CHAPTER-3
DECIMALS

Students Learning Outcomes

After studying this chapter, students will be able to:

➤ Convert decimals to rational numbers.

➤ Define terminating decimals as decimals having a finite number of digits after the decimal point.

➤ Define recurring decimals as non-terminating decimals in which a single digit or a block of digits repeats itself an infinite number of times after decimal point (e.g., $= 0.285714285714285714........$)

➤ Use the following rule to find whether a given rational number is terminating or not.

➤ Rule: If the denominator of a rational number in standard form has no prime factor other than 2, 5 or 2 and 5, or 2 and 5, then and only then the rational number is a terminating decimal.

➤ Express a given rational number as a decimal and indicate whether it is terminating or recurring.

➤ Get an approximate value of a number, called rounding off, to a desired number of decimal places.

SOLVED EXERCISE 3.1

1. Convert the following decimals into Rational numbers.

Solution:

(I) $$0.36 = \frac{36}{100} = \frac{9}{25}$$

(ii) $$0.75 = \frac{75}{100} = \frac{3}{4}$$

(iii) $$-0.125 = -\frac{125}{1000} = \frac{-1}{8}$$

(iv) $$-6.08 = \frac{-608}{100} = -\frac{152}{25}$$

(v) $$6.46 = \frac{646}{100} = \frac{323}{50}$$

(vi) $$15.25 = \frac{1525}{100} = \frac{61}{4}$$

(vii) $$8.125 = \frac{8125}{1000} = \frac{65}{8}$$

(viii) $$-0.00625 = \frac{-625}{100000} = \frac{-1}{160}$$

(ix) $$-0.268 = \frac{-268}{1000} = \frac{-67}{250}$$

SOLVED EXERCISE 3.2

1. Without actual division, separate the terminating and non-terminating decimals.

Solution:

(i)	(terminating)	(ii)	(terminating)
(iii)	(non-terminating)		
(iv)	(non-terminating)	(v)	(terminating)
(vi)	(non-terminating)		
(vii)	(non-terminating)	(viii)	(non-terminating)

2. Express the following rational numbers in terminating decimals.

Solution:

(i) = 0.02

$$100\overline{)200}$$
$$\underline{200}$$
$$0$$

(ii) = 1.35

$$20\overline{)27}$$
$$\underline{20}$$
$$70$$
$$\underline{60}$$
$$100$$
$$\underline{100}$$
$$0$$

(iii)

$$25\overline{)30}$$
$$\underline{25}$$
$$50$$
$$\underline{50}$$
$$0$$

0.12

(iv)

$$50\overline{)310}$$
$$\underline{300}$$
$$100$$
$$\underline{100}$$
$$0$$

0.62

(v)

$$1000\overline{)5000}$$
$$\underline{5000}$$
$$0$$

0.005

(vi)

$$8\overline{)20}$$
$$\underline{16}$$
$$40$$
$$\underline{40}$$
$$0$$

2.5

(vii)

```
      3.5
   6) 21
      18
      ──
      30
      30
      ──
       0
```

(ix)

```
       0.75
   32) 240
       224
       ───
       160
       160
       ───
         0
```

(viii)

```
          1.3125
     64) 84
         64
         ──
        200
        192
        ───
         80
         64
         ───
        160
        128
        ───
        320
        320
        ───
          0
```

3. **Express the following rational numbers in non terminating decimals**

Solution:

(i)

```
        1.333
     3) 4
        3
        ──
        10
         9
        ──
        10
         9
        ──
        10
         9
        ──
         0
```

= $1.\overline{3}$

(iii)

```
          0.615384
     13) 80
         78
         ──
         20
         13
         ──
         70
         65
         ──
         50
         39
         ──
        110
        104
        ───
         60
         52
         ──
          8
```

$$\frac{8}{13} = 0.\overline{615384}$$

(ii) $\dfrac{20}{7}$

```
    2.857142
7) 20
   14
   ──
    60
    56
    ──
    40
    35
    ──
    50
    49
    ──
    10
     7
    ──
    30
    28
    ──
    20
    14
    ──
     6
```

$$\frac{20}{7} = 2.\overline{857142}$$

(iv)

```
    1.666
6) 10
    6
    ──
    40
    36
    ──
    40
    36
    ──
     4
```

$$\frac{10}{6} = 1.\overline{6}$$

(v)

```
      1.09
22) 24
    22
    ──
    200
    198
    ───
      2
```

$$\frac{24}{22} = 1.0\overline{9}$$

(viii)

```
      0.285714
91) 260
    182
    ───
    780
    728
    ───
    520
    455
    ───
    650
    637
    ───
    130
     91
    ───
    390
    364
    ───
     26
```

(vi)

$$\begin{array}{r} 0.583 \\ 12\overline{)70} \\ 60 \\ \hline 100 \\ 96 \\ \hline 40 \\ 36 \\ \hline 4 \end{array}$$

$$\frac{7}{12} = 0.58\overline{3}$$

$$\frac{26}{91} = 0.\overline{285714}$$

(vii)

$$\begin{array}{r} 0.45 \\ 11\overline{)50} \\ 44 \\ \hline 60 \\ 55 \\ \hline 5 \end{array}$$

$$\frac{5}{11} = 0.\overline{45}$$

GOTEST

4. Round off the following decimals up to three decimal places.

Solution:

(i) 5.41679 = 5.417

(ii) 11.10365 = 11.104

(iii) 0.92517 = 0.925

(iv) 3.10351 = 3.104

(v) 0.74206 = 0.742

(vi) 23.15147=23.151

SOLVED REVIEW EXERCISE 3

1. **Answer the following questions.**

(i) Define the terminating decimals.

Answer:
A decimal in which the number of digits after the decimal point is finite, is called a terminating decimal.

(ii) Write the names of two classes of decimals.

Answer:

(a) Terminating decimals   (b) Non-terminating decimals

(iii) Which non-terminating decimals are called recurring decimals?

Answer:
The non-terminating decimals in which a single digit or a block of digits repeats itself infinite number of times after the decimal point is called recurring decimal.

(iv) How many digits after a decimal point show a non-terminating decimal?

Answer:
Infinite

(v) Write the rule to find whether a given rational number is terminating or not.

Answer:
If the denominator of a rational number in standard form has no prime factor other than 2, 5 or 2 and 5, then and only then the rational number is terminating decimal.

(vi) What is meant by the term round off in decimals?

Answer:
The term round off is used to leave the digits after the decimal point.

2. **Fill in the blank.**

(i) A _____ decimal may be recurring or non-recurring.

(ii) Two parts of a decimal separated by a dot is called the _____.

(iii) In terminating decimals, division _____ after a finite number of steps.

(iv) In decimals, the term round off is used to leave the digits after the _____.

(v) A fraction will be terminating if the _____ has 2 or 5 or both as factors.

Answers:

(i)	non-terminating	(ii)	decimal point	(iii)	terminate
(iv)	decimal points	(v)	denominator		

3. **Tick (✓) the correct answer.**

(i) To separate a whole number from fractional part in a decimal, we use the symbol,

(a) -   (b) .   (c) :   (d) /

(ii) If we round off the decimal 3.7461 up to two decimal place, we get:

(a) 3.74   (b) 3.7   (c) 3.84   (d) 3.75

(iii) A rational number is terminating decimal, if its denominator has no prime factor other than:

(a) 2 and 3   (b) 3 and 5

(c)   2 and 5   (d)   2 and 7

(iv)   When we change 0.25 to the rational number, we get;

(a)   25/100   (b)   5/20   (c)   1/4   (d)   5/25

Answers:

(i)	b	(ii)	d	(iii)	c	(iv)	c

4.   Convert the following decimals into rational numbers.

Solution:

(i)   0.375 = (ii)   0.25 =

(iii)   0.5 =   (iv)   4.75 =

(v)   0.79 =   (vi)   1.29 =   (vii)   2.34 =

5.   Convert the following into decimal fractions and identify terminating and non-terminating fractions.

Solution:

(i)   = 0.8 (terminating)   (ii)   = 0.9166 (non-terminating)

(iii)   = 0.888 (non-terminating)   (iv)   = 0.142 (non-terminating)

(v)   = 3.142 (non-terminating)   (vi)   = 3.5 (terminating)

(vii)   = 0.3 terminating

6.   Round off the following up to 2-decimal places.

Solution:

(i)   4.5723 = 4.57   (ii)   107.328 = 107.33

(iii)   5.7395 = 5.74   (iv)   6.7982 = 6.80

(v)   25.4893 = 25.49