- *Digvijay*
- *Arjun*

Practice Set 2.1 Algebra 9th Std Maths Part 1 Answers Chapter 2 Real Numbers

Question 1.
Classify the decimal form of the given rational numbers into terminating and non-terminating recurring type.

i. $\frac{13}{5}$ ii. $\frac{2}{11}$

iii. $\frac{29}{16}$ iv. $\frac{17}{125}$

v. $\frac{11}{6}$

Solution:
i. Denominator = 5 = 1 x 5
Since, 5 is the only prime factor denominator.
the decimal form of the rational number 135 will be terminating type.
ii. Denominator = 11 = 1 x 11
Since, the denominator is other than prime factors 2 or 5.
∴ the decimal form of the rational number 211 will be non-terminating recurring type.
iii. Denominator = 16
= 2 x 2 x 2 x 2
Since, 2 is the only prime factor in the denominator.
∴ the decimal form of the rational number 2916 will be terminating type.
iv. Denominator = 125
= 5 x 5 x 5
Since, 5 is the only prime factor in the denominator.
the decimal form of the rational number 17125 will be terminating type.
v. Denominator = 6
= 2 x 3
Since, the denominator is other than prime factors 2 or 5.
∴ the decimal form of the rational number 116 will be non-terminating recurring type.
Question 2.
Write the following rational numbers in decimal form.

i. $\frac{127}{200}$

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ii. $\frac{25}{99}$

iii. $\frac{23}{7}$

iv. $\frac{4}{5}$

v. $\frac{17}{8}$

Solution:

i. −57

$$
\begin{array}{r}
0.714285\ldots \\
7\overline{)5.000000} \\
-\ 0 \\
\hline
50 \\
-\ 49 \\
\hline
10 \\
-\ \ 7 \\
\hline
30 \\
-\ \ 28 \\
\hline
20 \\
-\ \ 14 \\
\hline
60 \\
-\ \ 56 \\
\hline
40 \\
-\ \ 35 \\
\hline
5
\end{array}
$$

$\therefore \quad \frac{-5}{7} = -0.\overline{714285}$

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ii. 911

$$
\begin{array}{r}
0.81.... \\
11\overline{)\,9.00} \\
-\,0 \\
\hline
90 \\
-\,88 \\
\hline
20 \\
-\;11 \\
\hline
9
\end{array}
$$

$\therefore \quad \mathbf{\frac{9}{11} = 0.\overline{81}}$

iii. $\sqrt{5}$

	2.2360679…
2	$\bar{5}.\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}$
+ 2	− 4
42	100
+ 2	− 84
443	1600
+ 3	− 1329
4466	27100
+ 6	− 26796
44720	30400
+ 0	− 0
447206	3040000
+ 6	− 2683236
4472127	35676400
+ 7	− 31304889
44721349	437151100
+ 9	− 402492141
44721358	34658959

$\therefore \quad \mathbf{\sqrt{5} = 2.2360679.....}$

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iv. 12113

$$
\begin{array}{r}
9.307692\ldots \\
13\overline{)121.000000} \\
-\ 117 \\
\hline
40 \\
-\ 39 \\
\hline
10 \\
-\ 0 \\
\hline
100 \\
-\ 91 \\
\hline
90 \\
-\ 78 \\
\hline
120 \\
-\ 117 \\
\hline
30 \\
-\ 26 \\
\hline
4
\end{array}
$$

$\therefore \quad \mathbf{\frac{121}{13} = 9.\overline{307692}}$

v. 298

$$
\begin{array}{r}
3.625 \\
8\overline{)29.000} \\
-24 \\
\hline
50 \\
-\ 48 \\
\hline
20 \\
-\ 16 \\
\hline
40 \\
-\ 40 \\
\hline
0
\end{array}
$$

$\therefore \quad \mathbf{\frac{29}{8} = 3.625}$

Question 3.

Write the following rational numbers in $\frac{p}{q}$ form.

i. $0.\dot{6}$ ii. $0.\overline{37}$

iii. $3.\overline{17}$ iv. $15.\overline{89}$

v. $2.\overline{514}$

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- *Arjun*

Solution:

i. Let x = $0.6^{\cdot}$ ...(i)

∴ x = 0.666...

Since, one number i.e. 6 is repeating after the decimal point.

Thus, multiplying both sides by 10,

10x = 6.666...

∴ 10 x 6.6 ...(ii)

Subtracting (i) from (ii),

10x – x = 6.6 – 0.6

∴ 9x = 6

$$\therefore \quad x = \frac{6}{9} = \frac{3 \times 2}{3 \times 3}$$

$$\therefore \quad x = \frac{2}{3}$$

$$\therefore \quad \mathbf{0.\dot{6} = \frac{2}{3}}$$

ii. Let x = 0.37^{----}

∴ x = 0.3737...

Since, two numbers i.e. 3 and 7 are repeating after the decimal point.

Thus, multiplying both sides by 100,

100x = 37.3737.....

∴ 100x = 37.37^{----} .....(ii)

Subtracting (i) from (ii),

100x – x = $37.37^{----} - 0.37^{----}$

∴ 99x = 37

$$\therefore \quad x = \frac{37}{99}$$

$$\therefore \quad \mathbf{0.\overline{37} = \frac{37}{99}}$$

iii. Letx = 3.17^{----} ...(i)

∴ x = 3.1717...

Since, two numbers i.e. 1 and 7 are repeating after the decimal point.

Thus, multiplying both sides by 100,

100x = 317.1717...

∴ 100x= 317.17 ...(ii)

Subtracting (i) from (ii),

100x – x = $317.17^{----} - 3.17^{----}$

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∴ 99x = 314

$$\therefore \quad x = \frac{314}{99}$$

$$\therefore \quad \mathbf{3.\overline{17} = \frac{314}{99}}$$

iv. Let x = 15.89^{----} …….. (i)

∴ x = 15.8989…

Since, two numbers i.e. 8 and 9 are repeating after the decimal point.

Thus, multiplying both sides by 100,

100x= 1589.8989…

∴ 100x = 1589.89^{----} …(ii)

Subtracting (i) from (ii),

100x – x = $1589.89^{----} - 15.89^{----}$

∴ 99x = 1574

$$\therefore \quad x = \frac{1574}{99}$$

$$\therefore \quad \mathbf{15.\overline{89} = \frac{1574}{99}}$$

v. Let x = $2.514^{-------}$

∴ x = 2.514514…

Since, three numbers i.e. 5, 1 and 4 are repeating after the decimal point.

Thus, multiplying both sides by 1000,

1000x = 2514.514514…

1000x = $2514.514^{-------}$ ….(ii)

Subtracting (i) from (ii),

1000x – x = $2514.514^{-------} - 2.514^{-------}$

∴ 999x = 2512

$$\therefore \quad x = \frac{2512}{999}$$

$$\therefore \quad \mathbf{2.\overline{514} = \frac{2512}{999}}$$

Question 1.

How to convert 2.43 in $\frac{p}{q}$ form ? (Textbook pg. no. 20)

Solution:

Let x = 2.43

In 2.43, the number 4 on the right side of the decimal point is not recurring.

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So, in order to get only recurring digits on the right side of the decimal point, we will multiply 2.43 by 10.
∴ 10x = 24.3 ...(i)
∴ 10x = 24.333...
Here, digit 3 is the only recurring digit. Thus, by multiplying both sides by 10, 100x = 243.333...
∴ 100x= 243.3 ...(ii)
Subtracting (i) from (ii),
100x – 10x = 243.3 – 24.3
∴ 90x = 219

$$\therefore \quad x = \frac{219}{90} = \frac{3 \times 73}{3 \times 30} = \frac{73}{30}$$

$$\therefore \quad 2.4\dot{3} = \frac{73}{30}$$

Practice Set 2.2 Algebra 9th Std Maths Part 1 Answers Chapter 2 Real Numbers

Question 1.
Show that 4√2 is an irrational number.
Solution:
Let us assume that 4√2 is a rational number .
So, we can find co-prime integers 'a' and 'b' (b ≠ 0) such that
4√2 = ab
∴ √2 = a4b

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Since, a and b are integers, $\frac{a}{4b}$ is a rational number and so √2 is a rational number.

Alternate Proof:

Let us assume that 4√2 is a rational number.

So, we can find co-prime integers 'a' and 'b' (b ≠ 0) such that

$$4\sqrt{2} = \frac{a}{b}$$

$$\therefore \quad b\left(4\sqrt{2}\right) = a$$

$$\therefore \quad 32b^2 = a^2 \qquad \text{... (i) [Squaring both the sides]}$$

$$\therefore \quad b^2 = \frac{a^2}{32}$$

Since, 32 divides a^2, so 32 divides 'a' as well.

So, we write a = 32c, where c is an integer.

∴ $a^2 = (32c)^2$ ... [Squaring both the sides]

∴ $32b^2 = 32 \times 32c^2$ ...[From(i)]

∴ $b^2 = 32c^2$

∴ $c^2 = \frac{b^2}{32}$

Since, 32 divides b^2, so 32 divides 'b'.

∴ 32 divides both a and b.

a and b have at least 32 as a common factor.

But this contradicts the fact that a and b have no common factor other than 1.

∴ Our assumption that 4√2 is a rational number is wrong.

∴ 4√2 is an irrational number.

Question 2.

Prove that 3 + √5 is an irrational number.

Solution:

Let us assume that 3 + √5 is a rational number.

So, we can find co-prime integers 'a' and 'b' (b ≠ 0) such that

$$3+\sqrt{5} = \frac{a}{b}$$

$$\therefore \quad \sqrt{5} = \frac{a}{b} - 3$$

Since, a and b are integers, $\frac{a}{b} - 3$ is a rational number and so √5 is a rational number.

But this contradicts the fact that √5 is an irrational number.

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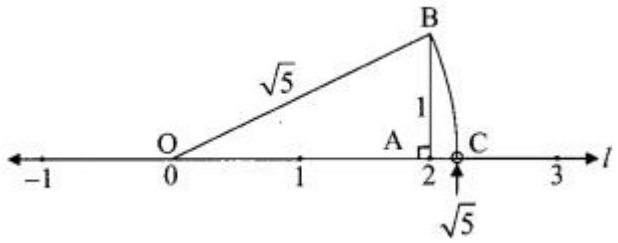
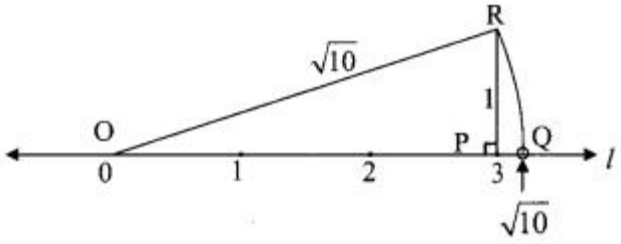
∴ Our assumption that 3 – √5 is a rational number is wrong.
3 + √5 is an irrational number.
Question 3.
Represent the numbers √5 and √10 on a number line.
Solution:
i. Draw a number line and take point A at 2.
Draw AB perpendicular to the number line such that AB = 1 unit.
In ΔOAB, m∠OAB = 90°
∴ $(OB)^2 = (OA)^2 + (AB)^2$ … [Pythagoras theorem]
$= (2)^2 + (1)^2$
∴ $(OB)^2 = 5$
∴ OB = √5 units. … [Taking square root of both sides]
With O as centre and radius equal to OB, draw an arc to intersect the number line at C.



The coordinate of the point C is √5 .

ii. Draw a number line and take point Pat 3.
Draw PR perpendicular to the number line such that PR = 1 unit.
In ΔOPR, m∠OPR = 90°
∴ $(OR)^2 = (OP)^2 + (PR)^2$ … [Pythagoras theorem]
$= (3)^2 + (1)^2$
∴ $(OR)^2 = 10$
∴ OR= √10units. … [Taking square root of both sides]
With O as centre and radius equal to OR, draw an arc to intersect the number line at Q.



The coordinate of the point Q is √10 .

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Question 4.
Write any three rational numbers between the two numbers given below.
i. 0.3 and – 0.5
ii. – 2.3 and – 2.33
iii. 5.2 and 5.3
iv. – 4.5 and – 4.6
Solution:
i. 0.3 = 0.30 and -0.5 = -0.50
We know that,
0. 30 >0.29 >….. >0.10>.. > – 0.10>…. > -0.30>…> -0.50
∴ the three rational numbers between 0.3 and -0.5 are -0.3, -0.1 and 0.1.

Alternate Method:
A rational number between two rational numbers a and b

$$= \frac{a + b}{2}$$

$$\frac{0.3 + (-0.5)}{2} = \frac{0.3 - 0.5}{2}$$

$$= \frac{-0.2}{2}$$

$$= -0.1$$

$$\frac{0.3 + (-0.1)}{2} = \frac{0.3 - 0.1}{2}$$

$$= \frac{0.2}{2}$$

$$= 0.1$$

$$\frac{-0.1 + (-0.5)}{2} = \frac{-0.1 - 0.5}{2}$$

$$= \frac{-0.6}{2}$$

$$= -0.3$$

∴ the three rational numbers between 0.3 and -0.5 are -0.3, -0.1 and 0.1.

ii. -2.3 = -2.300 and -2.33 = -2.330
We know that,
-2.300 > -2.301>… > -2.310>…> -2.320>…> -2.330
∴ the three rational numbers between -2.3 and -2.33 are -2.310, -2.320 and -2.325.

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iii. 5.2 = 5.20 and 5.3 = 5.30
We know that,
5.20 < 5.21 < 5.22 < 5.23 < ... < 5.30
∴ the three rational numbers between 5.2 and 5.3 are 5.21, 5.22 and 5.23.

iv. -4.5 = -4.50 and -4.6 = -4.60 We know that,
-4.50 > -4.51 > -4.52 >... > – 4.55 >...>- 4.60
∴ the three rational numbers between -4.5 and -4.6 are -4.51, -4.52 and -4.55.

Practice Set 2.3 Algebra 9th Std Maths Part 1 Answers Chapter 2 Real Numbers

Question 1.
State the order of the surds given below.

i.	$\sqrt[3]{7}$	ii.	$5\sqrt{12}$
iii.	$\sqrt[4]{10}$	iv.	$\sqrt{39}$
v.	$\sqrt[3]{18}$		

Answer:
i. 3, ii. 2, iii. 4, iv. 2, v. 3

Question 2.
State which of the following are surds Justify. [2 Marks each]

i.	$\sqrt[3]{51}$	ii.	$\sqrt[4]{16}$
iii.	$\sqrt[5]{81}$	iv.	$\sqrt{256}$
v.	$\sqrt[3]{64}$	vi.	$\sqrt{\frac{22}{7}}$

Answer:
i. $51--\sqrt{_3}$ is a surd because 51 is a positive rational number, 3 is a positive integer greater than 1 and $51--\sqrt{_3}$ is irrational.

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ii. $16--\sqrt{_4}$ is not a surd because

$$\sqrt[4]{16} = (16)^{\frac{1}{4}}$$

$$= (2^4)^{\frac{1}{4}}$$

= 2, which is not an irrational number.

iii. $81--\sqrt{_5}$ is a surd because 81 is a positive rational number, 5 is a positive integer greater than 1 and $81--\sqrt{_5}$ is irrational.

iv. $256---\sqrt{}$ is not a surd because

$$\sqrt{256} = (256)^{\frac{1}{2}}$$

$$= (16^2)^{\frac{1}{2}}$$

= 16, which is not an irrational number.

v. $64--\sqrt{_3}$ is not a surd because

$$\sqrt[3]{64} = (64)^{\frac{1}{3}}$$

$$= (4^3)^{\frac{1}{3}}$$

= 4, which is not an irrational number.

vi. $227--\sqrt{}$ is a surd because 227 is a positive rational number, 2 is a positive integer greater than 1 and $227--\sqrt{}$ is irrational.

Question 3.

Classify the given pair of surds into like surds and unlike surds. [2 Marks each]

i.	$\sqrt{52}, 5\sqrt{13}$	ii.	$\sqrt{68}, 5\sqrt{3}$
iii.	$4\sqrt{18}, 7\sqrt{2}$	iv.	$19\sqrt{12}, 6\sqrt{3}$
v.	$5\sqrt{22}, 7\sqrt{33}$	vi.	$5\sqrt{5}, \sqrt{75}$

Solution:

If the order of the surds and the radicands are same, then the surds are like surds.

$\sqrt{52}, 5\sqrt{13}$

$$\sqrt{52} = \sqrt{4\times13}$$

$$= \sqrt{4}\times\sqrt{13}$$

$$= 2\sqrt{13}$$

Here, the order of $213--\sqrt{}$ and $513--\sqrt{}$ is same and their radicands are

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also same.

$\therefore 52\sqrt{--}$ and $513\sqrt{--}$ are like surds.

ii. $\sqrt{68}, 5\sqrt{3}$

$$\sqrt{68} = \sqrt{4\times17}$$
$$= \sqrt{4}\times\sqrt{17}$$
$$= 2\sqrt{17}$$

Here, the order of $217\sqrt{--}$ and $53\sqrt{-}$ is same but their radicands are not.

$\therefore 68\sqrt{--}$ and $53\sqrt{-}$ are unlike surds.

iii. $4\sqrt{18}, 7\sqrt{2}$

$$4\sqrt{18} = 4\times\sqrt{9\times2}$$
$$= 4\times\sqrt{9}\times\sqrt{2}$$
$$= 4\times3\sqrt{2}$$
$$= 12\sqrt{2}$$

Here, the order of $122\sqrt{-}$ and $72\sqrt{-}$ is same and their radicands are also same.

$\therefore 418\sqrt{--}$ and $72\sqrt{-}$ are like surds.

iv. $19\sqrt{12}, 6\sqrt{3}$

$$19\sqrt{12} = 19\times\sqrt{4\times3}$$
$$= 19\times\sqrt{4}\times\sqrt{3}$$
$$= 19\times2\sqrt{3}$$
$$= 38\sqrt{3}$$

Here, the order of $383\sqrt{-}$ and $63\sqrt{-}$ is same and their radicands are also same.

$\therefore 1912\sqrt{--}$ and $63\sqrt{-}$ are like surds.

v. $522\sqrt{--}, 733\sqrt{--}$

Here, the order of $522\sqrt{--}$ and $733\sqrt{--}$ is same but their radicands are not.

$\therefore 522\sqrt{--}$ and $733\sqrt{--}$ are unlike surds.

vi. $5\sqrt{5}, \sqrt{75}$

$$\sqrt{75} = \sqrt{25\times3}$$
$$= \sqrt{25}\times\sqrt{3}$$
$$= 5\sqrt{3}$$

Here, the order of $5\sqrt{5}$ and $5\sqrt{3}$ is same but their radicands are not.

$\therefore 5\sqrt{5}$ and $\sqrt{75}$ are unlike surds.

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Question 4.

Simplify the following surds.

i. $\sqrt{27}$ ii. $\sqrt{50}$ iii. $\sqrt{250}$

iv. $\sqrt{112}$ v. $\sqrt{168}$

Solution:

i. $\sqrt{27} = \sqrt{9\times3}$
$= \sqrt{9}\times\sqrt{3}$
$= \mathbf{3\sqrt{3}}$

ii. $\sqrt{50} = \sqrt{25\times2}$
$= \sqrt{25}\times\sqrt{2}$
$= \mathbf{5\sqrt{2}}$

iii. $\sqrt{250} = \sqrt{25\times10}$
$= \sqrt{25}\times\sqrt{10}$
$= \mathbf{5\sqrt{10}}$

iv. $\sqrt{112} = \sqrt{16\times7}$
$= \sqrt{16}\times\sqrt{7}$
$= \mathbf{4\sqrt{7}}$

v. $\sqrt{168} = \sqrt{4\times42}$
$= \sqrt{4}\times\sqrt{42}$
$= \mathbf{2\sqrt{42}}$

Question 5.

Compare the following pair of surds.

i. $7\sqrt{2}$, $5\sqrt{3}$

ii. $\sqrt{247}$, $\sqrt{274}$

iii. $2\sqrt{7}$, $\sqrt{28}$

iv. $5\sqrt{5}$, $7\sqrt{2}$

v. $4\sqrt{42}$, $9\sqrt{2}$

vi. $5\sqrt{3}$, 9

vii. 7, $2\sqrt{5}$

Solution:

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i. $7\sqrt{2} = \sqrt{49} \times \sqrt{2} = \sqrt{98}$

$5\sqrt{3} = \sqrt{25} \times \sqrt{3} = \sqrt{75}$

Since, $98 > 75$

$\therefore \quad \sqrt{98} > \sqrt{75}$

$\therefore \quad \mathbf{7\sqrt{2} > 5\sqrt{3}}$

ii. Since, $247 < 274$

$\therefore \quad \mathbf{\sqrt{247} < \sqrt{274}}$

iii. $2\sqrt{7} = \sqrt{4} \times \sqrt{7} = \sqrt{28}$

Since, $28 = 28$

$\therefore \quad \sqrt{28} = \sqrt{28}$

$\therefore \quad \mathbf{2\sqrt{7} = \sqrt{28}}$

iv. $5\sqrt{5} = \sqrt{25} \times \sqrt{5} = \sqrt{125}$

$7\sqrt{2} = \sqrt{49} \times \sqrt{2} = \sqrt{98}$

Since, $125 > 98$

$\therefore \quad \sqrt{125} > \sqrt{98}$

$\therefore \quad \mathbf{5\sqrt{5} > 7\sqrt{2}}$

v. $4\sqrt{42} = \sqrt{16} \times \sqrt{42} = \sqrt{672}$

$9\sqrt{2} = \sqrt{81} \times \sqrt{2} = \sqrt{162}$

Since, $672 > 162$

$\therefore \quad \sqrt{672} > \sqrt{162}$

$\therefore \quad \mathbf{4\sqrt{42} > 9\sqrt{2}}$

vi. $5\sqrt{3} = \sqrt{25} \times \sqrt{3} = \sqrt{75}$

$9 = \sqrt{81}$

Since, $75 < 81$

$\therefore \quad \sqrt{75} < \sqrt{81}$

$\therefore \quad \mathbf{5\sqrt{3} < 9}$

vii. $7 = \sqrt{49}$

$2\sqrt{5} = \sqrt{4} \times \sqrt{5} = \sqrt{20}$

Since, $49 > 20$

$\therefore \quad \sqrt{49} > \sqrt{20}$

$\therefore \quad \mathbf{7 > 2\sqrt{5}}$

Question 6.

Simplify.

i. $5\sqrt{3} + 8\sqrt{3}$

ii. $9\sqrt{5} - 4\sqrt{5} + \sqrt{125}$

iii. $7\sqrt{48} - \sqrt{27} - \sqrt{3}$

iv. $\sqrt{7} - \frac{3}{5}\sqrt{7} + 2\sqrt{7}$

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Solution:

i. $5\sqrt{3} + 8\sqrt{3} = (5+8)\sqrt{3} = 13\sqrt{3}$

$\therefore$ $\mathbf{5\sqrt{3} + 8\sqrt{3} = 13\sqrt{3}}$

ii. $9\sqrt{5} - 4\sqrt{5} + \sqrt{125}$

$= 9\sqrt{5} - 4\sqrt{5} + \sqrt{25\times5}$

$= 9\sqrt{5} - 4\sqrt{5} + \sqrt{25} \times \sqrt{5}$

$= 9\sqrt{5} - 4\sqrt{5} + 5\sqrt{5}$

$= (9 - 4 + 5)\sqrt{5}$

$= 10\sqrt{5}$

$\therefore$ $\mathbf{9\sqrt{5} - 4\sqrt{5} + \sqrt{125} = 10\sqrt{5}}$

iii. $7\sqrt{48} - \sqrt{27} - \sqrt{3}$

$= 7\sqrt{16\times3} - \sqrt{9\times3} - \sqrt{3}$

$= 7\times\sqrt{16}\times\sqrt{3} - \sqrt{9} \times \sqrt{3} - \sqrt{3}$

$= 7\times4\sqrt{3} - 3\sqrt{3} - \sqrt{3}$

$= 28\sqrt{3} - 3\sqrt{3} - \sqrt{3}$

$= (28 - 3 - 1)\sqrt{3}$

$= 24\sqrt{3}$

$\therefore$ $\mathbf{7\sqrt{48} - \sqrt{27} - \sqrt{3} = 24\sqrt{3}}$

iv. $\sqrt{7} - \frac{3}{5}\sqrt{7} + 2\sqrt{7}$

$= \left(1 - \frac{3}{5} + 2\right)\sqrt{7}$

$= \left(3 - \frac{3}{5}\right)\sqrt{7}$

$= \left(\frac{15-3}{5}\right)\sqrt{7}$

$= \frac{12\sqrt{7}}{5}$

$\therefore$ $\mathbf{\sqrt{7} - \frac{3}{5}\sqrt{7} + 2\sqrt{7} = \frac{12\sqrt{7}}{5}}$

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Question 7.

Multiply and write the answer in the simplest form.

i. $3\sqrt{12} \times \sqrt{18}$

ii. $3\sqrt{12} \times 7\sqrt{15}$

iii. $3\sqrt{8} \times \sqrt{5}$

iv. $5\sqrt{8} \times 2\sqrt{8}$

Solution:

i. $3\sqrt{12} \times \sqrt{18} = 3 \times \sqrt{4\times3} \times \sqrt{9\times2}$

$= 3 \times 2\sqrt{3} \times 3\sqrt{2}$

$= 3 \times 2 \times 3 \times \sqrt{3} \times \sqrt{2}$

$= 18\sqrt{6}$

$\therefore$ $\mathbf{3\sqrt{12} \times \sqrt{18} = 18\sqrt{6}}$

ii. $3\sqrt{12} \times 7\sqrt{15} = 3 \times \sqrt{4\times3} \times 7 \times \sqrt{5\times3}$

$= 3 \times 2\sqrt{3} \times 7\sqrt{5} \times \sqrt{3}$

$= 3 \times 2 \times 7 \times \sqrt{3} \times \sqrt{3} \times \sqrt{5}$

$= 42 \times 3 \times \sqrt{5}$

$= 126\sqrt{5}$

$\therefore$ $\mathbf{3\sqrt{12} \times 7\sqrt{15} = 126\sqrt{5}}$

iii. $3\sqrt{8} \times \sqrt{5} = 3 \times \sqrt{4\times2} \times \sqrt{5}$

$= 3 \times 2\sqrt{2} \times \sqrt{5}$

$= 6\sqrt{10}$

$\therefore$ $\mathbf{3\sqrt{8} \times \sqrt{5} = 6\sqrt{10}}$

iv. $5\sqrt{8} \times 2\sqrt{8} = 5 \times 2 \times \sqrt{8} \times \sqrt{8}$

$= 5 \times 2 \times 8$

$\therefore$ $\mathbf{5\sqrt{8} \times 2\sqrt{8} = 80}$

Question 8.

Divide and write form.

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i. $\sqrt{98} \div \sqrt{2}$

ii. $\sqrt{125} \div \sqrt{50}$

iii. $\sqrt{54} \div \sqrt{27}$

iv. $\sqrt{310} \div \sqrt{5}$

Solution:

i. $\frac{\sqrt{98}}{\sqrt{2}} = \sqrt{\frac{98}{2}} = \sqrt{49} = 7$

ii. $\frac{\sqrt{125}}{\sqrt{50}} = \sqrt{\frac{125}{50}} = \sqrt{\frac{25\times5}{25\times2}} = \sqrt{\frac{5}{2}}$

iii. $\frac{\sqrt{54}}{\sqrt{27}} = \sqrt{\frac{54}{27}} = \sqrt{2}$

iv. $\frac{\sqrt{310}}{\sqrt{5}} = \sqrt{\frac{310}{5}} = \sqrt{\frac{5\times62}{5}} = \sqrt{62}$

Question 9.

Rationalize the denominator.

i. $\frac{3}{\sqrt{5}}$ ii. $\frac{1}{\sqrt{14}}$ iii. $\frac{5}{\sqrt{7}}$

iv. $\frac{6}{9\sqrt{3}}$ v. $\frac{11}{\sqrt{3}}$

Solution:

- *Digvijay*
- *Arjun*

i. $\frac{3}{\sqrt{5}} = \frac{3}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

...[Multiplying the numerator and denominator by $\sqrt{5}$]

$= \frac{3 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}} = \frac{3\sqrt{5}}{5}$

$\therefore \quad \mathbf{\frac{3}{\sqrt{5}} = \frac{3\sqrt{5}}{5}}$

ii. $\frac{1}{\sqrt{14}} = \frac{1}{\sqrt{14}} \times \frac{\sqrt{14}}{\sqrt{14}}$

...[Multiplying the numerator and denominator by $\sqrt{14}$]

$= \frac{1 \times \sqrt{14}}{\sqrt{14} \times \sqrt{14}} = \frac{\sqrt{14}}{14}$

$\therefore \quad \mathbf{\frac{1}{\sqrt{14}} = \frac{\sqrt{14}}{14}}$

iii. $\frac{5}{\sqrt{7}} = \frac{5}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$

...[Multiplying the numerator and denominator by $\sqrt{7}$]

$= \frac{5 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{5\sqrt{7}}{7}$

$\therefore \quad \mathbf{\frac{5}{\sqrt{7}} = \frac{5\sqrt{7}}{7}}$

iv. $\frac{6}{9\sqrt{3}} = \frac{6}{9\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

...[Multiplying the numerator and denominator by $\sqrt{3}$]

$= \frac{6 \times \sqrt{3}}{9\sqrt{3} \times \sqrt{3}}$

$= \frac{6\sqrt{3}}{9 \times 3} = \frac{2\sqrt{3}}{9}$

$\therefore \quad \mathbf{\frac{6}{9\sqrt{3}} = \frac{2\sqrt{3}}{9}}$

v. $\frac{11}{\sqrt{3}} = \frac{11}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

...[Multiplying the numerator and denominator by $\sqrt{3}$]

$= \frac{11 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{11\sqrt{3}}{3}$

$\therefore \quad \mathbf{\frac{11}{\sqrt{3}} = \frac{11\sqrt{3}}{3}}$

Question 1.

$9+16-----\sqrt{}\ ?\ +\ 9-\sqrt{}\ +\ 16--\sqrt{}$ (Texbookpg. no. 28)

Solution:

$\sqrt{9+16} = \sqrt{25} = 5$

$\sqrt{9} + \sqrt{16} = 3 + 4 = 7$

$\therefore \quad \sqrt{9+16} \neq \sqrt{9} + \sqrt{16}$

Question 2.

$100+36-------\sqrt{}\ ?\ 100---\sqrt{}\ +\ 36--\sqrt{}$ (Textbook pg. no. 28)

Solution:

$\sqrt{100+36} = \sqrt{136} = 2\sqrt{34}$

$\sqrt{100} + \sqrt{36} = 10 + 6 = 16$

$\therefore \quad \sqrt{100+36} \neq \sqrt{100} + \sqrt{36}$

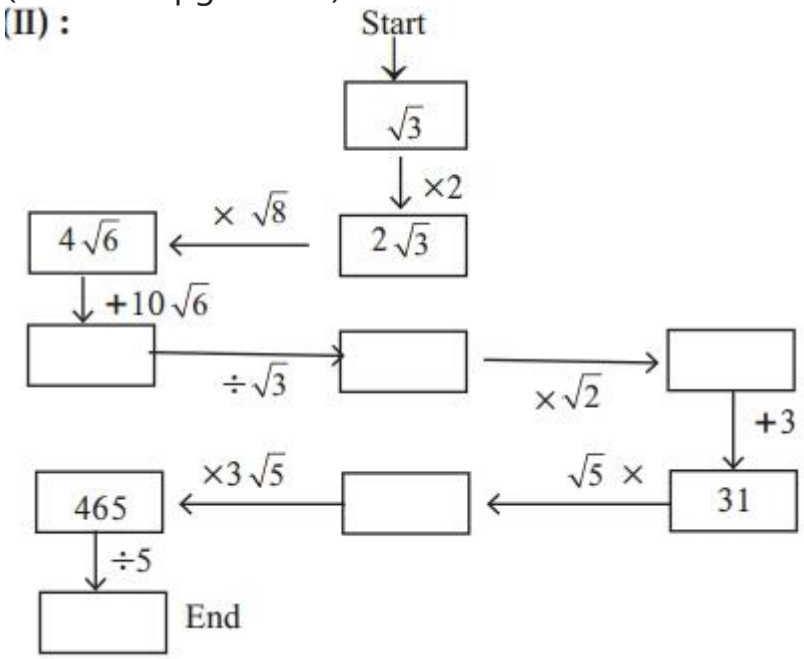
From the above examples,

$\mathbf{\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}}$

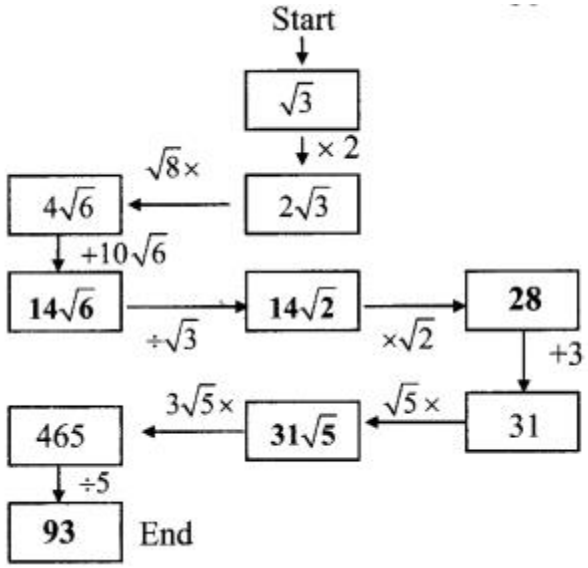
- *Digvijay*
- *Arjun*

Question 3.
Follow the arrows and complete the chart by doing the operations given. (Textbook pg. no. 34)

(II) :

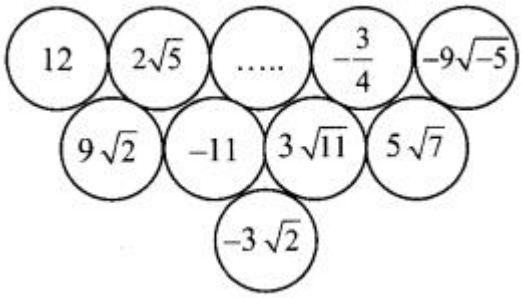


Solution:



Question 4.
There are some real numbers written on a card sheet. Use these numbers and construct two examples each of addition, subtraction, multiplication and division. Solve these examples. (Textbook pg. no. 34)

- *Digvijay*
- *Arjun*



Solution:

i. $9\sqrt{2} + (-3\sqrt{2}) = 9\sqrt{2} - 3\sqrt{2} = 6\sqrt{2}$

ii. $12 - 2\sqrt{5} = 2(6 - \sqrt{5})$

iii. $2\sqrt{5} \times 3\sqrt{11} = 6\sqrt{55}$

iv. $\frac{2\sqrt{5}}{9\sqrt{2}} = \frac{2\sqrt{5}}{9\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{10}}{9 \times 2} = \frac{\sqrt{10}}{9}$

Practice Set 2.4 Algebra 9th Std Maths Part 1 Answers Chapter 2 Real Numbers

Question 1.
Multiply.

i. $\sqrt{3}\left(\sqrt{7} - \sqrt{3}\right)$

ii. $\left(\sqrt{5} - \sqrt{7}\right)\sqrt{2}$

iii. $\left(3\sqrt{2} - \sqrt{3}\right)\left(4\sqrt{3} - \sqrt{2}\right)$

- *Digvijay*
- *Arjun*

Solution:

i. $\sqrt{3}\left(\sqrt{7}-\sqrt{3}\right) = \sqrt{3}\times\sqrt{7} - \sqrt{3}\times\sqrt{3}$

$= \sqrt{3\times7} - \sqrt{3\times3}$

$\therefore \quad \sqrt{3}\left(\sqrt{7}-\sqrt{3}\right) = \sqrt{21} - 3$

ii. $\left(\sqrt{5}-\sqrt{7}\right)\sqrt{2} = \sqrt{5}\times\sqrt{2} - \sqrt{7}\times\sqrt{2}$

$= \sqrt{5\times2} - \sqrt{7\times2}$

$\therefore \quad \left(\sqrt{5}-\sqrt{7}\right)\sqrt{2} = \sqrt{10} - \sqrt{14}$

iii. $\left(3\sqrt{2}-\sqrt{3}\right)\left(4\sqrt{3}-\sqrt{2}\right)$

$= 3\sqrt{2}\left(4\sqrt{3}-\sqrt{2}\right) - \sqrt{3}\left(4\sqrt{3}-\sqrt{2}\right)$

$= 3\sqrt{2} \times 4\sqrt{3} - 3\sqrt{2} \times \sqrt{2}$

$- \sqrt{3} \times 4\sqrt{3} + \sqrt{3} \times \sqrt{2}$

$= 12\sqrt{2\times3} - 3\sqrt{2\times2} - 4\sqrt{3\times3} + \sqrt{3\times2}$

$= 12\sqrt{6} - (3\times2) - (4\times3) + \sqrt{6}$

$= 12\sqrt{6} - 6 - 12 + \sqrt{6}$

$= (12+1)\sqrt{6} - 6 - 12$

$= 13\sqrt{6} - 18$

$\therefore \quad \left(3\sqrt{2}-\sqrt{3}\right)\left(4\sqrt{3}-\sqrt{2}\right) = 13\sqrt{6} - 18$

Question 2.

Rationalize the denominator.

i. $\dfrac{1}{\sqrt{7}+\sqrt{2}}$

ii. $\dfrac{3}{2\sqrt{5}-3\sqrt{2}}$

iii. $\dfrac{4}{7+4\sqrt{3}}$

iv. $\dfrac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

Solution:

- *Digvijay*
- *Arjun*

i. $$\frac{1}{\sqrt{7}+\sqrt{2}} = \frac{1}{\left(\sqrt{7}+\sqrt{2}\right)} \times \frac{\left(\sqrt{7}-\sqrt{2}\right)}{\left(\sqrt{7}-\sqrt{2}\right)}$$

...[Multiplying the numerator and denominator by $\left(\sqrt{7}-\sqrt{2}\right)$]

$$= \frac{\sqrt{7}-\sqrt{2}}{\left(\sqrt{7}\right)^2-\left(\sqrt{2}\right)^2}$$

...[$\because (a-b)(a+b) = a^2 - b^2$]

$$= \frac{\sqrt{7}-\sqrt{2}}{7-2}$$

$$\therefore \quad \frac{\mathbf{1}}{\sqrt{7}+\sqrt{2}} = \frac{\sqrt{7}-\sqrt{2}}{\mathbf{5}}$$

ii. $$\frac{3}{2\sqrt{5}-3\sqrt{2}} = \frac{3}{\left(2\sqrt{5}-3\sqrt{2}\right)} \times \frac{\left(2\sqrt{5}+3\sqrt{2}\right)}{\left(2\sqrt{5}+3\sqrt{2}\right)}$$

...[Multiplying the numerator and denominator by $\left(2\sqrt{5}+3\sqrt{2}\right)$]

$$= \frac{3\left(2\sqrt{5}+3\sqrt{2}\right)}{\left(2\sqrt{5}\right)^2-\left(3\sqrt{2}\right)^2}$$

...[$\because (a-b)(a+b) = a^2 - b^2$]

$$= \frac{3\left(2\sqrt{5}+3\sqrt{2}\right)}{(4\times5)-(9\times2)}$$

$$= \frac{3\left(2\sqrt{5}+3\sqrt{2}\right)}{20-18}$$

$$\therefore \quad \frac{\mathbf{3}}{\mathbf{2\sqrt{5}-3\sqrt{2}}} = \frac{\mathbf{3\left(2\sqrt{5}+3\sqrt{2}\right)}}{\mathbf{2}}$$

iii. $\frac{4}{7+4\sqrt{3}} = \frac{4}{(7+4\sqrt{3})} \times \frac{(7-4\sqrt{3})}{(7-4\sqrt{3})}$

...[Multiplying the numerator and denominator by $(7-4\sqrt{3})$]

$$= \frac{4(7-4\sqrt{3})}{(7)^2-(4\sqrt{3})^2}$$

...[$\because (a-b)(a+b) = a^2 - b^2$]

$$= \frac{4(7-4\sqrt{3})}{49-(16\times 3)}$$

$$= \frac{4(7-4\sqrt{3})}{49-48} = \frac{4(7-4\sqrt{3})}{1}$$

$\therefore$ $\frac{4}{7+4\sqrt{3}} = \mathbf{28 - 16\sqrt{3}}$

iv. $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} = \frac{(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})} \times \frac{(\sqrt{5}-\sqrt{3})}{(\sqrt{5}-\sqrt{3})}$

...[Multiplying the numerator and denominator by $(\sqrt{5}-\sqrt{3})$]

$$= \frac{\left(\sqrt{5}-\sqrt{3}\right)^2}{\left(\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2}$$

$$\ldots[\because (a-b)(a+b) = a^2 - b^2]$$

$$= \frac{\left(\sqrt{5}\right)^2 - 2\times\sqrt{5}\times\sqrt{3} + \left(\sqrt{3}\right)^2}{5-3}$$

$$\ldots[\because (a-b)^2 = a^2 - 2ab + b^2]$$

$$= \frac{5 - 2\sqrt{15} + 3}{2}$$

$$= \frac{8 - 2\sqrt{15}}{2}$$

$$= \frac{2\left(4-\sqrt{15}\right)}{2} = 4 - \sqrt{15}$$

$$\therefore \quad \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} = 4 - \sqrt{15}$$

Practice Set 2.5 Algebra 9th Std Maths Part 1 Answers Chapter 2 Real Numbers

Question 1.
Find the value.
i. | 15 – 2|
ii. | 4 – 9|
iii. | 7| x | -4|
Solution:
i. |15 – 2| = |13| = 13
ii. |4 – 9| = |-5| = 5
iii. |7| x |- 4| = 7 x 4 = 28

Question 2.
Solve.

- *Digvijay*
- *Arjun*

i. $|3x - 5| = 1$ ii. $|7 - 2x| = 5$

iii. $\left|\frac{8-x}{2}\right| = 5$ iv. $\left|5+\frac{x}{4}\right| = 5$

Solution:

i. |3x – 5| = 1

∴ 3x – 5 = 1 or 3x – 5 = -1

∴ 3x = 1 + 5 or 3x = -1 + 5

∴ 3x = 6 or 3x = 4

$\therefore \quad x = \frac{6}{3} \quad \text{or} \quad x = \frac{4}{3}$

$\therefore \quad x = \mathbf{2} \quad \text{or} \quad x = \mathbf{\frac{4}{3}}$

ii. |7 – 2x| = 5

∴ 7 – 2x = 5 or 7 – 2x = -5

∴ 7 – 5 = 2x or 7 + 5 = 2x

∴ 2x = 2 or 2x = 12

∴ x = 22 or x = 122

∴ x = 1 or x = 6

iii. $\left|\frac{8-x}{2}\right| = 5$

$\therefore \quad \frac{8-x}{2} = 5 \quad \text{or} \quad \frac{8-x}{2} = -5$

∴ 8 – x = 10 or 8 – x = -10 .. [Multiplying both the sides by 2]

∴ 8 – 10 = x or 8 + 10 = x

∴ x = -2 or x = 18

iv. $\left|5+\frac{x}{4}\right| = 5$

$\therefore \quad 5+\frac{x}{4} = 5 \quad \text{or} \quad 5+\frac{x}{4} = -5$

$\therefore \quad \frac{x}{4} = 5-5 \quad \text{or} \quad \frac{x}{4} = -5-5$

$\therefore \quad \frac{x}{4} = 0 \quad \text{or} \quad \frac{x}{4} = -10$

$\therefore \quad x = \mathbf{0} \quad \text{or} \quad x = \mathbf{-40}$

…[Multiplying both the sides by 4]

Problem Set 2 Algebra 9th Std Maths Part 1 Answers Chapter 2 Real Numbers

Question 1.
Choose the correct alternative answer for the questions given below. [1 Mark each]

i. Which one of the following is an irrational number?

(A) $\sqrt{\frac{16}{25}}$ (B) $\sqrt{5}$

(C) $\frac{3}{9}$ (D) $\sqrt{196}$

Answer:
√5

ii. Which of the following is an irrational number?
(A) 0.17
(B) $1.513^{-------}$
(C) 0.2746^{----}
(D) 0.101001000……..
Answer:
(D) 0.101001000……..
iii. Decimal expansion of which of the following is non-terminating recurring?

(A) $\frac{2}{5}$ (B) $\frac{3}{16}$ (C) $\frac{3}{11}$ (D) $\frac{137}{25}$

Answer:
(C) 311
iv. Every point on the number line represents which of the following numbers?
(A) Natural numbers
(B) Irrational numbers
(C) Rational numbers
(D) Real numbers
Answer:
(D) Real numbers

v. The number [/latex]0.\dot { 4 }[/latex] in pq form is ……

(A) $\frac{4}{9}$ (B) $\frac{40}{9}$

(C) $\frac{3.6}{9}$ (D) $\frac{36}{9}$

Answer:
(A) 49

- *Digvijay*
- *Arjun*

vi. What is √n , if n is not a perfect square number ?
(A) Natural number
(B) Rational number
(C) Irrational number
(D) Options A, B, C all are correct.
Answer:
(C) Irrational number

vii. Which of the following is not a surd ?
(A) $\sqrt{7}$ (B) $\sqrt[3]{17}$
(C) $\sqrt[3]{64}$ (D) $\sqrt{193}$
Answer:
(C) $64--\sqrt{----\sqrt{}_3}$
viii. What is the order of the surd $5-\sqrt{---\sqrt{}_3}$?
(A) 3
(B) 2
(C) 6
(D) 5
Answer:
(C) 6
ix. Which one is the conjugate pair of $2\sqrt{5} + \sqrt{3}$?
(A) $-2\sqrt{5} + \sqrt{3}$
(B) $-2\sqrt{5} - \sqrt{3}$
(C) $2\sqrt{3} - \sqrt{5}$
(D) $\sqrt{3} + 2\sqrt{5}$
Answer:
(A) $-2\sqrt{5} + \sqrt{3}$

x. The value of |12 – (13 + 7) x 4| is ____ .
(A) – 68
(B) 68
(C) – 32
(D) 32
Answer:
(B) 68

Hints:
ii. Since the decimal expansion is neither terminating nor recurring, 0.101001000…. is an irrational number.

iii. 311
Denominator =11 = 1 x 11
Since, the denominator is other than prime factors 2 or 5.
∴ the decimal expansion of 311 will be non terminating recurring.
v. Let x = [/latex]0.\dot { 4 }[/latex]
∴10 x = [/latex]0.\dot { 4 }[/latex]

- *Digvijay*
- *Arjun*

∴10 – x = [/latex]4.\dot { 4 }[/latex] – [/latex]0.\dot { 4 }[/latex]
∴9x = 4
∴ x = 49
vii. $61--\sqrt{}_3 = 4$, which is not an irrational number.
viii. $5-\sqrt{---}\sqrt{}_3=5-\sqrt{}_{3\times2}=5-\sqrt{}_6$
∴ Order = 6
ix. The conjugate of $2\sqrt{5} + \sqrt{3}$ is $2\sqrt{5} – \sqrt{3}$ or $-2\sqrt{5} + \sqrt{3}$

x. |12 – (13+7) x 4| = |12 – 20 x 4|
= |12 – 80|
= |-68|
= 68

Question 2.
Write the following numbers in pq form.
i. 0.555
ii. $29.568^{\text{-------}}$
iii. 9.315315…..
iv. 357.417417…..
v . $30.219^{\text{-------}}$
Solution:

i. $$0.555 = \frac{0.555\times1000}{1\times1000} = \frac{555}{1000} = \frac{5\times111}{5\times200}$$

$$= \frac{\mathbf{111}}{\mathbf{200}}$$

ii. Let x = $29.568^{\text{-------}}$ …(i)
x = 29.568568…
Since, three numbers i.e. 5, 6 and 8 are repeating after the decimal point.
Thus, multiplying both sides by 1000,
1000x = 29568.568568…
1000 x= $29568.568^{\text{-------}}$ …(ii)
Subtracting (i) from (ii),
1000x – x = $29568.568^{\text{-------}} – 29.568^{\text{-------}}$
∴ 999x = 29539

$$\therefore \quad x = \frac{29539}{999}$$

$$\therefore \quad \mathbf{29.\overline{568} = \frac{29539}{999}}$$

iii. Let x = 9.315315 … = $9.315^{\text{-------}}$ …(i)
Since, three numbers i.e. 3, 1 and 5 are repeating after the decimal point.
Thus, multiplying both sides by 1000,
1000x = 9315.315315…
∴1000x = $9315.315^{\text{-------}}$ …(ii)
Subtracting (i) from (ii),

- *Digvijay*
- *Arjun*

$1000x - x = 9315.315\overline{} - 9.315\overline{}$

$\therefore 999x = 9306$

$$\therefore \quad x = \frac{9306}{999} = \frac{9 \times 1034}{9 \times 111} = \frac{1034}{111}$$

$$\therefore \quad \mathbf{9.315315\ldots = \frac{1034}{111}}$$

iv. Let $x = 357.417417\ldots = 357.417\overline{}$ …(i)

Since, three numbers i.e. 4, 1 and 7 are repeating after the decimal point.

Thus, multiplying both sides by 1000,

$1000x = 357417.417417\ldots$

$\therefore 1000x = 357417.417$ …(ii)

Subtracting (i) from (ii),

$1000x - x = 357417.417\overline{} - 357.417\overline{}$

$\therefore 999x = 357060$

$$\therefore \quad x = \frac{357060}{999} = \frac{3 \times 119020}{3 \times 333}$$

$$\therefore \quad \mathbf{357.417417\ldots = \frac{119020}{333}}$$

v. Let $x = 30.219\overline{}$ …(i)

$\therefore x = 30.219219$

Since, three numbers i.e. 2, 1 and 9 are repeating after the decimal point.

Thus, multiplying both sides by 1000,

$1000x = 30219.219219\ldots$

$\therefore 1000x = 30219.219\overline{}$ …(ii)

Subtracting (i) from (ii),

$1000x - x = 30219.219\overline{} - 30.219\overline{}$

$\therefore 999x = 30189$

$$\therefore \quad x = \frac{30189}{999} = \frac{3 \times 10063}{3 \times 333}$$

$$\therefore \quad \mathbf{30.\overline{219} = \frac{10063}{333}}$$

Question 3.

Write the following numbers in its decimal form.

- *Digvijay*
- *Arjun*

i. $\frac{-5}{7}$

ii. $\frac{9}{11}$

iii. $\sqrt{5}$

iv. $\frac{121}{13}$

v. $\frac{29}{8}$

Solution:

i. −57

$$
\begin{array}{r}
0.714285\ldots \\
7\overline{)5.000000} \\
-\ 0 \\
\hline
50 \\
-\ 49 \\
\hline
10 \\
-\ \ 7 \\
\hline
30 \\
-\ \ 28 \\
\hline
20 \\
-\ \ 14 \\
\hline
60 \\
-\ \ 56 \\
\hline
40 \\
-\ \ 35 \\
\hline
5
\end{array}
$$

$\therefore \quad \frac{-5}{7} = -0.\overline{714285}$

- *Digvijay*
- *Arjun*

ii. 911

$$
\begin{array}{r}
0.81\ldots. \\
11\overline{)\,9.00} \\
-\,0 \\
\hline
90 \\
-\,88 \\
\hline
20 \\
-\,11 \\
\hline
9
\end{array}
$$

$\therefore \quad \mathbf{\frac{9}{11} = 0.\overline{81}}$

iii. $\sqrt{5}$

	2.2360679…
2	$\overline{5.00}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}\,\overline{00}$
+ 2	− 4
42	100
+ 2	− 84
443	1600
+ 3	− 1329
4466	27100
+ 6	− 26796
44720	30400
+ 0	− 0
447206	3040000
+ 6	− 2683236
4472127	35676400
+ 7	− 31304889
44721349	437151100
+ 9	− 402492141
44721358	34658959

$\therefore \quad \mathbf{\sqrt{5} = 2.2360679.....}$

- *Digvijay*
- *Arjun*

iv. 12113

$$
\begin{array}{r}
9.307692\ldots \\
13\overline{)121.000000} \\
-\ 117 \\
\hline
40 \\
-\ 39 \\
\hline
10 \\
-\ 0 \\
\hline
100 \\
-\ 91 \\
\hline
90 \\
-\ 78 \\
\hline
120 \\
-\ 117 \\
\hline
30 \\
-\ 26 \\
\hline
4
\end{array}
$$

$\therefore \quad \mathbf{\frac{121}{13} = 9.\overline{307692}}$

v. 298

$$
\begin{array}{r}
3.625 \\
8\overline{)29.000} \\
-24 \\
\hline
50 \\
-\ 48 \\
\hline
20 \\
-\ 16 \\
\hline
40 \\
-\ 40 \\
\hline
0
\end{array}
$$

$\therefore \quad \mathbf{\frac{29}{8} = 3.625}$

Question 4.
Show that $5 + \sqrt{7}$ is an irrational number. [3 Marks]
Solution:
Let us assume that $5 + \sqrt{7}$ is a rational number. So, we can find co-prime integers 'a' and 'b' ($b \neq 0$) such that

- *Digvijay*
- *Arjun*

$$5+\sqrt{7}=\frac{a}{b}$$

$$\therefore \quad \sqrt{7}=\frac{a}{b}-5$$

Since, 'a' and 'b' are integers, $b\sqrt{}_a - 5$ is a rational number and so √7 is a rational number.
∴ But this contradicts the fact that √7 is an irrational number.
Our assumption that 5 + √7 is a rational number is wrong.
∴ 5 + √7 is an irrational number.

Question 5.
Write the following surds in simplest form.

i. $\frac{3}{4}\sqrt{8}$ ii. $-\frac{5}{9}\sqrt{45}$

Solution:

i. $\frac{3}{4}\sqrt{8} = \frac{3}{4} \times \sqrt{4\times 2}$

$= \frac{3}{4}\times 2\sqrt{2}$

$\therefore \quad \mathbf{\frac{3}{4}\sqrt{8} = \frac{3}{2}\sqrt{2}}$

ii. $-\frac{5}{9}\sqrt{45} = -\frac{5}{9}\times\sqrt{9\times 5}$

$= -\frac{5}{9}\times 3\sqrt{5}$

$\therefore \quad \mathbf{-\frac{5}{9}\sqrt{45} = \frac{-5}{3}\sqrt{5}}$

Question 6.
Write the simplest form of rationalising factor for the given surds.

i. $\sqrt{32}$ ii. $\sqrt{50}$

iii. $\sqrt{27}$ iv. $\frac{3}{5}\sqrt{10}$

v. $3\sqrt{72}$ vi. $4\sqrt{11}$

Solution:

i. $\sqrt{32} = \sqrt{16\times 2} = 4\sqrt{2}$

Now, 4√2 x √2 = 4 x 2 = 8, which is a rational number.
∴ √2 is the simplest form of the rationalising factor of √32 .

ii. $\sqrt{50} = \sqrt{25\times 2} = 5\sqrt{2}$

Now, 5√2 x √2 = 5 x 2 = 10, which is a rational number.
∴ √2 is the simplest form of the rationalising factor of √50 .

iii. $\sqrt{27} = \sqrt{9\times 3} = 3\sqrt{3}$

- *Digvijay*
- *Arjun*

Now, 3√3 x √3 = 3 x 3 = 9, which is a rational number.
∴ √ 3 is the simplest form of the rationalising factor of √27 .

iv. $\frac{3}{5}\sqrt{10}$

$\frac{3}{5}\sqrt{10} \times \sqrt{10}$

$= \frac{3}{5} \times 10$

$= 3 \times 2$

= 6, which is a rational number.
∴ √10 is the simplest form of the rationalising factor of $5-\sqrt{}_3$ √10 .

v. $3\sqrt{72} = 3\sqrt{36 \times 2} = 3 \times 6\sqrt{2} = 18\sqrt{2}$

Now, 18√2 x √2 = 18 x 2 = 36, which is a rational number.
∴ √2 is the simplest form of the rationalising factor of 3√72.
vi. 4√11
4√11 x √11 = 4 x 11 = 44, which is a rational number.
∴ √11 is the simplest form of the rationalising factor of 4√11.

Question 7.
Simplify.

i. $\frac{4}{7}\sqrt{147} + \frac{3}{8}\sqrt{192} - \frac{1}{5}\sqrt{75}$

ii. $5\sqrt{3} + 2\sqrt{27} + \frac{1}{\sqrt{3}}$

iii. $\sqrt{216} - 5\sqrt{6} + \sqrt{294} - \frac{3}{\sqrt{6}}$

iv. $4\sqrt{12} - \sqrt{75} - 7\sqrt{48}$

v. $2\sqrt{48} - \sqrt{75} - \frac{1}{\sqrt{3}}$

Solution:

- *Digvijay*
- *Arjun*

i. $\frac{4}{7}\sqrt{147}+\frac{3}{8}\sqrt{192}-\frac{1}{5}\sqrt{75}$

$=\frac{4}{7}\sqrt{49\times3}+\frac{3}{8}\sqrt{64\times3}-\frac{1}{5}\sqrt{25\times3}$

$=\frac{4}{7}\times7\sqrt{3}+\frac{3}{8}\times8\sqrt{3}-\frac{1}{5}\times5\sqrt{3}$

$=4\sqrt{3}+3\sqrt{3}-\sqrt{3}$

$=(4+3-1)\sqrt{3}$

$=6\sqrt{3}$

$\therefore$ $\mathbf{\frac{4}{7}\sqrt{147}+\frac{3}{8}\sqrt{192}-\frac{1}{5}\sqrt{75}=6\sqrt{3}}$

ii. $5\sqrt{3}+2\sqrt{27}+\frac{1}{\sqrt{3}}$

$= 5\sqrt{3}+2\sqrt{9\times3}+\frac{1}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}}$

$= 5\sqrt{3}+2\times 3\sqrt{3}+\frac{\sqrt{3}}{3}$

$= 5\sqrt{3}+6\sqrt{3}+\frac{\sqrt{3}}{3}$

$= \left(5+6+\frac{1}{3}\right)\sqrt{3}$

$= \left(11+\frac{1}{3}\right)\sqrt{3} = \left(\frac{33+1}{3}\right)\sqrt{3} = \frac{34}{3}\sqrt{3}$

$\therefore \quad \mathbf{5\sqrt{3}+2\sqrt{27}+\frac{1}{\sqrt{3}} = \frac{34}{3}\sqrt{3}}$

iii. $\sqrt{216}-5\sqrt{6}+\sqrt{294}-\frac{3}{\sqrt{6}}$

$= \sqrt{36\times6}-5\sqrt{6}+\sqrt{49\times6}-\frac{3}{\sqrt{6}}\times\frac{\sqrt{6}}{\sqrt{6}}$

$= 6\sqrt{6}-5\sqrt{6}+7\sqrt{6}-\frac{3\sqrt{6}}{6}$

$= 6\sqrt{6}-5\sqrt{6}+7\sqrt{6}-\frac{1}{2}\sqrt{6}$

$= \left(6-5+7-\frac{1}{2}\right)\sqrt{6}$

$= \left(8-\frac{1}{2}\right)\sqrt{6} = \left(\frac{16-1}{2}\right)\sqrt{6} = \frac{15}{2}\sqrt{6}$

$\therefore \quad \mathbf{\sqrt{216}-5\sqrt{6}+\sqrt{294}-\frac{3}{\sqrt{6}} = \frac{15}{2}\sqrt{6}}$

iv. $4\sqrt{12}-\sqrt{75}-7\sqrt{48}$

$= 4\sqrt{4\times3}-\sqrt{25\times3}-7\sqrt{16\times3}$

$=4\times 2\sqrt{3}-5\sqrt{3}-7\times4\sqrt{3}$

$=8\sqrt{3}-5\sqrt{3}-28\sqrt{3}$

$= (8-5-28)\sqrt{3}$

$= (-25)\sqrt{3}$

$\therefore \quad \mathbf{4\sqrt{12}-\sqrt{75}-7\sqrt{48}=-25\sqrt{3}}$

v. $2\sqrt{48}-\sqrt{75}-\frac{1}{\sqrt{3}}$

$= 2\sqrt{16\times3}-\sqrt{25\times3}-\frac{1}{\sqrt{3}}\times\frac{\sqrt{3}}{\sqrt{3}}$

$=2\times4\sqrt{3}-5\sqrt{3}-\frac{1}{3}\sqrt{3}$

$=8\sqrt{3}-5\sqrt{3}-\frac{1}{3}\sqrt{3}$

$=\left(8-5-\frac{1}{3}\right)\sqrt{3}$

$=\left(3-\frac{1}{3}\right)\sqrt{3}$

$=\left(\frac{9-1}{3}\right)\sqrt{3}$

$=\frac{8}{3}\sqrt{3}$

$\therefore \quad \mathbf{2\sqrt{48}-\sqrt{75}-\frac{1}{\sqrt{3}}=\frac{8}{3}\sqrt{3}}$

Question 8.
Rationalize the denominator.

- *Digvijay*
- *Arjun*

i. $\frac{1}{\sqrt{5}}$

ii. $\frac{2}{3\sqrt{7}}$

iii. $\frac{1}{\sqrt{3}-\sqrt{2}}$

iv. $\frac{1}{3\sqrt{5}+2\sqrt{2}}$

v. $\frac{12}{4\sqrt{3}-\sqrt{2}}$

Solution:

i. $\frac{1}{\sqrt{5}} = \frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

...[Multiplying the numerator and denominator by $\sqrt{5}$]

$= \frac{1 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$

$\therefore \quad \mathbf{\frac{1}{\sqrt{5}} = \frac{\sqrt{5}}{5}}$

ii. $\frac{2}{3\sqrt{7}} = \frac{2}{3\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}}$

...[Multiplying the numerator and denominator by $\sqrt{7}$]

$= \frac{2 \times \sqrt{7}}{3\sqrt{7} \times \sqrt{7}} = \frac{2\sqrt{7}}{3 \times 7}$

$\therefore \quad \mathbf{\frac{2}{3\sqrt{7}} = \frac{2\sqrt{7}}{21}}$

iii. $\frac{1}{\sqrt{3}-\sqrt{2}} = \frac{1}{\left(\sqrt{3}-\sqrt{2}\right)} \times \frac{\left(\sqrt{3}+\sqrt{2}\right)}{\left(\sqrt{3}+\sqrt{2}\right)}$

...[Multiplying the numerator and denominator by $\left(\sqrt{3}+\sqrt{2}\right)$]

$= \frac{1 \times \left(\sqrt{3}+\sqrt{2}\right)}{\left(\sqrt{3}-\sqrt{2}\right)\left(\sqrt{3}+\sqrt{2}\right)}$

$$= \frac{\sqrt{3}+\sqrt{2}}{\left(\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$

...[$\because$ $(a+b)(a-b) = a^2 - b^2$]

$$= \frac{\sqrt{3}+\sqrt{2}}{3-2} = \frac{\sqrt{3}+\sqrt{2}}{1}$$

$$\therefore \quad \frac{1}{\sqrt{3}-\sqrt{2}} = \sqrt{3}+\sqrt{2}$$

iv. $$\frac{1}{3\sqrt{5}+2\sqrt{2}} = \frac{1}{\left(3\sqrt{5}+2\sqrt{2}\right)} \times \frac{\left(3\sqrt{5}-2\sqrt{2}\right)}{\left(3\sqrt{5}-2\sqrt{2}\right)}$$

...[Multiplying the numerator and denominator by $\left(3\sqrt{5}-2\sqrt{2}\right)$]

$$= \frac{1\times\left(3\sqrt{5}-2\sqrt{2}\right)}{\left(3\sqrt{5}+2\sqrt{2}\right)\left(3\sqrt{5}-2\sqrt{2}\right)}$$

$$= \frac{3\sqrt{5}-2\sqrt{2}}{\left(3\sqrt{5}\right)^2-\left(2\sqrt{2}\right)^2}$$

•, ...[$\because$ $(a+b)(a-b) = a^2 - b^2$]

$$= \frac{3\sqrt{5}-2\sqrt{2}}{(9\times5)-(4\times2)}$$

$$= \frac{3\sqrt{5}-2\sqrt{2}}{45-8}$$

$$\therefore \quad \frac{1}{3\sqrt{5}+2\sqrt{2}} = \frac{3\sqrt{5}-2\sqrt{2}}{37}$$

v. $$\frac{12}{4\sqrt{3}-\sqrt{2}} = \frac{12}{\left(4\sqrt{3}-\sqrt{2}\right)} \times \frac{\left(4\sqrt{3}+\sqrt{2}\right)}{\left(4\sqrt{3}+\sqrt{2}\right)}$$

...[Multiplying the numerator and denominator by $\left(4\sqrt{3}+\sqrt{2}\right)$]

$$= \frac{12\left(4\sqrt{3}+\sqrt{2}\right)}{\left(4\sqrt{3}-\sqrt{2}\right)\left(4\sqrt{3}+\sqrt{2}\right)}$$

$$= \frac{12\left(4\sqrt{3}+\sqrt{2}\right)}{\left(4\sqrt{3}\right)^2-\left(\sqrt{2}\right)^2}$$

...[$\because$ $(a+b)(a-b) = a^2 - b^2$]

$$= \frac{12\left(4\sqrt{3}+\sqrt{2}\right)}{(16\times 3)-2} = \frac{12\left(4\sqrt{3}+\sqrt{2}\right)}{48-2}$$

$$= \frac{12\left(4\sqrt{3}+\sqrt{2}\right)}{46}$$

$$\therefore \quad \frac{12}{4\sqrt{3}-\sqrt{2}} = \frac{6\left(4\sqrt{3}+\sqrt{2}\right)}{23}$$

Question 1.
Draw three or four circles of different radii on a card board. Cut these circles. Take a thread and measure the length of circumference and diameter of each of the circles. Note down the readings in the given table. (Textbook pg.no.23)

No.	radius (r)	diameter (d)	Circum-ference (c)	Ratio = $\frac{c}{d}$
i.	7 cm			
ii.	8 cm			
iii.	5.5 cm			

Solution:
i. 14,44,3.1

- *Digvijay*
- *Arjun*

ii. 16,50.3,3.1
iii. 11,34.6,3.1

From table, we observe that the ratio $\frac{d}{c}$ is nearly 3.1 which is constant. This ratio is denoted by π (pi).

Question 2.

To find the approximate value of π, take the wire of length 11 cm, 22 cm and 33 cm each. Make a circle from the wire. Measure the diameter and complete the following table.

Circle No.	Circum-ference (c)	Diameter (d)	Ratio of (c) to (d)
i.	11 cm		
ii.	22 cm		
iii.	33 cm		

Verify that the ratio of circumference to the diameter of a circle is approximately $\frac{22}{7}$. (Textbook pg. no. 24)

Solution:

i. 3.5, $\frac{22}{7}$

ii. 7, $\frac{22}{7}$

iii. 10.5, $\frac{22}{7}$

∴ The ratio of circumference to the diameter of each circle is $\frac{22}{7}$.