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Period 1

Introduction, Rational Numbers , Properties of Rational Numbers

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 02
CHAPTER NAME : RATIONAL NUMBERS

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Learning outcomes

Students will be able to

- Differentiate between rational numbers and fractions
- Express and apply it in real life situations .

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INTRODUCTION

What happens when two integers are added, subtracted, multiplied, divided?
Depending on the sign of integers various arithmetic operations are carried out.
What are fractions?
Fractions are a number which can be expressed in p/q form , where both numerator and denominator are whole numbers.

Video on application of rational numbers in real life
https://www.youtube.com/watch?v=TpJ2JmBb8JY (1:20)

What are Rational Numbers?

A number of the form p /q where p and q (≠0) are integers, **is called a rational number.**

Numerator and Denominator
In p / q, the integer p is the numerator, and the integer q (≠0) is the denominator.
Thus in −3/ 7 , the numerator is -3 and the denominator is 7.

Positive and Negative Rational Numbers

A rational number whose numerator and denominator both are positive integers is called a positive rational number.

A rational number, whose numerator is a negative integer and denominator is a positive integer, is called a negative rational number.

Similarly, if the numerator is positive integer and denominator is a negative integer; is also a negative rational number.

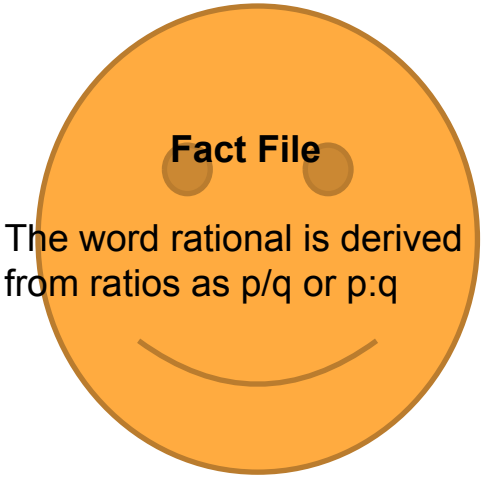
REMEMBER

Every integer is a rational number but the converse is not true

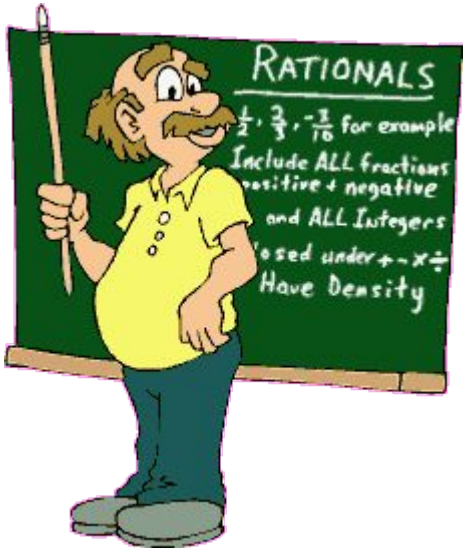
Every fraction is a rational number but the converse is not true

1. Write down a rational number whose numerator is the largest number of two digits and denominator is the smallest number of four digits.

Solution:
We know that the largest two digit number is 99
So the smallest four digit number is 1000
Numerator = 99
Denominator = 1000
Rational number = 99/1000



2. Write the numerator of each of the following rational numbers:
(i) – 125/127
(ii) 37/ -137
(iii) – 85/ 93
(iv) 2
(v) 0



Solution:
(i) – 125/127
Here the numerator = – 125
(ii) 37/ -137
Here the numerator = 37
(iii) – 85/ 93
Here the numerator = – 85
(iv) 2 = 2/1
Here the numerator = 2
(v) 0 = 0/1
Here the numerator = 0

4. Write down a rational number with numerator (-5) × (-4) and with denominator (28 – 27) × (8 – 5).

Solution:

It is given that

Numerator = (-5) × (-4) = 20

Denominator = (28 – 27) × (8 – 5) = 1 × 3 = 3

So the rational number = 20/3

5. (i) – 15/1 in integer form is …….

(ii) 23/-1 in integer form is ……..

(iii) If 18 = 18/a then a = …….

(iv) If – 57 = 57/a then a = ……..

Solution:

(i) – 15/1 in integer form is – 15.

(ii) 23/-1 in integer form is – 23.

(iii) If 18 = 18/a then a = 18/18 = 1

.

(iv) If – 57 = 57/a then a = 57/-57 = – 1.

6. Separate positive and negative rational numbers from the following:
-3/ 5, 3/-5, -3/-5, 3/5, 0, -13/-3, 15/-8, -15/8

Solution:
Here the positive rational numbers are
-3/-5 = 3/5 as both are negative
-13/-3 = 13/3 as both are negative and 3/5
Similarly the negative rational numbers are
-3/5, 3/ -5, 15/-8 and -15/8
0 is neither positive nor negative integer.

7. Find three rational numbers equivalent to
(i) 3/5
(ii) 4/-7
(iii) -5/9
(iv) 8/-15

Solution:

(i) 3/5

It can be written as

3/5 = (3 × 2)/ (5 × 2) = 6/10

3/5 = (3 × 3)/ (5 × 3) = 9/15

3/5 = (3 × 4)/ (5 × 4) = 12/20

Therefore, 6/10, 9/15 and 12/20 are the rational numbers which are equivalent to the given rational number 3/5.

(ii) 4/-7

It can be written as

4/-7 = (4 × 2)/ (-7 × 2) = 8/ -14

4/-7 = (4 × 3)/ (-7 × 3) = 12/-21

4/-7 = (4 × 4)/ (-7 × 4) = 16/ -28

Therefore, 8/-14, 12/-21 and 16/-28 are the rational numbers which are equivalent to the given rational number 4/-7.

(iii) -5/9
It can be written as
-5/9 = (-5 × 2)/ (9 × 2) = -10/18
-5/9 = (-5 × 3)/ (9 × 3) = – 15/27
-5/9 = (-5 × 4)/ (9 × 4) = -20/36
Therefore, -10/18, -15/27 and -20/36 are the rational numbers which are equivalent to the given rational number -5/9.

(iv) 8/-15
It can be written as
8/-15 = (8 × 2)/ (-15 × 2) = 16/-30
8/-15 = (8 × 3)/ (-15 × 3) = 24/ -45
8/-15 = (8 × 4)/ (-15 × 4) = 32/-60
Therefore, 16/-30, 24/-45 and 32/-60 are the rational numbers which are equivalent to the given rational number 8/-15.

8. Which of the following are not rational numbers:
(i) – 3
(ii) 0
(iii) 0/4
(iv) 8/0
(v) 0/0

Solution:
(i) – 3 = -3/1 is a rational number.
(ii) 0 = 0/1 is a rational number.
(iii) 0/4 is a rational number.
(iv) 8/0 is not a rational number.
(v) 0/0 is not a rational number as both numerator and denominator are zero.

9. Express each of the following integers as a rational number with denominator 7:
(i) 5
(ii) – 8
(iii) 0
(iv) – 16
(v) 7

Solution:
(i) 5
By multiplying and dividing by 7
= (5 × 7)/ 7
= 35/7
(ii) – 8
By multiplying and dividing by 7
= (-8 × 7)/ 7
= – 56/7
(iii) 0
By multiplying and dividing by 7
= (0 × 7)/ 7
= 0/7
(iv) – 16
By multiplying and dividing by 7
= (-16 × 7)/ 7

10. Express 3/5 as a rational number with denominator:
(i) 20
(ii) – 20
(iii) 45
(iv) 25
(v) – 35

Solution:
(i) 20
It can be written as
3/5 = (3 × 4)/ (5 × 4) = 12/20
(ii) – 20
It can be written as
3/5 = (3 × -4)/ (5 × -4) = -12/-20
(iii) 45
It can be written as
3/5 = (3 × 9)/ (5 × 9) = 27/45
(iv) 25
It can be written as
3/5 = (3 × 5)/ (5 × 5) = 15/25
(v) – 35
It can be written as
3/5 = (3 × -7)/ (5 × -7) = -21/-35

11. Express 4/7 as a rational number with numerator:
(i) 12
(ii) – 12
(iii) – 16
(iv) – 20
(v) 20

Solution:
(i) 12
It can be written as
4/7 = (4 × 3)/ (7 × 3) = 12/21
(ii) – 12
It can be written as
4/7 = (4 × -3)/ (7 × -3) = -12/-21
(iii) – 16
It can be written as
4/7 = (4 × -4)/ (7 × -4) = – 16/-28
(iv) – 20
It can be written as
4/7 = (4 × -5)/ (7 × -5) = -20/-35
(v) 20
It can be written as

12. Find x, such that:

(i) – 2/3 = 6/ x

(ii) 7/-4 = x/8

(iii) 3/7 = x/-35

(i) – 2/3 = 6/ x

By cross multiplication

-2x = 6 × 3

x = (6 × 3)/ -2

x = 18/-2 = -9

Hence, – 2/3 = 6/-9.

(ii) 7/-4 = x/8

By cross multiplication

7 × 8 = – 4 × x

56 = -4x

x = 56/-4 = -14

Hence, 7/-4 = -14/8.

(iii) 3/7 = x/-35

By cross multiplication

7x = – 35 × 3

x = (-35 × 3)/ 7

x = -15

13. Express each of the following rational numbers to the lowest terms:

(i) 12/15

(ii) – 120/144

(iii) – 48/ – 72

(iv) 14/-56

Solution:

(i) 12/15

Here dividing by 3 which is the HCF of 12 and 15

(12 ÷ 3)/ (15 ÷ 3) = 4/5

(ii) – 120/144

Here dividing by 25 which is the HCF of -120 and 144

(-120 ÷ 24)/ (144 ÷ 24) = – 5/6

(iii) – 48/ – 72
Here dividing by 24 which is the HCF of -48 and – 72
(-48 ÷ 24)/ (-72 ÷ 24) = -2/-3 = 2/3

(iv) 14/-56
Here dividing by 14 which is the HCF of 14 and – 56
(14 ÷ 14)/ (-56 ÷ 14) = 1/-4 or – 1/4

14. Express each of the following rational numbers in the standard form.
(i) -7/-8
(ii) 5/ – 12
(iii) – 7/ – 20
(iv) 4/ -9

Solution:
Here a rational number is in standard form if its denominator is positive in lowest term.
(i) -7/-8 = 7/8
(ii) 5/ – 12 = -5/12
(iii) – 7/ – 20 = 7/20
(iv) 4/ -9 = -4/9

HW

Exercise 2A Q No. 2 and AHA

1.Write down the rational number whose

a) Numerator is the largest two digit number and denominator is the smallest three- digit number.

b) Numerator is the smallest three digit number and denominator is the largest four digit- number.

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