7 FRACTIONS AND DECIMALS

- Common Fractions
- Operations Involving Common Fractions
- Decimal Fractions
- Operations Involving Decimal Fractions

Introduction

Let us recall what we have learnt about common fractions and decimal fractions in previous classes.

Common Fractions	***Decimal Fractions***
1. A common fraction is a part of a natural number.	1. A decimal fraction is a part of a power of 10.
2. Common fraction $\frac{3}{4}$ represents 3 parts out of 4 equal parts, where 3 above the division line is known as the numerator and 4 below the division line is known as the denominator.	2. The decimal fraction 0.04 represents 4 parts out of 100 equal parts. The number of digits after the decimal point is the number of decimal places.
3. The numerator is less than the denominator in proper fractions like $\frac{1}{4}, \frac{2}{5}, \frac{5}{8}$.	3. The value of the decimal equivalents of proper fractions, like 0.25, 0.4, 0.625, is less than 1.
4. The numerator is greater than the denominator in improper fractions like $\frac{3}{2}, \frac{7}{5}, \frac{9}{8}$.	4. The value of the decimal equivalents of improper fractions, like 1.5, 1.4, 1.125, is greater than 1.
5. A mixed fraction, like $1\frac{3}{4}$, is the sum of a natural number 1 and a proper fraction $\frac{3}{4}$.	5. The decimal fraction 3.4 is the sum of its integral part 3 and its fractional part 0.4.
6. The denominators of like fractions, like $\frac{3}{7}, \frac{4}{7}, \frac{1}{7}$, are the same.	6. Like decimal fractions, like 0.728, 10.001, have the same number of decimal places.
7. The denominators of unlike fractions, like $\frac{3}{5}, \frac{1}{2}, \frac{5}{8}$, are different.	7. Unlike decimal fractions, like 1.5, 0.05, do not have the same number of decimal places.
8. The value of equivalent common fractions is the same. Equivalent common fractions are obtained by multiplying or dividing the numerator as well as the denominator of the fraction by the same number. $\frac{3}{4}=\frac{6}{8}=\frac{9}{12}$	8. The value of equivalent decimal fractions is the same. Equivalent decimals are obtained by adding zeroes to the extreme right of the decimal part. For. e.g., 3.6 = 3.60 = 3.600
9. A common fraction may be converted into a decimal fraction. $\frac{1}{2} = 0.5$, $\frac{5}{16} = 0.3125$	9. A decimal fraction may be converted into a common fraction. $1.25 = \frac{5}{4}$, $0.875 = \frac{7}{8}$

Common Fractions

Reduction to Simplest Form

A common fraction, also known as vulgar fraction, is reduced to its simplest form or lowest terms, by dividing the numerator and denominator by their HCF.

Example 1: Reduce $\frac{385}{539}$ to its simplest form.

$385 = 5 \times \underline{7 \times 11}$

$539 = 7 \times \underline{7 \times 11}$

HCF of 385 and 539 = 77

Thus $\frac{385 \div 77}{539 \div 77} = \frac{5}{7}$

Try this!

Reduce $\frac{582}{1024}$ to its simplest form.

Comparing Common Fractions

1. Convert the given fractions into equivalent fractions with the same denominator. The fraction with the greater numerator is greater.
   Or
2. Convert the given fractions into equivalent fractions with the same numerator. The fraction with the smaller denominator is greater.
   Or
3. Divide the numerators by their denominators and then compare the decimal values.

Example 2: Write the following fractions in ascending order.

$$\frac{5}{6}, \frac{3}{4}, \frac{1}{2}, \frac{11}{12}, \frac{2}{3}$$

The LCM of the denominators is 12. Converting the given fractions into equivalent fractions with 12 as denominator, we have

$$\frac{5\times2}{6\times2} = \frac{10}{12}, \frac{3\times3}{4\times3} = \frac{9}{12}, \frac{1\times6}{2\times6} = \frac{6}{12}, \frac{11\times1}{12\times1} = \frac{11}{12},$$
$$\frac{2\times4}{3\times4} = \frac{8}{12}$$

Beginning with the least numerator, the fractions in ascending order are:

$$\frac{6}{12}, \frac{8}{12}, \frac{9}{12}, \frac{10}{12}, \frac{11}{12} \text{ or } \frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}, \frac{11}{12}$$

Example 3: Write the following fractions in descending order.

$$1\frac{2}{3}, \frac{15}{16}, \frac{3}{13}, 1\frac{3}{7}, \frac{6}{9}$$

Convert the mixed fractions into common fractions:

$$\frac{5}{3}, \frac{15}{16}, \frac{3}{13}, \frac{10}{7}, \frac{6}{9}$$

Here we find it simpler to find the LCM of the numerators. LCM of numerators = 30. Converting given fractions into equivalent fractions with 30 as numerator, we have

$$\frac{5\times6}{3\times6} = \frac{30}{18}, \frac{15\times2}{16\times2} = \frac{30}{32}, \frac{3\times10}{13\times10} = \frac{30}{130},$$
$$\frac{10\times3}{7\times3} = \frac{30}{21}, \frac{6\times5}{9\times5} = \frac{30}{45}$$

Beginning with the smallest denominator, the fractions in descending order are:

$$\frac{30}{18}, \frac{30}{21}, \frac{30}{32}, \frac{30}{45}, \frac{30}{130} \text{ or } 1\frac{2}{3}, 1\frac{3}{7}, \frac{15}{16}, \frac{6}{9}, \frac{3}{13}$$

Example 4: Write the following fractions in ascending order.

$$\frac{16}{33}, \frac{7}{15}, \frac{9}{19}, \frac{2}{5}, \frac{10}{21}$$

As finding the LCM of numerators or denominators is not convenient, find the decimal values of the given fractions up to at least 3 decimal places.

$$\frac{16}{33} = 0.485, \frac{7}{15} = 0.467, \frac{9}{19} = 0.474,$$
$$\frac{2}{5} = 0.4, \frac{10}{21} = 0.476$$

As $0.4 < 0.467 < 0.474 < 0.476 < 0.485$, the fractions in ascending order are:

$$\frac{2}{5}, \frac{7}{15}, \frac{9}{19}, \frac{10}{21}, \frac{16}{33}$$

Try this!

Write the following fraction

1. In descending order:
$\frac{2}{9}, \frac{5}{12}, \frac{7}{15}, \frac{10}{14}$

2. In ascending order:
$\frac{15}{8}, \frac{3}{6}, \frac{10}{12}, \frac{5}{15}$

Operations Involving Common Fractions

Addition and Subtraction

Example 5: Evaluate $\frac{5}{7} + \frac{1}{5} - \frac{3}{14}$.

Adding and subtracting equivalent fractions with LCM of denominators as the common denominator, we get

$$\frac{5}{7} + \frac{1}{5} - \frac{3}{14} = \frac{(5 \times 10) + (1 \times 14) - (3 \times 5)}{70}$$

$$= \frac{50 + 14 - 15}{70}$$

$$= \frac{49}{70} = \frac{7}{10}$$

Example 6: Evaluate $1\frac{7}{8} + 2\frac{1}{2} - 2\frac{11}{12}$.

Converting mixed fractions into common fractions, we get

$$1\frac{7}{8} + 2\frac{1}{2} - 2\frac{11}{12} = \frac{15}{8} + \frac{5}{2} - \frac{35}{12}$$

$$= \frac{45 + 60 - 70}{24}$$

$$= \frac{35}{24} = 1\frac{11}{24}$$

Multiplication and Division

Example 7: Evaluate $\frac{6}{7} \times 2\frac{1}{3}$.

$$\frac{6}{7} \times 2\frac{1}{3} = \frac{6}{7} \times \frac{7}{3} = \frac{6 \times 7}{7 \times 3}.$$

$$= \frac{42}{21} = 2$$

Example 8: Evaluate $3\frac{5}{7} \div \frac{13}{14}$.

$$3\frac{5}{7} \div \frac{13}{14} = \frac{26}{7} \div \frac{13}{14}$$

$$= \frac{26}{7} \times \frac{14}{13} = 4$$

Try this!

Evaluate

1. $1\frac{3}{12} - 2\frac{7}{8} + 5\frac{6}{10}$.
2. $\frac{2}{5} \times 1\frac{10}{18}$.
3. $\frac{5}{8} \div \frac{10}{16}$.

Finding HCF and LCM of Common Fractions

HCF of common fractions

$$= \frac{\text{HCF of the numerators}}{\text{LCM of the denominators}}$$

LCM of common fractions

$$= \frac{\text{LCM of the numerators}}{\text{HCF of the denominators}}$$

Example 9: (i) Which is the greatest fraction that will divide $\frac{9}{14}, \frac{3}{7}$, and $\frac{6}{21}$ exactly without leaving any remainders?

(ii) Which is the smallest fraction that can be divided by the above fractions without leaving any remainders?

(i) HCF of the given fractions

$$= \frac{\text{HCF of } 9, 3, \text{ and } 6}{\text{LCM of } 14, 7, \text{ and } 21} = \frac{3}{42}$$

CHECK: $\frac{9}{14} \div \frac{3}{42} = \frac{9}{14} \times \frac{42}{3} = 9;$

$\frac{3}{7} \div \frac{3}{42} = \frac{3}{7} \times \frac{42}{3} = 6;$ $\frac{6}{21} \div \frac{3}{42} = \frac{6}{21} \times \frac{42}{3} = 4$

(ii) LCM of the given fractions

$$= \frac{\text{LCM of } 9, 3, \text{ and } 6}{\text{HCF of } 14, 7, \text{ and } 21} = \frac{18}{7}$$

CHECK: $\frac{18}{7} \div \frac{9}{14} = \frac{18}{7} \times \frac{14}{9} = 4;$

$\frac{18}{7} \div \frac{3}{7} = \frac{18}{7} \times \frac{7}{3} = 6;$ $\frac{18}{7} \div \frac{6}{21} = \frac{18}{7} \times \frac{21}{6} = 9$

Simplification and Word Problems

The order of operations follows the rule of BODMAS as detailed in the chapter on directed numbers.

Example 10: Simplify

$$2\frac{5}{6} - \left[3\frac{2}{3} - 1\frac{2}{5}\left\{1\frac{2}{3} - \left(1\frac{1}{2} - 2\frac{1}{7} - 1\frac{5}{14}\right)\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5}\left\{\frac{5}{3} - \left(\frac{3}{2} - \frac{15}{7} - \frac{19}{14}\right)\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5}\left\{\frac{5}{3} - \left(\frac{3}{2} - \frac{30-19}{14}\right)\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5}\left\{\frac{5}{3} - \left(\frac{3}{2} - \frac{11}{14}\right)\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5}\left\{\frac{5}{3} - \left(\frac{21-11}{14}\right)\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5}\left\{\frac{5}{3} - \frac{5}{7}\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5}\left\{\frac{35-15}{21}\right\}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{7}{5} \times \frac{20}{21}\right]$$

$$= \frac{17}{6} - \left[\frac{11}{3} - \frac{4}{3}\right]$$

$$= \frac{17}{6} - \frac{7}{3}$$

$$= \frac{17-14}{6}$$

$$= \frac{3}{6} = \frac{1}{2}$$

Example 11: $\frac{2}{3}$ of the girls in a class are over 5 feet tall, $\frac{1}{6}$ of the girls in that class are over 5 feet 3 inches tall. If 27 girls are between 5 feet and 5 feet 3 inches, how many girls are there in that class?

Let there be x number of girls in that class.

Given $\frac{2}{3}x - \frac{1}{6}x = 27$

$\Rightarrow \frac{4x - x}{6} = 27$

$\Rightarrow \frac{3x}{6} = 27$

$\Rightarrow x = 27 \times 2 = 54$

Thus, there are 54 girls in that class.

CHECK: Girls > 5′ = $\frac{2}{3} \times 54 = 36$, Girls > 5′3″

= $\frac{1}{6} \times 54 = 9$, Girls > 5′, < 5′3″ = 36 – 9 = 27

Exercise 7.1

1. Arrange the following fractions in descending order.

(i) $2\frac{3}{7}, \frac{5}{8}, 1\frac{6}{11}, 3\frac{2}{5}, \frac{1}{2}$

(ii) $\frac{3}{4}, \frac{1}{2}, \frac{5}{6}, \frac{7}{12}, \frac{2}{3}$

(iii) $2\frac{1}{10}, 2\frac{1}{3}, 2\frac{4}{5}, 3\frac{1}{2}, \frac{14}{15}$

(iv) $3\frac{2}{7}, 3\frac{1}{5}, 3\frac{5}{16}, 3\frac{4}{11}, 3\frac{3}{10}$

(v) $\frac{6}{13}, \frac{4}{7}, \frac{5}{9}, \frac{11}{20}, \frac{12}{25}$

2. Arrange the following fractions in ascending order.

(i) $3\frac{1}{8}, \frac{1}{3}, 2\frac{3}{5}, 1\frac{4}{13}, \frac{5}{7}$

(ii) $\frac{3}{5}, \frac{7}{10}, \frac{11}{15}, \frac{2}{3}, \frac{1}{2}$

(iii) $\frac{24}{25}, 1\frac{5}{7}, 1\frac{1}{7}, 1\frac{1}{3}, 1\frac{1}{5}$

(iv) $1\frac{3}{7}, 1\frac{2}{5}, 1\frac{4}{9}, 1\frac{5}{11}, 1\frac{7}{10}$

(v) $\frac{1}{2}, \frac{5}{11}, \frac{4}{9}, \frac{6}{13}, \frac{13}{25}$

3. Evaluate the following fractions.

(i) $\frac{3}{11} + \frac{2}{11} + \frac{5}{11}$ (ii) $\frac{2}{7} + \frac{2}{3}$

(iii) $\frac{3}{5} + 1\frac{2}{5}$ (iv) $6\frac{1}{2} + 1\frac{2}{3} + 1\frac{5}{6}$

(v) $\frac{2}{9} + \frac{3}{7} + 1\frac{1}{3}$

(vi) $\frac{4}{11} + 2\frac{1}{2} + 3\frac{1}{4} + 2\frac{5}{11} + \frac{7}{44}$

4. Evaluate the following fractions.

(i) $\frac{8}{13} - \frac{3}{13}$ (ii) $\frac{5}{7} - \frac{1}{2}$

(iii) $2\frac{2}{3} - 1\frac{1}{2}$ (iv) $\frac{7}{9} - \frac{3}{4}$

(v) $1\frac{3}{5} - \frac{4}{7}$ (vi) $2\frac{2}{6} - 1\frac{3}{5}$

5. Evaluate the following fractions.

(i) $\frac{3}{4} \times \frac{1}{2}$ (ii) $\frac{6}{11} \times 1\frac{2}{9}$

(iii) $\frac{2}{5} \times \frac{15}{16} \times \frac{8}{9}$ (iv) $\frac{6}{7} \times 3\frac{1}{2} \times 2\frac{1}{3}$

(v) $1\frac{5}{7} \times 2\frac{1}{10} \times 6\frac{1}{4}$ (vi) $5\frac{1}{4} \times 3\frac{1}{7} \times 2\frac{2}{11}$

6. Evaluate the following fractions.

(i) $\frac{3}{8} \div 1\frac{1}{2}$ (ii) $\frac{1}{4} \div \frac{1}{2}$

(iii) $\frac{3}{5} \div \frac{5}{3}$ (iv) $6\frac{3}{7} \div 1\frac{2}{7}$

(v) $3\frac{4}{7} \div \frac{5}{7}$ (vi) $4\frac{2}{3} \div \frac{4}{9}$

7. Find the HCF of the following fractions.

(i) $\frac{1}{3}$ and $\frac{1}{2}$ (ii) $\frac{3}{4}$ and $\frac{2}{5}$

(iii) $\frac{3}{7}$ and $1\frac{5}{7}$ (iv) $\frac{15}{22}$ and $\frac{10}{11}$

(v) $1\frac{5}{7}, 1\frac{1}{35}$, and $2\frac{2}{5}$ (vi) $\frac{15}{16}, \frac{21}{40}$, and $\frac{9}{20}$

8. Find the LCM of the following fractions.

(i) $\frac{1}{4}$ and $\frac{2}{3}$ (ii) $\frac{2}{3}$ and $\frac{4}{5}$

(iii) $\frac{2}{7}$ and $\frac{5}{14}$ (iv) $\frac{6}{11}$ and $\frac{9}{11}$

(v) $\frac{6}{5}, \frac{3}{5}, \frac{3}{4}$, and $\frac{1}{3}$ (vi) $1\frac{1}{6}, 1\frac{5}{9}, \frac{21}{24}$, and $1\frac{9}{12}$

9. Find the greatest fraction that divides $\frac{1}{6}$ and $2\frac{1}{2}$ exactly and also find the smallest fraction that can be divided by the given fractions.

10. Simplify the following expressions:

(i) $2\frac{3}{5} - \left[\frac{2}{3} + \left\{2\frac{1}{3} - \left(1\frac{1}{2} - \overline{\frac{3}{5} - \frac{1}{2}}\right)\right\}\right]$

(ii) $\frac{5}{8} \div 1\frac{3}{7} \times \frac{2}{7} \div \left(3\frac{1}{6} - 2\frac{1}{2}\right)$

(iii) $\frac{7}{11}$ of $\left(1\frac{3}{5} - \overline{1\frac{2}{5} - \frac{3}{7}}\right)$

(iv) $7\left(\frac{3}{8} \div \frac{1}{4} - \frac{3}{7} - 1\frac{3}{4} \text{ of } \frac{6}{7} \div 1\frac{1}{2}\right)$

(v) $1\frac{4}{7} - \frac{6}{7}\left[1\frac{2}{3} - \frac{3}{4}\left\{\frac{2}{3} + \left(\frac{5}{9} - \frac{1}{3}\right)\right\}\right]$

(vi) $\dfrac{1\frac{1}{2}}{1\frac{13}{14}} - \dfrac{1\frac{2}{11}}{1\frac{17}{22}}$

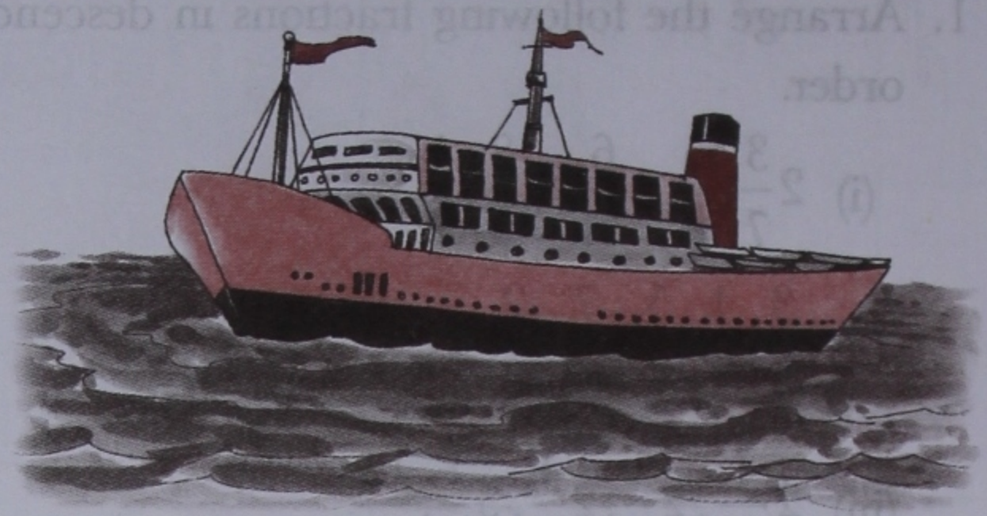
(vii) $\dfrac{2 \div 1\frac{5}{7} - 1\frac{3}{7}}{3 \div 2\frac{1}{2} - \frac{4}{15}} + \dfrac{3 \text{ of } 1\frac{1}{4} - 3\frac{1}{2}}{2 \text{ of } 2\frac{2}{5} - 4\frac{1}{5}}$

11. In a village consisting of 150 females and 100 males, $\frac{1}{15}$ of all females and $\frac{1}{10}$ of all males are graduates. What fraction of all the villagers are graduates?

12. $\frac{7}{11}$ of all the money in Mr Ghosh's bank account is Rs 98,000. How much money does Mr Ghosh have in his bank account?

13. A $116\frac{2}{3}$ m long cable is cut into equal pieces measuring $8\frac{1}{3}$ m each. How many such small pieces are there?

14. $\frac{1}{6}$ of a ship's crew are deck officers, $\frac{1}{4}$ are engineers and stewards, and the rest are sailors. If there are 48 crew members in all, how many sailors are on board the ship?



15. $\frac{2}{7}$ part of a road was paved on the first day, $\frac{1}{5}$ part on the second day, and $\frac{1}{3}$ part was paved on the third day. If $443\frac{1}{3}$ m was paved on the fourth day to complete the road, what is the total length of the road paved?

16. The perimeter of an isosceles trapezium measures $13\frac{7}{30}$ cm. If its unequal sides measure $3\frac{2}{5}$ cm and $5\frac{1}{6}$ cm, find the measure of its equal sides.

17. A father and his two sons construct a house for Rs 5,25,000. The elder son contributes $\frac{3}{5}$ of his father's contribution while the younger son contributes $\frac{1}{2}$ of his father's contribution. How much do the three contribute individually?

18. Rajiv inherited $\frac{2}{9}$ of the money his grandfather left behind while his cousin Rakesh's share was $\frac{1}{7}$. If Rajiv's share was Rs 60,000 more than Rakesh's share, find how much money their grandfather left behind.

19. Amar, Akbar, and Anthony receive a total of Rs 2016 as monthly allowance from their father such that Anthony gets $\frac{1}{2}$ of what Amar does and Akbar gets $1\frac{2}{3}$ times Anthony's share. How much money do the three brothers get individually?

20. $\frac{1}{4}$ students of a school come by school bus while $\frac{2}{5}$ students ride a bicycle to school. All the other students walk to school, of which $\frac{1}{3}$ walk on their own and the rest are escorted by an elder. If 196 students come to school walking on their own, how many students study in that school?

Decimal Fractions

Comparing Decimal Fractions

1. The decimal fraction with the greater integral part is greater.
2. If the integral parts of two decimal fractions are the same, then beginning from the tenths place, the decimal with the greater digit in the same place is greater.

Example 12: Compare and find which is greater between 1.3 and 1.2.

Comparing the integral parts: 1 = 1

Now compare the digits in the tenths place: 3 > 2

Thus, 1.3 > 1.2

Example 13: Write the following decimal fractions in descending order.

1.2323, 1.3223, 1.2332, 1.3232, 1.3322

Write the decimal fractions in a place-value chart.

Decimal	Integral part		Tenths	Hundredths	Thousandths	Ten-thousandths
1.2323	1	.	2	3	2	3
1.3223	1	.	3	2	2	3
1.2332	1	.	2	3	3	2
1.3232	1	.	3	2	3	2
1.3322	1	.	3	3	2	2

The integral parts of all given decimals is the same; we find three decimals with 3 in the tenths place, of which only 1.3322 has 3 in the hundredths place too. Hence, it is the greatest of the given decimals. Similarly comparing the other decimals, the numbers in descending order are: 1.3322, 1.3232, 1.3223, 1.2332, 1.2323.

Try this!

Compare 1.832 and 1.823.

Fundamental Operations Involving Decimal Fractions

Addition and Subtraction

Add or subtract like decimals, arranging the numbers vertically with the decimal point in one line.

Example 14: Find 5.63 + 58.0356

$$\begin{array}{r} 5.6300 \\ +\ 58.0356 \\ \hline 63.6656 \end{array}$$

Example 15: Find 56 – 5.6215

$$\begin{array}{r} 56.0000 \\ -\ \ 5.6215 \\ \hline 50.3785 \end{array}$$

Multiplication

The product will have as many decimal places as the sum of the decimal places of the multiplicand and the multiplier.

Example 16: Find 2.023 × 3.65

Decimal places in multiplicand = 3

Decimal places in multiplier = 2

Decimal places in product = 3 + 2 = 5

$$\begin{array}{r} 2023 \\ \times\ 365 \\ \hline 10115 \\ 12138\times \\ 6069\times\times \\ \hline 738395 \end{array}$$

Thus, 2.023 × 3.65 = 7.38395

Division

The dividend and divisor are multiplied with a power of 10 to make the divisor a natural number and then division is carried out, placing a decimal point in the quotient as soon as the tenths digit is brought down.

Example 17 : Find 9.487 ÷ 3.58

Multiply the dividend and divisor by 100.

$$\frac{9.487\times100}{3.58\times100} = \frac{948.7}{358}$$

```
          2.65
      ____________
358 ) 948.70
      - 716
      ------
        2327
      - 2148        (decimal point is placed in the quotient at this step)
      ------
        1790        (any number of zeroes may be added to the extreme
      -  1790       right of the decimal part)
      ------
           x
      ------
```

Try this!

1. Find 10.184 + 5.82
2. Find 3.586 – 1.082
3. Find 2.345 × 1.06
4. Find 1.82 3.5

Finding HCF and LCM of Decimal Fractions

Step 1: Convert given decimals into like decimals.

Step 2: If decimal place of all decimals is n, multiply all decimals by 10^n to get natural numbers.

Step 3: Find HCF or LCM of natural numbers obtained above.

Step 4: Divide HCF or LCM calculated above by 10^n.

The result obtained is the HCF or LCM of the given decimal fractions.

Example 18: Find the HCF of 0.9, 3.6, and 0.54.

Step 1: Converting given decimals to like decimals, we have 0.90, 3.60, and 0.54 where decimal place = n = 2

Step 2: Multiplying all decimals by 10^2 or 100 we have natural numbers 90, 360, and 54.

Step 3:
$$90 = \underline{2\times3\times3}\times5$$
$$360 = 2\times2\times\underline{2\times3\times3}\times5$$
$$54 = \underline{2\times3\times3}\times3$$

HCF of 90, 360, and 54 = 18

Step 4: Dividing 18 by $10^2 = \frac{18}{100} = 0.18$

Thus, HCF of 0.9, 3.6, and 0.54 = 0.18

Example 19: Find the smallest decimal fraction that can be divided exactly by 0.045, 1.8, and 0.27.

Step 1: Converting given decimals to like decimals, we have 0.045, 1.800, and 0.270 where decimal places = n = 3.

Step 2: Multiplying all decimals by 10^3 or 1000, we have natural numbers 45, 1800, and 270.

Step 3:
$$45 = 3\times3\times5 = 3^2\times5^1$$
$$1800 = 2\times2\times2\times3\times3\times5\times5 = 2^3\times3^2\times5^2$$
$$270 = 2\times3\times3\times3\times5 = 2^1\times3^3\times5^1$$

LCM of 45, 1800, and 270
$$= 2^3\times3^3\times5^2 = 5400$$

Step 4: Dividing 5400 by $10^3 = \frac{5400}{1000} = 5.4$

Thus, LCM of 0.045, 1.8, and 0.27 is 5.4

Try this!

Find the HCF of 0.45, 0.72 and 0.135

Simplification and Word Problems

The order of operations on decimal fractions also follows the rule of BODMAS.

Example 20: Simplify $1.835 + 1.5 \text{ of } [2.46 - 2.82 \div \{0.43 + 0.5 \text{ of } (10.15 - 2.8 \text{ of } \overline{4.329 - 1.254})\}]$

$= 1.835 + 1.5 \text{ of } [2.46 - 2.82 \div \{0.43 + 0.5 \text{ of } (10.15 - 2.8 \text{ of } 3.075)\}]$

$= 1.835 + 1.5 \text{ of } [2.46 - 2.82 \div \{0.43 + 0.5 \text{ of } (10.15 - 8.61)\}]$

$= 1.835 + 1.5 \text{ of } [2.46 - 2.82 \div \{0.43 + 0.5 \text{ of } 1.54\}]$

$= 1.835 + 1.5 \text{ of } [2.46 - 2.82 \div \{0.43 + 0.77\}]$

$= 1.835 + 1.5 \text{ of } [2.46 - 2.82 \div 1.2]$

$= 1.835 + 1.5 \text{ of } [2.46 - 2.35]$

$= 1.835 + 1.5 \text{ of } 0.11$

$= 1.835 + 0.165$

$= 2$

Using Formulae for Simplification

Recall the special products we learnt in Algebra in the previous class.

- $(a + b)^2 = a^2 + 2ab + b^2$
- $(a - b)^2 = a^2 - 2ab + b^2$
- $a^2 - b^2 = (a + b)(a - b)$

Example 21: Simplify $\dfrac{4.75^2 - 2.25^2}{4.75^2 - 2 \times 4.75 \times 2.25 + 2.25^2}$

$\div \dfrac{4.75 - 2.25}{4.75^2 + 2 \times 4.75 \times 2.25 + 2.25^2}$

$= \dfrac{(4.75 + 2.25)(4.75 - 2.25)}{(4.75 - 2.25)^2} \times \dfrac{(4.75 + 2.25)^2}{4.75 - 2.25}$

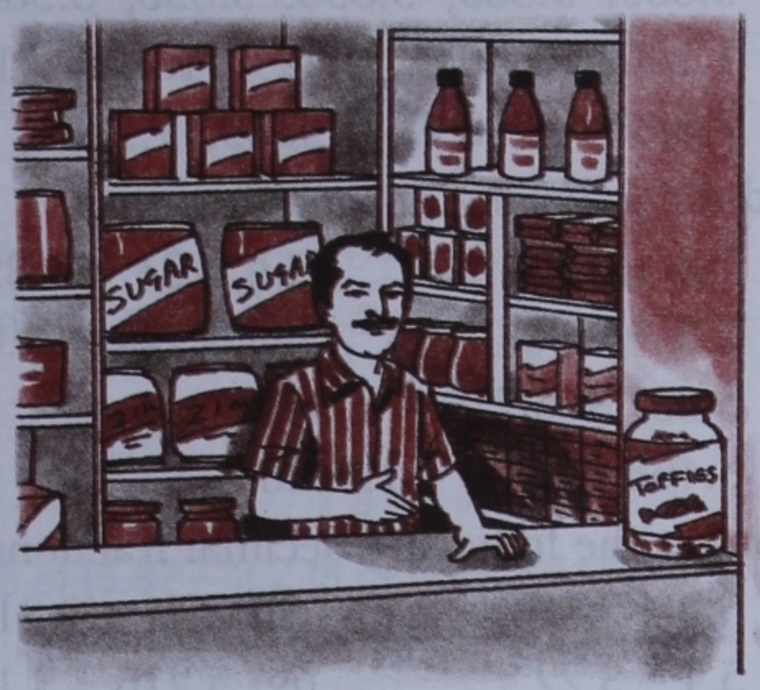
$= \dfrac{7 \times \cancel{2.5}}{2.5 \times 2.5} \times \dfrac{7 \times 7}{\cancel{2.5}}$

$= \dfrac{343}{6.25} = \dfrac{34300}{625} = 54.88$

Try this!

Simplify : $2(68.86 + 55)$

Example 22: A grocer buys 5.5 kg of sugar at Rs 15.20 per kg and 15 kg of sugar, the next day, at Rs 14.38 per kg. He then mixes all the sugar and repacks it in 250 g packets. How many packets of sugar does the grocer have and how much had he paid for the sugar in each packet?



	Quantity	Rate	Price
Sugar purchased on the first day	5.5 kg	15.20	Rs 83.60
Sugar purchased on the second day	15.0 kg	14.38	Rs 215.70
Total	20.5 kg	for	Rs 299.30

Number of 250 g packets in which sugar has been repacked $= \dfrac{\text{Total quantity}}{250 \text{ g}} = \dfrac{20500 \text{ g}}{250 \text{ g}} = 82$

Cost of sugar in each packet $= \dfrac{\text{Rs } 299.30}{82}$

$= \text{Rs } 3.65$

Thus, the grocer has 82 small packets worth Rs 3.65 each.

Try this!

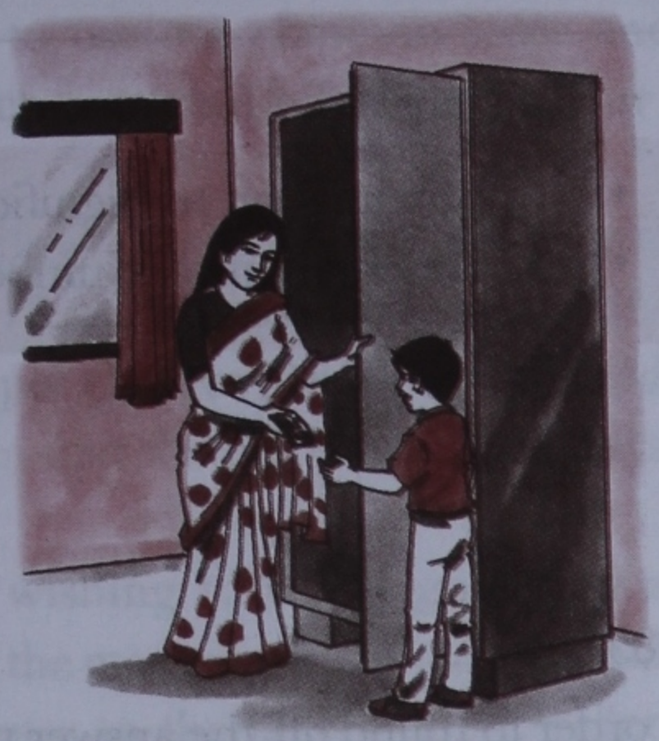
Simplify :

1. $(0.7 + \overline{0.7 - 0.1 \text{ of } 0.7})$
2. $89.1 + 17.25 - 1.1011$

Exercise 7.2

1. Arrange the following decimal fractions in ascending order.
   (i) 68.95, 6.985, 9.685, 86.59, 8.695
   (ii) 1.36, 1.29, 1.48, 1.26, 1.38
   (iii) 5.689, 5.869, 5.896, 5.698, 5.986
   (iv) 1.1001, 1.0011, 1.111, 1.0101, 1.1011
   (v) 7.8899, 7.9898, 7.9889, 7.9988, 7.8998
2. Add the following decimal fractions.
   (i) 7.8 + 3.2 (ii) 8.91 + 1.89
   (iii) 2.3 + 2.65 (iv) 1.721 + 1.892
   (v) 5.867 + 6.719 + 3.0018
   (vi) 3.468 + 2.12 + 1.34464
3. Subtract the following decimal fractions.
   (i) 6.9 – 2.9 (ii) 3.41 – 2.21
   (iii) 5.4 – 3.22 (iv) 5.216 – 3.162
   (v) 2.0 – 0.9963 (vi) 8.016 – 2.98694
4. Multiply the following decimal fractions.
   (i) 5.8×2.5 (ii) 4.64×0.5
   (iii) 9.5×0.04 (iv) 2.13×1.65
   (v) 5.68×0.145 (vi) 2.94×0.3215
5. Divide the following decimal fractions.
   (i) $14.5 \div 2.9$ (ii) $2.1 \div 1.4$
   (iii) $14.5 \div 4$ (iv) $19.68 \div 6.15$
   (v) $2.028 \div 3.12$ (vi) $1.7019 \div 5.49$
6. Find the HCF of the following decimal fractions.
   (i) 0.72 and 4.8 (ii) 1.092 and 1.176
   (iii) 0.21, 0.1925, and 0.175
   (iv) 0.286, 0.3718, and 0.3146
7. Find the LCM of the following decimal fractions.
   (i) 4.5 and 0.42 (ii) 0.18 and 0.144
   (iii) 2.52, 0.189, and 0.168
   (iv) 0.112, 0.8, and 0.48
8. Find the greatest decimal fraction that can be divided by 0.33, 0.495, and 0.297 leaving exactly 0.15 as remainder.
9. Simplify the following expressions.
   (i) $(1.52 \text{ of } 3.5 \div 0.8 - 4.4) \div 2.5 + 0.1$
   (ii) $(5.025 \div 2.5 + 1.49) \times 1.5 - 1.5 \times 2.5 + 1.5$
   (iii) $[4.5 + 0.4\{7.31 - (2.45 + 3.68 - 1.32)\}] \div 1.1$
   (iv) $\dfrac{3.27 \times 0.77}{3.85 \times 2.18}$ (v) $\dfrac{1.82 \times 2.5}{3.25} - \dfrac{2.22}{1.85}$
   (vi) $\dfrac{0.47 \times 0.81 \times 0.68}{1.62 \times 0.85 \times 2.35} \div \dfrac{8}{5}$
   (vii) $\dfrac{6.84 \times 4.52}{1.808 \times 2.85} - \dfrac{1.62 \times 8.26}{2.36 \times 2.025}$
   (viii) $0.3 \div 0.1 - [0.3 + \{0.1 \times 0.3 - (0.3 + \overline{0.3 - 0.1} \text{ of } 0.3)\}]$
10. Simplify the following expressions.
    (i) $3.865^2 - 1.135^2$
    (ii) $1.481^2 + 2 \times 1.481 \times 0.519 + 0.519^2$
    (iii) $4.694^2 - 2 \times 4.694 \times 3.494 + 3.494^2$
11. Junej buys 1.08 kg of plasticine at Rs 35.50 per kg and 0.35 ℓ of paint at Rs 142.80 per litre. If he gives the shopkeeper a 100 rupee note, how much change should he get back?
12. 0.125 part of a peace-keeping force are doctors, 0.09375 part are engineers, 0.03125 parts are cooks, and the rest are armed soldiers. If the peace-keeping force has 1152 members, how many armed soldiers are in it?
13. Geetanjali read 0.25 part of a book on the first day, 0.35 part on the second day, and 160 pages, to finish reading the book, on the third day. How many pages were there in the book?
14. If 1 m is equal to 3.28084 feet, how many feet will 15 m be equal to?
15. If 2.54 cm make an inch, how many inches will 60.96 cm make?
16. 0.4 part of a 9.3 g ornamental chain is made of gold. If the chain is cut into 6 equal pieces, how much gold will be there in each piece?
17. The perimeter of an isosceles trapezium is 7.07 cm. If its unequal sides measure 1.85 cm and 2.32 cm, how much do its equal sides measure?
18. Mrs Rane gives 0.025 part of her salary as pocket money to her son Vinod every month. Vinod spends 0.8 part of his pocket money and

saves the rest. If he saves Rs 277.50 in three months, how much does Mrs Rane earn in a month?



19. The average earning of three family members A, B, and C is Rs 11240.25. One member B leaves for another town and a new family member D starts earning. The new average earning of A, C, and D is now Rs 10520.50. If D is earning Rs 9886.25, how much was B earning?
20. A petrol pump attendant lowers a 5 m long dip-stick to check the oil-level in an underground tank. For every 0.1 m height of oil on the dip-stick, there is 1200 l of oil in the tank. If 0.38 part of the dip-stick is wet with oil, how many litres of oil are there in the tank?

Challenge

1. $\frac{2}{5} - \frac{9}{10} \times \frac{4}{7} \div \left\{1\frac{3}{7} - 1\frac{3}{4} \times \left(\frac{4}{7} + \overline{\frac{6}{7} - \frac{2}{3}}\right)\right\}$

2. $3 \div \left[2\frac{5}{6} - \frac{7}{15}\left\{5\frac{1}{2} - \left(1\frac{5}{6} + 2\frac{1}{3} - 3\frac{2}{3}\right)\right\}\right]$

3. $2\frac{1}{6} \div \left\{1\frac{3}{5} + \left(1\frac{5}{6} + 3\frac{1}{2} - 2\frac{3}{5}\right)\right\} \times 12$

$$\div \left\{1\frac{2}{3} - \frac{7}{13} \text{ of } \left(\frac{1}{3} + 2\frac{1}{7}\right)\right\}$$

4. $3.8 \text{ of } [5.67 - 2.2 \text{ of } \{4.66 - 1.4 \text{ of } (3.2 - \overline{5.18 - 3.63})\}]$

5. $1.4 + [1 - 0.34 \div \{4.5 - (4.4 \text{ of } 1.45 - 2.6 \text{ of } 1.05)\}]$

6. $\dfrac{6.5^2 - 3.5^2}{1.26^2 + 2 \times 1.26 \times 2.74 + 2.74^2}$

7. $\dfrac{1.385^2 - 2 \times 1.385 \times 0.785 + 0.785^2}{3.25^2 - 2.75^2} \div \dfrac{1.2}{3.25 - 2.75}$

Revision Exercise

1. Evaluate the following fractions :
   (i) $2\frac{1}{7} + 3\frac{1}{2} + 4$ (ii) $3\frac{1}{5} + 2\frac{1}{10} - \frac{1}{2} - \frac{1}{4}$
   (iii) $\frac{7}{3} + \frac{11}{5} + 2\frac{1}{15}$ (iv) $6 - 2\frac{1}{2} - 1\frac{2}{4}$
2. Evaluate the following fractions :
   (i) $1\frac{1}{2} \times 2\frac{1}{3} + 1\frac{1}{4}$ (ii) $3\frac{1}{3} \times 3\frac{1}{4} \times 2\frac{1}{7}$
   (iii) $7\frac{1}{2} \div 6\frac{2}{3}$ (iv) $12\frac{1}{3} \div 8\frac{2}{9}$
3. Simplify :
   (i) $\left[44\frac{1}{5} \times \frac{10}{34}\right] \div \left[\frac{14}{16} \times \frac{5}{12}\right]$
   (ii) $\left[7\frac{3}{9} \times 9\frac{4}{5}\right] - \left[1\frac{2}{3} \div 8\frac{1}{3}\right]$
   (iii) $5.381 + 2.5 \text{ of } [6.42 - 2.82]$
   (iv) $4.396 + 32.06 - 0.7 + [2.52 \div 1.2]$
4. In a class of 40 students, two-fifth are girls. Each girl brings a ribbon of $3\frac{2}{4}$ m and each boy brings $2\frac{1}{4}$. What is the total length of ribbon collected by 40 students?
5. The cost of 7.25 kg oranges is Rs.362.50 and the cost of 4.75 kg grapes is Rs.191.25. Himani buys 6 kg oranges and 5 kg grapes. How much money has Himani spent?