CHAPTER: Rational Numbers

Grade: 8
Board: **CBSE**
Book: **NCERT**

1.

Chapter Summary and Placement

<Read through the following to understand how this chapter is connected with the previous and next grades and also the important concepts covered in it.>

1. This chapter connects to rational numbers chapter in grade 6
2. In this grade this chapter reviews properties satisfied by a set of rational numbers
3. Connects to the future grades indirectly through number theory

2.

LEARNING OUTCOMES

<On completion of the chapter, students will be able to:>

1. Recapitulate the rational numbers set, operations on rational numbers[addition, subtraction, multiplication and division]
2. Restate the properties of numbers and reviews the properties satisfied by set of rational numbers
3. Recollect and compare the the properties satisfied by different set of numbers like natural numbers, whole numbers, Integers and rational numbers
4. Represent the given rational number on number line
5. Examine the property of denseness of rational numbers between any two rational numbers
6. Insert required number of rational numbers between any two given rational numbers
7. Solve worksheet related to higher order of thinking[Worksheet 4]

4. TEACHING PLAN

Follow this section for getting ideas on teaching the content covered in the chapter. The subtopic given in the first column with the matching learning outcome can be explained using instructions and resources listed subsequently

Subtopic and Learning Objective #1

Subtopic:Rational number set and operations on rational numbers

LO:

Recapitulate the rational numbers set, operations on rational numbers[addition, subtraction, multiplication and division]

1.To make the student recollect the definition of rational numbers, perform addition, subtraction, multiplication and division of rational numbers

Teacher Activity

1. Recap set of rational numbers, method of doing addition, subtraction, multiplication and division of rational numbers

Note: -53/7 ≠ -5+3/7
It is …..
-53/7 = -[53/7]

Check for understanding:

a) Set of numbers of the form p/q , p and q set of integers, q≠0 is called _____
b) 25/6 + -2/3=_____
c) 5/6- -2/3=_____
d) -5/6x-2/3=_____
e) -5/6÷-2/3=_____

Can ask more questions to make students perfect

Resources Suggested

Blackboard, pen and paper

Subtopic and Learning Objective #2

Sub topic:Properties satisfied by set of rational numbers
LO:
Restate the properties of numbers and reviews the properties satisfied by set of rational numbers
1. To make student understand the properties satisfied by set of rational numbers

Teacher Activity

1. Introduce properties satisfied by set of rational numbers[closure, commutative, associative, identity, inverse, distributive] under all operations as given in NCERT text book
2. **Resource 1 can be used for explanation**

Check for understanding:

a) Give an example of commutative property of rational numbers under multiplication
b) Additive inverse of -2 /3 is_____
c) Multiplicative inverse of -1/3is _____
d) Which rational number has same multiplicative inverse as itself?
e) Which rational numbers multiplicative inverse is not defined?

Resources Suggested

Blackboard, pen and paper
Resource 1 for reference

Resource 1

Properties of numbers

Let a, b, c be numbers belonging to pre defined set and * be an operation[addition/ subtraction/ multiplication/ division] then

Closure property: If a *b is also belongs to the same set of numbers then the set of numbers is closed under the operation *

Commutative property : If a*b=b*a then the set of numbers satisfy the commutative property under the operation *

Associative property: If a*(b*c)=(a*b)*c then the set of numbers satisfy the associative property under the operation *

Existence of identity element : If a*i = i* a = a then i is called as the identity element under the operation *

Existence of inverse of the element : If $a*(a^{I})=(a^{I})* a= i$ then a^{I} is called as inverse of a under the operation *

Distributive property: let * be multiplication/division and if

ax(b+c)=axb+axc then multiplication is said to be distributive over addition

ax(b-c)=axb-axc then multiplication is said to be distributive over subtraction

Resource 1

a÷(b+c)=a÷b+a÷c then division is said to be distributive over addition

a÷(b-c)=a÷b - a÷c then division is said to be distributive over subtraction

Note:

1. * can be any operation among addition/ subtraction/ multiplication/ division
2. Pre defined set can be set of Rational numbers

Subtopic and Learning Objective #5

Sub topic:Comparison of properties among different set of numbers

LO:

Recollect and compare the the properties satisfied by different set of numbers like natural numbers, whole numbers, Integers and rational numbers

1. To make student recollect the properties of numbers satisfied by different sets and compare them

Teacher Activity

1. Can do a quick recap of properties satisfied by the set of natural, whole, integers and comparing with properties of set of rational numbers
2. **Resource 2 can be used for explanation**

Check for understanding:

a) Which set of numbers satisfy commutative under addition?
b) Which set of numbers are closed under multiplication

Ask more questions to the students until they are thorough with the properties satisfied by different set of numbers

Resources Suggested

Blackboard, pen and paper
Resource 2 for reference

Subtopic and Learning Objective #6

Subtopic:Representation of rational numbers on number line
LO:
Represents the given rational number on number line
1. To make student represent the given rational number on number line

Teacher Activity

1. Introduce points to be remembered to represent rational numbers on number line rational numbers on number line and represent the given rational number on number line
2. **Resource 3** can be used

Check for understanding:

a) Represent the given rational numbers on number line[numbers can be of teachers choice]

Resources Suggested

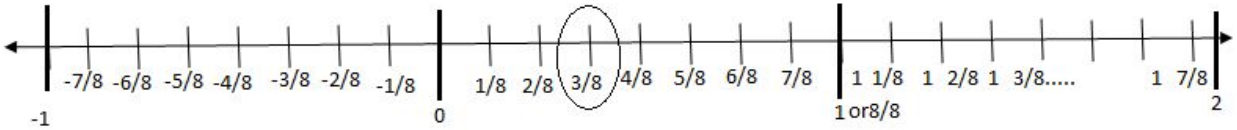
Blackboard, pen and paper
Resource 3 can be used

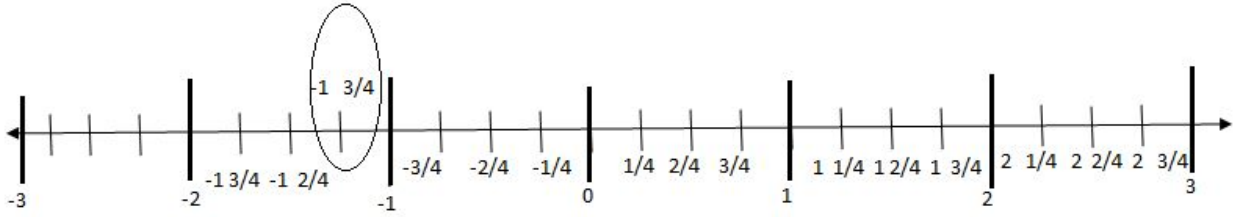
Resource 2

As we know fractions are rational numbers but rational numbers can not be fractions [since 0/2 is a rational number but it can not be a fraction]

Points to be remembered about rational numbers number line:

- All proper fractions lie between 0 and 1 or 0 and -1
- Improper are to be converted to mixed fractions to know the position. All improper fractions lie between the whole number of mixed fraction and next whole number[325lies between 3 and 4, similarly -325lies between -3 and -4]
- Each main division must be subdivided as many divisions as in denominator of the fraction. Like to represent 38the number of subdivisions from 0 to 1 on the number line must be 8





Represent -13/4 on number line

Any rational number can be represented on the number line by using the above points

Subtopic and Learning Objective #7

Sub topic:Property of denseness of rational numbers
LO:
Examine the property of denseness of rational numbers between any two rational numbers
1. To make student understand the property of denseness

Teacher Activity

1. Introduce property of denseness: An infinite number of rational numbers an be found between any two rational numbers[however close they may be] e this property can be explained as in NCERT textbook

Check for understanding:

a) Explain the property of densenes?

Resources Suggested

Blackboard, pen and paper

Subtopic and Learning Objective #8

Sub topic:Insertion of rational numbers between any two numbers
LO:
Insert required number of rational numbers between any two given rational numbers
1. To make student understand method of inserting required numbers between any two rational numbers

Teacher Activity

1. Introduce method of insertion of rational numbers between any two rational numbers as in NCERT text book

Check for understanding:

a) Insert 5 rational numbers between 5/8 and ¾

b) How many maximum number of rational numbers can be inserted between 1/2 and 3/4?

Resources Suggested

Blackboard, pen and paper

5. WORKSHEETS

Print or copy the worksheet questions on the blackboard and ask the students to attempt them. They can be given as homework or a class test as well.

Worksheet 1

Use it like: test after the chapter is complete, homework

1. Add $\frac{-5}{7}$, $2\frac{3}{14}$, $-5\frac{2}{7}$, $\frac{11}{14}$.

2. Subtract $\frac{-3}{11}$ from $\frac{1}{484}$

3. The product of two rational numbers is $\frac{5}{18}$ and one of the numbers is $\frac{15}{108}$ find the other?

4. If the perimeter of an equilateral triangle is $2\frac{11}{12}$ cm then find length of each side

5. A giraffe can eat $80\frac{4}{5}$ kg of apples in an hour how many kg of apples can be consumed in 5 hours?

Worksheet 2

1. Identify the following properties of rational numbers

i) $\frac{a}{b}+\frac{c}{d}=\frac{c}{d}+\frac{a}{b}$

ii) $\frac{a}{b}\times\left(\frac{c}{d}+\frac{e}{f}\right)=\frac{a}{b}\times\frac{c}{d}+\frac{a}{b}\times\frac{e}{f}$

iii) $\frac{a}{b}+0=0+\frac{a}{b}=\frac{a}{b}$ Then 0 is called _____

iv) $\frac{a}{b}\div\frac{c}{d}$ Is also a rational number

v) $\frac{a}{b}\times\frac{c}{d}=\frac{c}{d}\times\frac{a}{b}=1$ Then $\frac{a}{b}$ *and* $\frac{c}{d}$ are called as_____ to each other

Worksheet 2

2. Identify the properties given below and state whether set of rational numbers satisfy those properties or not:

i) $\left[\frac{-5}{8}+\frac{9}{8}\right]+\frac{13}{8}=\frac{-5}{8}+\left[\frac{9}{8}+\frac{13}{8}\right]$

ii) $\frac{13}{8}\times\left[\frac{-15}{34}+\frac{9}{8}\right]=\frac{13}{8}\times\frac{-15}{34}+\frac{13}{8}\times\frac{9}{8}$

iii) $\frac{12}{-13}\times\frac{-13}{12}=\frac{-13}{12}\times\frac{12}{-13}=1$

iv) $\frac{-4}{5}+\frac{-5}{12}=\frac{-5}{12}+\frac{-4}{5}$

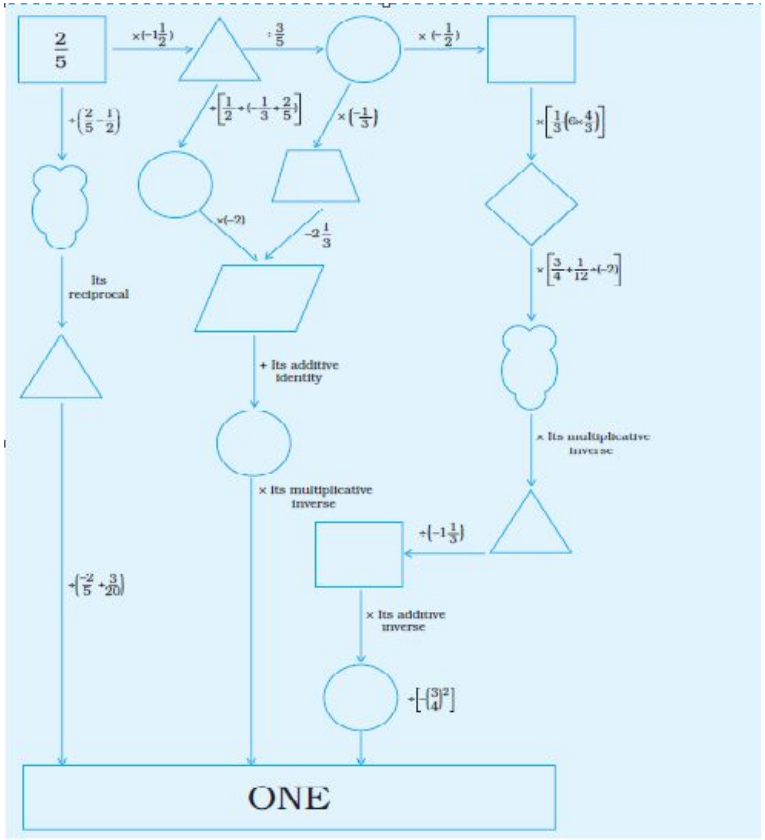
v) $\frac{13}{8}\div\left[\frac{-15}{34}+\frac{9}{8}\right]=\frac{13}{8}\div\frac{-15}{34}+\frac{13}{8}\div\frac{9}{8}$

Worksheet 3

Answer the following:

1. Insert 5 rational numbers between -⅘ and -⅔?
2. Inserti)8 ii)80 iii)800 rational numbers between ⅓ and 3/8

Worksheet 4


$\frac{2}{5}$
$\times(-1\frac{1}{2})$
$\div\frac{3}{5}$
$\times(-\frac{1}{2})$
$\div\left(\frac{2}{5}-\frac{1}{2}\right)$
$\div\left[\frac{1}{2}\div(-\frac{1}{3}\div\frac{2}{5})\right]$
$\times(-\frac{1}{3})$
$\times\left[\frac{1}{3}(6\times\frac{4}{3})\right]$
$\times(-2)$
$-2\frac{1}{3}$
$\times\left[\frac{3}{4}\div\frac{1}{12}\div(-2)\right]$
Its reciprocal
+ Its additive identity
× Its multiplicative inverse
× Its multiplicative inverse
$\div(-1\frac{1}{3})$
$\div\left(\frac{-2}{5}\div\frac{3}{20}\right)$
× Its additive inverse
$\div\left[\left(\frac{3}{4}\right)^2\right]$
ONE

6. SOLUTIONS

This section gives you sample answers for activities and questions listed above.

Worksheet 1

1. -5/7 + 31/14 - 37/7 +11/4
   =-10+31-74+1114
   =42/14
   =3
2. 1/484 +3/11
   =1+132484
   =133/484
3. _____x15/108 =5/18
   Required number= 518x10815= 2
4. Length of each side of equilateral triangle= 35/12 ÷ 3
   = 35/36 cm
5. Apples consumed in 5 hours= 4045x 5 = 404 kg

Worksheet 2

1. Commutative property under addition
   (ii) Multiplication is distributive over addition
   (iii)Identity element under addition
   (iv) Closure under division
   (v) Multiplicative inverse
2. (i) Associative property under addition, Yes set of rational numbers satisfy
   (ii) Multiplication is distributive over addition,Yes set of rational numbers satisfy
   (iii)Existence of inverse,Yes set of rational numbers satisfy for non zero rational numbers [except 0]
   (iv) Commutative under addition,Yes set of rational numbers satisfy
   (v) Associative under division,No set of rational numbers do not satisfy

Worksheet 3

1. By making denominators same the rational numbers become

-4x35x3 -2x53x5

Now make the gap bigger by converting into equivalent fractions

-12x615x6 -10x615x6

Now need to find out 5 rational numbers between -72/90and-60/90

-71/90, -70/90,-69/90, -68/90, -67/90……..

By making denominators same the rational numbers become

1x83x8 3x38x3

Now make the gap bigger by converting into equivalent fractions

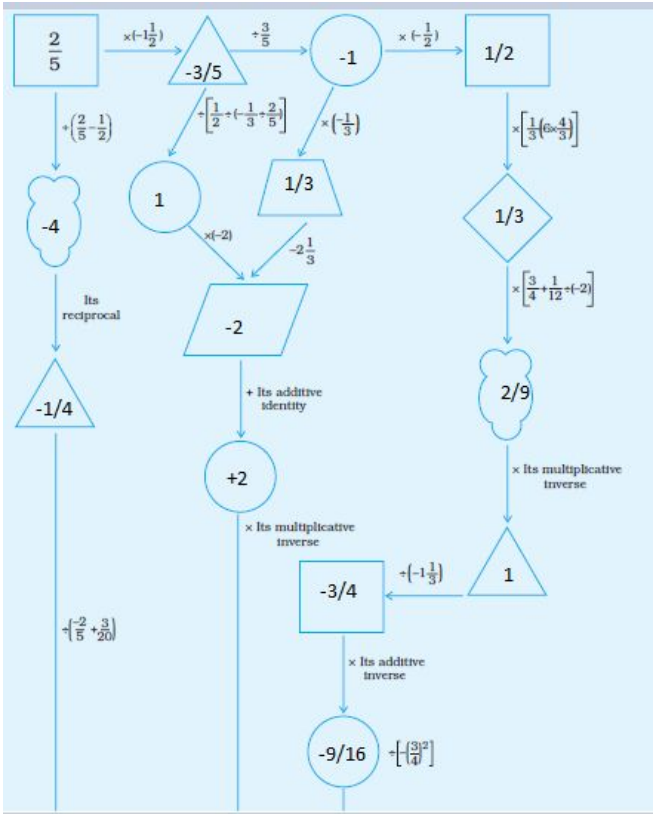
8x924x9 9x924x9

Now need to find out 8 rational numbers between 72/216 and 81/216

Now it can further increased by mul. NR and DR by 10 and can find 80 rationals in between

Now it can further increased by mul. NR and DR by 100 and can find 800 rationals in between

Worksheet 4


2/5
×(−1 1/2)
-3/5
÷3/5
-1
× (−1/2)
1/2
÷(2/5 − 1/2)
÷[1/2 ÷(−1/3 ÷2/5)]
×(−1/3)
×[1/3 (6×4/3)]
-4
1
1/3
1/3
×(−2)
−2 1/3
×[3/4 ÷1/12 ÷(−2)]
Its reciprocal
-2
-1/4
+ its additive identity
2/9
+2
× its multiplicative inverse
× its multiplicative inverse
-3/4
÷(−1 1/3)
1
÷(−2/5 ÷3/20)
× its additive inverse
-9/16
÷[−(3/4)²]

7. EXTRA RESOURCES

Carry out the following suggested activities/ tasks if you have the time and resources to do them

Teacher can use these videos if time and facilities permit:

1. https://www.youtube.com/watch?v=_6hYeS8I9zQ- Introduction about rational numbers
2. https://www.youtube.com/watch?v=r_EWyF5EFmA- Property of denseness