

CHAPTER

2

VII-MATHEMATICS-NCERT

2. Fractions and Decimals (notes)

<https://sureshmathsmaterial.com/>

- Fraction:** A fraction is a number representing a part of a whole. The whole may be a single object or a group of objects
- $\frac{5}{12}$ is a fraction. Here 5 is called the numerator and 12 is called the denominator
- Proper Fraction:** In a fraction, the numerator is less than the denominator is called proper fraction.

Ex: $\frac{2}{5}, \frac{3}{11}, \frac{5}{21}, \dots$

- Improper Fraction:** The fractions, where the numerator is bigger than the denominator are called improper fractions.

Ex: $\frac{7}{5}, \frac{13}{11}, \frac{35}{21}, \dots$

- Mixed Fractions:** Mixed fraction has a combination of a whole and a part.

- The mixed fraction will be written as **Quotient** $\frac{\text{Remainder}}{\text{Divisor}}$

Ex: $3\frac{2}{5}, 1\frac{3}{11}, 2\frac{5}{21}, \dots$

- We can express a mixed fraction as an improper fraction as $\frac{(\text{Whole} \times \text{Denominator}) + \text{Numerator}}{\text{Denominator}}$

Ex: $3\frac{2}{5} = \frac{(3 \times 5) + 2}{5} = \frac{17}{5}$
 $1\frac{3}{11} = \frac{(1 \times 11) + 3}{11} = \frac{14}{11}$
 $2\frac{5}{21} = \frac{(2 \times 21) + 5}{21} = \frac{47}{21}$

- If we multiply (or divide) the numerator and the denominator of the given fraction with same number we get an equivalent fraction.

Ex: (i) $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{10}{15} = \dots$
(ii) $\frac{3}{7} = \frac{6}{14} = \frac{9}{21} = \frac{15}{35} = \dots$

- A fraction is said to be in the simplest (or lowest) form if its numerator and denominator have no common factor except 1.

- Like fractions:** Fractions with same denominators are called like fractions.

Ex: $\frac{3}{5}, \frac{1}{5}, \frac{11}{5}, \dots$

- Unlike fractions:** Fractions with different denominators are called unlike fractions.

Ex: $\frac{3}{5}, \frac{5}{7}, \frac{2}{11}, \dots$

- For two fractions with the same denominator, the fraction with the greater numerator is greater

Ex: $\frac{7}{5} > \frac{4}{5}, \quad \frac{11}{23} > \frac{10}{23}$

- If the numerator is the same in two fractions, the fraction with the smaller denominator is greater of the two.

Ex: $\frac{7}{15} > \frac{7}{27}, \quad \frac{11}{23} > \frac{11}{29}$

14. Addition and subtraction of like fractions:

$$\frac{x}{a} + \frac{y}{a} = \frac{x+y}{a} \quad \text{and} \quad \frac{x}{a} - \frac{y}{a} = \frac{x-y}{a}$$

$$\text{Ex: (i) } \frac{3}{7} + \frac{2}{7} = \frac{3+2}{7} = \frac{5}{7}$$

$$\text{(ii) } \frac{23}{35} - \frac{9}{35} = \frac{23-9}{35} = \frac{14}{35}$$

$$\text{(iii) } 5\frac{2}{9} + 2\frac{5}{9} = \frac{47}{9} + \frac{23}{9} = \frac{47+23}{9} = \frac{70}{9} = 7\frac{7}{9}$$

15. Addition and subtraction of unlike fractions

$$\frac{x}{a} + \frac{y}{b} = \frac{x \times b + y \times a}{a \times b} \quad \text{and} \quad \frac{x}{a} - \frac{y}{b} = \frac{x \times b - y \times a}{a \times b}$$

$$\text{Ex: } \frac{2}{3} + \frac{1}{4} = \frac{2 \times 4 + 1 \times 3}{3 \times 4} = \frac{8+3}{12} = \frac{11}{12}$$

Multiplication of a Fraction by a Whole Number:

To multiply a whole number with a proper or an improper fraction, we multiply the whole number with the numerator of the fraction, keeping the denominator same.

$$\text{Ex: (i) } 2 \times \frac{5}{3} = \frac{2 \times 5}{3} = \frac{10}{3}$$

$$\text{(ii) } \frac{7}{5} \times 4 = \frac{7 \times 4}{5} = \frac{28}{5}$$

TRY THESE**1. Find the product. If the product is an improper fraction express it as a mixed fraction.**

$$\text{(a) } \frac{2}{7} \times 3 = \frac{2 \times 3}{7} = \frac{6}{7}$$

$$\text{(b) } \frac{9}{7} \times 6 = \frac{9 \times 6}{7} = \frac{54}{7} = 7\frac{5}{7}$$

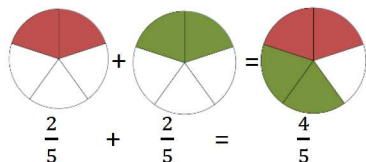
$$\text{(c) } 3 \times \frac{1}{8} = \frac{3 \times 1}{8} = \frac{3}{8}$$

$$\text{(d) } \frac{13}{11} \times 6 = \frac{13 \times 6}{11} = \frac{78}{11} = 7\frac{1}{11}$$

$$\begin{array}{r} 7 \\ 7 \overline{)54} \\ \underline{(-)49} \\ 5 \end{array} \quad \begin{array}{r} 7 \\ 11 \overline{)78} \\ \underline{(-)77} \\ 1 \end{array}$$

2. Represent pictorially : $2 \times \frac{2}{5} = \frac{4}{5}$

$$\text{Sol: } 2 \times \frac{2}{5} = \frac{2}{5} + \frac{2}{5} = \frac{4}{5}$$

**Multiplication of a Mixed Fraction by a Whole Number:**

To multiply a mixed fraction to a whole number, first convert the mixed fraction to an improper fraction and then multiply.

Ex: (i) $3 \times 2\frac{5}{7} = 3 \times \frac{19}{7} = \frac{3 \times 19}{7} = \frac{57}{7} = 8\frac{1}{7}$

(ii) $2 \times 4\frac{2}{5} = 2 \times \frac{22}{5} = \frac{44}{5} = 8\frac{4}{5}$

TRY THESE

(i) $5 \times 2\frac{3}{7} = 5 \times \frac{17}{7} = \frac{5 \times 17}{7} = \frac{85}{7} = 12\frac{1}{7}$

(ii) $1\frac{4}{9} \times 6 = \frac{13}{9} \times 6 = \frac{13 \times 6}{9} = \frac{78}{9} = 8\frac{6}{9} = 8\frac{2}{3}$

Fraction as an operator 'of' : 'of' represents multiplication

Ex: $\frac{1}{2}$ of 3 = $\frac{1}{2} \times 3 = \frac{3}{2} = 1\frac{1}{2}$

TRY THESE

(i) $\frac{1}{2}$ of 10 = $\frac{1}{2} \times 10 = \frac{1 \times 10}{2} = \frac{10}{2} = 5$

(ii) $\frac{1}{4}$ of 16 = $\frac{1}{4} \times 16 = \frac{1 \times 16}{4} = \frac{16}{4} = 4$

(iii) $\frac{2}{5}$ of 25 = $\frac{2}{5} \times 25 = \frac{2 \times 25}{5} = \frac{50}{5} = 10$

Exp 1: In a class of 40 students $\frac{1}{5}$ of the total number of students like to study English, $\frac{2}{5}$ of the total number like to study Mathematics and the remaining students like to study Science. (i) How many students like to study English? (ii) How many students like to study Mathematics? (iii) What fraction of the total number of students likes to study Science?

Sol: Total number of students = 40.

(i) Number of students like to study English = $\frac{1}{5}$ of 40 = $\frac{1}{5} \times 40 = \frac{40}{5} = 8$

(ii) Number of students like to study Mathematics = $\frac{2}{5}$ of 40 = $\frac{2}{5} \times 40 = \frac{80}{5} = 16$

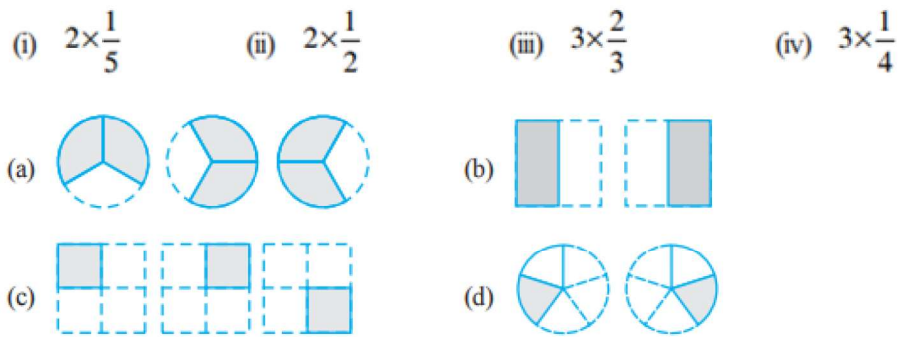
(iii) The number of students who like English and Mathematics = $8 + 16 = 24$

The number of students who like Science = $40 - 24 = 16$.

Thus, the required fraction is $\frac{16}{40} = \frac{2}{5}$

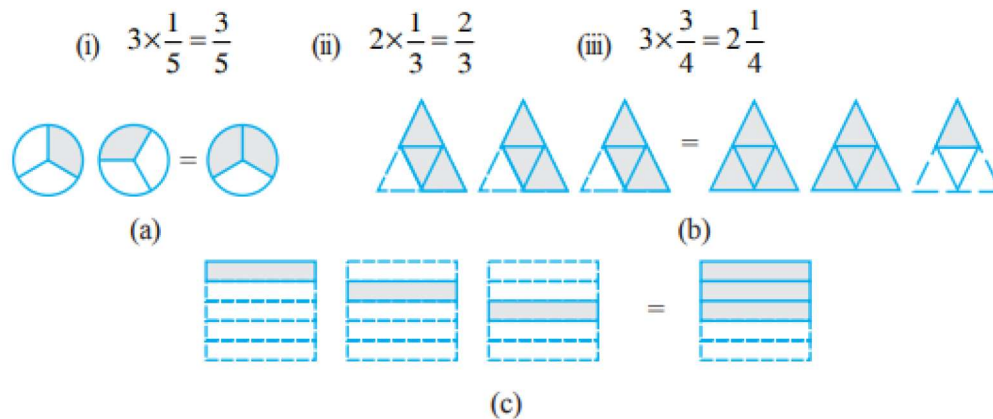
EXERCISE 2.1

1. Which of the drawings (a) to (d) show :



Sol: (i) – (d) (ii) – (b) (iii) – (a) (iv) – (c)

2. Some pictures (a) to (c) are given below. Tell which of them show:



Sol: (i) – (c) , (ii) – (a) , (iii) – (b)

3. Multiply and reduce to lowest form and convert into a mixed fraction:

Sol: $a \times \frac{b}{c} = \frac{a \times b}{c}$

(i) $7 \times \frac{3}{5} = \frac{21}{5} = 4 \frac{1}{5}$

(ii) $4 \times \frac{1}{3} = \frac{4}{3} = 1 \frac{1}{3}$

(iii) $2 \times \frac{6}{7} = \frac{12}{7} = 1 \frac{5}{7}$

(iv) $5 \times \frac{2}{9} = \frac{10}{9} = 1 \frac{1}{9}$

(v) $\frac{2}{3} \times 4 = \frac{8}{3} = 2 \frac{2}{3}$

(vi) $\frac{5}{2} \times 6 = \frac{30}{2} = 15$

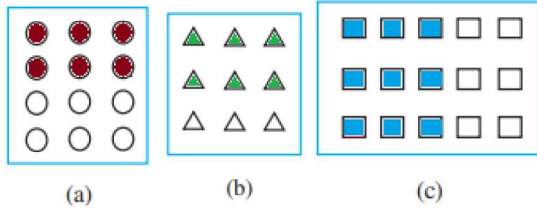
(vii) $11 \times \frac{4}{7} = \frac{44}{7} = 6 \frac{2}{7}$

(viii) $20 \times \frac{4}{5} = \frac{80}{5} = 16$

(ix) $13 \times \frac{1}{3} = \frac{13}{3} = 4 \frac{1}{3}$

(x) $15 \times \frac{3}{5} = \frac{45}{5} = 9$

4. Shade: (i) $\frac{1}{2}$ of the circles in box (a) (ii) $\frac{2}{3}$ of the triangles in box (b)
(iii) $\frac{3}{5}$ of the squares in box (c)



5. Find:

$$(i) \frac{1}{2} \text{ of } 24 = \frac{1}{2} \times 24 = \frac{24}{2} = 12$$

$$(ii) \frac{1}{2} \text{ of } 46 = \frac{1}{2} \times 46 = \frac{46}{2} = 23$$

$$(i) \frac{2}{3} \text{ of } 18 = \frac{2}{3} \times 18 = \frac{2 \times 18}{3} = 2 \times 6 = 12$$

6. Multiply and express as a mixed fraction :

$$(a) 3 \times 5\frac{1}{5} = 3 \times \frac{26}{5} = \frac{3 \times 26}{5} = \frac{78}{5} = 15\frac{3}{5}$$

$$(b) 5 \times 6\frac{3}{4} = 5 \times \frac{27}{4} = \frac{5 \times 27}{4} = \frac{135}{4} = 33\frac{3}{4}$$

$$(c) 7 \times 2\frac{1}{4} = 7 \times \frac{9}{4} = \frac{7 \times 9}{4} = \frac{63}{4} = 15\frac{3}{4}$$

$$(d) 4 \times 6\frac{1}{3} = 4 \times \frac{19}{3} = \frac{4 \times 19}{3} = \frac{76}{3} = 25\frac{1}{3}$$

$$(e) 3\frac{1}{4} \times 6 = \frac{13}{4} \times 6 = \frac{13 \times 6}{4} = \frac{39}{2} = 19\frac{1}{2}$$

$$(f) 3\frac{2}{5} \times 8 = \frac{17}{5} \times 8 = \frac{17 \times 8}{5} = \frac{136}{5} = 27\frac{1}{5}$$

7. Find:

$$(a) (i) \frac{1}{2} \text{ of } 2\frac{3}{4} = \frac{1}{2} \times \frac{11}{4} = \frac{1 \times 11}{2 \times 4} = \frac{11}{8} = 1\frac{3}{8}$$

$$(ii) \frac{1}{2} \text{ of } 4\frac{2}{9} = \frac{1}{2} \times \frac{38}{9} = \frac{1 \times 38}{2 \times 9} = \frac{38}{18} = \frac{19}{9} = 2\frac{1}{9}$$

$$(b)(i) \frac{5}{8} \text{ of } 3\frac{5}{6} = \frac{5}{8} \times \frac{23}{6} = \frac{5 \times 23}{8 \times 6} = \frac{115}{48} = 2\frac{19}{48}$$

$$(ii) \frac{5}{8} \text{ of } 9\frac{2}{3} = \frac{5}{8} \times \frac{29}{3} = \frac{5 \times 29}{8 \times 3} = \frac{145}{24} = 6\frac{1}{24}$$

8. Vidya and Pratap went for a picnic. Their mother gave them a water bottle that contained 5 litres of water. Vidya consumed $\frac{2}{5}$ of the water. Pratap consumed the remaining water. (i) How much water did Vidya drink? (ii) What fraction of the total quantity of water did Pratap drink?

Sol: Total water = 5 litres

(i) Water drank by Vidya = $\frac{2}{5}$ of 5 litres = $\frac{2}{5} \times 5$ litres = $\frac{10}{5} = 2$ litres

(ii) Water drank by Pratap = $5 - 2 = 3$ litres

Fraction of water drank by Pratap = $\frac{3}{5}$

Multiplication of a Fraction by a Fraction:

$$\text{Fraction} \times \text{Fraction} = \frac{\text{Product of numerators}}{\text{Product of Denominators}}; \quad \frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$$

(i) $\frac{1}{2} \times \frac{1}{7} = \frac{1 \times 1}{2 \times 7} = \frac{1}{14}$

(iii) $\frac{1}{7} \times \frac{1}{2} = \frac{1 \times 1}{7 \times 2} = \frac{1}{14}$

(ii) $\frac{1}{5} \times \frac{1}{7} = \frac{1 \times 1}{5 \times 7} = \frac{1}{35}$

(vi) $\frac{1}{7} \times \frac{1}{5} = \frac{1 \times 1}{7 \times 5} = \frac{1}{35}$

Exp 2: Sushant reads $\frac{1}{3}$ part of a book in 1 hour. How much part of the book will he read in $2\frac{1}{5}$ hours?

Sol: The part of the book read by Sushant in 1 hour = $\frac{1}{3}$.

The part of the book read by Sushant in $2\frac{1}{5}$ hour = $2\frac{1}{5} \times \frac{1}{3} = \frac{11}{5} \times \frac{1}{3} = \frac{11 \times 1}{5 \times 3} = \frac{11}{15}$

TRY THESE

(i) $\frac{1}{3} \times \frac{4}{5} = \frac{1 \times 4}{3 \times 5} = \frac{4}{15}$ (ii) $\frac{2}{3} \times \frac{1}{5} = \frac{2 \times 1}{3 \times 5} = \frac{2}{15}$

(iii) $\frac{8}{3} \times \frac{4}{7} = \frac{8 \times 4}{3 \times 7} = \frac{32}{21}$ (vi) $\frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} = \frac{1}{2}$

Value of the Products:

For fractions $\frac{a}{b}, \frac{x}{y}$ (i) If $ay < bx$ then $\frac{a}{b} < \frac{x}{y}$ and (ii) If $ay > bx$ then $\frac{a}{b} > \frac{x}{y}$

$\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$	$\frac{8}{15} < \frac{2}{5}, \frac{8}{15} < \frac{4}{5}$	Product is less than each of the fractions
$\frac{1}{5} \times \frac{2}{7} = \frac{2}{35}$	$\frac{2}{35} < \frac{1}{5}, \frac{2}{35} < \frac{2}{7}$	Product is less than each of the fractions
$\frac{3}{5} \times \frac{7}{8} = \frac{21}{40}$	$\frac{21}{40} < \frac{3}{5}, \frac{21}{40} < \frac{7}{8}$	Product is less than each of the fractions

$\frac{2}{5} \times \frac{4}{9} = \frac{8}{45}$	$\frac{8}{45} < \frac{2}{5}, \frac{8}{45} < \frac{4}{9}$	Product is less than each of the fractions
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The value of the product of two proper fractions is smaller than each of the two fractions.

$\frac{7}{3} \times \frac{5}{2} = \frac{35}{6}$	$\frac{35}{6} > \frac{7}{3}, \frac{35}{6} > \frac{5}{2}$	Product is greater than each of the fractions
$\frac{6}{5} \times \frac{4}{3} = \frac{24}{15}$	$\frac{24}{15} > \frac{6}{5}, \frac{24}{15} > \frac{4}{3}$	Product is greater than each of the fractions
$\frac{9}{2} \times \frac{7}{4} = \frac{63}{8}$	$\frac{63}{8} > \frac{9}{2}, \frac{63}{8} > \frac{7}{4}$	Product is greater than each of the fractions
$\frac{3}{2} \times \frac{8}{7} = \frac{24}{14}$	$\frac{24}{14} > \frac{3}{2}, \frac{24}{14} > \frac{8}{7}$	Product is greater than each of the fractions

The value of the product of two improper fractions is more than each of the two fractions.

$\frac{2}{3} \times \frac{7}{5} = \frac{14}{15}$	$\frac{14}{15} > \frac{2}{3}, \frac{14}{15} < \frac{7}{5}$	Product is greater than proper fraction and less than improper fraction.
$\frac{6}{5} \times \frac{2}{8} = \frac{12}{40} = \frac{3}{10}$	$\frac{3}{10} < \frac{6}{5}, \frac{3}{10} > \frac{2}{8}$	
$\frac{8}{3} \times \frac{4}{5} = \frac{32}{15}$	$\frac{32}{15} < \frac{8}{3}, \frac{32}{15} > \frac{4}{5}$	

The value of the product of proper and improper fraction is less than proper fraction and greater than improper fraction.

EXERCISE-2.2

1. Find

$$(a) \frac{1}{4} \text{ of } \frac{1}{4} = \frac{1}{4} \times \frac{1}{4} = \frac{1 \times 1}{4 \times 4} = \frac{1}{16}$$

$$(b) \frac{1}{4} \text{ of } \frac{3}{5} = \frac{1}{4} \times \frac{3}{5} = \frac{1 \times 3}{4 \times 5} = \frac{3}{20}$$

$$(c) \frac{1}{4} \text{ of } \frac{4}{3} = \frac{1}{4} \times \frac{4}{3} = \frac{1 \times 4}{4 \times 3} = \frac{4}{12}$$

$$(a) \frac{1}{7} \text{ of } \frac{2}{9} = \frac{1}{7} \times \frac{2}{9} = \frac{1 \times 2}{7 \times 9} = \frac{2}{63}$$

$$(b) \frac{1}{7} \text{ of } \frac{6}{5} = \frac{1}{7} \times \frac{6}{5} = \frac{1 \times 6}{7 \times 5} = \frac{6}{35}$$

$$(c) \frac{1}{7} \text{ of } \frac{3}{10} = \frac{1}{7} \times \frac{3}{10} = \frac{1 \times 3}{7 \times 10} = \frac{3}{70}$$

2. Multiply and reduce to lowest form (if possible) :

$$(i) \frac{2}{3} \times \frac{2}{3} = \frac{2}{3} \times \frac{2}{3} = \frac{2 \times 2}{3 \times 3} = \frac{4}{9}$$

$$(ii) \frac{2}{7} \times \frac{7}{9} = \frac{2 \times 7}{7 \times 9} = \frac{2}{9}$$

$$(iii) \frac{3}{8} \times \frac{6}{4} = \frac{3 \times 6}{8 \times 4} = \frac{18}{32} = \frac{9}{16}$$

$$(iv) \frac{9}{5} \times \frac{3}{5} = \frac{9 \times 3}{5 \times 5} = \frac{27}{25}$$

$$(v) \frac{1}{3} \times \frac{15}{8} = \frac{1 \times 15}{3 \times 8} = \frac{15}{24} = \frac{5}{8}$$

$$(vi) \frac{11}{2} \times \frac{3}{10} = \frac{11 \times 3}{2 \times 10} = \frac{33}{20}$$

$$(vii) \frac{4}{5} \times \frac{12}{7} = \frac{4 \times 12}{5 \times 7} = \frac{48}{35}$$

3. Multiply the following fractions:

$$(i) \frac{2}{5} \times \frac{1}{4} = \frac{2}{5} \times \frac{21}{4} = \frac{2 \times 21}{5 \times 4} = \frac{21}{10}$$

$$(ii) \frac{6}{5} \times \frac{7}{9} = \frac{32}{5} \times \frac{7}{9} = \frac{32 \times 7}{5 \times 9} = \frac{224}{45}$$

$$(iii) \frac{3}{2} \times \frac{1}{3} = \frac{3}{2} \times \frac{16}{3} = \frac{3 \times 16}{2 \times 3} = \frac{8}{1} = 8$$

$$(iv) \frac{5}{6} \times \frac{3}{7} = \frac{5}{6} \times \frac{17}{7} = \frac{5 \times 17}{6 \times 7} = \frac{85}{42}$$

$$(v) \frac{3}{5} \times \frac{4}{7} = \frac{17}{5} \times \frac{4}{7} = \frac{17 \times 4}{5 \times 7} = \frac{68}{35}$$

$$(vi) \frac{2}{5} \times \frac{3}{1} = \frac{13}{5} \times \frac{3}{1} = \frac{13 \times 3}{5 \times 1} = \frac{39}{5}$$

$$(vii) \frac{3}{7} \times \frac{3}{5} = \frac{25}{7} \times \frac{3}{5} = \frac{25 \times 3}{7 \times 5} = \frac{15}{7}$$

4. Which is greater:

$$(i) \frac{2}{7} \text{ of } \frac{3}{4} = \frac{2}{7} \times \frac{3}{4} = \frac{2 \times 3}{7 \times 4} = \frac{3}{14}$$

$$\frac{3}{5} \text{ of } \frac{5}{8} = \frac{3}{5} \times \frac{5}{8} = \frac{3 \times 5}{5 \times 8} = \frac{3}{8}$$

$$\frac{3}{8} > \frac{3}{14} \Rightarrow \frac{3}{5} \text{ of } \frac{5}{8} \text{ is greater}$$

$$(ii) \frac{1}{2} \text{ of } \frac{6}{7} = \frac{1}{2} \times \frac{6}{7} = \frac{1 \times 6}{2 \times 7} = \frac{3}{7}$$

$$\frac{2}{3} \text{ of } \frac{3}{7} = \frac{2}{3} \times \frac{3}{7} = \frac{2 \times 3}{3 \times 7} = \frac{2}{7}$$

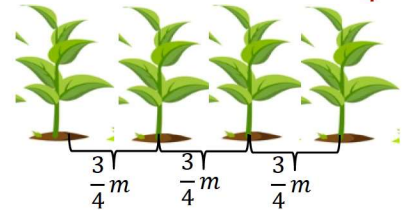
$$\frac{3}{7} > \frac{2}{7} \Rightarrow \frac{1}{2} \text{ of } \frac{6}{7} \text{ is greater}$$

5. Saili plants 4 saplings, in a row, in her garden. The distance between two adjacent saplings is $\frac{3}{4}$ m. Find the distance between the first and the last sapling.

Sol: The distance between two adjacent saplings = $\frac{3}{4}$ m

Total number of saplings = 4

The distance between the first and the last sapling = $3 \times \frac{3}{4} \text{ m} = \frac{9}{4} \text{ m} = 2\frac{1}{4} \text{ m}$



6. Lipika reads a book for $1\frac{3}{4}$ hours everyday. She reads the entire book in 6 days. How many hours in all were required by her to read the book?

Sol: Lipika reads a book in 1 day = $1\frac{3}{4} \text{ h} = \frac{7}{4} \text{ h}$

Total days = 6

Total hours taken by Lipika to read the book = $6 \times \frac{7}{4} = \frac{6 \times 7}{4} = \frac{21}{2} = 10\frac{1}{2} \text{ hours}$

7. A car runs 16 km using 1 litre of petrol. How much distance will it cover using $2\frac{3}{4}$ litres of petrol.

Sol: Car covers the distance using 1 litre of petrol = 16 km

Car covers the distance using $2\frac{3}{4}$ litres of petrol $= 2\frac{3}{4} \times 16 \text{ km} = \frac{11}{4} \times 16 = 11 \times 4 = 44 \text{ km}$

8. (a) (i) Provide the number in the box \square , such that $\frac{2}{3} \times \square = \frac{10}{30}$
 (ii) The simplest form of the number obtained in \square is _____

Sol: $\frac{2}{3} \times \frac{5}{10} = \frac{2 \times 5}{3 \times 10} = \frac{10}{30} = \frac{1}{3}$

- (b) (i) Provide the number in the box \square , such that $\frac{3}{5} \times \square = \frac{24}{75}$
 (ii) The simplest form of the number obtained in \square is _____

Sol: $\frac{3}{5} \times \frac{8}{15} = \frac{3 \times 8}{5 \times 15} = \frac{24}{75} = \frac{8}{25}$

Reciprocal of a fraction:

If the product of two numbers is 1, then they are called the reciprocals of each other.

Swap over the Numerator and Denominator we get reciprocal of the fraction.

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

The reciprocal of $\frac{a}{b} = \frac{b}{a}$

THINK, DISCUSS AND WRITE

- (i) Will the reciprocal of a proper fraction be again a proper fraction?

Sol: No, The reciprocal of a proper fraction is always an improper fraction.

$\frac{2}{7}$ is a proper fraction. Reciprocal of $\frac{2}{7}$ is $\frac{7}{2}$ an improper fraction.

- (ii) Will the reciprocal of an improper fraction be again an improper fraction?

Sol: No, The reciprocal of a proper fraction is always an improper fraction

$\frac{9}{5}$ is an improper fraction. Reciprocal of $\frac{9}{5} = \frac{5}{9}$ is a proper fraction

DIVISION OF FRACTIONS

To divide a whole number by any fraction, multiply that whole number by the reciprocal of that fraction.

Note: Reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$

(i) $7 \div \frac{2}{5} = 7 \times \frac{5}{2} = \frac{7 \times 5}{2} = \frac{35}{2} = 17\frac{1}{2}$

$$(ii) \quad 6 \div \frac{4}{7} = 6 \times \frac{7}{4} = \frac{6 \times 7}{4} = \frac{21}{2} = 10 \frac{1}{2}$$

$$(iii) \quad 2 \div \frac{8}{9} = 2 \times \frac{9}{8} = \frac{2 \times 9}{8} = \frac{9}{4} = 2 \frac{1}{4}$$

While dividing a whole number by a mixed fraction, first convert the mixed fraction into improper fraction and then solve it.

$$(i) \quad 4 \div 2 \frac{2}{15} = 4 \div \frac{12}{5} = 4 \times \frac{5}{12} = \frac{4 \times 5}{12} = \frac{5}{3} = 1 \frac{2}{3}$$

$$(ii) \quad 5 \div 3 \frac{1}{3} = 5 \div \frac{10}{3} = 5 \times \frac{3}{10} = \frac{5 \times 3}{10} = \frac{3}{2} = 1 \frac{1}{2}$$

$$(iii) \quad 6 \div 5 \frac{1}{43} = 6 \div \frac{16}{3} = 6 \times \frac{3}{16} = \frac{6 \times 3}{16} = \frac{9}{8} = 1 \frac{1}{8}$$

$$(vi) \quad 7 \div 2 \frac{4}{7} = 7 \div \frac{18}{7} = 7 \times \frac{7}{18} = \frac{7 \times 7}{18} = \frac{49}{18} = 2 \frac{13}{18}$$

Division of a Fraction by a Whole Number or another fraction

$$(i) \quad \frac{3}{4} \div 3 = \frac{3}{4} \div \frac{3}{1} = \frac{3}{4} \times \frac{1}{3} = \frac{3 \times 1}{4 \times 3} = \frac{1}{4}$$

$$(ii) \quad 2 \frac{2}{3} \div 5 = \frac{8}{3} \div \frac{5}{1} = \frac{8}{3} \times \frac{1}{5} = \frac{8 \times 1}{3 \times 5} = \frac{8}{15}$$

$$(iii) \quad \frac{1}{3} \div \frac{6}{5} = \frac{1}{3} \times \frac{5}{6} = \frac{1 \times 5}{3 \times 6} = \frac{5}{18}$$

$$(iv) \quad \frac{8}{5} \div \frac{2}{3} = \frac{8}{5} \times \frac{3}{2} = \frac{8 \times 3}{5 \times 2} = \frac{12}{5} = 2 \frac{2}{5}$$

$$(vi) \quad \frac{3}{5} \div \frac{1}{2} = \frac{3}{5} \times \frac{2}{1} = \frac{3 \times 2}{5 \times 1} = \frac{6}{5} = 1 \frac{1}{5}$$

$$(vii) \quad \frac{1}{2} \div \frac{3}{5} = \frac{1}{2} \times \frac{5}{3} = \frac{1 \times 5}{2 \times 3} = \frac{5}{6}$$

$$(viii) \quad 2 \frac{1}{2} \div \frac{3}{5} = \frac{5}{2} \div \frac{3}{5} = \frac{5}{2} \times \frac{5}{3} = \frac{5 \times 5}{2 \times 3} = \frac{25}{6} = 4 \frac{1}{6}$$

$$(ix) \quad 5 \frac{1}{6} \div \frac{9}{2} = \frac{31}{6} \div \frac{9}{2} = \frac{31}{6} \times \frac{2}{9} = \frac{31 \times 2}{6 \times 9} = \frac{31}{27} = 1 \frac{4}{27}$$

EXERCISE 2.3

1. Find

$$(i) \quad 12 \div \frac{3}{4} = \frac{12}{1} \div \frac{3}{4} = \frac{12}{1} \times \frac{4}{3} = \frac{12 \times 4}{1 \times 3} = \frac{16}{1} = 16$$

$$(ii) \quad 14 \div \frac{5}{6} = \frac{14}{1} \div \frac{5}{6} = \frac{14}{1} \times \frac{6}{5} = \frac{14 \times 6}{1 \times 5} = \frac{84}{5} = 16 \frac{4}{5}$$

$$(iii) \quad 8 \div \frac{7}{3} = \frac{8}{1} \div \frac{7}{3} = \frac{8}{1} \times \frac{3}{7} = \frac{8 \times 3}{1 \times 7} = \frac{24}{7} = 3\frac{3}{7}$$

$$(iv) \quad 4 \div \frac{8}{3} = \frac{4}{1} \div \frac{8}{3} = \frac{4}{1} \times \frac{3}{8} = \frac{4 \times 3}{1 \times 8} = \frac{3}{2} = 1\frac{1}{2}$$

$$(v) \quad 3 \div 2\frac{1}{3} = \frac{3}{1} \div \frac{7}{3} = \frac{3}{1} \times \frac{3}{7} = \frac{3 \times 3}{1 \times 7} = \frac{9}{7} = 1\frac{2}{7}$$

$$(vi) \quad 5 \div 3\frac{4}{7} = \frac{5}{1} \div \frac{25}{7} = \frac{5}{1} \times \frac{7}{25} = \frac{5 \times 7}{1 \times 25} = \frac{7}{5} = 1\frac{2}{5}$$

2. Find the reciprocal of each of the following fractions. Classify the reciprocals as proper fractions, improper fractions and whole numbers.

Sol: (i) Reciprocal of $\frac{3}{7} = \frac{7}{3} \rightarrow$ Improper fraction

(ii) Reciprocal of $\frac{5}{8} = \frac{8}{5} \rightarrow$ Improper fraction

(iii) Reciprocal of $\frac{9}{7} = \frac{7}{9} \rightarrow$ Proper fraction

(iv) Reciprocal of $\frac{6}{5} = \frac{5}{6} \rightarrow$ Proper fraction

(v) Reciprocal of $\frac{12}{7} = \frac{7}{12} \rightarrow$ Proper fraction

(vi) Reciprocal of $\frac{1}{8} = 8 \rightarrow$ Whole number

(vii) Reciprocal of $\frac{1}{11} = 11 \rightarrow$ Whole number

3. Find:

$$(i) \quad \frac{7}{3} \div 2 = \frac{7}{3} \div \frac{2}{1} = \frac{7}{3} \times \frac{1}{2} = \frac{7 \times 1}{3 \times 2} = \frac{7}{6} = 1\frac{1}{6}$$

$$(ii) \quad \frac{4}{9} \div 5 = \frac{4}{9} \div \frac{5}{1} = \frac{4}{9} \times \frac{1}{5} = \frac{4 \times 1}{9 \times 5} = \frac{4}{45}$$

$$(iii) \quad \frac{6}{13} \div 7 = \frac{6}{13} \div \frac{7}{1} = \frac{6}{13} \times \frac{1}{7} = \frac{6 \times 1}{13 \times 7} = \frac{6}{91}$$

$$(iv) \quad 4\frac{1}{3} \div 3 = \frac{13}{3} \div \frac{3}{1} = \frac{13}{3} \times \frac{1}{3} = \frac{13 \times 1}{3 \times 3} = \frac{13}{9}$$

$$(v) \quad 3\frac{1}{2} \div 4 = \frac{7}{2} \div \frac{4}{1} = \frac{7}{2} \times \frac{1}{4} = \frac{7 \times 1}{2 \times 4} = \frac{7}{8}$$

$$(vi) \quad 4\frac{3}{7} \div 7 = \frac{31}{7} \div \frac{7}{1} = \frac{31}{7} \times \frac{1}{7} = \frac{31 \times 1}{7 \times 7} = \frac{31}{49}$$

4. Find:

$$(i) \quad \frac{2}{5} \div \frac{1}{2} = \frac{2}{5} \times \frac{2}{1} = \frac{2 \times 2}{5 \times 1} = \frac{4}{5}$$

$$(ii) \quad \frac{4}{9} \div \frac{2}{3} = \frac{4}{9} \times \frac{3}{2} = \frac{4 \times 3}{9 \times 2} = \frac{2}{3}$$

$$(iii) \quad \frac{3}{7} \div \frac{8}{7} = \frac{3}{7} \times \frac{7}{8} = \frac{3 \times 7}{7 \times 8} = \frac{3}{8}$$

$$(iv) \quad 2\frac{1}{3} \div \frac{3}{5} = \frac{7}{3} \div \frac{3}{5} = \frac{7}{3} \times \frac{5}{3} = \frac{7 \times 5}{3 \times 3} = \frac{35}{9} = 3\frac{7}{9}$$

$$(v) \quad 3\frac{1}{2} \div \frac{8}{3} = \frac{7}{2} \div \frac{8}{3} = \frac{7}{2} \times \frac{3}{8} = \frac{7 \times 3}{2 \times 8} = \frac{21}{16} = 1\frac{5}{16}$$

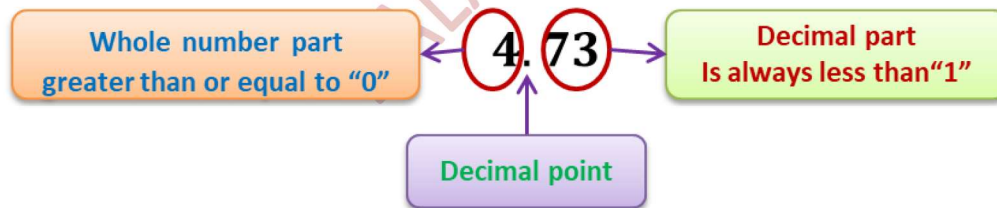
$$(vi) \quad \frac{2}{5} \div 1\frac{1}{2} = \frac{2}{5} \div \frac{3}{2} = \frac{2}{5} \times \frac{2}{3} = \frac{2 \times 2}{5 \times 3} = \frac{4}{15}$$

$$(vii) \quad 3\frac{1}{5} \div 1\frac{2}{3} = \frac{16}{5} \div \frac{5}{3} = \frac{16}{5} \times \frac{3}{5} = \frac{16 \times 3}{5 \times 5} = \frac{48}{25} = 1\frac{23}{25}$$

$$(viii) \quad 2\frac{1}{5} \div 1\frac{1}{5} = \frac{8}{5} \div \frac{6}{5} = \frac{8}{5} \times \frac{5}{6} = \frac{8 \times 5}{5 \times 6} = \frac{4}{3} = 1\frac{1}{3}$$

Decimal numbers:

A decimal is another way of expressing a fraction. The dot or the point between the two digits is called the decimal point. Number of digits after the decimal point is called the number of decimal places.



The number of digits after the decimal point in the decimal numeral is equal to the number of zeros after 1 in the denominator of the corresponding common fraction.

$$\frac{4}{10} = 0.4, \quad \frac{2}{100} = 0.02, \quad \frac{37}{1000} = 0.037, \quad \frac{426}{100} = 4.26, \quad \frac{527}{10} = 52.7, \quad \frac{784}{1000} = 0.784$$

Multiplication Decimals:

The number of decimal digits in the product of any two decimal numbers is equal to the sum of decimal digits that are multiplied.

TRY THESE

1. Find:

(i) $2.7 \times 4 = 10.8$

(ii) $1.8 \times 1.2 = 2.16$

(iii) $2.3 \times 4.35 = 10.005$

2. Arrange the products obtained in (1) in descending order.**Sol:** The products in descending order: , 10.8, 10.005, 2.16,**Exp 3: The side of an equilateral triangle is 3.5 cm. Find its perimeter.****Sol:** Length of side=3.5 cm

Perimeter of equilateral triangle = $3 \times \text{side} = 3 \times 3.5 \text{ cm} = 10.5 \text{ cm}$

Exp 4: The length of a rectangle is 7.1 cm and its breadth is 2.5 cm. What is the area of the rectangle?**Sol:** Length(l) = 7.1 cm and Breadth(b) = 2.5 cm

Area of the rectangle = $l \times b = 7.1 \times 2.5 \text{ cm}^2 = 17.75 \text{ cm}^2$

$$\begin{array}{r} 7.1 \\ \times 2.5 \\ \hline 355 \\ 142X \\ \hline 17.75 \end{array}$$

Multiplication of Decimal Numbers by 10, 100 and 1000:

when a decimal number is multiplied by 10, 100 or 1000, the digits in the product are same as in the decimal number but the decimal point in the product is shifted to the right by as, many of places as there are zeros over one.

$1.76 \times 10 = 17.6$

$12.356 \times 100 = 1235.6$

$0.3 \times 10 = 3$

$2.35 \times 10 = 23.5$

$1.76 \times 1000 = 1760$

$1.2 \times 100 = 120$

$12.356 \times 10 = 123.56$

$2.35 \times 1000 = 2350$

$56.3 \times 1000 = 56300$

$1.76 \times 100 = 176$

$12.356 \times 1000 = 12356$

$2.35 \times 100 = 235$

$0.5 \times 1000 = 500$

EXERCISE-2.4**1. Find**

(i) $0.2 \times 6 = 1.2$

(iv) $20.1 \times 4 = 80.4$

(vi) $2 \times 0.86 = 1.72$

(ii) $8 \times 4.6 = 36.8$

(v) $0.05 \times 7 = 0.35$

(iii) $2.71 \times 5 = 13.55$

(vi) $211.02 \times 4 = 844.08$

2. Find the area of rectangle whose length is 5.7cm and breadth is 3 cm.**Sol:** Length(l) = 5.7 cm and Breadth(b) = 3 cm

Area of the rectangle = $l \times b = 5.7 \times 3 \text{ cm}^2 = 17.1 \text{ cm}^2$

3. Find:

(i) $1.3 \times 10 = 13$

(ii) $36.8 \times 10 = 368$

(iii) $153.7 \times 10 = 1537$

(iv) $168.07 \times 10 = 1680.7$

(v) $31.1 \times 100 = 3110$

(vi) $156.1 \times 100 = 15610$

(vii) $3.62 \times 100 = 362$

(viii) $43.07 \times 100 = 4307$

(ix) $0.5 \times 10 = 5$

(x) $0.08 \times 10 = 0.8$

(xi) $0.9 \times 100 = 90$

(xii) $0.03 \times 1000 = 30$

4. A two-wheeler covers a distance of 55.3 km in one litre of petrol. How much distance will it cover in 10 litres of petrol?

Sol: The distance covers by a two wheeler in 1 litre of petrol=55.3 km

The distance covers by a two wheeler in 10 litre of petrol= 10×55.3 km=553 km

5. Find:

(i) $2.5 \times 0.3 = 0.75$

(ii) $0.1 \times 51.7 = 5.17$

(iii) $0.2 \times 316.8 = 63.36$

(iv) $1.3 \times 3.1 = 4.03$

(v) $0.5 \times 0.05 = 0.025$

(vi) $11.2 \times 0.15 = 1.68$

(vii) $1.07 \times 0.02 = 0.0214$

(viii) $10.05 \times 1.05 = 10.5525$

(ix) $101.01 \times 0.01 = 1.0101$

(x) $100.01 \times 1.1 = 110.011$

DIVISION OF DECIMAL NUMBERS:

Division by 10, 100 and 1000

While dividing a number by 10, 100 or 1000, the digits of the number and the quotient are same but the decimal point in the quotient shifts to the left by as many places as there are zeros over.

$31.5 \div 10 = 3.15$

$231.5 \div 10 = 23.15$

$1.5 \div 10 = 0.15$

$29.36 \div 10 = 2.936$

$31.5 \div 100 = 0.315$

$231.5 \div 100 = 2.315$

$1.5 \div 100 = 0.015$

$29.36 \div 100 = 0.2936$

$31.5 \div 1000 = 0.0315$

$231.5 \div 1000 = 0.2315$

$1.5 \div 1000 = 0.0015$

$29.36 \div 1000 = 0.02936$

Try these

(i) $235.4 \div 10 = 23.54$

(ii) $235.4 \div 100 = 2.354$

(iii) $235.4 \div 1000 = 0.2354$

Division of a Decimal Number by a Whole Number:

(i) $6.4 \div 2 = 3.2$

(ii) $35.7 \div 3 = 11.9$

(iii) $25.5 \div 3 = 8.5$

(iv) $43.15 \div 5 = 8.63$

$$\begin{array}{r} 3.2 \\ 2 \overline{) 6.4} \\ \underline{6} \\ 4 \\ \underline{4} \\ 0 \end{array}$$

$$\begin{array}{r} 11.9 \\ 3 \overline{) 35.7} \\ \underline{3} \\ 5 \\ \underline{3} \\ 27 \\ \underline{27} \\ 0 \end{array}$$

$$\begin{array}{r} 8.5 \\ 3 \overline{) 25.5} \\ \underline{24} \\ 15 \\ \underline{15} \\ 0 \end{array}$$

$$\begin{array}{r} 8.63 \\ 5 \overline{) 43.15} \\ \underline{40} \\ 31 \\ \underline{30} \\ 15 \\ \underline{15} \\ 0 \end{array}$$

(v) $82.44 \div 6 = 13.74$

$$\begin{array}{r} 13.74 \\ 6 \overline{) 82.44} \\ \underline{6} \\ 22 \\ \underline{18} \\ 44 \\ \underline{42} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

$$\begin{array}{r} 3.1 \\ 5 \overline{) 15.5} \\ \underline{15} \\ 05 \\ \underline{5} \\ 0 \end{array}$$

$$\begin{array}{r} 18.05 \\ 7 \overline{) 126.35} \\ \underline{7} \\ 56 \\ \underline{56} \\ 03 \\ \underline{0} \\ 35 \\ \underline{35} \\ 0 \end{array}$$

$$\begin{array}{r} 3.24 \\ 4 \overline{) 12.96} \\ \underline{12} \\ 09 \\ \underline{8} \\ 16 \\ \underline{16} \\ 0 \end{array}$$

(vi) $15.5 \div 5 = 3.1$

(vii) $126.35 \div 7 = 18.05$

(viii) $12.96 \div 4 = 3.24$

Exp 5: Find the average of 4.2, 3.8 and 7.6

Sol: Average = $\frac{\text{Sum of observations}}{\text{Number of observations}} = \frac{4.2 + 3.8 + 7.6}{3} = \frac{15.6}{3} = 5.2$

Division of a Decimal Number by another Decimal

Ex: $25.5 \div 0.5 = \frac{25.5 \times 10}{0.5 \times 10} = \frac{255}{5} = 51$

Ex: $22.5 \div 1.5 = \frac{22.5 \times 10}{1.5 \times 10} = \frac{225}{15} = 15$

TRY THESE

(i) $\frac{7.75}{0.25} = \frac{7.75 \times 100}{0.25 \times 100} = \frac{775}{25} = 31$

(ii) $\frac{42.8}{0.02} = \frac{42.8 \times 100}{0.02 \times 100} = \frac{4280}{2} = 2140$

(iii) $\frac{5.6}{1.4} = \frac{5.6 \times 10}{1.4 \times 10} = \frac{56}{14} = 4$

Exp 6: Each side of a regular polygon is 2.5 cm in length. The perimeter of the polygon is 12.5cm. How many sides does the polygon have?

Sol: Length of each side of polygon = 2.5 cm

$$\text{Number of sides of the polygon} = \frac{\text{perimeter of the polygon}}{\text{Length of each side of polygon}} = \frac{12.5}{2.5} = \frac{125}{25} = 5$$

Exp7 :A car covers a distance of 89.1 km in 2.2 hours. What is the average distance covered by it in 1 hour?

Sol: Distance covered in 2.2 hours=89.1 km

$$\text{Distance covered in 1 hour} = \frac{89.1}{2.2} = \frac{891}{22} = \frac{81}{2} = 40.5 \text{ km}$$

EXERCISE-2.5

1. Find:

(i) $0.4 \div 2 = 0.2$

(ii) $0.35 \div 5 = 0.07$

(iii) $2.48 \div 4 = 0.62$

(iv) $65.4 \div 6 = 10.9$

(v) $651.2 \div 4 = 162.8$

2. Find:

(i) $4.8 \div 10 = 0.48$

(ii) $52.5 \div 10 = 5.25$

(iii) $0.7 \div 10 = 0.07$

(iv) $33.1 \div 10 = 3.31$

3. Find:

(i) $2.7 \div 100 = 0.027$

(ii) $0.3 \div 100 = 0.003$

(iii) $0.78 \div 100 = 0.0078$

4. Find

(i) $7.9 \div 1000 = 0.0079$

(ii) $26.3 \div 1000 = 0.0263$

(iii) $38.53 \div 1000 = 0.03853$

5. Find:

(i) $7 \div 3.5 = \frac{7}{3.5} = \frac{7 \times 10}{3.5 \times 10} = \frac{70}{35} = 2$

(ii) $36 \div 0.2 = \frac{36}{0.2} = \frac{36 \times 10}{0.2 \times 10} = \frac{360}{2} = 180$

(iii) $3.25 \div 0.5 = \frac{3.25}{0.5} = \frac{3.25 \times 10}{0.5 \times 10} = \frac{32.5}{5} = 6.5$

(iv) $30.94 \div 0.7 = \frac{30.94}{0.7} = \frac{30.94 \times 10}{0.7 \times 10} = \frac{309.4}{7} = 44.2$

(v) $0.5 \div 0.25 = \frac{0.5}{0.25} = \frac{0.5 \times 100}{0.25 \times 100} = \frac{50}{25} = 2$

(vi) $7.75 \div 0.25 = \frac{7.75}{0.25} = \frac{7.75 \times 100}{0.25 \times 100} = \frac{775}{25} = 31$

(vii) $76.5 \div 0.15 = \frac{76.5}{0.15} = \frac{76.5 \times 100}{0.15 \times 100} = \frac{7650}{15} = 510$

(vi) $14.49 \div 7 = 2.07$

(vii) $3.96 \div 4 = 0.99$

(viii) $0.80 \div 5 = 0.16$

(v) $272.23 \div 10 = 27.223$

(vi) $0.56 \div 10 = 0.056$

(vii) $3.97 \div 10 = 0.397$

(iv) $432.6 \div 100 = 4.326$

(v) $23.6 \div 100 = 0.236$

(vi) $98.53 \div 100 = 0.9853$

(iv) $128.9 \div 1000 = 0.1289$

(v) $0.5 \div 1000 = 0.0005$

$$(viii) 37.8 \div 1.4 = \frac{37.8}{1.4} = \frac{37.8 \times 10}{1.4 \times 10} = \frac{378}{14} = 27$$

$$(ix) 2.73 \div 1.3 = \frac{2.73}{1.3} = \frac{2.73 \times 10}{1.3 \times 10} = \frac{27.3}{13} = 2.1$$

6. A vehicle covers a distance of 43.2 km in 2.4 litres of petrol. How much distance will it cover in one litre of petrol?

Sol: Vehicle covers distance in 2.4 litres of petrol=43.2 km

$$\text{Vehicle covers distance in 1 litre of petrol} = \frac{43.2}{2.4} = \frac{432}{24} = 18\text{km}$$

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