Decimals

Introduction

A fraction with the denominator power of 10 (like 10, 100, 1000 etc.) is called decimal. It is expressed as a number using a point called decimal point. Decimal consist of two parts which are separated by a decimal point.

Integral Part

The part which is left to the decimal point is called integral part or whole number part. For example, in the decimal 896.3, 896 is the integral part.

Decimal Part

The part which is right to the decimal point is called fractional part or decimal part.
For example: 45.683 is a decimal number in which 683 is fractional part or decimal part.
Note: Decimal part read as separately one by one like 35.721 is read as thirty five point seven, two, one not as thirty five point seven hundred twenty one.

Decimal Place Value Chart

Thousands (Th)1000	Hundreds (H) 100	Tens (T) 10	Ones (0) 1	Decimal point	Tenths (T) $\frac{1}{10}$	Hundredths (H) $\frac{1}{100}$	Thousandths (Th) $\frac{1}{1000}$
	3	1	5	.	1	6	2

The decimal 315.162 has 3 hundreds, I tens, 5 ones, I tenths, 6 hundredths, and 2 thousandths.

Note: 1 tenths $=\frac{1}{10}$ (one part out of ten parts), 1 hundredths $=\frac{1}{100}$ (one part out of hundred parts), 1 thousandths $=\frac{1}{1000}$ (one part out of thousand parts).

Expanded Form of Decimals

Expanded form of a decimal represents the addition of place values of the digits respected to their position in the decimal. For the example: Expanded form of

315.162 is $300+10+5+\frac{1}{10}+\frac{6}{100}+\frac{2}{1000}$.

Illustrative EXAMPLE

Write the expanded form of the decimal 0.956

Explanation

$0\frac{9}{10}+\frac{5}{100}+\frac{6}{1000}$.

Decimal Places

The number of digits right to the point in a decimal is called decimal places of that decimal For example: In the decimal 26.345, there are three digits right to the point, therefore, the decimal 26.345 has three decimal places.

Illustrative EXAMPLE

How many decimal places does the decimal 25.26 has?

Explanation

There are two digits right to the point in the decimal 25.26, thus it has two decimal places.

Like Decimals

The decimal having same number of digits right to the point are called like decimals.
In other words like decimals have same decimal places.
For example: 2.56, 5.48, 0.25, etc. are like decimals as they have the same number of decimal places.

Illustrative EXAMPLE

"4.56 and 256.35 are like decimals". Justify the statement.

Explanation

Both the decimals 4.56 and 256.35 have two decimal places and the decimals have same number of decimal places are like decimals.

Unlike Decimals

Decimal numbers of different decimal places are called unlike decimals. In other word unlike decimals have different decimals places.
For example: 0.2, 1.23, 2.236 etc. are unlike decimals as they have different decimal places.

Illustrative EXAMPLE

Check, 25.36 and 5.256 like decimals or unlike decimals.

Explanation

25.36 has two decimal places whereas 2.256 has three decimal places. They have the different decimal places, therefore, they are unlike decimals.

Equivalent Decimals

The decimals which have same value are called equivalent decimals. For example:
2.5, 2.50, 2.500, are equivalent decimals as they have the same value.

Illustrative EXAMPLE

Write two equivalent decimals of 2.57

Explanation

Twoequivalentdecimalsof2.57are2.570 and 2.5700. You may find many other equivalent decimals of 2.57 by just adding zeroes in the extreme right side of the decimal.

Note: If the number of zeroes is increased in the extreme right side of a decimal, the value of the decimal remains constant.

Conversion of Unlike Decimals into Like Decimals and Vice-Versa

Step 1: Select the decimal which has the highest number of decimal places.

Step 2: Now place the zeroes in the extreme right side in the other decimals so that they have equal number of digits right to the decimal point.

Illustrative EXAMPLE

Convert 4.5, 9.03, 7.551, 2.1 into like decimals.

Explanation

The decimal 7.551 has the highest number of decimal places among the decimals 4.5, 9.03, 7.551, and 2.1.
The decimal 4.5 has only one decimal place, thus put 2 zeroes in the extreme right side =4.500.
The decimal 9.03 has only two decimal places, thus put 1 zeroes in the extreme right side = 9.030
The decimal 2.1 has only one decimal place, thus put 2 zeroes in the extreme right side = 2.100.
Now 4.500, 9.030, 7.551, and 2.100 are like decimals.

Note: In the same way you can convert like decimals into unlike decimals.

Conversion of a Decimal into a Fraction

Step 1: Remove the point from the decimal and write the obtained number as the numerator.

Step 2: Write 1 as denominator and put zeroes right to it so that the number of zeroes is equal to the number of digits right to the point in the given decimal.

Illustrative EXAMPLE

Convert 23.56 into a fraction.

Explanation

On removing the point from the decimal 23.56 we get the number 2356.
Thus 2356 becomes numerator for the required fraction. There are two digits right to the point in the decimal 23.56 thus the required denominator will be 100 as 100 contains two zeroes.

Thus the required fraction for $23.56 = \frac{2356}{100}$

Conversion of a Fraction into a Decimal

If denominator of the fraction is power of 10, count the digits of the numerator from right and put a decimal point in the numerator so that the number of digits right to the decimal point is equal to the number of zeroes in the denominator.

Illustrative EXAMPLE

Convert $\frac{12562}{100}$ into a decimal.

Explanation

The denominator 100 contains two zeroes, therefore, put a point after two digits counting from right.

Thus the required decimal $\frac{12562}{100} = 125.62$.

Division Method

Step 1: Insert a point in the extreme right to the dividend, and add zeroes right to the point (Note: you may increase the number of zeroes as per the requirements).

Step 2: Now divide the numerator by the denominator.

Step 3: Insert a point extreme right to the quotient before bringing down zeroes right to the point.

Step 4: Continue the division unless remainder becomes 0.

Illustrative EXAMPLE

Convert the fraction $\frac{45}{4}$ into a decimal.

Explanation

We can write 45 as = 45.000

Now divide 45.000... by 4 as per the above given rules unless remainder becomes 0. Thus we get the quotient 11.25.

Therefore, the required decimal for the fraction $\frac{45}{4} = 11.25$.

Comparison of Decimals

Step 1: Compare the integral parts of the decimals, the decimal having greater integral part is greater.

Step 2: If the integral parts are equal, compare the digits at tenth place in the decimals. The decimal having greater digit at tenth place is greater.

Step 3: If the digits at tenth place are equal, compare the digits at hundredth place and so on.

Illustrative EXAMPLE

Compare 217.15 and 217.26.

Explanation

Integral part in 217.15 = 217

Integral part in 217.26 = 217

Thus both the decimals have same integral part. Therefore, compare the digits at tenths place.

Digit at the tenth place in 217.15 = 1

Digit at the tenth place in 217.26 = 2

2 is greater than 1. Therefore, 217.26 > 217.15.

You Must KNOW

- One decimal place to the right of the decimal point is the “tenths” place, but one decimal place to the left of the decimal point is the “ones” place.
- As you move left to right in a decimal place value increases by 10 times and as we move right to left, the place value decreases by 10 times.

SUMMARY

- Decimal is a fraction having the denominator power of 10.
- Decimal point separates whole part and decimal part.
- Decimal places of a decimal are related to its decimal part.
- Equivalent decimals have same value.
- Decimal part of a decimal determines denominator for the required fraction.

Commonly Asked QUESTIONS

5 is at the ..... place in the decimal 21.456. Choose the correct option to fill in the blank.

(a) Tenths (b) Hundredths
(c) Thousandths (d) Ten-thousandths
(e) None of these

Answer: (b)
Explanation
Place value of 5 in the decimal Thus 5 is at the hundredths place.

Which one of the following is the expanded form of 740.023?

(a) $700+40+\frac{2}{10}+\frac{3}{100}$ (b) $700+4+\frac{2}{10}+\frac{3}{1000}$
(c) $700+40+\frac{2}{10}+\frac{3}{1000}$ (d) $700+40+\frac{2}{10}+\frac{3}{1000}$
(e) None of these
Answer: (c)

Which one of the following options contains the decimal indicated in the following place value chart?
Hundreds Tens Ones Tenths Hundredths

Hundreds	Tens	Ones	Tenths	Hundredth
2	0	5	5	6

(a) 200.560 (b) 2.560
(c) 20.56 (d) 20.056
(e) None of these

Answer: (a)

Write the decimal five hundred forty two and two tenths six hundredths

(a) 500.4226 (b) 54.2034
(c) 542.026 (d) 542.26
(e) None of these
Answer: (b)

Which one of the following is correct for $600+30+\frac{2}{10}+\frac{3}{1000}+\frac{4}{1000}$?

(a) 63.2034 (b) 630.234
(c) 603.234 (d) 603.2034 (e) None of these
Answer: (d)

Which one of the following has least number of decimal places?

(a) 0.07 (b) 563.9
(c) 88.003 (d) 0.0001
(e) None of these

Answer: (b)

Write $400+50+5+\frac{2}{1000}$ and $80+7+\frac{1}{10}+\frac{6}{100}+\frac{2}{1000}$ into simple form of decimals and choose which one of the following is not true?

(a) They are like decimals
(b) They are unlike decimals
(c) They are equivalent decimals
(d) All of these
(e) None of these

Answer: (a)

Explanation

$400+50+5+\frac{2}{1000}=455.002$

And $80+7+\frac{1}{10}+\frac{6}{100}+\frac{2}{1000}=87.162.$

Both 455.002 and 87.162 have same number of decimal places. Thus they are like decimals.

Which one of the following statements is not true?

(a) Like decimals may have different values
(b) Equivalent decimals of a decimal contain same number of digits
(c) Decimal places of a decimal is determined by the number of digits present in the decimal part
(d) Two unlike decimals may have same integral part
(e) None of these

Answer: (b)

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5 and 8 are two extreme right digits of two different decimals. Place value of 5 and 8 are $\frac{5}{100}$ and $\frac{8}{1000}$ respectively. The decimals are:

(a) Like (b) Unlike
(c) Equivalent (d) All of these
(e) None of these

Answer: (b)

Which one of the following is the appropriate fraction for the given expression $700+20+1+\frac{6}{10}+\frac{2}{100}+\frac{3}{1000}$?

(a) $\frac{72101263}{100}$ (b) $\frac{721623}{1000}$

(c) $\frac{721}{1000}$ (d) $\frac{721623}{100000}$

(e) None of these

Answer: (b)

Which one of the following is the appropriate denominator for the decimal denoted by the following decimal place value chart?

Ten	Ones	Tenths	Hundredths	Thousandth
2	5	0	0	3

(a) 10 (b) 100

(c) 1000 (d) 10000

(e) None of these

Answer: (c)

Arrange the decimals 4.32, 4.032, 4.321, 4.015 in descending order.

(a) 4.321, 4.32, 4.032, 4.015

(b) 4.321, 4.32, 4.015, 4.032

(c) 4.32, 4.015, 4.032, 4,321

(d) 4.321, 4.015, 4.32, 4.032

(e) None of these

Answer: (a)

Advin divides a natural number by 1000, 10, 100, and 10000 respectively and reaches at the following conclusions. Which one of the following conclusions is correct?

(a) When there is greater denominator, the whole part of the obtained decimal is smaller

(b) As the number of zeroes is added right to the denominator, the decimal point is shifted left to the numerator

(c) When numerator is smaller than denominator, the obtained decimals have same whole part

(d) The decimal obtained in each case contains same digit only position of point changes

(e) None of these

Answer: (a)

If x and Y represent whole part and decimal part for the decimals respectively, which one of the following statements is not true?

(a) x lies left to the point in the decimal

(b) If the total number of digits in Y is 3, the denominator of the required fraction for the decimal will be 1000

(c) x is independent in terms of like fractions

(d) Extreme right digit of Y comes in the thousandths column in the place value chart

(e) None of these

Answer: (d)

Self Evaluation TEST

Duration 10 Minutes

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1. **Where should we place a decimal point in the number 2135648 such that place value of 8 becomes $\frac{8}{10000}$**

(a) Left to the 2
(b) Between 1 and 3
(c) Between 3 and 5
(d) Between 5 and 6
(e) None of these

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2. **Which one of the following is not true?**

(a) If place of decimal point in a numerator of a fraction is shifted two digit left and denominator is divided by 100, the value of the fraction remains same
(b) Place value of the digits which are right to the decimal is less than 1 and which are left to the decimal is more than 1
(c) All three proper, improper and mixed fractions can be changed into decimal fraction
(d) The numbers which have only 0 to left to the decimal and natural numbers right to the decimal always lie between 0 and 1
(e) None of these

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3. **Which one of the following decimals cannot be changed into mixed fraction?**

(a) 0.4585
(b) 4.585
(c) 45.85
(d) 458.5
(e) None of these

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4. **When the proper fractions are changed into decimal fractions, they have the same____.**

(a) Integral part
(b) Decimal part
(c) Number of digits
(d) All of these
(e) None of these

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5. **Which one of the following is the correct ascending order?**

(a) 0.67,6.7,0.125,45.6
(b) 45.6,0.125,6.7,0.67
(c) 0.67,0.125,6.7,45.6
(d) 0.125,0.67,6.7,45.6
(e) None of these

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6. **Convert the decimal 25.7 into fraction.**

(a) $\frac{257}{100}$
(b) $\frac{257}{1000}$
(c) $\frac{257}{10}$
(d) $\frac{257}{10000}$
(e) None of these

7. **Convert $\frac{75}{4}$ and $\frac{75}{8}$ into decimals and choose the correct option.**

(a) They are like decimals
(b) They are unlike decimals
(c) They are equivalent decimals
(d) All of these
(e) None of these

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8. **Who is correct?**

Jack: Proper fractions are related with the decimals which have 0 as integral part.
Codi: All like decimals have same number of denominator when they are converted into fraction.

(a) Jack (b) Codi
(c) Both are correct (d) Both are partially incorrect
(e) None of these

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9. **Convert $\frac{175}{4}$ into decimal and choose which one of the following is its equivalent decimal?**

(a) 0.43750 (b) 4.3750
(c) 43.750 (d) 437.50
(e) None of these

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10. **Arrange the following decimals in descending order.**

25.365, 25.361,0.25961, 250.001
(a) 250.001,25.365,25.361,0.25961
(b) 0.25961, 25.361, 25.365, 250.001
(c) 25.365,25.361,0.25961,250.001
(d) 250.001, 0.25961, 25.365, 25.361
(e) None of these

Answers – Self Evaluation Test

1.	C	**2.**	B	**3.**	A	**4.**	A	**5.**	D	**6.**	C	**7.**	B	**8.**	C	**9.**	C	**10.**	A

Self Evaluation Test

SOLUTIONS

1. We should place a point between 3 and 5 such that place value of 8 becomes $\frac{8}{1000}$.

2. If there is 0 at the unit place of a decimal fraction, its place value is less than 1.

3. 0.4585 is the correct answer.

4. When the proper fractions are changed into decimal fractions, they have the same integral part.

5. 0.125, 0.67, 6.7,45.6 is the correct answer.

8. All the proper fractions have 0 in whole-number part and denominator is determined by the decimal part of a decimal for the required fraction.

9. $\frac{175}{4} = 43.75$ Thus 43.750 is its equivalent decimal.

10. The correct descending order is 250.001, 25.365, 25.361, 0.25961.