7 Fractions

Fractional Numbers

Fractional number may be :

a.   part of a whole   b.   part of a collection

Fraction as Part of a Whole :

Half (One - half) : When a whole is divided into two equal parts, then each part is called one-half of the whole. It is written as $\frac{1}{2}$ and is read as one by two or one upon two or one-half.

Shaded region represents one-half part ($\frac{1}{2}$)

One-third   : When a whole is divided into three equal parts, then each part is called one-third of the whole. It is written as $\frac{1}{3}$ and is read as one by three or one upon three or one-third.

Shaded region represents one-third part ($\frac{1}{3}$)

One-fourth   : When a whole is divided into four equal parts, then each part is called one-fourth or one quarter (a quarter) of the whole. It is written as $\frac{1}{4}$ and is read as one by four or one upon four or a quarter.

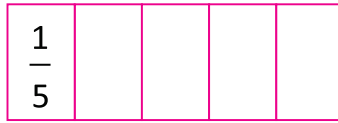Shaded region represents one-fourth part ($\frac{1}{4}$)

If a whole is divided into five equal parts, then each part is called one-fifth of the whole. It is written as $\dfrac{1}{5}$ and is read as one upon five or one by five or one-fifth.

Shaded region represent one-fifth part ($\dfrac{1}{5}$)

If a whole is divided into six equal parts, then each parts is called one-sixth of the whole. It is written as $\dfrac{1}{6}$ and is read as one upon six or one by six.

Shaded region represent one-sixth part ($\dfrac{1}{6}$)

If a whole is divided into seven equal parts, then each part is called one-seventh of the whole. It is written as $\dfrac{1}{7}$ and is read as one upon seven or one by seven.

Shaded region represents one-seventh part ($\dfrac{1}{7}$)

If a whole is divided into eight equal parts, then each parts is called one-eighth of the whole. It is written as $\dfrac{1}{8}$ and is read as one upon eight or one by eight.

Shaded region represents one-eighth part ($\dfrac{1}{8}$)

A Gateway to Mathematics-3

If a whole is divided into nine equal parts, then each part is called one-nineth of the whole. It is written as $\frac{1}{9}$ and is read as one upon nine or one by nine.

$\frac{1}{9}$								

Shaded region represents one-nineth part ($\frac{1}{9}$)

If a whole is divided into ten equal parts, then each part is called one-tenth of the whole. It is written as $\frac{1}{10}$ and is read as one upon ten or one by ten.

$\frac{1}{10}$									

Shaded region represents one-tenth part ($\frac{1}{10}$)

If a whole is divided into 3 equal parts, then two parts of them is called the two-third of the whole. It is written as $\frac{2}{3}$ and is read as two upon three or two by three or two over three.

Shaded region represents two-third part ($\frac{2}{3}$)

If a whole is divided into 4 equal parts then three parts of it is read as three-fourth of the whole. It is written as $\frac{3}{4}$ and is read as three upon four or three by four or three over four.
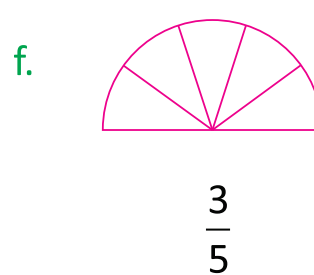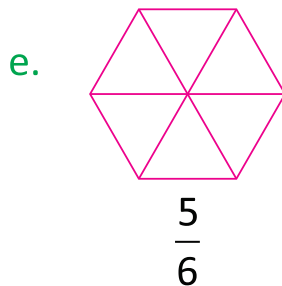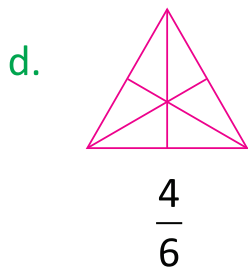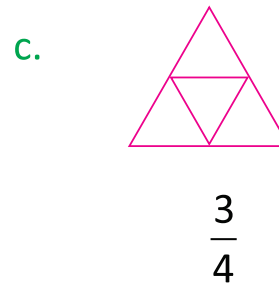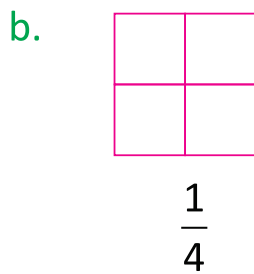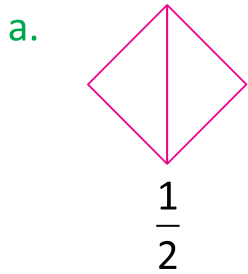
Shaded region represents three-fourth ($\frac{3}{4}$)

Following the same way, you can define $\frac{4}{6}, \frac{3}{6}, \frac{2}{5}, \frac{1}{5}, \frac{6}{7}, \frac{5}{7}, \frac{4}{9}, \frac{3}{9}, \frac{2}{4}, \frac{1}{4}, \frac{7}{8}, \frac{5}{8}, \frac{3}{8}$ etc.
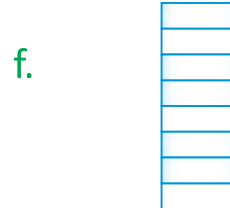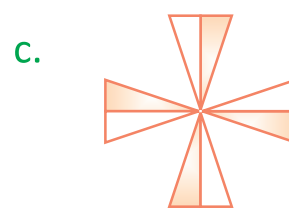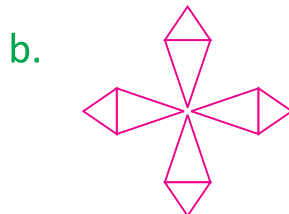
1. Shade the given fractions in the figures.

a.

$$\frac{1}{2}$$

b.

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

c.

$$\frac{3}{4}$$

d.

$$\frac{4}{6}$$

e.

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

f.

$$\frac{3}{5}$$

2. Write the fraction of each of the following shaded regions.

a.

b.

c.

d.

e.

f.

3. Write the fractions for each in the given boxes.

a.   three-fourth

b.   two-seventh

c.   four-ninth

d.   six-fifth

e.   five-sixth

f.   five-eighth

4. Write the number name for each of the following fractions.

a. $\dfrac{5}{8}$ ....

b. $\dfrac{4}{6}$ ....

c. $\dfrac{3}{4}$ ....

d. $\dfrac{5}{7}$ ....

e. $\dfrac{2}{5}$ ....

f. $\dfrac{7}{10}$ ....

5. Write a fraction for each of the following division numeral.

a. $7 \div 13$ = ☐

b. $2 \div 11$ = ☐

c. $4 \div 8$ = ☐

d. $3 \div 5$ = ☐

e. $6 \div 10$ = ☐

f. $5 \div 7$ = ☐

6. Write the division numeral for each of the given fractions.

a. $\dfrac{2}{3}$ = ...

b. $\dfrac{6}{8}$ = ...

c. $\dfrac{5}{6}$ = ...

d. $\dfrac{8}{12}$ = ...

e. $\dfrac{6}{13}$ = ...

f. $\dfrac{7}{15}$ = ...

Numerator and Denominator

Every fraction has two numerals. These numerals are separated by small line called bar. The numeral above the bar is called the numerator and numeral below the bar is called the denominator.

For Example :   8   ⟶ 8 is the numerator

 –   ⟶ is the bar

 4   ⟶ 4 is the denominator

Facts to Know

❖ Denominator tells us how many parts a whole has been divided in. The numerator tells us how many parts of them are taken.

Unit Fraction

If the numerator of a fraction is one then it is called unit fraction.

For Example : $\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}, \dfrac{1}{6}, \dfrac{1}{7}$ are unit fractions because their numerators are 1.

Example I : Find $\dfrac{1}{7}$ of 63 books.

Solution : The total number of books is 63.

Now, $\dfrac{1}{7}$ of $63 = \dfrac{1}{7} \times 63 = \dfrac{1 \times 63}{7} = 63 \div 7 = 9$

Answer: 9 books

Example II : Rachit has 32 pens. How many pens make 5/8 of it ?

Solution : $\dfrac{5}{8}$ of $32 = \dfrac{5}{8} \times 32 = \dfrac{5 \times 32}{8} = \dfrac{160}{8} = 160 \div 8 = 20$ pens

Answer: 20 pens

Exercise 7.2

1. **Write numerators and denominators of the following fractions.**

   a. $\dfrac{4}{6}$　　　b. $\dfrac{6}{8}$　　　c. $\dfrac{5}{9}$　　　d. $\dfrac{7}{10}$　　　e. $\dfrac{8}{12}$

2. **Write the fractions whose numerators and denominators are given.**

   a. Numerator = 6　　Denominator = 9

   b. Denominator = 5　　Numerator = 8

   c. Numerator = 9　　Denominator = 12

   d. Denominator = 14　　Numerator = 7

   e. Denominator = 8　　Numerator = 18

3. **Find the value of each of the given fractions.**

   a. $\dfrac{1}{4}$ of 12 = ...　　b. $\dfrac{1}{6}$ of 36 = ...　　c. $\dfrac{1}{12}$ of 48 = ...

   d. $\dfrac{3}{14}$ of 56 = ...　　e. $\dfrac{2}{9}$ of 27 = ...　　f. $\dfrac{1}{7}$ of 63 = ...

4. Calculate the following fractions.

    a.   One-sixth of 36   b.   four-ninth of 54

    c.   Three-seventh of 28   d.   Five-eighth of 72

    e.   Two-fourth of 24   f.   Six-senventh of 63

5. If a collection has 42 objects, then how many objects are there in one-half of the collection ?

6. If a collection has 30 objects, then how many objects are there in one-sixth of the collection ?

7. If a collection has 48 objects, then how many objects are there in one-eighth of the collection ?

8. If a collection has 63 objects, then how many objects are there in one-seventh of the collection ?

9. Find the unit fraction among the following.

$$\frac{3}{4}, \frac{2}{5}, \frac{9}{5}, \frac{5}{6}, \frac{1}{3}, \frac{7}{3}, \frac{4}{7}, \frac{8}{9}$$

10. Fill in the blanks.

    a.   [   ]   sevenths make a whole.   [   ]   fifths make a whole.

    c.   [   ]   halves make a whole.
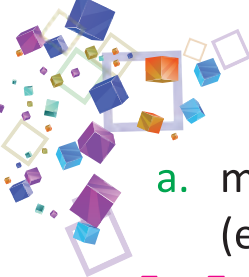
Equivalent Fractions

On multiplying the numerator and denominator of a given fraction by the same number (except zero), we get equivalent fraction.

For Example : $\dfrac{1}{3} = \dfrac{1 \times 2}{3 \times 2} = \dfrac{2}{6}, \quad \dfrac{1}{3} = \dfrac{1 \times 3}{3 \times 3} = \dfrac{3}{9}, \quad \dfrac{1}{3} = \dfrac{1 \times 4}{3 \times 4} = \dfrac{4}{12}$

Therefore, $\dfrac{1}{3}, \dfrac{2}{6}, \dfrac{3}{9}, \dfrac{4}{12}$ are the equivalent fractions.

Equivalent fractions of a given fraction can be obtained by :

a. multiplying its numerator and denominator with the same number (except zero).

For Example : If given fractions is $\frac{1}{5}$,

then, $\frac{1}{5} = \frac{1 \times 2}{5 \times 2} = \frac{2}{10}, \frac{1}{5} = \frac{1 \times 3}{5 \times 3} = \frac{3}{15}, \frac{1}{5} = \frac{1 \times 4}{5 \times 4} = \frac{4}{20}$

Therefore, $\frac{1}{5}, \frac{2}{10}, \frac{3}{15}, \frac{4}{20}$ are equivalent fractions.

b. dividing its numerator and denominator with the same number (except zero).

For Example : $\frac{2}{12} = \frac{2 \div 2}{12 \div 2} = \frac{1}{6}, \frac{3}{18} = \frac{3 \div 3}{18 \div 3} = \frac{1}{6}, \frac{4}{24} = \frac{4 \div 4}{24 \div 4} = \frac{1}{6}$

The numerator and denominator of fractions $\frac{2}{12}, \frac{3}{18}, \frac{4}{24}$ are divided by 2, 3 and 4 to get new fraction $\frac{1}{6}$ which is equivalent to the original fractions.

Ascending and Descending Order of Fraction Numbers

If the numerators of the given fractions are same (equal), then the bigger fraction has the smaller denominator.

Example III: Write the smallest fraction of $\frac{2}{9}, \frac{2}{12}, \frac{2}{18}, \frac{2}{28}$ and arrange them in ascending and descending order.

Solution : Here, the fractions have the same numerator '2'.

As the denominator 28 is the greatest among 9, 12, 18,

therefore, the fraction $\frac{2}{28}$ is the smallest one.

Answer: $\frac{2}{28}$ is the smallest fraction.

Ascending order $\qquad = \qquad \frac{2}{28} < \frac{2}{18} < \frac{2}{12} < \frac{2}{9}$

Therefore, ascending order $\quad = \qquad \frac{2}{28}, \frac{2}{18}, \frac{2}{12}, \frac{2}{9}$

Descending order $\quad = \quad \dfrac{2}{9} > \dfrac{2}{12} > \dfrac{2}{18} > \dfrac{2}{28}$

Therefore, descending order $\quad = \dfrac{2}{9}, \dfrac{2}{12}, \dfrac{2}{18}, \dfrac{2}{28}$

If the denominators of the given fractions are same (equal), then the bigger fraction has the larger numerator.

Example IV : Write the greatest fraction of $\dfrac{9}{8}, \dfrac{4}{8}, \dfrac{6}{8}, \dfrac{7}{8}$ and arrange them in ascending and descending order.

Solution : Here the fractions have the same denominator '8'.

As the numerator 9 is the greatest among 7, 6, 4,

therefore, the fraction $\dfrac{9}{8}$ is the greatest one.

Answer: $\dfrac{9}{8}$ is the greatest fraction.

Ascending order $\quad = \quad \dfrac{4}{8} < \dfrac{6}{8} < \dfrac{7}{8} < \dfrac{9}{8}$

Therefore, ascending order $\quad = \quad \dfrac{4}{8}, \dfrac{6}{8}, \dfrac{7}{8}, \dfrac{9}{8} =$ *Answer*

Descending order $\quad = \quad \dfrac{9}{8} > \dfrac{7}{8} > \dfrac{6}{8} > \dfrac{4}{8}$

Therefore, descending order $= \quad \dfrac{9}{8}, \dfrac{7}{8}, \dfrac{6}{8}, \dfrac{4}{8} =$ *Answer*

Example V : Which is greater $\dfrac{7}{8}$ or $\dfrac{6}{8}$?

Solution : The fractions have the same denominator.

Now, numerator 7 > numerator 6.

Therefore, $\dfrac{7}{8} > \dfrac{6}{8}$

Answer: $\dfrac{7}{8} > \dfrac{6}{8}$

1. **Find the fractions having the same denominator.**

a. $\dfrac{2}{8}, \dfrac{2}{6}, \dfrac{1}{7}, \dfrac{4}{6}$ b. $\dfrac{4}{6}, \dfrac{2}{7}, \dfrac{7}{4}, \dfrac{3}{4}$ c. $\dfrac{1}{4}, \dfrac{2}{5}, \dfrac{8}{4}, \dfrac{6}{4}$ d. $\dfrac{3}{6}, \dfrac{2}{6}, \dfrac{2}{5}, \dfrac{7}{4}$

2. **Find the fraction having the same numerator.**

a. $\dfrac{1}{2}, \dfrac{4}{5}, \dfrac{3}{5}, \dfrac{1}{5}$ b. $\dfrac{2}{3}, \dfrac{2}{9}, \dfrac{3}{6}, \dfrac{4}{7}$ c. $\dfrac{7}{5}, \dfrac{3}{5}, \dfrac{3}{7}, \dfrac{4}{6}$ d. $\dfrac{4}{2}, \dfrac{6}{7}, \dfrac{4}{9}, \dfrac{4}{5}$

3. **Find the greatest fraction in each of the following.**

a. $\dfrac{1}{6}, \dfrac{2}{6}, \dfrac{3}{6}, \dfrac{4}{6}$ b. $\dfrac{2}{7}, \dfrac{2}{3}, \dfrac{2}{4}, \dfrac{2}{6}$ c. $\dfrac{7}{3}, \dfrac{7}{4}, \dfrac{7}{5}, \dfrac{7}{6}$ d. $\dfrac{8}{10}, \dfrac{8}{9}, \dfrac{8}{11}, \dfrac{8}{12}$

4. **Find the smallest fraction in each of the following.**

a. $\dfrac{4}{2}, \dfrac{4}{3}, \dfrac{4}{4}, \dfrac{4}{5}$ b. $\dfrac{7}{3}, \dfrac{7}{4}, \dfrac{7}{5}, \dfrac{7}{6}$ c. $\dfrac{4}{9}, \dfrac{2}{9}, \dfrac{8}{9}, \dfrac{6}{9}$ d. $\dfrac{2}{2}, \dfrac{2}{3}, \dfrac{2}{5}, \dfrac{2}{7}$

5. **Fill in the circle with < or >.**

a. $\dfrac{4}{3}$ ◯ $\dfrac{2}{3}$ b. $\dfrac{2}{5}$ ◯ $\dfrac{8}{5}$ c. $\dfrac{4}{7}$ ◯ $\dfrac{3}{7}$

d. $\dfrac{9}{11}$ ◯ $\dfrac{10}{11}$ e. $\dfrac{7}{12}$ ◯ $\dfrac{4}{12}$ f. $\dfrac{6}{9}$ ◯ $\dfrac{12}{9}$

6. **Arrange the following in descending order.**

a. $\dfrac{3}{2}, \dfrac{6}{2}, \dfrac{5}{2}, \dfrac{4}{2}$ b. $\dfrac{6}{7}, \dfrac{8}{7}, \dfrac{2}{7}, \dfrac{4}{7}$ c. $\dfrac{9}{13}, \dfrac{9}{5}, \dfrac{9}{7}, \dfrac{9}{4}$ d. $\dfrac{4}{9}, \dfrac{4}{7}, \dfrac{4}{8}, \dfrac{4}{2}$

7. **Arrange the following in ascending order.**

a. $\dfrac{4}{5}, \dfrac{4}{6}, \dfrac{4}{7}, \dfrac{4}{9}$ b. $\dfrac{4}{2}, \dfrac{1}{2}, \dfrac{3}{2}, \dfrac{5}{2}$ c. $\dfrac{3}{5}, \dfrac{3}{4}, \dfrac{3}{11}, \dfrac{3}{7}$ d. $\dfrac{6}{7}, \dfrac{1}{7}, \dfrac{3}{7}, \dfrac{5}{7}$
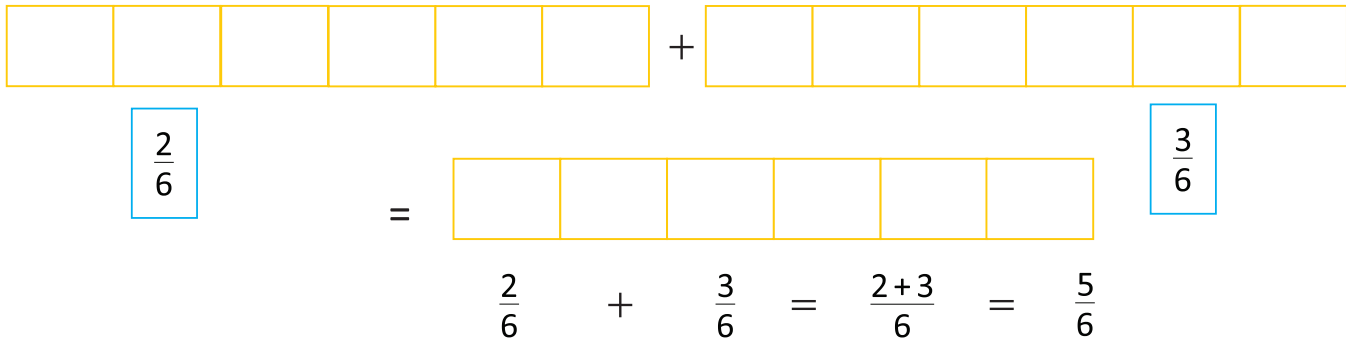
Ascending of Fractional Numbers having the Same Denominator

Observe the following figure.

$$\frac{2}{6} \qquad + \qquad \frac{3}{6}$$

$$\frac{2}{6} \quad + \quad \frac{3}{6} \quad = \quad \frac{2+3}{6} \quad = \quad \frac{5}{6}$$

The sum of two or more fractions having the same denominator

$$= \frac{\text{Sum of the Numerators}}{\text{Denominator}}$$

Subtraction of Fractional Numbers having the same Denominator

The difference between two fractions having the same denominator

$$= \frac{\text{Difference between Numerators}}{\text{Denominator}}$$

Example VI : Find the difference between $\frac{2}{7}$ and $\frac{5}{7}$.

Solution : Both the fractions have the same denominator, i.e. 7.

Therefore, $\frac{5}{7} - \frac{2}{7} = \frac{5-2}{7} = \frac{3}{7}$.

Answer: $\frac{3}{7}$

Example VII : Subtract $\frac{4}{9}$ from $\frac{5}{9}$.

Solution : Both the fractions have the same denominator, i.e. 9.

Therefore, $\frac{5}{9} - \frac{4}{9} = \frac{5-4}{9} = \frac{1}{9}$.

Answer: $\frac{1}{9}$

1. **Find the sum of the following.**

a. $\dfrac{2}{9} + \dfrac{6}{9}$ b. $\dfrac{2}{7} + \dfrac{3}{7}$ c. $\dfrac{6}{11} + \dfrac{4}{11}$ d. $\dfrac{4}{15} + \dfrac{9}{15}$ e. $\dfrac{6}{13} + \dfrac{8}{13}$

2. **Add each pair of fractions.**

a. $\dfrac{2}{7}, \dfrac{6}{7}$ b. $\dfrac{2}{5}, \dfrac{7}{5}$ c. $\dfrac{3}{9}, \dfrac{4}{9}$ d. $\dfrac{8}{11}, \dfrac{7}{11}$ e. $\dfrac{6}{13}, \dfrac{2}{13}$

3. **Write the correct number in each box.**

a. $\dfrac{3}{6} + \dfrac{4}{6} = \dfrac{\Box + \Box}{6} = \dfrac{\Box}{6}$ b. $\dfrac{1}{9} + \dfrac{7}{9} = \dfrac{\Box + \Box}{9} = \dfrac{\Box}{9}$

c. $\dfrac{2}{8} + \dfrac{3}{8} = \dfrac{\Box + \Box}{8} = \dfrac{\Box}{8}$ d. $\dfrac{2}{7} + \dfrac{4}{7} = \dfrac{\Box + \Box}{7} = \dfrac{\Box}{7}$

4. **Find the difference between the following.**

a. $\dfrac{6}{9}$ and $\dfrac{2}{9}$ b. $\dfrac{15}{8}$ and $\dfrac{4}{8}$ c. $\dfrac{7}{12}$ and $\dfrac{2}{12}$

d. $\dfrac{9}{18}$ and $\dfrac{4}{18}$ e. $\dfrac{8}{15}$ and $\dfrac{16}{15}$ f. $\dfrac{4}{10}$ and $\dfrac{1}{10}$

5. **Find the difference.**

a. $\dfrac{7}{8} - \dfrac{6}{8}$ b. $\dfrac{6}{14} - \dfrac{3}{14}$ c. $\dfrac{8}{7} - \dfrac{5}{7}$ d. $\dfrac{14}{15} - \dfrac{7}{15}$ e. $\dfrac{16}{19} - \dfrac{8}{19}$

Points to Remember

- ❖ Fractional number may be the part of a whole or collection.
- ❖ Every fraction has two numerals. These numerals are separated by small line called bar.
- ❖ There is a numerator and a denominator in a fraction.
- ❖ Equivalent fractions of a given fraction can be obtained by multiplying or dividing its numerator and denominator with the same number (except zero).
- ❖ Fractional numbers can be arranged in either ascending order or descending order.
- ❖ There is a rule to add or subtract the fractional numbers having the same denominator.

EXERCISE

1. Multiple Choice Questions (MCQs)

Tick (✓) the correct option.

a. Which one of the following is a unit fraction ?

(i) $\frac{3}{4}$ (ii) $\frac{5}{7}$ (iii) $\frac{1}{7}$ (iv) $\frac{8}{2}$

b. Which one is $\frac{1}{8}$ of 72?

(i) 11   (ii) 18   (iii) 8   (iv) 9

c. Which fraction do we get on dividing a whole number into two equal parts ?

(i) One-fourth   (ii) One-half

(iii) One-third   (iv) One-sixth

d. A collection has 84 objects. Then, how many objects are there in one-fourth of the collection ?

(i) 7   (ii) 21   (iii) 18   (iv) 8

e. How many numerals are there in a fraction ?

(i) Three   (ii) Four   (iii) Two   (iv) Five

2. Calculate the following fractions.

a. Five-ninth of 63   b. Four-sixth of 54

3. A collection has 48 objects. Then, how many objects are there in one-sixth of the collection ?

4. Write the next three fractions of the following.

a. $\frac{1}{5}$ = $\frac{2}{10}$ = $\frac{4}{20}$ = ... = ... = ...

b. $\dfrac{3}{2}$ = $\dfrac{6}{4}$ = $\dfrac{12}{8}$ = ... = ... = ...

5. **Find the greatest fraction in each of the following.**

a. $\dfrac{7}{5}, \dfrac{1}{5}, \dfrac{6}{5}, \dfrac{2}{5}$ b. $\dfrac{8}{9}, \dfrac{8}{4}, \dfrac{8}{3}, \dfrac{8}{7}$

6. **Find the smallest fraction in each of the following.**

a. $\dfrac{3}{6}, \dfrac{1}{6}, \dfrac{4}{6}, \dfrac{2}{6}$ b. $\dfrac{6}{9}, \dfrac{6}{12}, \dfrac{6}{18}, \dfrac{6}{16}$

7. **Arrange the following in ascending order.**

a. $\dfrac{4}{8}, \dfrac{4}{3}, \dfrac{4}{6}, \dfrac{4}{9}$ b. $\dfrac{3}{6}, \dfrac{3}{13}, \dfrac{3}{9}, \dfrac{3}{14}$

8. **Arrange the following in descending order.**

a. $\dfrac{14}{5}, \dfrac{14}{9}, \dfrac{14}{11}, \dfrac{14}{2}$ b. $\dfrac{9}{13}, \dfrac{4}{13}, \dfrac{7}{13}, \dfrac{2}{13}$

9. **Find the sum in each of the following.**

a. $\dfrac{8}{18}, \dfrac{3}{18}, \dfrac{4}{18}$ b. $\dfrac{3}{8}, \dfrac{4}{8}, \dfrac{2}{8}$

10. **Find the difference in each of the following.**

a. $\dfrac{14}{13}$ and $\dfrac{9}{13}$ b. $\dfrac{15}{12}$ and $\dfrac{4}{12}$

11. **Subtract the following.**

a. $\dfrac{5}{2}$ from $\dfrac{8}{2}$ b. $\dfrac{6}{8}$ from $\dfrac{9}{8}$

c. $\dfrac{2}{10}$ from $\dfrac{9}{10}$ d. $\dfrac{3}{11}$ from $\dfrac{7}{11}$

12. **Write the correct number in each box.**

a. $\dfrac{7}{10} - \dfrac{3}{10}$ = $\dfrac{\square - \square}{10}$ = $\dfrac{\square}{10}$ b. $\dfrac{7}{8} - \dfrac{1}{8}$ = $\dfrac{\square - \square}{8}$ = $\dfrac{\square}{8}$
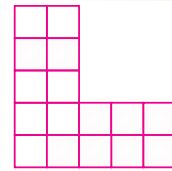
c. $\dfrac{11}{16} - \dfrac{2}{16}$ = $\dfrac{\square - \square}{16}$ = $\dfrac{\square}{16}$ d. $\dfrac{13}{7} - \dfrac{8}{7}$ = $\dfrac{\square - \square}{7}$ = $\dfrac{\square}{7}$

Write fraction of the shaded region.

Lab Activity

**Objective** : To find unit fraction of a quantity.

Materials Required : Ice-cream spoons

Process:

Student should work in pairs.

To find $\frac{1}{3}$ of 9 :

❖ One student counts 9 ice-cream spoons and places them in a row.

❖ These 9 spoons are arranged into 3 equal groups, separated by the partner.

❖ Each fraction represents a group and should be written down as shown.

❖ Count the number of ice cream sticks in each group and write.

one half $\frac{1}{3}$
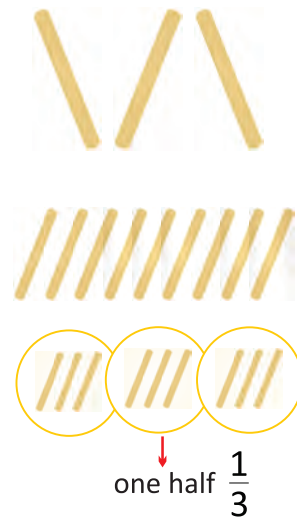
Records of the Activity :

Number of spoons = 9

Number of groups = 3 $\frac{1}{3}$ of 9 = 3

Number in each group = 3

Try to do this :

1. Find $\frac{1}{2}$ of 10.   2. Find $\frac{1}{4}$ of 12.