

UNIT 4

FRACTIONS AND DECIMALS

(A) Main Concepts and Results

- A **fraction** is a number representing a part of a whole. This whole may be a single object or a group of objects.
- A fraction whose numerator is less than the denominator is called a **proper fraction**, otherwise it is called an **improper fraction**.
- Numbers of the type $3\frac{5}{7}, 8\frac{4}{9}, 2\frac{1}{5}$ etc. are called **mixed fractions** (numbers).
- An improper fraction can be converted into a mixed fraction and vice versa.
- Fractions equivalent to a given fraction can be obtained by multiplying or dividing its numerator and denominator by a non-zero number.
- A fraction in which there is no common factor, except 1, in its numerator and denominator is called a fraction in the **simplest** or **lowest** form.
- Fractions with same denominators are called **like fractions** and if the denominators are different, then they are called **unlike fractions**.
- Fractions can be compared by converting them into like fractions and then arranging them in ascending or descending order.
- Addition (or subtraction) of like fractions can be done by adding (or subtracting) their numerators.

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- Addition (or subtraction) of unlike fractions can be done by converting them into like fractions.
- Fractions with denominators 10, 100, etc. can be written in a form, using a decimal point, called **decimal numbers** or **decimals**.
- Place value of the place immediately after the decimal point (i.e. tenth place) is $\frac{1}{10}$, that of next place (i.e. hundredths place) is $\frac{1}{100}$ and so on.
- Fractions can be converted into decimals by writing them in the form with denominators 10, 100, and so on. Similarly, decimals can be converted into fractions by removing their decimal points and writing 10, 100, etc in the denominators, depending upon the number of decimal places in the decimals.
- Decimal numbers can be compared using the idea of place value and then can be arranged in ascending or descending order.
- Decimals can be added (or subtracted) by writing them with equal number of decimal places.
- Many daily life problems can be solved by converting different units of measurements such as money, length, weight, etc. in the decimal form and then adding (or subtracting) them.

(B) Solved Examples

In examples 1 and 2, write the correct answer from the given four options:

Example 1. Which of the following fractions is the smallest?

- (A) $\frac{11}{9}$ (B) $\frac{11}{7}$ (C) $\frac{11}{10}$ (D) $\frac{11}{6}$

Solution: Answer is (C)

Example 2: 0.7625 lies between

- (A) 0.7 and 0.76 (B) 0.77 and 0.78
(C) 0.76 and 0.761 (D) 0.76 and 0.763

Solution: Answer is (D)

Example 3: Fill in the blanks so that the statement is true:

Decimal 8.125 is equal to the fraction _____.

Solution: $\frac{65}{8}$ or $8\frac{1}{8}$ (because $8.125 = \frac{8125}{1000}$)

Example 4: Fill in the blanks so that the statement is true:

$6.45 - 3.78 =$ _____.

Solution: 2.67

Example 5: State true or false:

The fraction $14\frac{2}{5}$ is equal to 14.2.

Solution: False [Hint: $14\frac{2}{10} = 14.2$]

Example 6: Fill in the blanks using $>$ or $<$:

$$\frac{8}{45} - \frac{16}{89}$$

Solution: $\frac{8}{45} = \frac{8 \times 2}{45 \times 2} = \frac{16}{90}$

$$\text{Now, } \frac{16}{90} < \frac{16}{89}, \quad \text{so, } \frac{8}{45} < \frac{16}{89}$$

Another method: $8 \times 89 = 712$ and $16 \times 45 = 720$

As $712 < 720$, therefore $\frac{8}{45} < \frac{16}{89}$

Example 7: Express $\frac{12}{25}$ as a decimal.

Solution: $\frac{12}{25} = \frac{12 \times 4}{25 \times 4}$
 $= \frac{48}{100} = 0.48$

Example 8: Convert 5809g to kg.

Solution: Since $1000\text{g} = 1\text{kg}$, therefore, $5809\text{g} = \frac{5809}{1000}\text{kg}$
 $= 5.809\text{kg}$.

Example 9: Round off 87.952 to tenths place.

Solution: For rounding off to tenths place, we look at the hundredths place. Here the digit is 5.

So, the digit at the tenths place (9) will be increased by 1 (i.e., it will become $9 + 1$)

Hence, rounding off 87.952 to tenths place, we get 88.0

(Note: Do not write it as 88.)

Example 10: Add the fractions $5\frac{3}{8}$ and $\frac{5}{16}$

$$\begin{aligned} \text{Solution: } 5\frac{3}{8} + \frac{5}{16} &= \frac{43}{8} + \frac{5}{16} \\ &= \frac{43 \times 2}{8 \times 2} + \frac{5}{16} = \frac{86}{16} + \frac{5}{16} \\ &= \frac{86+5}{16} = \frac{91}{16} = 5\frac{11}{16} \end{aligned}$$

Example 11: What should be added to 37.28 to obtain 46.8?

Solution: Here, we want to fill in the box in $37.28 + \square = 46.8$.

For this, We will have to find $46.8 - 37.28$. We perform this operation as follows by writing the two numbers having equal number of decimal places:

(Since $46.8 = 46.80$)

$$\begin{array}{r} 46.80 \\ - 37.28 \\ \hline 9.52 \end{array}$$

Hence, the required number to be added to 37.28 is 9.52.

Example 12: Arrange the following in ascending order.

2.2, 2.023, 2.0226, 22.1, 20.42

Solution: We have to arrange them from the smallest to the greatest number. We arrange them as follows (using the idea of place value and comparing their digits at different places);
2.0226, 2.023, 2.2, 20.42, 22.1

(Note: Using the $<$ sign, these numbers can also be written as $2.0226 < 2.023 < 2.2 < 20.42 < 22.1$.)

Example 13: Gorang purchased 2kg 280g apples, 3kg 375g bananas, 225g grapes and 5kg 385g oranges. Find the total weight of the fruits purchased by Gorang in kg.

Solution: Weight of apples = 2kg 280g = 2280g (Since 1kg = 1000g)

Weight of bananas = 3kg 375g = 3375g

Weight of grapes = 225g

Weight of oranges = 5kg 385g = 5385g

Total weight = 2280g + 3375g + 225g + 5385g

2280g

+ 3375g

+ 225g

+ 5385g

11265g

Thus, total weight = 11265g = $\frac{11265}{1000}$ kg

= 11.265kg i.e. 11kg 265g

Example 14: What is wrong in the following?

$$\frac{7}{4} + \frac{5}{2} = \frac{7+5}{4+2} = \frac{12}{6} = 2$$

Solution: Writing $\frac{7}{4} + \frac{5}{2} = \frac{7+5}{4+2}$ is wrong. It should be as follows:

$$\frac{7}{4} + \frac{5}{2} = \frac{7}{4} + \frac{10}{4} \quad (\text{Converting into like fractions})$$

$$\frac{7+10}{4} = \frac{17}{4} \quad (\text{Only numerators are added})$$

(C) Exercise

In questions 1 to 20, out of the four options, only one answer is correct.

Choose the correct answer.

1. The fraction which is not equal to $\frac{4}{5}$ is

(A) $\frac{40}{50}$

(B) $\frac{12}{15}$

(C) $\frac{16}{20}$

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

2. The two consecutive integers between which the fraction $\frac{5}{7}$ lies are
 (A) 5 and 6 (B) 0 and 1 (C) 5 and 7 (D) 6 and 7
3. When $\frac{1}{4}$ is written with denominator as 12, its numerator is
 (A) 3 (B) 8 (C) 24 (D) 12
4. Which of the following is not in the lowest form?
 (A) $\frac{7}{5}$ (B) $\frac{15}{20}$ (C) $\frac{13}{33}$ (D) $\frac{27}{28}$
5. If $\frac{5}{8} = \frac{20}{p}$, then value of p is
 (A) 23 (B) 2 (C) 32 (D) 16
6. Which of the following is not equal to the others?
 (A) $\frac{6}{8}$ (B) $\frac{12}{16}$ (C) $\frac{15}{25}$ (D) $\frac{18}{24}$
7. Which of the following fractions is the greatest?
 (A) $\frac{5}{7}$ (B) $\frac{5}{6}$ (C) $\frac{5}{9}$ (D) $\frac{5}{8}$
8. Which of the following fractions is the smallest?
 (A) $\frac{7}{8}$ (B) $\frac{9}{8}$ (C) $\frac{3}{8}$ (D) $\frac{5}{8}$
9. Sum of $\frac{4}{17}$ and $\frac{15}{17}$ is
 (A) $\frac{19}{17}$ (B) $\frac{11}{17}$ (C) $\frac{19}{34}$ (D) $\frac{2}{17}$
10. On subtracting $\frac{5}{9}$ from $\frac{19}{9}$, the result is
 (A) $\frac{24}{9}$ (B) $\frac{14}{9}$ (C) $\frac{14}{18}$ (D) $\frac{14}{0}$
11. 0.7499 lies between
 (A) 0.7 and 0.74 (B) 0.75 and 0.79
 (C) 0.749 and 0.75 (D) 0.74992 and 0.75

- 12.** 0.023 lies between
 (A) 0.2 and 0.3 (B) 0.02 and 0.03
 (C) 0.03 and 0.029 (D) 0.026 and 0.024
- 13.** $\frac{11}{7}$ can be expressed in the form
 (A) $7\frac{1}{4}$ (B) $4\frac{1}{7}$ (C) $1\frac{4}{7}$ (D) $11\frac{1}{7}$
- 14.** The mixed fraction $5\frac{4}{7}$ can be expressed as
 (A) $\frac{33}{7}$ (B) $\frac{39}{7}$ (C) $\frac{33}{4}$ (D) $\frac{39}{4}$
- 15.** $0.07 + 0.008$ is equal to
 (A) 0.15 (B) 0.015 (C) 0.078 (D) 0.78
- 16.** Which of the following decimals is the greatest?
 (A) 0.182 (B) 0.0925 (C) 0.29 (D) 0.038
- 17.** Which of the following decimals is the smallest?
 (A) 0.27 (B) 1.5 (C) 0.082 (D) 0.103
- 18.** 13.572 correct to the tenths place is
 (A) 10 (B) 13.57 (C) 14.5 (D) 13.6
- 19.** $15.8 - 6.73$ is equal to
 (A) 8.07 (B) 9.07 (C) 9.13 (D) 9.25
- 20.** The decimal 0.238 is equal to the fraction
 (A) $\frac{119}{500}$ (B) $\frac{238}{25}$ (C) $\frac{119}{25}$ (D) $\frac{119}{50}$

In questions 21 to 44, fill in the blanks to make the statements true:

- 21.** A number representing a part of a _____ is called a fraction.
- 22.** A fraction with denominator greater than the numerator is called a _____ fraction.
- 23.** Fractions with the same denominator are called _____ fractions.
- 24.** $13\frac{5}{18}$ is a _____ fraction.

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25. $\frac{18}{5}$ is an _____ fraction. 26. $\frac{7}{19}$ is a _____ fraction.
27. $\frac{5}{8}$ and $\frac{3}{8}$ are _____ proper fractions.
28. $\frac{6}{11}$ and $\frac{6}{13}$ are _____ proper fractions.
29. The fraction $\frac{6}{15}$ in simplest form is _____.
30. The fraction $\frac{17}{34}$ in simplest form is _____.
31. $\frac{18}{135}$ and $\frac{90}{675}$ are proper, unlike and _____ fractions.
32. $8\frac{2}{7}$ is equal to the improper fraction _____.
33. $\frac{87}{7}$ is equal to the mixed fraction _____.
34. $9 + \frac{2}{10} + \frac{6}{100}$ is equal to the decimal number _____.
35. Decimal 16.25 is equal to the fraction _____.
36. Fraction $\frac{7}{25}$ is equal to the decimal number _____.
37. $\frac{17}{9} + \frac{41}{9} =$ _____.
38. $\frac{67}{14} - \frac{24}{14} =$ _____.
39. $\frac{17}{2} + 3\frac{1}{2} =$ _____.
40. $9\frac{1}{4} - \frac{5}{4} =$ _____.
41. $4.55 + 9.73 =$ _____.
42. $8.76 - 2.68 =$ _____.
43. The value of 50 coins of 50 paise = Rs _____.
44. 3 Hundredths + 3 tenths = _____.

In each of the questions 45 to 65, state whether the statement is true or false:

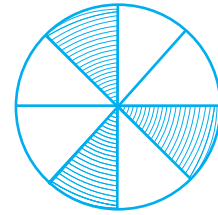
45. Fractions with same numerator are called like fractions.
46. Fraction $\frac{18}{39}$ is in its lowest form.

47. Fractions $\frac{15}{39}$ and $\frac{45}{117}$ are equivalent fractions.
48. The sum of two fractions is always a fraction.
49. The result obtained by subtracting a fraction from another fraction is necessarily a fraction.
50. If a whole or an object is divided into a number of equal parts, then each part represents a fraction.
51. The place value of a digit at the tenths place is 10 times the same digit at the ones place.
52. The place value of a digit at the hundredths place is $\frac{1}{10}$ times the same digit at the tenths place.
53. The decimal 3.725 is equal to 3.72 correct to two decimal places.

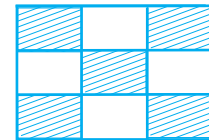
54. In the decimal form, fraction $\frac{25}{8} = 3.125$.

55. The decimal $23.2 = 23\frac{2}{5}$

56. The fraction represented by the shaded portion in the adjoining figure is $\frac{3}{8}$.



57. The fraction represented by the unshaded portion in the adjoining figure is $\frac{5}{9}$.



58. $\frac{25}{19} + \frac{6}{19} = \frac{31}{38}$

59. $\frac{8}{18} - \frac{8}{15} = \frac{8}{3}$

60. $\frac{7}{12} + \frac{11}{12} = \frac{3}{2}$

61. $3.03 + 0.016 = 3.019$

62. $42.28 - 3.19 = 39.09$

63. $\frac{16}{25} > \frac{13}{25}$

64. $19.25 < 19.053$

65. $13.730 = 13.73$

In each of the questions 66 to 71, fill in the blanks using '>', '<' or '=' :

66. $\frac{11}{16} \dots \frac{14}{15}$

67. $\frac{8}{15} \dots \frac{95}{14}$

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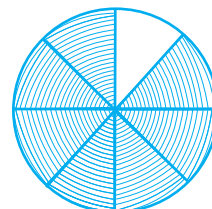
68. $\frac{12}{75} \div \frac{32}{200}$

69. $3.25 \dots 3.4$

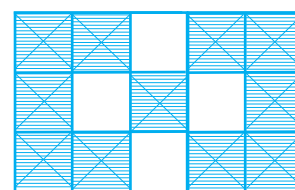
70. $\frac{18}{15} \dots 1.3$

71. $6.25 \dots \frac{25}{4}$

72. Write the fraction represented by the shaded portion of the adjoining figure:



73. Write the fraction represented by the unshaded portion of the adjoining figure:



74. Ali divided one fruit cake equally among six persons. What part of the cake he gave to each person?
75. Arrange 12.142, 12.124, 12.104, 12.401 and 12.214 in ascending order.
76. Write the largest four digit decimal number less than 1 using the digits 1, 5, 3 and 8 once.
77. Using the digits 2, 4, 5 and 3 once, write the smallest four digit decimal number.
78. Express $\frac{11}{20}$ as a decimal.
79. Express $6\frac{2}{3}$ as an improper fraction.
80. Express $3\frac{2}{5}$ as a decimal.
81. Express 0.041 as a fraction.
82. Express 6.03 as a mixed fraction.
83. Convert 5201g to kg.

84. Convert 2009 paise to rupees and express the result as a mixed fraction.
85. Convert 1537cm to m and express the result as an improper fraction.
86. Convert 2435m to km and express the result as mixed fraction.
87. Arrange the fractions $\frac{2}{3}$, $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{5}{6}$ in ascending order.
88. Arrange the fractions $\frac{6}{7}$, $\frac{7}{8}$, $\frac{4}{5}$ and $\frac{3}{4}$ in descending order.
89. Write $\frac{3}{4}$ as a fraction with denominator 44.
90. Write $\frac{5}{6}$ as a fraction with numerator 60.
91. Write $\frac{129}{8}$ as a mixed fraction.
92. Round off 20.83 to nearest tenths.
93. Round off 75.195 to nearest hundredths.
94. Round off 27.981 to nearest tenths.
95. Add the fractions $\frac{3}{8}$ and $\frac{2}{3}$.
96. Add the fractions $\frac{3}{8}$ and $6\frac{3}{4}$.
97. Subtract $\frac{1}{6}$ from $\frac{1}{2}$.
98. Subtract $8\frac{1}{3}$ from $\frac{100}{9}$.
99. Subtract $1\frac{1}{4}$ from $6\frac{1}{2}$.
100. Add $1\frac{1}{4}$ and $6\frac{1}{2}$.
101. Katrina rode her bicycle $6\frac{1}{2}$ km in the morning and $8\frac{3}{4}$ km in the evening. Find the distance travelled by her altogether on that day.

- 102.** A rectangle is divided into certain number of equal parts. If 16 of the parts so formed represent the fraction $\frac{1}{4}$, find the number of parts in which the rectangle has been divided.
- 103.** Grip size of a tennis racquet is $11\frac{9}{80}$ cm. Express the size as an improper fraction.
- 104.** On an average $\frac{1}{10}$ of the food eaten is turned into organism's own body and is available for the next level of consumer in a food chain. What fraction of the food eaten is not available for the next level?
- 105.** Mr. Rajan got a job at the age of 24 years and he got retired from the job at the age of 60 years. What fraction of his age till retirement was he in the job?
- 106.** The food we eat remains in the stomach for a maximum of 4 hours. For what fraction of a day, does it remain there?
- 107.** What should be added to 25.5 to get 50?
- 108.** Alok purchased 1kg 200g potatoes, 250g dhania, 5kg 300g onion, 500g palak and 2kg 600g tomatoes. Find the total weight of his purchases in kilograms.
- 109.** Arrange in ascending order:
0.011, 1.001, 0.101, 0.110
- 110.** Add the following:
20.02 and 2.002
- 111.** It was estimated that because of people switching to Metro trains, about 33000 tonnes of CNG, 3300 tonnes of diesel and 21000 tonnes of petrol was saved by the end of year 2007. Find the fraction of :
(i) the quantity of diesel saved to the quantity of petrol saved.
(ii) the quantity of diesel saved to the quantity of CNG saved.

- 112.** Energy content of different foods are as follows:

Food	Energy Content per kg.
Wheat	3.2 Joules
Rice	5.3 Joules
Potatoes (Cooked)	3.7 Joules
Milk	3.0 Joules

Which food provides the least energy and which provides the maximum?

Express the least energy as a fraction of the maximum energy.

- 113.** A cup is $\frac{1}{3}$ full of milk. What part of the cup is still to be filled by milk to make it full?
- 114.** Mary bought $3\frac{1}{2}$ m of lace. She used $1\frac{3}{4}$ m of lace for her new dress. How much lace is left with her?
- 115.** When Sunita weighed herself on Monday, she found that she had gained $1\frac{1}{4}$ 5kg. Earlier her weight was $46\frac{3}{8}$ kg. What was her weight on Monday?
- 116.** Sunil purchased $12\frac{1}{2}$ litres of juice on Monday and $14\frac{3}{4}$ litres of juice on Tuesday. How many litres of juice did he purchase together in two days?
- 117.** Nazima gave $2\frac{3}{4}$ litres out of the $5\frac{1}{2}$ litres of juice she purchased to her friends. How many litres of juice is left with her?
- 118.** Roma gave a wooden board of length $150\frac{1}{4}$ cm to a carpenter for making a shelf. The Carpenter sawed off a piece of $40\frac{1}{5}$ cm from it. What is the length of the remaining piece?

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- 119.** Nasir travelled $3\frac{1}{2}$ km in a bus and then walked $1\frac{1}{8}$ km to reach a town. How much did he travel to reach the town?
- 120.** The fish caught by Neetu was of weight $3\frac{3}{4}$ kg and the fish caught by Narendra was of weight $2\frac{1}{2}$ kg. How much more did Neetu's fish weigh than that of Narendra?
- 121.** Neelam's father needs $1\frac{3}{4}$ m of cloth for the skirt of Neelam's new dress and $\frac{1}{2}$ m for the scarf. How much cloth must he buy in all?
- 122.** What is wrong in the following additions?

(a)

$$\begin{array}{r} 8\frac{1}{2} = 8\frac{2}{4} \\ + 4\frac{1}{4} = 4\frac{1}{4} \\ \hline = 12\frac{3}{8} \end{array}$$


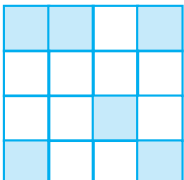
(b)


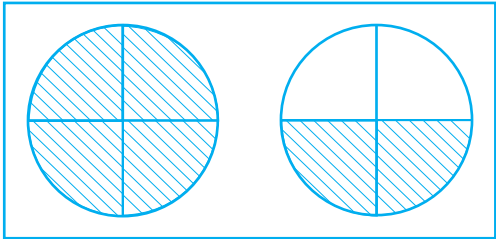

$$\begin{array}{r} 6\frac{1}{2} \\ + 2\frac{1}{4} \\ \hline = 8\frac{2}{6} = 8\frac{1}{3} \end{array}$$

- 123.** Which one is greater?

1 metre 40 centimetres + 60 centimetres or 2.6 metres.

- 124.** Match the fractions of Column I with the shaded or marked portion of figures of Column II:

Column I	Column II
(i) $\frac{6}{4}$	(A) 
(ii) $\frac{6}{10}$	(B) 

(iii) $\frac{6}{6}$	(C) 
(iv) $\frac{6}{16}$	(D) 
	(E) 

- 125.** Find the fraction that represents the number of natural numbers to total numbers in the collection 0, 1, 2, 3, 4, 5. What fraction will it be for whole numbers?
- 126.** Write the fraction representing the total number of natural numbers in the collection of numbers -3, -2, -1, 0, 1, 2, 3. What fraction will it be for whole numbers? What fraction will it be for integers?
- 127.** Write a pair of fractions whose sum is $\frac{7}{11}$ and difference is $\frac{2}{11}$.
- 128.** What fraction of a straight angle is a right angle?
- 129.** Put the right card in the right bag.

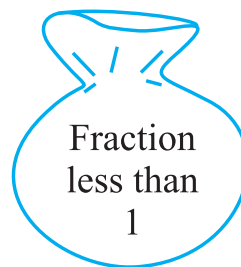
Cards

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

(ii) $\frac{4}{4}$

Bags

Bag I



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(iii) $\frac{9}{8}$

(iv) $\frac{8}{9}$

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

(vi) $\frac{6}{11}$

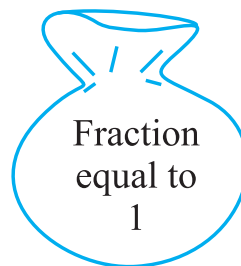
(vii) $\frac{18}{18}$

(viii) $\frac{19}{25}$

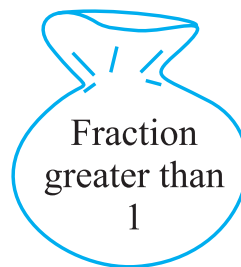
(ix) $\frac{2}{3}$

(x) $\frac{13}{17}$

Bag II



Bag III



(D) Activities

Activity: Find the number of boys and girls in your school and write:

- (i) The fraction representing boys among the total students
- (ii) The fraction representing girls among the total students
- (iii) check that the sum of two fractions in (i) and (ii) is 1.