SAMPLE CONTENT

PERFECT

MATHEMATICS

STD. VIII
(Eng. Med.)

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PERFECT

Mathematics

STD. VIII

Salient Features

- Written as per the new textbook.
- Exhaustive coverage of entire syllabus.
- Topic-wise distribution of textual questions and practice problems at the beginning of every chapter.
- Covers solutions to all Practice sets.
- Includes additional activities for practice.
- Includes additional problems and MCQs for practice.
- Chapter-wise assessment for every chapter.
- Constructions drawn with accurate measurements.
- Includes Important formulae at the end of the book.
- Smart Check for Answer verification.

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PREFACE

Creation of the **‘Mathematics’** book was a rollercoaster ride. We had a plethora of ideas, suggestions and decisions to ponder over. However, our basic premise was to keep this book in line with the new, improved syllabus and to provide students with an absolutely fresh material.

Mathematics : Std. VIII has been prepared as per the new syllabus which is more child-centric and focuses on active learning along-with making the process of education more enjoyable and interesting.

For better understanding of different types of questions, Topic-Wise Distribution of Textual Questions and Practice Problems have been provided at the beginning of every chapter. Before each practice set, short and easy explanation of different concepts with illustrations for better understanding is given. Solutions to Textual Questions and Examples are provided in a lucid manner.

‘Smart Check’ given to enable the students to cross-check their answers.

‘Apply Your Knowledge’ covers all the Textual Activities and Projects along with their answers.

‘Multiple Choice Questions’ and ‘Additional Problems for Practice’ include multiple unsolved problems for revision and in the process help the students to sharpen their problem solving skills. ‘Solved examples’ from textbook are also included in the book.

Every chapter ends with a ‘Chapter Assessment’. This test stands as a testimony to the fact that the child has understood the chapter thoroughly.

‘Activities for practice’ includes additional activities along with their answers for the students to practice.

All the diagrams are neat and have proper labelling. The book has a unique feature that all the constructions are as per the scale.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we’ve nearly missed something or want to applaud us for our triumphs, we’d love to hear from you.

Please write to us on : mail@targetpublications.org

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

Publisher

Edition: Second

KEY FEATURES

Activities for Practice

Activities for Practice: In this section we have provided multiple activities for practice in accordance with the latest paper pattern.

Multiple Choice Questions for Practice

Multiple Choice Questions: This section is provided for additional practice of Multiple Choice Questions.

Additional Problems for Practice

Additional Problems for Practice, in this section we have provided ample practice problems for students.

Solved examples from textbook are indicated by "+".

Chapter Assessment

Chapter Assessment covers questions from the chapter for self-evaluation purpose.

This is our attempt to offer students with revision and help them assess their knowledge of each chapter.

Important Formulae

Important Formulae given at the end of the book includes all the key formulae in the chapter.

It offers students a handy tool to solve problems and ace the last minute revision.

Smart Check

Smart Check is a technique to verify the answers. This is our attempt to cross-check the accuracy of the answer.

Smart check is indicated by ✓ symbol.

Contents

Note: 1. Solved examples from textbook are indicated by "+".

2. Smart check is indicated by ✓ symbol.

1 Rational and Irrational Numbers

Type of Problems	Practice Set	Q. Nos.
To show rational numbers on a number line	1.1	Q.1, 2
	Practice Problems (Based on Practice Set 1.1)	Q.1, 2
Comparison of rational numbers	1.2	Q.1
	Practice Problems (Based on Practice Set 1.2)	Q.1
Decimal representation of rational numbers	1.3	Q.1
	Practice Problems (Based on Practice Set 1.3)	Q.1
To show irrational numbers on a number line	1.4	Q.1, 2, 3
	Practice Problems (Based on Practice Set 1.4)	Q.1, 2

Let's Recall

1. **Natural numbers:**
   The counting numbers 1, 2, 3, 4, … are called natural numbers.

2. **Whole numbers:**
   The union of the set of natural numbers and zero is a set of whole numbers.
   The whole numbers are 0, 1, 2, 3, 4, …

3. **Integers:**
   The set of all natural numbers, zero and opposite of all natural numbers is called set of integers.
   The integers are …, –3, –2, –1, 0, 1, 2, 3,…

4. **Rational numbers:**
   If m is any integer and n is a non zero integer, then the number $\frac{m}{n}$ is called a rational number.

   Examples: $\frac{-3}{4}, \frac{-9}{48}, -1, 0, \frac{2}{7}, \frac{6}{10}, 3$, etc.

Note: There are infinite rational numbers between any two rational numbers.

Example: Find the rational numbers between $\frac{3}{8}$ and $\frac{5}{8}$.

Solution:

$$\frac{3}{8} = \frac{3 \times 10}{8 \times 10} = \frac{30}{80}, \quad \frac{5}{8} = \frac{5 \times 10}{8 \times 10} = \frac{50}{80}$$

∴ The rational numbers between $\frac{3}{8}$ and $\frac{5}{8}$ are $\frac{31}{80}, \frac{35}{80}, \frac{37}{80}$, etc.

Let's Study

To show rational numbers on a number line

Example: Show the numbers $\frac{9}{4}$ and $\frac{-3}{4}$ on a number line.

Step 1 : Draw a number line and mark numbers at equal distances.

Step 2 : $\frac{9}{4} = 9 \times \frac{1}{4}$ Here, the denominator is 4.

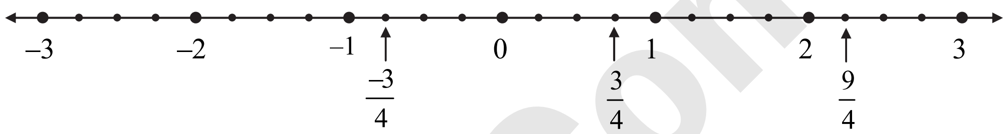
Divide each unit on the right side of zero in 4 equal parts.

Step 3 : Mark the point on the 9th equal part from 0 as $\frac{9}{4}$

or $\frac{9}{4} = 2 + \frac{1}{4}$

Mark the point at $\left(\frac{1}{4}\right)^{th}$ distance of unit after 2 as $\frac{9}{4}$.

To show $\frac{-3}{4}$ on the number line, first mark $\frac{3}{4}$ on the number line. The number to the left of 0 at the same distance as $\frac{3}{4}$ is $\frac{-3}{4}$.



Note: A rational number is shown on the number line by dividing each unit into number of parts equal to the denominator of the rational number.

Practice Set 1.1

1. **Show the following numbers on a number line. Draw a separate number line for each example.**

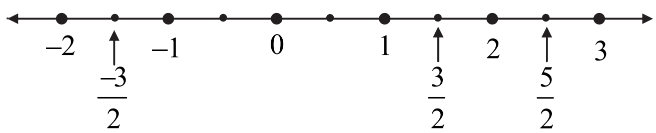
i. $\frac{3}{2}, \frac{5}{2}, -\frac{3}{2}$ ii. $\frac{7}{5}, \frac{-2}{5}, \frac{-4}{5}$ iii. $\frac{-5}{8}, \frac{11}{8}$ iv. $\frac{13}{10}, \frac{-17}{10}$

Solution:

i. $\frac{3}{2}, \frac{5}{2}, -\frac{3}{2}$

Here, the denominator of each fraction is 2.

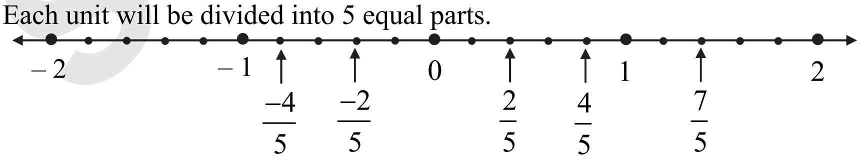
∴ Each unit will be divided into 2 equal parts.



ii. $\frac{7}{5}, \frac{-2}{5}, \frac{-4}{5}$

Here, the denominator of each fraction is 5.

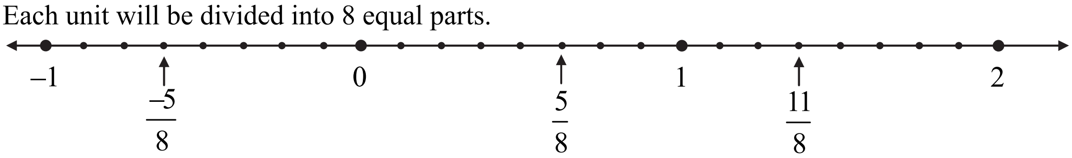
∴ Each unit will be divided into 5 equal parts.



iii. $\frac{-5}{8}, \frac{11}{8}$

Here, the denominator of each fraction is 8.

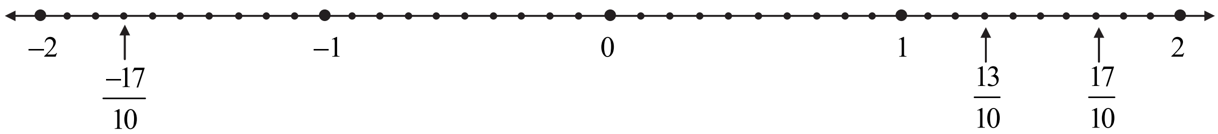
∴ Each unit will be divided into 8 equal parts.



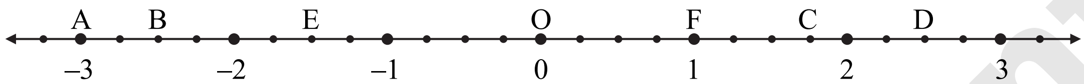
iv. $\frac{13}{10}, \frac{-17}{10}$

Here, the denominator of each fraction is 10.

$\therefore$ Each unit will be divided into 10 equal parts.



2. Observe the number line and answer the questions.



i. Which number is indicated by point B?

ii. Which point indicates the number $1\frac{3}{4}$?

iii. State whether the statement, 'the point D denotes the number $\frac{5}{2}$' is true or false.

Ans: Here, each unit is divided into 4 equal parts.

i. Point B is marked on the 10^{th} equal part on the left side of O.

$\therefore$ The number indicated by point B is $\mathbf{\frac{-10}{4}}$.

---

ii. $1\frac{3}{4} = \frac{1 \times 4 + 3}{4}$

$= \frac{4+3}{4}$

$= \frac{7}{4}$

Point C is marked on the 7^{th} equal part on the right side of O.

$\therefore$ The number $1\frac{3}{4}$ is indicated by **point C**.

---

iii. True

Point D is marked on the 10^{th} equal part on the right side of O.

$\therefore$ D denotes the number $\frac{10}{4} = \frac{5 \times 2}{2 \times 2} = \frac{5}{2}$

Let's Study

Comparison of rational numbers

1. Comparison of two numbers:

For any pair of numbers on a number line, the number to the left is smaller than the other number.

Example: Compare the numbers 0 and $\mathbf{\frac{3}{5}}$.

On a number line, 0 is to the left of $\frac{3}{5}$.

$\therefore$ $0 < \frac{3}{5}$

2. Comparison of a positive and a negative number:

A negative number is always less than a positive number.

Example: $\frac{-7}{2} < \frac{8}{3}$

3. **Comparison of two positive numbers:**

If the numerator and the denominator of a rational number is multiplied by any non zero number, then the value of rational number does not change i.e. $\frac{a}{b}=\frac{a\times k}{b\times k}$, $(k \neq 0)$.

If the denominators of two rational numbers are the same, then the number having greater numerator is the greater rational number.

Example: Compare the numbers $\frac{5}{4}$ and $\frac{2}{7}$.

Solution:

Here, the denominators of the given rational numbers are not the same.

So, first we have to make their denominators same by taking their LCM.

LCM of 4 and 7 = 28

$\frac{5}{4}=\frac{5\times 7}{4\times 7}=\frac{35}{28}$,

$\frac{2}{7}=\frac{2\times 4}{7\times 4}=\frac{14}{28}$

Now, we have to compare their numerators.

Since, 35 > 14

$\therefore$ $\frac{35}{28}>\frac{14}{28}$

$\therefore$ $\frac{5}{4}>\frac{2}{7}$

4. **Comparison of two negative numbers:**

If a and b are positive numbers such that $a < b$, then $-a > -b$.

Examples:

i. **Compare the numbers –3 and –8.**

Solution:

Since, 3 < 8

$\therefore$ $-3 > -8$

ii. **Compare the numbers $\frac{-6}{5}$ and $\frac{-3}{11}$.**

Solution:

Here, the denominators of the given rational numbers are not the same.

So, first we have to make their denominators same by taking their LCM.

LCM of 5 and 11 = 55

$\frac{-6}{5}=\frac{-6\times 11}{5\times 11}=\frac{-66}{55}$,

$\frac{-3}{11}=\frac{-3\times 5}{11\times 5}=\frac{-15}{55}$

Now, we have to compare their numerators.

Since, 66 > 15

$\therefore$ $\frac{66}{55}>\frac{15}{55}$

$\therefore$ $\frac{-66}{55}<-\frac{15}{55}$

$\therefore$ $-\frac{6}{5}<-\frac{3}{11}$

Try This

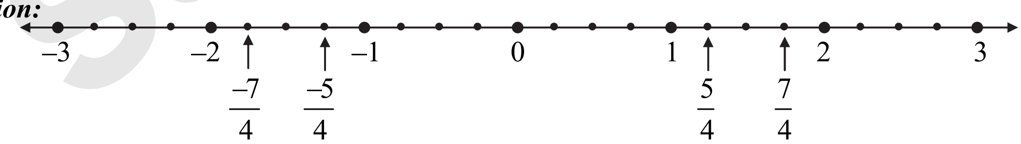
1. **Verify the following comparisons using a number line.**

i. $2 < 3$, but $-2 > -3$

ii. $\frac{5}{4}<\frac{7}{4}$, but $\frac{-5}{4}>\frac{-7}{4}$

(Textbook pg. no. 3)

Solution:



We know that, on a number line the number to the left is smaller than the other.

$\therefore$ $2 < 3$ and $-3 < -2$

i.e. $2 < 3$ and $-2 > -3$

$\frac{5}{4}<\frac{7}{4}$ and $\frac{-7}{4}<\frac{-5}{4}$

i.e. $\frac{5}{4}<\frac{7}{4}$ and $\frac{-5}{4}>\frac{-7}{4}$

5. Rules to compare two rational numbers:

If $\frac{a}{b}$ and $\frac{c}{d}$ are rational numbers such that b and d are positive, and if

i. $a \times d < b \times c$, then $\frac{a}{b} < \frac{c}{d}$

Example: $\frac{1}{5} < \frac{2}{3}$, because $1 \times 3 < 5 \times 2$

ii. $a \times d = b \times c$, then $\frac{a}{b} = \frac{c}{d}$

Example: $\frac{3}{5} = \frac{6}{10}$, because $3 \times 10 = 5 \times 6$

iii. $a \times d > b \times c$, then $\frac{a}{b} > \frac{c}{d}$

Example: $\frac{3}{4} > \frac{2}{5}$, because $3 \times 5 > 4 \times 2$

Practice Set 1.2

1. Compare the following numbers.

i. $-7, -2$

ii. $0, -\frac{9}{5}$

iii. $\frac{8}{7}, 0$

iv. $-\frac{5}{4}, \frac{1}{4}$

v. $\frac{40}{29}, \frac{141}{29}$

vi. $-\frac{17}{20}, -\frac{13}{20}$

vii. $\frac{15}{12}, \frac{7}{16}$

viii. $-\frac{25}{8}, -\frac{9}{4}$

ix. $\frac{12}{15}, \frac{3}{5}$

x. $-\frac{7}{11}, -\frac{3}{4}$

Solution:

i. $-7, -2$

If a and b are positive numbers such that $a < b$, then $-a > -b$.

Since, $2 < 7$

∴ $\mathbf{-2 > -7}$

---

ii. $0, -\frac{9}{5}$

On a number line, $-\frac{9}{5}$ is to the left of zero.

∴ $\mathbf{0 > -\frac{9}{5}}$

---

iii. $\frac{8}{7}, 0$

On a number line, zero is to the left of $\frac{8}{7}$.

∴ $\mathbf{\frac{8}{7} > 0}$

iv. $-\frac{5}{4}, \frac{1}{4}$

We know that, a negative number is always less than a positive number.

∴ $\mathbf{-\frac{5}{4} < \frac{1}{4}}$

---

v. $\frac{40}{29}, \frac{141}{29}$

Here, the denominators of the given numbers are the same.

Since, $40 < 141$

∴ $\mathbf{\frac{40}{29} < \frac{141}{29}}$

---

vi. $-\frac{17}{20}, -\frac{13}{20}$

Here, the denominators of the given numbers are the same.

Since, $17 > 13$

∴ $-17 < -13$

∴ $\mathbf{-\frac{17}{20} < -\frac{13}{20}}$

---

vii. $\frac{15}{12}, \frac{7}{16}$

Here, the denominators of the given numbers are not the same.

LCM of 12 and 16 = 48

$\frac{15}{12} = \frac{15 \times 4}{12 \times 4} = \frac{60}{48}$,

$\frac{7}{16} = \frac{7 \times 3}{16 \times 3} = \frac{21}{48}$

Since, $60 > 21$

∴ $\frac{60}{48} > \frac{21}{48}$

∴ $\mathbf{\frac{15}{12} > \frac{7}{16}}$

Alternate method:

$15 \times 16 = 240$

$12 \times 7 = 84$

Since, $240 > 84$

∴ $15 \times 16 > 12 \times 7$

∴ $\mathbf{\frac{15}{12} > \frac{7}{16}}$ ... $\left[\text{If } a \times d > b \times c, \text{ then } \frac{a}{b} > \frac{c}{d}\right]$

viii. $-\frac{25}{8}, -\frac{9}{4}$

Here, the denominators of the given numbers are not the same.

LCM of 8 and 4 = 8

$-\frac{9}{4} = -\frac{9 \times 2}{4 \times 2} = -\frac{18}{8}$

Since, 25 > 18

$\therefore \frac{25}{8} > \frac{18}{8}$

$\therefore -\frac{25}{8} < -\frac{18}{8}$

$\therefore \mathbf{-\frac{25}{8} < -\frac{9}{4}}$

---

ix. $\frac{12}{15}, \frac{3}{5}$

Here, the denominators of the given numbers are not the same.

LCM of 15 and 5 = 15

$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15}$

Since, 12 > 9

$\therefore \frac{12}{15} > \frac{9}{15}$

$\therefore \mathbf{\frac{12}{15} > \frac{3}{5}}$

---

x. $-\frac{7}{11}, -\frac{3}{4}$

Here, the denominators of the given numbers are not the same.

LCM of 11 and 4 = 44

$-\frac{7}{11} = -\frac{7 \times 4}{11 \times 4} = -\frac{28}{44}$,

$-\frac{3}{4} = -\frac{3 \times 11}{4 \times 11} = -\frac{33}{44}$

Since, 28 < 33

$\therefore \frac{28}{44} < \frac{33}{44}$

$\therefore -\frac{28}{44} > -\frac{33}{44}$

$\therefore \mathbf{-\frac{7}{11} > -\frac{3}{4}}$

Let's Study

Decimal representation of rational numbers

1. Terminating decimal form:

If the rational number when expressed in decimal form has finite number of decimal places and the remainder obtained after division is zero, then that form of the rational number is called terminating decimal form.

Example:

Write the rational number $\frac{13}{4}$ in decimal form.

Solution:

$$\begin{array}{r} 3.25 \\ 4\overline{)13.00} \\ -12 \\ \hline 10 \\ -\ 8 \\ \hline 20 \\ -\ 20 \\ \hline 0 \end{array}$$

$\frac{13}{4} = 3.25$

Here, the remainder obtained after division is zero.

Hence, the process of division ends.

Such a decimal form of a rational number is called a terminating decimal form.

2. Non-terminating recurring decimal form:

i. If a single digit or a group of digits occur repeatedly on the right of the decimal point, then that form of rational number is called the recurring decimal form.

ii. If a single digit occurs repeatedly on the right of the decimal point, we put a point above that digit, and if a group of digits occur repeatedly, we put a horizontal line above those digits.

Examples:

i. $\frac{25}{9} = 2.77\ldots = 2.\dot{7}$

Here, digit 7 is repeating after the decimal point.

ii. $-\frac{17}{11} = -1.5454\ldots = -1.\overline{54}$

Here, digits 5 and 4 are repeating after the decimal point.

iii. $\frac{23}{7} = 3.285714285714\ldots = 3.\overline{285714}$

Here, digits 2, 8, 5, 7 , 1 and 4 are repeating after the decimal point.

Note: A terminating decimal number can be written in non-terminating recurring decimal form.

Example:

$\frac{9}{4} = 2.25 = 2.25000\ldots = 2.25\dot{0}$

Practice Set 1.3

1. Write the following rational numbers in decimal form.

i. $\frac{9}{37}$ ii. $\frac{18}{42}$ iii. $\frac{9}{14}$ iv. $-\frac{103}{5}$ v. $-\frac{11}{13}$

Solution:

i. $\frac{9}{37}$

$$\begin{array}{r} 0.243 \\ 37\overline{)9.000} \\ -0 \\ \hline 90 \\ -74 \\ \hline 160 \\ -148 \\ \hline 120 \\ -111 \\ \hline 9 \end{array}$$

$\therefore \frac{9}{37} = \mathbf{0.\overline{243}}$

ii. $\frac{18}{42} = \frac{3 \times 6}{7 \times 6} = \frac{3}{7}$

$$\begin{array}{r} 0.428571 \\ 7\overline{)3.000000} \\ -0 \\ \hline 30 \\ -28 \\ \hline 20 \\ -14 \\ \hline 60 \\ -56 \\ \hline 40 \\ -35 \\ \hline 50 \\ -49 \\ \hline 10 \\ -7 \\ \hline 3 \end{array}$$

$\therefore \frac{18}{42} = \frac{3}{7} = \mathbf{0.\overline{428571}}$

iii. $\frac{9}{14}$

$$\begin{array}{r} 0.6428571 \\ 14\overline{)9.0000000} \\ -0 \\ \hline 90 \\ -84 \\ \hline 60 \\ -56 \\ \hline 40 \\ -28 \\ \hline 120 \\ -112 \\ \hline 80 \\ -70 \\ \hline 100 \\ -98 \\ \hline 20 \\ -14 \\ \hline 6 \end{array}$$

$\therefore \frac{9}{14} = \mathbf{0.6\overline{428571}}$

iv. $-\frac{103}{5}$

$$\begin{array}{r} 20.6 \\ 5\overline{)103.0} \\ -10 \\ \hline 03 \\ -0 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

$\therefore \frac{103}{5} = 20.6$

$\therefore -\frac{103}{5} = \mathbf{-20.6}$

v. $-\frac{11}{13}$

$$\begin{array}{r} 0.846153 \\ 13\overline{)11.000000} \\ -0 \\ \hline 110 \\ -104 \\ \hline 60 \\ -52 \\ \hline 80 \\ -78 \\ \hline 20 \\ -13 \\ \hline 70 \\ -65 \\ \hline 50 \\ -39 \\ \hline 11 \end{array}$$

$\therefore \frac{11}{13} = 0.\overline{846153}$

$\therefore -\frac{11}{13} = \mathbf{-0.\overline{846153}}$

Let's Study

Irrational numbers

In addition to the rational numbers, there are many more numbers on the number line. They are not rational numbers.
The numbers which are not rational are irrational numbers.

Examples: $\sqrt{2}$, $\sqrt{5}$, $\sqrt{7}$, $3\sqrt{2}$, $5+\sqrt{2}$, $7-\sqrt{3}$, etc.

To show the number $\sqrt{2}$ on a number line:

i. Draw a number line and take a point A at 1 such that l(OA)= 1 unit.

ii. Draw a line l perpendicular to the number line through the point A.

iii. Take a point P on the line l such that l(AP) = 1 unit.

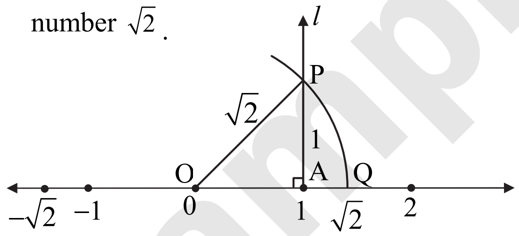
iv. Draw seg OP.
ΔOAP formed is a right angled triangle.
By Pythagoras theorem,
$[l(\text{OP})]^2 = [l(\text{OA})]^2 + [l(\text{AP})]^2$
$= 1^2 + 1^2 = 1 + 1 = 2$

∴ l(OP) $= \sqrt{2}$ units
…[Taking square root of both sides]

v. Draw an arc with centre O and radius OP. Mark the point of intersection of the number line and the arc as Q.

∴ l(OQ) = l(OP) = $\sqrt{2}$ units

∴ The point Q on the number line represents the number $\sqrt{2}$.



To show $-\sqrt{2}$ on the number line, mark a point to the left of O at the same distance as $\sqrt{2}$.

Similarly, irrational numbers $\sqrt{3}$, $\sqrt{5}$, $\sqrt{6}$, … can be shown on a number line.

Note: i. π is an irrational number. But for calculation purpose, its value is taken as $\frac{22}{7}$ or 3.14.
$\frac{22}{7}$ and 3.14 are rational numbers.

ii. The numbers which can be shown by points on a number line are called real numbers.

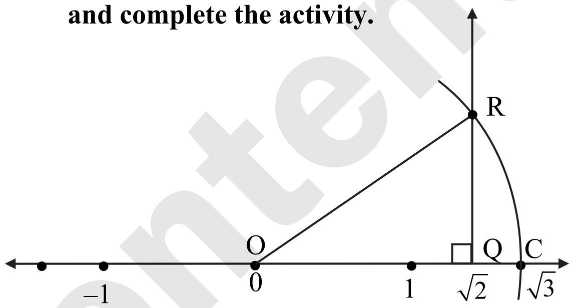
iii. All rational numbers and irrational numbers are real numbers.

Remember This

The decimal form of an irrational number is non-terminating and non-recurring.

Practice Set 1.4

1. The number $\sqrt{2}$ is shown on a number line. Steps are given to show $\sqrt{3}$ on the number line using $\sqrt{2}$. Fill in the boxes properly and complete the activity.



The point Q on the number line shows the number $\sqrt{2}$.
A line perpendicular to the number line is drawn through the point Q. Point R is at unit distance from Q on the line.
Right angled ΔOQR is obtained by drawing seg OR.
l(OQ) = $\sqrt{2}$, l(QR) = 1

∴ By Pythagoras theorem,
$[l(\text{OR})]^2 = [l(\text{OQ})]^2 + [l(\text{QR})]^2$
$= \boxed{\sqrt{2}}^2 + \boxed{1}^2$
$= \boxed{2} + \boxed{1} = \boxed{3}$

∴ l(OR) $= \boxed{\sqrt{3}}$
…[Taking square root of both sides]

Draw an arc with centre O and radius OR. Mark the point of intersection of the line and the arc as C. The point C shows the number $\sqrt{3}$.

2. Show the number $\sqrt{5}$ on the number line.

Solution:

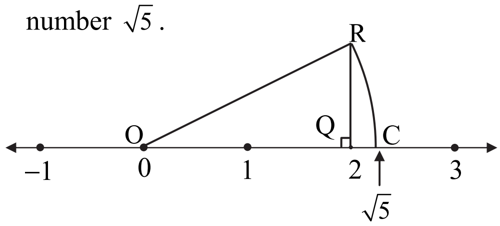
Draw a number line and take a point Q at 2 such that l(OQ) = 2 units.
Draw a line QR perpendicular to the number line through the point Q such that l(QR) = 1 unit.

Draw seg OR.
ΔOQR formed is a right angled triangle.
By Pythagoras theorem,

$[l(\text{OR})]^2 = [l(\text{OQ})]^2 + [l(\text{QR})]^2$
$= 2^2 + 1^2$
$= 4 + 1$
$= 5$

$\therefore$ $l(\text{OR}) = \sqrt{5}$ units ...[Taking square root of both sides]

Draw an arc with centre O and radius OR. Mark the point of intersection of the number line and arc as C. The point C shows the number $\sqrt{5}$.



3. Show the number $\sqrt{7}$ on the number line.

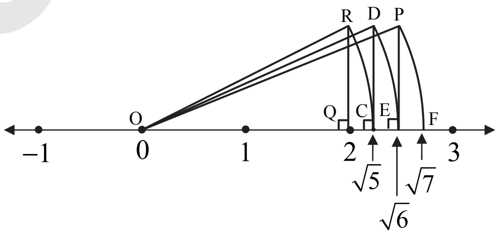
Solution:

Draw a number line and take a point Q at 2 such that $l(\text{OQ}) = 2$ units.
Draw a line QR perpendicular to the number line through the point Q such that $l(\text{QR}) = 1$ unit.
Draw seg OR.
ΔOQR formed is a right angled triangle.
By Pythagoras theorem,

$[l(\text{OR})]^2 = [l(\text{OQ})]^2 + [l(\text{QR})]^2$
$= 2^2 + 1^2$
$= 4 + 1$
$= 5$

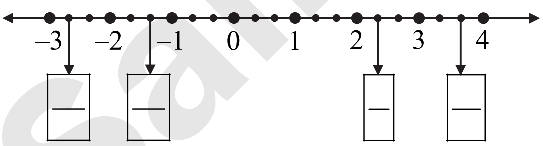
$\therefore$ $l(\text{OR}) = \sqrt{5}$ units ...[Taking square root of both sides]

Draw an arc with centre O and radius OR. Mark the point of intersection of the number line and arc as C. The point C shows the number $\sqrt{5}$.
Similarly, draw a line CD perpendicular to the number line through the point C such that $l(\text{CD}) = 1$ unit.
By Pythagoras theorem,
$l(\text{OD}) = \sqrt{6}$ units
The point E shows the number $\sqrt{6}$.
Similarly, draw a line EP perpendicular to the number line through the point E such that $l(\text{EP}) = 1$ unit.
By Pythagoras theorem,
$l(\text{OP}) = \sqrt{7}$ units
The point F shows the number $\sqrt{7}$.



Activities for Practice

1. Fill in the boxes.



2. Fill in the boxes with proper symbols(<, =, >):

i. $-\frac{5}{8}$ □ $\frac{2}{13}$

ii. 0 □ $-\frac{3}{5}$

iii. $-\frac{7}{3}$ □ $-\frac{5}{3}$

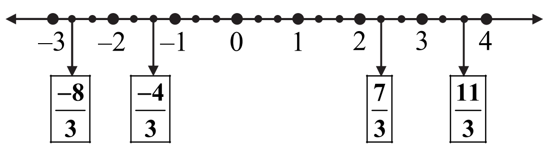
iv. $\frac{6}{10}$ □ $\frac{15}{25}$

3. Complete the following table.

Number	Terminating decimal form	Non-terminating recurring decimal form
$1.\overline{54}$	No	Yes
0.333…		
2.125		
7.35		
0.285714285714…		

Answers

1.



2.

i. $-\frac{5}{8}$ $\boxed{<}$ $\frac{2}{13}$

ii. 0 $\boxed{>}$ $-\frac{3}{5}$

iii. $-\frac{7}{3}$ $\boxed{<}$ $-\frac{5}{3}$

iv. $\frac{6}{10}$ $\boxed{=}$ $\frac{15}{25}$

3.

Number	**Terminating decimal form**	**Non-terminating recurring decimal form**
$1.\overline{54}$	No	Yes
0.333…	**No**	**Yes**
2.125	**Yes**	**No**
7.35	**Yes**	**No**
0.285714285714…	**No**	**Yes**

Multiple Choice Questions

1. On the number line if each unit is divided in 5 equal parts, then the twentieth point on right side of zero shows

(A) $\frac{1}{5}$ (B) $\frac{1}{4}$
(C) 4 (D) 5

2. The point at $\left(\frac{2}{5}\right)^{th}$ distance after 3 is

(A) $\frac{3}{5}$ (B) $\frac{6}{5}$
(C) $\frac{15}{5}$ (D) $\frac{17}{5}$

3. The decimal form of which of the following numbers will be non-terminating recurring type?

(A) $\frac{18}{5}$ (B) $\frac{17}{3}$
(C) $\frac{415}{10}$ (D) $\frac{21}{2}$

4. $\frac{217}{12} =$

(A) $18.08\dot{3}$ (B) $18.0\overline{83}$
(C) $18.\overline{083}$ (D) $18.\overline{803}$

5. Which of the following is not an irrational number?

(A) $6 + \sqrt{2}$
(B) $6 - \sqrt{2}$
(C) $2\sqrt{2}$
(D) All are irrational numbers

Additional Problems for Practice

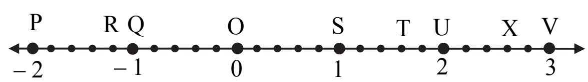
Based on Practice Set 1.1

1. Show the following numbers on a number line. Draw a separate number line for each example.

+i. $\frac{7}{3}, 2, -\frac{2}{3}$ ii. $\frac{6}{7}, -\frac{8}{7}, \frac{11}{7}$

iii. $\frac{2}{13}, -\frac{4}{13}$ iv. $\frac{3}{15}, \frac{7}{15}, \frac{8}{15}$

2. Observe the number line and answer the questions.



i. Which number is indicated by point R?

ii. Which point indicates the number $1\frac{3}{5}$?

iii. State whether the statement, 'the point X denotes the number $\frac{13}{5}$', is true or false.

Based on Practice Set 1.2

1. Compare the following numbers.

i. $\frac{6}{7}, \frac{3}{7}$

+ii. $\frac{5}{4}, \frac{2}{3}$

iii. $\frac{8}{15}, \frac{7}{3}$

+iv. $-\frac{7}{9}, \frac{4}{5}$

v. $-\frac{7}{8}, -\frac{3}{8}$

+vi. $-\frac{7}{3}, -\frac{5}{2}$

+vii. $\frac{3}{5}, \frac{6}{10}$

viii. $0, -\frac{18}{3}$

ix. $\frac{15}{12}, 0$

x. $\frac{102}{61}, \frac{77}{61}$

xi. $-\frac{501}{77}, -\frac{309}{77}$

xii. $-\frac{17}{9}, -\frac{2}{3}$

Based on Practice Set 1.3

1. Write the following rational numbers in decimal form.

+i. $\frac{7}{4}$

+ii. $\frac{7}{6}$

+iii. $\frac{5}{6}$

+iv. $-\frac{5}{3}$

v. $-\frac{308}{5}$

vi. $\frac{17}{99}$

+vii. $\frac{23}{99}$

+viii. $\frac{22}{7}$

ix. $\frac{6}{35}$

x. $\frac{67}{21}$

xi. $-\frac{51}{13}$

Based on Practice Set 1.4

1. Show the number $\sqrt{10}$ on the number line.

2. Show the number $-\sqrt{6}$ on the number line.

Chapter Assessment

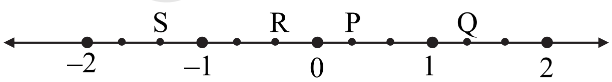
Total marks: 15

1. Choose the correct alternative for each of the following questions. [3]

i. For any pair of numbers on a number line, the number to the left is _______ than the other.

(A) smaller
(B) bigger
(C) equal to
(D) cannot be predicted

ii. For the number line given below, point _______ indicates the number $-1\frac{1}{3}$.



(A) P   (B) Q
(C) R   (D) S

iii. For the number line shown in Q.1. (ii), point P indicates the number _______.

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $-\frac{1}{3}$ (D) $-\frac{1}{2}$

2. Attempt the following questions. [6]

i. Show the following number on a number line.

$\frac{-7}{6}, \frac{5}{6}$

ii. Write the rational number $\frac{12}{16}$ in decimal form.

iii. Compare the following numbers.

a. $\frac{-16}{7}, \frac{-8}{7}$

b. $\frac{19}{15}, \frac{2}{5}$

3. Attempt the following questions. [6]

i. Show the number $\sqrt{6}$ on the number line.

ii. Write the rational number $\frac{16}{21}$ in decimal form.

Answers

Multiple Choice Questions

1. (C) 2. (D) 3. (B) 4. (A) 5. (D)

Additional Problems for Practice

Based on Practice Set 1.1

2. i. $-\frac{6}{5}$
   ii. Point T
   iii. True

Based on Practice Set 1.2

1. i. $\frac{6}{7} > \frac{3}{7}$
   ii. $\frac{5}{4} > \frac{2}{3}$
   iii. $\frac{8}{15} < \frac{7}{3}$
   iv. $\frac{-7}{9} < \frac{4}{5}$
   v. $\frac{-7}{8} < \frac{-3}{8}$
   vi. $\frac{-7}{3} > \frac{-5}{2}$
   vii. $\frac{3}{5} = \frac{6}{10}$
   viii. $0 > \frac{-18}{3}$
   ix. $\frac{15}{12} > 0$
   x. $\frac{102}{61} > \frac{77}{61}$
   xi. $\frac{-501}{77} < \frac{-309}{77}$
   xii. $\frac{-17}{9} < \frac{-2}{3}$

Based on Practice Set 1.3

1. i. 1.75
   ii. $1.1\dot{6}$
   iii. $0.8\dot{3}$
   iv. $-1.\dot{6}$
   v. -61.6
   vi. $0.\overline{17}$
   vii. $0.\overline{23}$
   viii. $3.\overline{142857}$
   ix. $0.1\overline{714285}$
   x. $3.\overline{190476}$
   xi. $-3.\overline{923076}$

Chapter Assessment

1. i. (A)
   ii. (D)
   iii. (A)

2. ii. 0.75
   iii. a. $\frac{-16}{7} < \frac{-8}{7}$
   b. $\frac{19}{15} > \frac{2}{5}$

3. ii. $0.\overline{761904}$

Smart Recap

Real numbers: $-\sqrt{3}$, –1, 0, 1, $\sqrt{2}$, $\frac{3}{5}$, 1, etc

- **Rational numbers**: –1, 0, $\frac{2}{3}$, $\frac{3}{5}$, 1, etc
  - **Integers**: …, –3, –2, –1, 0, 1, 2, 3, …
    - **Positive integers / Natural numbers**: 1, 2, 3, …
    - **Zero**: 0
    - **Negative integers**: ……, –3, –2, –1
    - **Whole numbers** (Positive integers / Natural numbers and Zero): 0, 1, 2, 3, …
  - **Fractions**: $\frac{2}{3}$, $\frac{3}{5}$, $\frac{2}{7}$, $\frac{29}{16}$, etc
    - **Terminating decimal form**: $\frac{4}{5} = 0.8$, $\frac{13}{5} = 2.6$, etc
    - **Non-terminating recurring decimal form**: $\frac{25}{99} = 0.\overline{25}$, $\frac{2}{3} = 0.\dot{6}$, etc
- **Irrational numbers**: $-\sqrt{3}$, $-\sqrt{2}$, $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, etc
  - **Positive**: $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, etc
  - **Negative**: $-\sqrt{2}$, $-\sqrt{3}$, $-\sqrt{5}$, etc

Rules to compare two rational numbers

If $\frac{a}{b}$ and $\frac{c}{d}$ are rational numbers such that b and d are positive, and if

i. $a \times d < b \times c$, then $\frac{a}{b} < \frac{c}{d}$

ii. $a \times d = b \times c$, then $\frac{a}{b} = \frac{c}{d}$

iii. $a \times d > b \times c$, then $\frac{a}{b} > \frac{c}{d}$

Comparison of Rational numbers

i. For any pair of numbers on a number line, the number to the left is smaller than the other number.

ii. A negative number is always less than a positive number.

iii. If the numerator and the denominator of a rational number is multiplied by any non zero number, then the value of rational number does not change i.e. $\frac{a}{b} = \frac{a \times k}{b \times k}$, $(k \neq 0)$.

iv. If the denominators of two rational numbers are the same, then the number having greater numerator is the greater rational number.

v. If a and b are positive numbers such that a < b, then – a > – b.

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