Olympiad Comprehensive Book



Fraction and Decimals

Fraction

Fraction is a method for representing the parts of a whole number. An orange is divided into two equal parts and so

the first part of orange is half of the whole orange and represented by $\frac{1}{2}$ of the orange.

Types of Fractions

Proper Fractions

A fraction whose numerator is less than denominator is called a proper fraction.

 $\frac{3}{5}$, $\frac{1}{2}$, $\frac{7}{9}$ are Proper fractions.

Improper Fractions

A fraction is called improper fraction even if:

- It has smaller denominator than numerator
- > It has equal numerator and denominator
 - $\frac{6}{5}, \frac{5}{2}, \frac{109}{34}, \frac{6}{6}$

Simplest form of a Fraction

A fraction is said to be in the simplest or lowest form if its numerator and denominator have no common factor except 1.

Mixed Fractions

Combination of a proper fraction and a whole number is called mixed fraction. Every mixed fraction has a whole and a fractional part.

Like and Unlike Fractions

When two or more fractions have same denominator then they are called like fractions whereas unlike fractions do not have equal denominators.

Equivalent Fractions

(a) $5\frac{1}{2}$

Answer (a)

Two fractions are said to be equivalent if they are equal to each other. Two equivalent fractions may have a different numerator and a different denominator.

Example: Convert $\frac{11}{2}$ into a mixed fraction.

(b)
$$3\frac{1}{2}$$

(d) All the above

(c) $\frac{1}{2}$ (e) None of these

Example: $\frac{5}{7}, \frac{1}{2}, \frac{2}{3}$ are:

(a) like fractions (b) unlike fractions (c) equivalent fractions (d) Mixed fractions

(e) None of these

Answer (b)

Operations on Fractions

Addition of Like Fractions

Addition of like fractions is the addition of their numerators and common denominator is the denominator of the resulting fraction.

Addition of numerators

Hence, the sum of like fractions = $\frac{\text{Addition of numerators}}{\text{Common denominator}}$

Subtraction of Like Fractions

Subtraction of like fractions is same as its addition except that addition is converted into subtraction.

Let two like fractions are $\frac{567}{456}$ and $\frac{4546}{456}$ Their subtraction = $\frac{\text{Subtraction of its numerators}}{\text{Common denominator}}$

Multiplication of Fractions

The following are the steps to perform the multiplication of like fractions:

Step 1: Multiply the numerators and multiply the denominators.

Step 2: Write the answer in lowest form.

or, Product of fractions=

Product of numerators

Product of denominators

Division of Fractions

Division of fractions is multiplication of the dividend by reciprocal of the divisor.

Example: Evaluate:
$$\left\{ \left(\frac{3}{5} - \frac{7}{11} \times \frac{1}{2} \right) \right\} + \frac{9}{121}$$

(a) $\frac{3}{121}$ (b) $\frac{43}{121}$
(c) $\frac{431}{1210}$ (d) All the above
(e) None of these
Answer (c)

Explanation:

$$\left\{ \left(\frac{3}{5} - \frac{7}{11} \times \frac{1}{2}\right) \right\} + \frac{9}{121} = \frac{3}{5} - \frac{7}{22} + \frac{9}{121}$$
$$= \frac{726 - 385 + 90}{1210}$$
$$= \frac{431}{1210}$$

Example: What should be divided by $\frac{6}{11}$ to get $\frac{3}{5}$?

(a) $\frac{18}{55}$	(b) $\frac{8}{55}$
(c) $\frac{55}{18}$	(d) $\frac{30}{33}$
(e) None of these	
Answer (a)	

Explanation: Required number $=\frac{6}{11}\times\frac{3}{5}=\frac{18}{55}$

Decimal

Digits of decimal number are separated by a dot (.) called decimal point. Digits at the left from the dot (decimal) are called whole part and digits at the right side are called decimal part of the decimal number.

Place Value of Decimals

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Conservation of Fractions into Decimals

To convert fractions into decimal divide numerator by the denominator.

Conservation of Decimals into Fractions

The following are the steps used for conversion of decimals into fractions:

Step 1: Rewrite decimal numbers into whole number by omitting decimal point.

Step 2: Write 1 under converted whole number and put one zero for each decimal places.

Step 3: Simplify them into its lowest term.

Like and Unlike Decimals

The decimals whose number of digits from right of the decimal point is equal are called like decimals. If total number of digits from right of the decimal point is not equal then they are called unlike decimals. The decimals 0.22, 0.29, 0.01, have two digits at right hand side from decimal point thus these are called like decimals.

Conversion of Unlike Decimals into Like Decimals

All operations on the decimals are performed by converting unlike decimals into like decimals. Unlike decimals 56.60 and 34.2 is first converted into like decimals as, 56.60 and 34.20.

Example: Write 4 ones, 2 tens, 6 hundreds, 3 thousands and 9 tenths, 4 hundredths, 2 thousandths as decimal number.

(a) 3624.942	(b) 6243.249
(c) 2643.429	(d) All the above
(e) None of these	
Answer (a)	

Explanation:

3000 + 600 + 20 + 4 + 0.9 + 0.04 + 0.002 = 3624.942.

Addition and Subtraction of Decimals

Addition and Subtraction of decimals is like adding and subtracting whole numbers. The only thing we must remember is to line up the place values correctly. The easiest way to do this is to line up the decimals.

Multiplication of Decimals

When multiplying numbers with decimals, we first multiply them as if they were whole numbers. Then, the placement of the number of decimal places in the result is equal to the sum of the number of decimal places of the numbers being multiplied. For example, if we multiply 2.3 by 4.5, each number has one digit to the right of the decimal, so

each has one decimal place. When they are multiplied, the result will have two digits to the right of the decimal or two decimal places.

Division of Decimals

Division with decimals easier to understand if the divisor is a whole number. If the divisor has a decimal in it, we can make it a whole number by moving the decimal point to the appropriate number of places to the right. Once you have moved the decimal point, then the divisor becomes a whole number and you can easily do the division.

Example: Simplify: (67.89×2.3)+34.05 (a) 199.453 (b) 189.567

(c) 190.197 (d) 191.342 (e) None of these **Answer** (c)

Explanation: $(67.89 \times 2.3) + 34.05 = 156.147 + 34.05 = 190.197$

Example: Evaluate: $\frac{7}{9} + \frac{11}{21} + \frac{3}{7}$ (a) 2.564 (b) 1.936 (c) 1.731 (d) 3.562 (e) None of these Answer (c)

Explanation: $\frac{7}{9} + \frac{11}{21} + \frac{3}{7}$ = 0.778 + 0.5238 + 0.429 = 1.7308 = 1.731