{5}{6}$

(g) $1\frac{3}{4} + 2\frac{5}{8} + 3$

(h) $7\frac{1}{8} + 8 + 2\frac{1}{2}$

(i) $5\frac{1}{6} + 4 + 2\frac{1}{3}$

(j) $5\frac{1}{9} + 2\frac{1}{12} + \frac{3}{4}$

(k) $3 + 5 + 1\frac{12}{13}$

(l) $6 + 5\frac{2}{11}$

3. Express the following as mixed fractions:

(a) $\frac{23}{4}$

(b) $\frac{20}{9}$

(c) $\frac{50}{11}$

(d) $\frac{83}{13}$

(e) $\frac{34}{5}$

(f) $\frac{65}{11}$

(g) $\frac{19}{5}$

(h) $\frac{75}{19}$

4. Express the following as improper fraction:

(a) $6\dfrac{1}{4}$ (b) $11\dfrac{2}{3}$ (c) $6\dfrac{3}{8}$ (d) $10\dfrac{5}{9}$ (e) $21\dfrac{4}{7}$

(f) $30\dfrac{8}{11}$ (g) $21\dfrac{13}{19}$ (h) $15\dfrac{3}{5}$
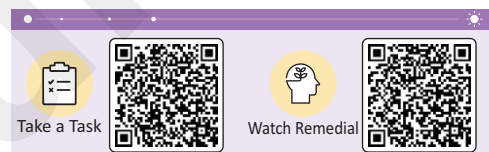
Subtraction

Revision

In class IV, we have learnt about the subtraction of like fractions.

Let us revise them.

Example 8 : Subtract $\dfrac{2}{11}$ from $\dfrac{7}{11}$.

Solution : $\dfrac{7}{11} - \dfrac{2}{11} = \dfrac{7-2}{11} = \dfrac{5}{11}$

Subtraction of Unlike Fractions

In subtraction of unlike fractions, first change he given fractions into their equivalent forms with a common denominator and then subtract them.

Example 9 : Subtract $\dfrac{1}{6}$ from $\dfrac{3}{4}$.

Solution : We have, $\dfrac{3}{4} - \dfrac{1}{6}$

The LCM of 4 and 6 is 12.

So, $\dfrac{3}{4} = \dfrac{3\times 3}{4\times 3} = \dfrac{9}{12}$

$\dfrac{1}{6} = \dfrac{1\times 2}{6\times 2} = \dfrac{2}{12}$

Now, $\dfrac{3}{4} - \dfrac{1}{6} = \dfrac{9}{12} - \dfrac{2}{12} = \dfrac{9-2}{12} = \dfrac{7}{12}$

$$\begin{array}{c|cc} 2 & 6 & 12 \\ \hline 3 & 3 & 6 \\ \hline & 1 & 2 \end{array}$$

$\therefore$ LCM $= 2 \times 3 \times 2 = 12$

(Since $12 \div 4 = 3$)

(Since $12 \div 6 = 2$)

Example 10 : Subtract $\dfrac{1}{10}$ from $\dfrac{7}{15}$.

Solution : We have, $\dfrac{7}{15} - \dfrac{1}{10}$

The LCM of 15 and 10 is 30.

So, $\dfrac{7}{15} = \dfrac{7\times 2}{15\times 2} = \dfrac{14}{30}$

$\dfrac{1}{10} = \dfrac{1\times 3}{10\times 3} = \dfrac{3}{30}$

Now, $\dfrac{7}{15} - \dfrac{1}{10} = \dfrac{14}{30} - \dfrac{3}{30} = \dfrac{14-3}{30} = \dfrac{11}{30}$

$$\begin{array}{c|cc} 2 & 15 & 10 \\ \hline 5 & 15 & 5 \\ \hline & 3 & 1 \end{array}$$

$\therefore$ LCM $2 \times 5 \times 3 = 30$

(Changing into equivalent fractions

with denominator 30)

Take a Task   Watch Remedial

1.   Find the difference :

(a) $\dfrac{7}{13} - \dfrac{2}{13}$

(b) $\dfrac{8}{19} - \dfrac{4}{19}$

(c) $\dfrac{16}{27} - \dfrac{1}{27}$

(d) $\dfrac{9}{31} - \dfrac{8}{31}$

(e) $\dfrac{14}{27} - \dfrac{4}{27}$

(f) $\dfrac{15}{16} - \dfrac{1}{16}$

(g) $\dfrac{3}{23} - \dfrac{1}{23}$

(h) $\dfrac{31}{51} - \dfrac{30}{51}$

2.   Find the difference:

(a) $\dfrac{2}{3} - \dfrac{1}{4}$

(b) $\dfrac{3}{8} - \dfrac{1}{4}$

(c) $\dfrac{1}{5} - \dfrac{1}{10}$

(d) $\dfrac{1}{3} - \dfrac{1}{8}$

(e) $\dfrac{7}{9} - \dfrac{5}{18}$

(f) $\dfrac{3}{4} - \dfrac{2}{3}$

(g) $\dfrac{1}{6} - \dfrac{1}{7}$

(h) $\dfrac{3}{10} - \dfrac{1}{8}$

(i) $\dfrac{7}{9} - \dfrac{5}{12}$

(j) $\dfrac{3}{4} - \dfrac{2}{7}$

(k) $\dfrac{7}{10} - \dfrac{2}{9}$

(l) $\dfrac{5}{6} - \dfrac{2}{7}$

Subtraction of a Fraction from a Whole Number

Example 11 : Subtract $\dfrac{7}{11}$ from 3.

Solution : Put 3 as fraction $\dfrac{3}{1}$.

The LCM of 11 and 1 is 11.

Now, $3 - \dfrac{7}{11} = \dfrac{33}{11} - \dfrac{7}{11}$ (Making like fractions)

$= \dfrac{33-7}{11} = \dfrac{26}{11} = 2\dfrac{4}{11}$ (Changing into mixed fraction)

Take a Task   Watch Remedial

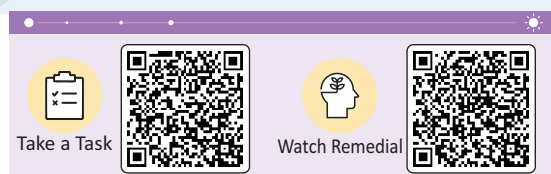**Example 12 :** Subtract $7\dfrac{1}{8}$ from $10\dfrac{1}{4}$.

Solution : First, we change the mixed fractions into improper fractions.

$7\dfrac{1}{8} = \dfrac{(7 \times 8)+1}{8} = \dfrac{56+1}{8} = \dfrac{57}{8}$

$10\dfrac{1}{4} = \dfrac{(10 \times 4)+1}{4} = \dfrac{40+1}{4} = \dfrac{41}{4}$

Now, $10\dfrac{1}{4} - 7\dfrac{1}{8} = \dfrac{41}{4} - \dfrac{57}{8}$

$= \dfrac{82}{8} - \dfrac{57}{8}$ (Making like fractions)

$$= \frac{82-57}{8} = \frac{25}{8} = 3\frac{1}{8}$$

Alternate Method

Subtract the whole number parts and fractional parts separately.

$$10\frac{1}{4} - 7\frac{1}{8} = (10-7) + \left(\frac{1}{4} - \frac{1}{8}\right)$$

$$= 3 + \left(\frac{2}{8} - \frac{1}{8}\right) = 3 + \left(\frac{2-1}{8}\right) = 3 + \frac{1}{8} = 3\frac{1}{8}$$

Example 13 : Solve $7 - \frac{8}{11}$.

Solution : $7 - \frac{8}{11} = \frac{7}{1} - \frac{8}{11} = \frac{77}{11} - \frac{8}{11}$

$$= \frac{77-8}{11} = \frac{69}{11} = 6\frac{3}{11}$$

(Changing $\frac{7}{1}$ to its equivalent fraction with denominator 11)

(Changing into mixed fraction)

Exercise 5.3

1. Multiple Choice Questions (MCQs)

Choose the correct option.

(a) $5\frac{2}{3} - 2 = ?$

   (i) $3\frac{3}{2}$ ☐   (ii) $2\frac{3}{4}$ ☐   (iii) $3\frac{2}{3}$ ☐

(b) $11 - 4\frac{2}{3} = ?$

   (i) $6\frac{3}{1}$ ☐   (ii) $1\frac{3}{6}$ ☐   (iii) $6\frac{1}{3}$ ☐

(c) $3\frac{1}{8} - 2 = ?$

   (i) $1\frac{1}{8}$ ☐   (ii) 8 ☐   (iii) $2\frac{1}{8}$ ☐

2. Find the difference:

(a) $3 - \frac{7}{8}$ (b) $4 - 1\frac{3}{4}$ (c) $8 - 6\frac{2}{5}$ (d) $12 - 8\frac{4}{5}$

(e) $7 - 2\frac{3}{4}$ (f) $5 - 3\frac{2}{3}$ (g) $11\frac{2}{5} - 3\frac{4}{5}$ (h) $12\frac{1}{9} - 3\frac{7}{9}$

(i) $7\frac{1}{2} - 5$ (j) $7\frac{8}{9} - 3\frac{7}{18}$ (k) $28 - 14\frac{5}{6}$ (l) $3 - 2\frac{11}{13}$

3. Fill in the blanks:

(a) $\dfrac{3}{10} + \underline{\hspace{3cm}} = \dfrac{8}{10}$

(b) $\dfrac{15}{12} - \dfrac{4}{21} = \underline{\hspace{3cm}}$

(c) $\underline{\hspace{3cm}} + \dfrac{5}{23} = \dfrac{11}{23}$

(d) $11\dfrac{1}{2} - 5\dfrac{1}{4} = \underline{\hspace{3cm}}$

(e) $1 - \dfrac{1}{4} = \underline{\hspace{3cm}}$

(f) $3\dfrac{1}{3} - 1\dfrac{1}{2} = \underline{\hspace{3cm}}$

4. Match the columns :

Column "A"	Column "B"
(a) $\dfrac{3}{5} + \dfrac{1}{3} =$	(i) $3\dfrac{13}{14}$
(b) $\dfrac{13}{15} - \dfrac{3}{4} =$	(ii) $2\dfrac{4}{15}$
(c) $2\dfrac{3}{7} + 1\dfrac{1}{2} =$	(iii) $4\dfrac{1}{3}$
(d) $5\dfrac{1}{4} - \dfrac{11}{12} =$	(iv) $\dfrac{14}{15}$
(e) $4\dfrac{3}{5} - 2\dfrac{1}{3} =$	(v) $\dfrac{7}{60}$

Mixed Problems on Addition and Subtraction

Example 14 : Solve $7\dfrac{1}{2} - 4\dfrac{1}{4} + 5\dfrac{3}{12}$.

Solution : First, change mixed fractions into improper fractions, then solve.

$$7\dfrac{1}{2} - 4\dfrac{1}{4} + 5\dfrac{3}{12} = \dfrac{15}{2} - \dfrac{17}{4} + \dfrac{63}{12}$$

$$= \dfrac{90 - 51 + 63}{12} = \dfrac{39 + 63}{12} \qquad [\because \text{ LCM of 2, 4 12 is 12}]$$

$$= \dfrac{102}{12} = 8\dfrac{6}{12} = 8\dfrac{1}{2} \qquad \left[\because \dfrac{\cancel{6}^{1}}{\cancel{12}_{2}} = \dfrac{1}{2}\right]$$

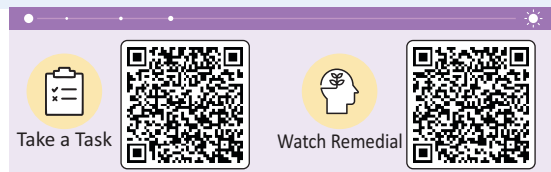**Example 15 :** Solve $\dfrac{3}{5} + \dfrac{2}{3} - \dfrac{1}{5}$

Solution : Change all the fractions to their equivalent forms with a common denominator.

LCM of 5, 3 and 5 is 15.

So, $\qquad \dfrac{3}{5} = \dfrac{3 \times 3}{5 \times 3} = \dfrac{9}{15} \qquad$ (Since $15 \div 5 = 3$)

$$\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15} \qquad \text{(Since } 15 \div 3 = 5\text{)}$$

$$\frac{1}{5} = \frac{1 \times 3}{5 \times 3} = \frac{3}{15} \qquad \text{(Since } 15 \div 5 = 3\text{)}$$

$$\text{Now, } \frac{3}{5} + \frac{2}{3} - \frac{1}{5} = \frac{9}{15} + \frac{10}{15} - \frac{3}{15} = \frac{9 + 10 - 3}{15}$$

$$= \frac{19 - 3}{15} = \frac{16}{15} = 1\frac{1}{15}$$

📕 Exercise 5.4

1. Simplify :

(a) $7\frac{1}{2} + 1\frac{3}{4} - 2\frac{1}{8}$

(b) $7\frac{1}{8} - \frac{11}{12} + 3\frac{1}{4}$

(c) $2\frac{1}{8} + 3\frac{1}{4} - 4\frac{3}{5}$

(d) $3\frac{1}{5} + 2\frac{1}{4} - 4\frac{1}{2}$

(e) $1\frac{1}{4} + 4\frac{3}{4} - 4\frac{1}{2}$

(f) $2\frac{1}{3} + 4\frac{1}{2} - 1\frac{1}{4}$

(g) $3\frac{1}{3} + 2\frac{1}{9} - 1\frac{3}{6}$

(h) $5\frac{1}{3} + 4\frac{4}{5} - 3\frac{1}{15}$

2. Match the columns :

| Column "A"	Column "B"
(a) $\frac{2}{7} + \frac{3}{8} + \frac{5}{28} =$	(i) $\frac{25}{36}$
(b) $\frac{4}{13} + \frac{1}{2} + \frac{6}{26} =$	(ii) $2\frac{5}{18}$
(c) $2\frac{1}{9} + 1\frac{5}{6} - 1\frac{2}{3} =$	(iii) $4\frac{1}{3}$
(d) $2\frac{3}{5} + 4\frac{1}{15} - 2\frac{1}{3} =$	(iv) $1\frac{1}{26}$
(e) $\frac{5}{12} + \frac{1}{18} + \frac{2}{9} =$	(v) $\frac{47}{56}$

Take a Task   Watch Remedial

Word Problems

Example 16 : In a long jump contest, Mary jumped $3\frac{3}{8}\,m$ and John jumped $3\frac{3}{4}\,m$. Who made a longer jump? How much more did one jump than the other?

Solution : Mary jumped $= 3\frac{3}{8}\,m$, John jumped $= 3\frac{3}{4}\,m$

Then, $3\frac{3}{8} = \frac{27}{8}$ and $3\frac{3}{4} = \frac{15}{4}$ (Making the improper fractions)
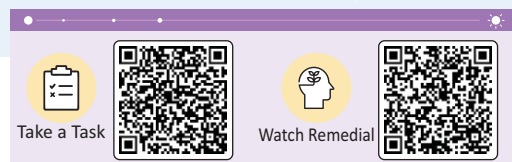
Now, which one is greater, $\frac{27}{8}$ or $\frac{15}{4}$?

Changing into equivalent fractions with denominator 8, we have

$$\frac{15}{4} = \frac{15 \times 2}{4 \times 2} = \frac{30}{8}, \qquad \frac{27}{8} = \frac{27 \times 1}{8 \times 1} = \frac{27}{8}$$

Now, compare the fractions $\frac{30}{8}$ and $\frac{27}{8}$.

Clearly, $\frac{30}{8} > \frac{27}{8}$.

Therefore, John jumped more distance than Mary.

Also, $\frac{30}{8} - \frac{27}{8} = \frac{30 - 27}{8} = \frac{3}{8}$

So, John jumped a distance of $\frac{3}{8}$ m more than Mary.

Example 17 : Ojas took $\frac{7}{8}$ hour to paint a table and $\frac{2}{3}$ hour to paint a chair. How much time did he take in painting both items?

Solution : Time taken in painting a table = $\frac{7}{8}$ hour

Time taken in painting a chair = $\frac{2}{3}$ hour

Total time taken = $\frac{7}{8}$ hour + $\frac{2}{3}$ hour

$$= \frac{7}{8} + \frac{2}{3} = \frac{21 + 16}{24} = \frac{37}{24} = 1\frac{13}{24} \text{ hours}$$

Therefore Ojas took $1\frac{13}{24}$ hours in painting both items.

Exercise 5.5

Knowledge Application

1. Geeta bought $1\frac{1}{2}$ kg potatoes, $3\frac{1}{4}$ kg tomatoes, $2\frac{3}{8}$ kg onion. What was the total quantity of vegetables she bought?

2. An electricity pole is $11\frac{2}{3}$ metres long. If $2\frac{1}{3}$ metres is under the ground, how much length of the pole is above the ground?

3. A shopkeeper had 90 kg of sugar. He sold $50\frac{2}{3}$ kg out of it. How much sugar is left after the sales?

4. The sum of the sides of a triangle is $18\frac{2}{9}$ cm. If two sides are $8\frac{2}{3}$ cm and $4\frac{1}{6}$ cm, find the length of third side.

5. A frog took three jumps one after the other. The first jump was of $\frac{3}{4}$ metre long distance, the second was of $\frac{3}{5}$ metre and third was $\frac{7}{10}$ metre long. How much total distance was covered by the frog in the three jumps?

6. Subtract the sum of $4\frac{4}{9}$ and $5\frac{8}{9}$ from the sum of $8\frac{4}{9}$ and $7\frac{2}{3}$.

Multiplication of Fractions

Multiplying fractional number by whole number

We know that the multiplication is a repeated addition.

For example : $2 \times 4 = 2 + 2 + 2 + 2 = 8$

It is the same case in fractions also.

For example : $\dfrac{2}{7} \times 3 = \dfrac{2}{7} + \dfrac{2}{7} + \dfrac{2}{7} = \dfrac{2+2+2}{7} = \dfrac{6}{7}$

Also, $\dfrac{2}{7} \times 3 = \dfrac{2 \times 3}{7} = \dfrac{6}{7}$

In multiplying a fraction by a whole number, we multiply the numerator of the fraction by the whole number and the denominator of the fraction by 1.

Example 1 : Multiply $3\dfrac{1}{4}$ by 5.

Solution : $3\dfrac{1}{4} \times 5 = \dfrac{13}{4} \times 5$ $\qquad\left[\text{Since } 3\dfrac{1}{4} = \dfrac{13}{4}\right]$

Alternate method $= \dfrac{13 \times 5}{4} = \dfrac{65}{4} = 16\dfrac{1}{4}$

$3\dfrac{1}{4} \times 5 = (3 \times 5) + \left(\dfrac{1}{4} \times 5\right)$

$= 15 + \left(\dfrac{1}{4} \times 5\right) = \dfrac{15}{1} + \dfrac{5}{4} = \dfrac{60+5}{4} = \dfrac{65}{4} = 16\dfrac{1}{4}$

Multiplying two fractional numbers

Example 2 : Multiply : (i) $\dfrac{7}{9}$ by $\dfrac{2}{3}$ $\qquad$ (ii) $1\dfrac{1}{2}$ by $2\dfrac{3}{5}$ $\qquad$ (iii) $2\dfrac{1}{2}$ by $1\dfrac{1}{4}$
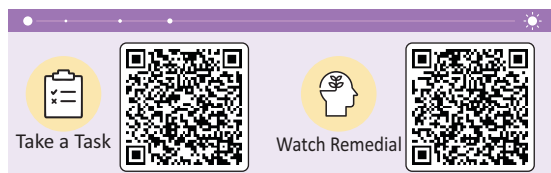
Solution :

(i) $\dfrac{7}{9} \times \dfrac{2}{3} = \dfrac{7 \times 2}{9 \times 3} = \dfrac{14}{27}$

(ii) $1\dfrac{1}{2} \times 2\dfrac{3}{5} = \dfrac{3}{2} \times \dfrac{13}{5}$ $\qquad$ (Changing the mixed fractions into

$\qquad\qquad = \dfrac{3 \times 13}{2 \times 5} = \dfrac{39}{10}$ $\qquad\qquad$ improper fractions)

(iii) $2\dfrac{1}{2} \times 1\dfrac{1}{4} = \dfrac{5}{2} \times \dfrac{5}{4} = \dfrac{25}{8} = 3\dfrac{1}{8}$

It is clear from all the above examples that to multiply the two fractions, multiply the respective numerators and denominators of the fractions.

1. Find the product:

(a) $\dfrac{4}{5} \times 3$ (b) $\dfrac{1}{3} \times 4$ (c) $\dfrac{1}{2} \times 6$ (d) $8 \times \dfrac{1}{9}$ (e) $5 \times \dfrac{4}{6}$

(f) $\dfrac{5}{13} \times 2$ (g) $7 \times \dfrac{1}{5}$ (h) $10 \times \dfrac{3}{4}$ (i) $2\dfrac{1}{2} \times 5$ (j) $5\dfrac{1}{2} \times 4$

2. Fill in the blanks:

(a) $\dfrac{3}{11} \times \dfrac{2}{5} =$ _____ (b) $\dfrac{7}{13} \times \dfrac{2}{7} =$ _____ (c) $1\dfrac{2}{5} \times \dfrac{4}{7} =$ _____

(d) $7\dfrac{1}{3} \times 1\dfrac{5}{11} =$ _____ (e) $\dfrac{2}{4} \times \dfrac{5}{8} \times \dfrac{3}{5} =$ _____

3. Find the product:

(a) $\dfrac{3}{11} \times \dfrac{1}{2}$ (b) $1\dfrac{4}{7} \times \dfrac{2}{11}$ (c) $3\dfrac{2}{3} \times \dfrac{10}{11}$ (d) $\dfrac{3}{10} \times 8\dfrac{3}{10}$ (e) $\dfrac{11}{12} \times \dfrac{4}{5}$

(f) $3\dfrac{4}{5} \times 2\dfrac{1}{2}$ (g) $5\dfrac{1}{3} \times 6\dfrac{7}{8}$ (h) $2\dfrac{1}{3} \times \dfrac{1}{4}$

Problems on Multiplication

┤Take a Task├ ┤Watch Remedial├

Example 3 : What is $\dfrac{1}{5}$ of one rupee?

Solution : We know that ₹1 = 100 P

$\therefore \quad \dfrac{1}{5}$ of a rupee $= \dfrac{1}{5} \times 100\,P \quad = \dfrac{\cancel{100}^{\,20}\,P}{\cancel{5}_{\,1}} = 20\,P$

Example 4 : What is $\dfrac{3}{4}$ of an hour?

Solution : We know that 1 hour = 60 minutes

$\therefore \quad \dfrac{3}{4}$ of 1 hour $= \dfrac{3}{4} \times 60$ minutes $= \dfrac{3 \times 60}{4}$ minutes

$= \dfrac{\cancel{180}^{\,45}}{\cancel{4}_{\,1}}$ minutes $= 45$ minutes
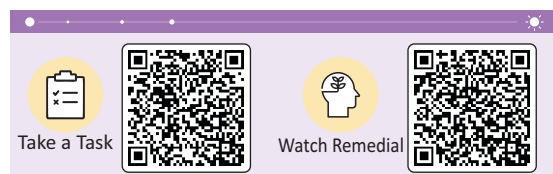
Example 5 : What is $\dfrac{1}{4}$ of one litre?

Solution : We know that 1 litre = 1000 millilitres

$$\therefore \quad \dfrac{1}{4} \text{ of a litre} = \dfrac{1}{4} \times 1000 \text{ millilitres}$$

$$= \dfrac{\overset{250}{\cancel{1000}}}{\underset{1}{\cancel{4}}} \text{ millilitres} = 250 \text{ millilitres}$$

Example 6 : What is $\dfrac{3}{5}$ of one year?

Solution : We know that 1 year = 365 days

$$\therefore \quad \dfrac{3}{5} \text{ of 1 year} = \dfrac{3}{5} \times 365 \text{ days}$$

$$= \dfrac{\overset{219}{\cancel{1095}}}{\underset{1}{\cancel{5}}} \text{ days} = 219 \text{ days}$$

Reciprocal of a Number

Two numbers are said to be reciprocal of each other if their product is 1.

For example : Consider the two numbers 5 and $\dfrac{1}{5}$.

We have, $5 \times \dfrac{1}{5} = \dfrac{5 \times 1}{5} = \dfrac{5}{5} = 1$

Similarly, $2 \times \dfrac{1}{2} = \dfrac{2 \times 1}{2} = \dfrac{2}{2} = 1$

So, $\left(3 \text{ and } \dfrac{1}{3}\right), \left(2 \text{ and } \dfrac{1}{2}\right)$ etc. are the examples of reciprocals of each other. Now, we can say that the reciprocal of a fractional number is obtained by interchanging its numerator and denominator.

Example 7 : Find the reciprocals of the following:

(i)   8   (ii) 13   (iii) $\dfrac{1}{5}$ $\left[\text{As } 8 = \dfrac{1}{8}\right]$

(iv) $\dfrac{3}{11}$ (v) $2\dfrac{1}{2}$

Solution : (i) Reciprocal of $8 = \dfrac{1}{8}$

(ii) Reciprocal of $13 = \dfrac{1}{13}$ (iii) Reciprocal of $\dfrac{1}{5} = \dfrac{5}{1} = 5$

(iv) Reciprocal of $\dfrac{3}{11} = \dfrac{11}{3}$ (v) We know that $2\dfrac{1}{2} = \dfrac{5}{2}$

Hence, the reciprocal of $\dfrac{5}{2}$ is $\dfrac{2}{5}$.

1. **Multiple Choice Questions (MCQs) . Choose the correct option.**

   (a) $\frac{4}{7}$ of 7 is

   (i) 3 ☐   (ii) 4 ☐   (iii) 7 ☐

   (b) $\frac{3}{7}$ of one week is

   (i) 1 day ☐   (ii) 2 days ☐   (iii) 3 days ☐

   (c) $\frac{4}{5}$ of 120 is

   (i) 86 ☐   (ii) 92 ☐   (iii) 96 ☐

2. **Find the following:**

   (a) $\frac{1}{2}$ of an hour   (b) $\frac{4}{5}$ of 50   (c) $\frac{3}{2}$ of one rupee   (d) $\frac{7}{5}$ of 40

   (e) $\frac{5}{8}$ of 32   (f) $\frac{1}{4}$ of 96   (g) $\frac{1}{2}$ of one litre   (h) $\frac{11}{13}$ of 65

3. **Find the reciprocals of the following:**

   (a) $\frac{2}{5}$ (b) $\frac{7}{8}$ (c) $\frac{11}{19}$ (d) $\frac{7}{11}$ (e) 9

   (f) $\frac{4}{13}$ (g) 41   (h) $3\frac{1}{2}$ (i) 19   (j) $1\frac{1}{4}$

Division of Fractions

Division of a fraction by a whole number

Example 8 : Divide $\frac{4}{9}$ by 3.

Solution : Reciprocal of 3 is $\frac{1}{3}$.

Now, $\frac{4}{9} \div 3 = \frac{4}{9} \times \frac{1}{3} = \frac{4 \times 1}{9 \times 3} = \frac{4}{27}$
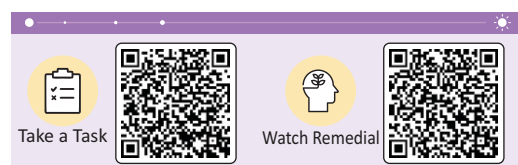
From the above example it is clear that, to divide a fractional number by a whole number, we have to multiply the fractional number by the reciprocal of the whole number.

Example 9 : Divide $\frac{6}{8}$ by 2.

Solution : $\frac{6}{8} \div 2 = \frac{6}{8} \times \frac{1}{2}$ [Reciprocal of 2 = $\frac{1}{2}$]

$= \frac{6 \times 1}{8 \times 2} = \frac{\cancel{6}^{3}}{\cancel{16}_{8}} = \frac{3}{8}$ [Reducing to its lowest terms]

Division of whole number by fractional number and fractional number by another fractional number

Example 10 : Divide 10 by $\frac{2}{5}$.

Solution :

$$10 \div \frac{2}{5} = 10 \times \frac{5}{2}$$

[Since $\frac{5}{2}$ is the reciprocal of $\frac{2}{5}$.]

$$= \frac{10 \times 5}{2} = \frac{50}{2} = 25$$

From the above example we can say that to divide a whole number by a fractional number, we multiply the whole number by the reciprocal of fractional number.

Example 11 : Divide the following:

(i) $\frac{10}{21}$ by $\frac{2}{3}$

(ii) $2\frac{1}{2}$ by $1\frac{1}{4}$

Solution :

(i) $\frac{10}{21} \div \frac{2}{3} = \frac{10}{21} \times \frac{3}{2} = \frac{10 \times 3}{21 \times 2} = \frac{30^{5}}{42_{7}} = \frac{5}{7}$

(ii) $2\frac{1}{2} \div 1\frac{1}{4} = \frac{5}{2} \div \frac{5}{4} = \frac{5}{2} \times \frac{4}{5} = \frac{5 \times 4}{2 \times 5} = \frac{20^{2}}{10_{1}} = 2$

So, it is clear from above examples that to divide a fractional number by another fractional number, multiply the first fractional number by the reciprocal of the second one.

Problems on division of fractional numbers

Example 12 : The product of two numbers is $9\frac{3}{4}$. If one of them is $3\frac{1}{4}$, find the other number.

Solution : Product of the two numbers = $9\frac{3}{4} = \frac{39}{4}$

One number = $3\frac{1}{4} = \frac{13}{4}$

The other number $= 9\frac{3}{4} \div 3\frac{1}{4} = \frac{39}{4} \div \frac{13}{4}$

$= \frac{39}{4} \times \frac{4}{13}$

(Since reciprocal of $\frac{13}{4} = \frac{4}{13}$)

$= \frac{156}{52} = 3$

(Reducing to its lowest form)

Hence, the required number is 3.

Example 13 : By what number $4\frac{1}{4}$ be multiplied to get $8\frac{1}{2}$?

Solution : To obtain the required number, we have to divide $8\frac{1}{2}$ by $4\frac{1}{4}$,

because $8\frac{1}{2}$ is the product of both the numbers.

Product of both the numbers $= 8\dfrac{1}{2} = \dfrac{17}{2}$

One number $= 4\dfrac{1}{4} = \dfrac{17}{4}$

The required number $= 8\dfrac{1}{2} \div 4\dfrac{1}{4} = \dfrac{17}{2} \div \dfrac{17}{4}$ (Reciprocal of $\dfrac{17}{4} = \dfrac{4}{17}$)

$$= \dfrac{17}{2} \times \dfrac{4}{17} = \dfrac{68}{34} = 2$$

Hence, 2 is the required number.

Example 14 :   Gautam read $\dfrac{3}{4}$ of the book of 120 pages. How many pages did he read in all?

Solution :   Number of pages of the book = 120

Gautam read $\dfrac{3}{4}$ of the book $= \dfrac{3}{4} \times 120$ pages $= \dfrac{3}{4} \times \dfrac{120}{1}$ pages

$$= \dfrac{360}{4} = 90 \text{ pages}$$

Hence, Gautam read 90 pages of the book.

Exercise 5.8

1. **Solve the following :**

(a) $2\dfrac{1}{2} \div 1\dfrac{4}{5}$ (b) $\dfrac{3}{8} \div 2$ (c) $4\dfrac{1}{3} \div \dfrac{3}{4}$ (d) $\dfrac{4}{5} \div 3$ (e) $\dfrac{10}{4} \div 2$

(f) $\dfrac{5}{6} \div \dfrac{2}{3}$ (g) $3\dfrac{3}{4} \div 1\dfrac{1}{2}$ (h) $5\dfrac{1}{2} \div \dfrac{1}{2}$ (i) $4\dfrac{2}{3} \div 2$ (j) $3\dfrac{1}{4} \div \dfrac{6}{7}$

Answer the following questions:

2. In a class, fee of each student is ₹$1\dfrac{1}{4}$. The amount collected was ₹125.

   Find the number of students.

3. By what number should $\dfrac{7}{11}$ be multiplied to get $3\dfrac{2}{11}$?

4. The product of two numbers is $2\dfrac{4}{7}$, If one of them is $\dfrac{5}{7}$, find the other number.

5. Susmita purchased a ribbon of length $8\dfrac{1}{2}$ m. If she divided it into 5 pieces of equal lengths, find the length of one piece.

6. By what number should $7\dfrac{1}{5}$ be multiplied to get 36?

Think Tank

1. Tick (✓) the correct answer.

(a) $\dfrac{9}{7} + \dfrac{2}{8} = ?$

  (i) $1\dfrac{43}{28}$ ☐ (ii) $1\dfrac{15}{28}$ ☐ (iii) $\dfrac{15}{28}$ ☐ (iv) $\dfrac{42}{28}$ ☐

(b) $\dfrac{9}{16} - \dfrac{5}{9} = ?$

  (i) $\dfrac{1}{144}$ ☐ (ii) $1\dfrac{1}{12}$ ☐ (iii) $\dfrac{81}{144}$ ☐ (iv) $\dfrac{80}{144}$ ☐

(c) $\dfrac{6}{9} \times \dfrac{12}{6} = ?$

  (i) $\dfrac{1}{3}$ ☐ (ii) $\dfrac{3}{4}$ ☐ (iii) $\dfrac{4}{3}$ ☐ (iv) $\dfrac{1}{4}$ ☐

2. Fill in the blanks with:

(a) Anil ate $\dfrac{1}{4}$ of 8 bananas. He ate _____ bananas.

(b) Sevaram sold $\dfrac{2}{3}$ of the 30 eggs in his shop. He sold _____ eggs.

(c) $7\dfrac{1}{3} \times 1\dfrac{5}{11} = $ _____ .

(d) $2\dfrac{1}{9} + 1\dfrac{5}{9} - 1\dfrac{2}{3} = $ _____ . (e) $2 + 2\dfrac{3}{16} - 4\dfrac{3}{16} = $ _____ .
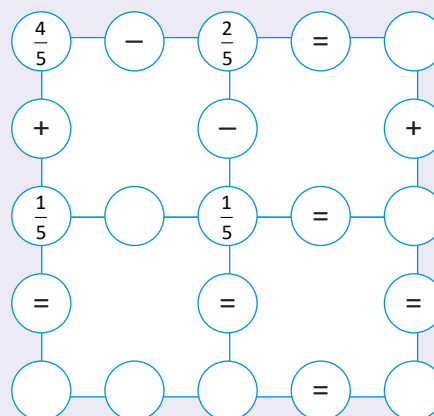
Custom Learning Path

Scan to Create Your Own Learning Path

Puzzle

Experiential Learning

Complete the tables of equivalent fractions and add and substract:

	Divide Numerator and Denominator By			
	2	3	5	6
$\dfrac{30}{60}$	$\dfrac{15}{30}$	$\dfrac{10}{20}$		
$\dfrac{60}{90}$				
$\dfrac{120}{150}$				
$\dfrac{30}{900}$				$\dfrac{5}{150}$

$\dfrac{4}{5}$ ◯ $-$ ◯ $\dfrac{2}{5}$ ◯ $=$ ◯

◯ $+$ ◯ $-$ ◯ $+$ ◯

$\dfrac{1}{5}$ ◯ ◯ $\dfrac{1}{5}$ ◯ $=$ ◯

◯ $=$ ◯ $=$ ◯ $=$ ◯

◯ $-$ ◯ ◯ ◯ $=$ ◯

Mental Math

Circle the fractions that add together to make 1.

Example:

$$\frac{1}{4}$$

$$\frac{2}{4} \qquad \frac{3}{4}$$

$$\frac{5}{4}$$

1.

$$\frac{1}{4}$$

$$\frac{1}{4} \qquad \frac{1}{4}$$

$$\frac{1}{4}$$

2.

$$\frac{2}{5}$$

$$\frac{1}{5} \qquad \frac{2}{5}$$

$$\frac{6}{5}$$

3.

$$\frac{5}{8}$$

$$\frac{1}{8} \qquad \frac{1}{4}$$

$$\frac{1}{8}$$
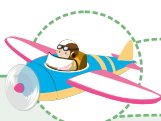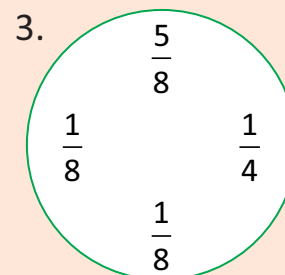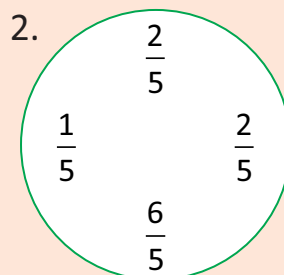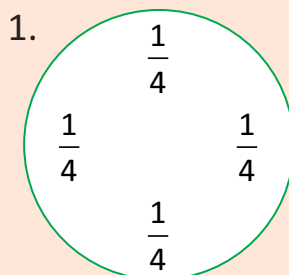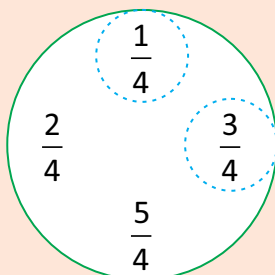
Fun Time Activity

Circle the correct answer:

1. A pizza is cut into 4 even pieces. Mukul eats 3 pieces. What fraction of the pizza did he eat?

$$\frac{1}{3} \qquad \frac{3}{4} \qquad \frac{4}{3}$$

2. I have 5 robots. 2 of them are red and the rest are blue. What fraction of the robots are red?

$$\frac{2}{5} \qquad \frac{2}{3} \qquad \frac{1}{2}$$

Maths Lab Activity

Divide the class in pairs. Teacher write the fractions on board.

$$\frac{5}{6} \quad \frac{8}{5} \qquad \frac{6}{7} \quad \frac{9}{3} \qquad \frac{4}{7} \quad \frac{62}{71}$$

❖ Now ask the student one by one, that first fraction is proper fraction or improper fraction similarly ask other student for next fractions.

❖ Now call next two student ask them to add first two fractions and write the answer on board.

❖ Ask other two students to subtract, other 2 students to multiply next two fractions, and next two student to divide the any two fractions.

❖ Repeat the same with other fractions.

❖ To make teaching-learning process a success, teacher will make sure that almost all students in the class will participate in this activity.

HOTS

1. Susmita got ₹ $80\dfrac{1}{4}$ from his father. She bought a book for ₹$20\dfrac{1}{2}$ and some copies for ₹$30\dfrac{1}{8}$ How much money is left with her?

2. A gas tanker contained 78 kg of gas. Out of which, $50\dfrac{3}{4}$ kg of gas is used. How much gas is left in the tanker?