2. Big and Small Numbers

What is the meaning of Place Value and Face Value in Maths

Place value and face value:

The **place value** of a digit of a number depends upon its position in the number. The **face value** of a digit of a number does not depend upon its position in the number. It always remains the same wherever it lies regardless of the place it occupies in the number.

Example: Let us see the place value and face value of the underlined digit in the number 1,32,460. The digit 2 in the number 1,32,460 lies in the thousands period (1000) and hence the place value of 2 is 2 thousands (or 2000). The face value of 2 is 2 only.

Expanded form:

When a number is written as the sum of the place values of all the digits of the number, then the number is in its expanded form.

Example: The expanded form of 9,67,480 is as shown below:
9,67,480 = 900000 + 60000 + 7000 + 400 + 80 + 0

Successor: The successor of a given number is the number that just succeeds it, i.e., 'the number just after' the given number. It is obtained by adding one (1) to the given number.

Examples

- The successor of 5,678 is 5,678 + 1 = 5,679.
- The successor of 99,999 is 99,999 + 1
  = 1,00,000.

Predecessor: The predecessor of a given number is the number that just precedes it, i.e. 'the number just before' the given number. It is obtained by subtracting one (1) from the given number.

Examples

- The predecessor of 1,257 is 1,257 – 1 = 1,256.
- The predecessor of 1,00,000 is 1,00,000 – 1
  = 99,999.

What is the Place Value Chart of an Indian and International System

There are two systems of reading and writing numbers: The Indian system and The International system of numeration.

1. Indian system of numeration

In the **Indian system of numeration**, starting from the right, the first period is ones, consisting of three place values (ones, tens, and hundreds). The next period is **thousands**, consisting of two place values (thousands and ten thousands). The third period from the right is **lakhs**, consisting of two place values (lakhs and ten lakhs), and then **crores** and so on. This system of numeration is also known as the **Hindu-Arabic system of numeration**. We use commas' for separating the periods, which help us in reading and writing large numbers. In the Indian system, the first comma comes after three digits from the right (i.e., after ones period) and the next comma comes after the next two digits {i.e., after thousands period) and then after every two digits and so on.

Indian Place value chart

Crores (C)		**Lakhs (L)**		**Thousands (Th)**		**Ones**		
Ten crores (TC)	Crores (C)	Ten Lakhs (TL)	Lakhs (L)	Ten Thousands (TTh)	Thousands (Th)	Hundreds (H)	Tens (T)	Ones (o)
10,00,00,000	1,00,00,000	10,00,000	1,00,000	10,000	1,000	100	10	1

Let us consider an example:
In the Indian system of numeration,
92357385 =9,23,57,385
Similarly, 2930625 in the Indian system of numeration will be written as 29,30,625.

2. International system of numeration

In the **International system of numeration**, starting from right, the first period is **ones**, consisting of three place values (ones, tens, and hundreds). The next period is **thousands**, consisting of three place values (one thousand, ten thousands, and hundred thousands) and then **millions** and after that **billions**.

International Place value chart

Billions			Millions			Thousands			One	
Hundred billions (HB)	Ten billion (TB)	One billion (B)	Hundred millions (HM)	Ten millions (TM)	One million (M)	Hundred thousands (HTh)	Ten thousands (TTh)	Thousands (Th)	Hundreds (H)	T (
100,000,000,000	10,000,000,000	1,000,000,000	100,000,000	10,000,000	1,000,000	100,000	10,000	1,000	100	

In International system of numeration all the periods have three place values each.
Since each period has three place values, so to write a number with the help of comma(s), we have to put a comma after every three digits from the right. For example, 275068142 will be written in the International system as 275,068,142.
Similarly, 925371852 will be written as 925,371,852.

Note:
First three places from the right are same in both the Indian and the International systems of numeration.

Example 1: Rewrite the following numbers in the Indian and International systems using commas (,):
(a) 74028952 (b) 1835762
Solution:
(a) 74028952
Indian system: 7,40,28,952 International system: 74,028,952
(b) 1835762
Indian system: 18,35,762 International system: 1,835,762

Example 2: Rewrite the following numbers in the International place value chart:
(i) 6432156 (ii) 87201593
Solution:

Millions		Thousands			Ones		
TM	M	HTh	TTh	Th	H	T	0
	6	4	3	2	1	5	6
8	7	2	0	1	5	9	3

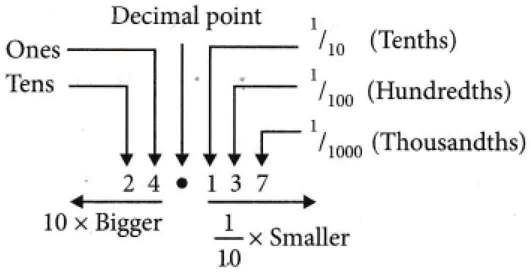
What is a Decimal Value and Place Value of Decimals

Decimal Fractions
Introduction
Riya, Nutan, and Roshan are studying in the same class. In the mathematics examination, marks obtained by Riya and Nutan are 72 and 78 respectively, but the marks obtained by Roshan is 80.5.

Children, do you know the meaning of 80.5 ? It is nothing but $80\frac{1}{2}$. $\frac{1}{2}$ can also be written as 0.5.

0. 5 is the decimal representation of fraction $\frac{1}{2}$. A decimal number is a number that contains a decimal point.

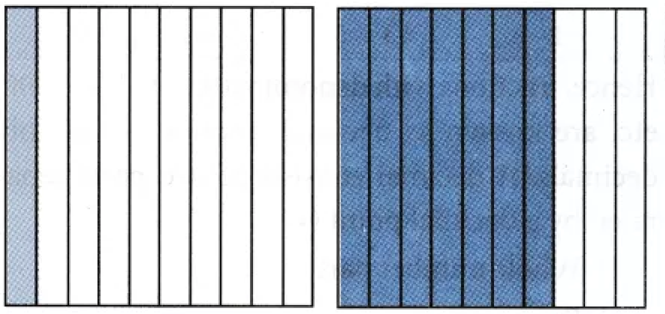
We know that the place value of a digit increases 10 times as it moves one step towards the left or decreases $\frac{1}{10}$ times as it moves one step towards the right. Watch the place value of digits in the Table.



Decimal Fractions

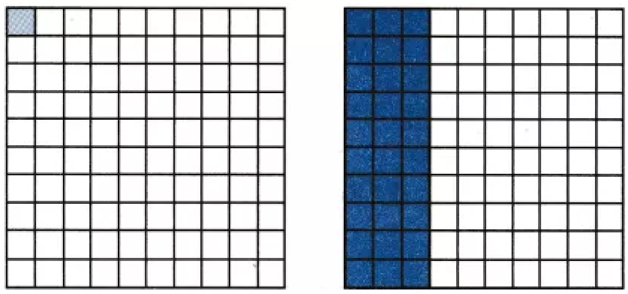
Let us consider a square divided into ten equal parts, then each part of the square will represent one-tenth $\left(\frac{1}{10}\right)$ of the whole square.

The decimal form of one-tenth is 0.1 read as 'zero decimal one' or 'zero point one'; The fractional form of one tenth is $\left(\frac{1}{10}\right)$



$\frac{1}{10}$ = one-tenth = 0.1; $\frac{7}{10}$ = seven-tenths = 0.7

When we divide a square into 100 equal parts, then each part of square represents $\left(\frac{1}{100}\right)$, which is called 'one hundredth' and can be written in the decimal form as 0.01.
Note: The word 'DECIMAL' means 'based on 10'. This word is derived from the latin word decima meaning – a tenth part.



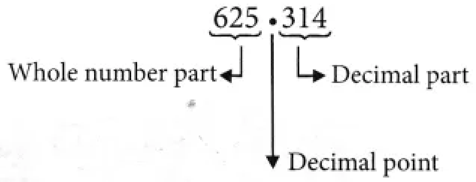
$\frac{1}{100}$ = one-hundredth; $\frac{30}{100}$ = 30 hundredths = 0.30

Similarly, if we divide a square into 1000 equal parts, then each part will be represented by $\left(\frac{1}{1000}\right)$ called 'one-thousandth' and written as 0.001 in decimal form.
From the above, it is clear that

1 ones	= 10 tenths	= 100 hundredths	= 1000 thousandths
1×1	$= 10 \times \left(\frac{1}{10}\right)$	$= 100 \times \left(\frac{1}{100}\right)$	$= 1000 \times \left(\frac{1}{1000}\right)$
	= 1	= 1	= 1

Hence, fractions with denominators 10,100,1000, etc. are known as decimal fractions or simply decimals. A decimal consists of two parts separated by a decimal point (•)
(i) Whole number part
(ii) Decimal part.
The digits, which are to the left side of a decimal point are called whole number part and the digits which are to the right side of a decimal point are called decimal part.

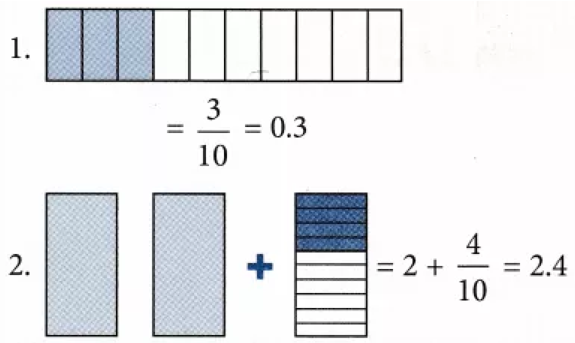
Example



Reading of a decimal fraction

While reading a decimal fraction, the digits on the left of the decimal point are read as whole number and the digits on the right of the decimal point are read as individual digits.
Example: 625.314 can be read as six hundred twenty-five point three one four.
22.768 = twenty-two point seven six eight.

Observe the following:



Note:
If there is no whole number part in a decimal number then write 0 on the left of the decimal point.
Example: 0.67, 0.132, 0.5, etc

Writing decimals in place value chart

Table given on the next page shows the value of each place in a decimal fraction.
We can use this place value chart to expand a decimal fraction using decimals or fractions.

Expanded Form

This is a form, in which we add the place value of each digit forming the number.

Example: $145.321 = 1 \times 100 + 4 \times 10 + 5 \times 1 + 3 \times \frac{1}{10} + 2 \times \frac{1}{100} + 1 \times \frac{1}{1000}$ (fractional form)

$= 1 \times 100 + 4 \times 10 + 5 \times 1 + 0.3 + 0.02 + 0.001$ (decimal form)

Decimal places: The number of digits contained in the decimal part of a decimal fraction gives the number of decimal places.

× 10 × 10 × 10	× 10 × 10	× 10	⟵ Increasing value by 10 times				
Thousands	Hundreds	Tens	Ones	.	Tenths	Hundredths	Thousandths
1000	100	10	1		$\frac{1}{10} = 0.1$	$\frac{1}{100} = 0.01$	$\frac{1}{1000} = 0.001$
					÷ 10	÷ 10 ÷ 10	÷ 10 ÷ 10 ÷ 10

⟶ Decreasing value by $\frac{1}{10}$th times

How do you Round to the Nearest Ten Thousand

Rounding off numbers

Rounding off numbers is to reduce the digits in a number while trying to keep its value almost same.
The number obtained after rounding is less accurate, but easier to use.

Rules to round off a digit in a number		
The digit to be rounded is	Less than 5	Value of previous digit remains the same
	Greater than or equal to 5	Value of previous digit is increased by one

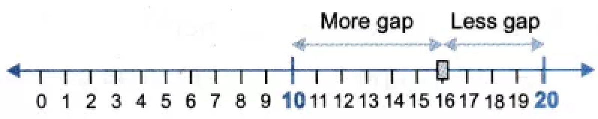
Number	Round to thousands	Round to hundreds	Round to tens	Round to units	Round to tenths	Round to hundredths
45,632.052	46,000	45,600	45,630	45,632	45,632.1	45,632.05
85,752.56	86,000	85,800	85,750	85,753	85,752.60	85,752.56

Green: Value of digit remains the same
Red: Increase the value of digit by 1

We have already learnt rounding off the numbers to the nearest tens, hundreds, etc. Let us review them. Let us consider a number, say 12 on a number line. It lies between 10 and 20. We observe that the gap between 10 and 12 is less than the gap between 12 and 20, i.e., 12 is nearer to 10 than 20. So, we round off 12 to 10, that is, to the nearest ten.

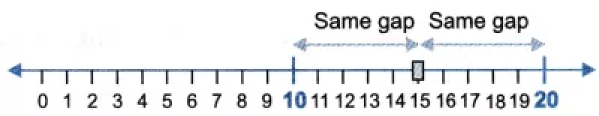
(i)

Similarly, if we take a number say 16, then it is nearer to 20 as compared to 10. So, we will round off 16 to the nearest ten as 20.



(ii)

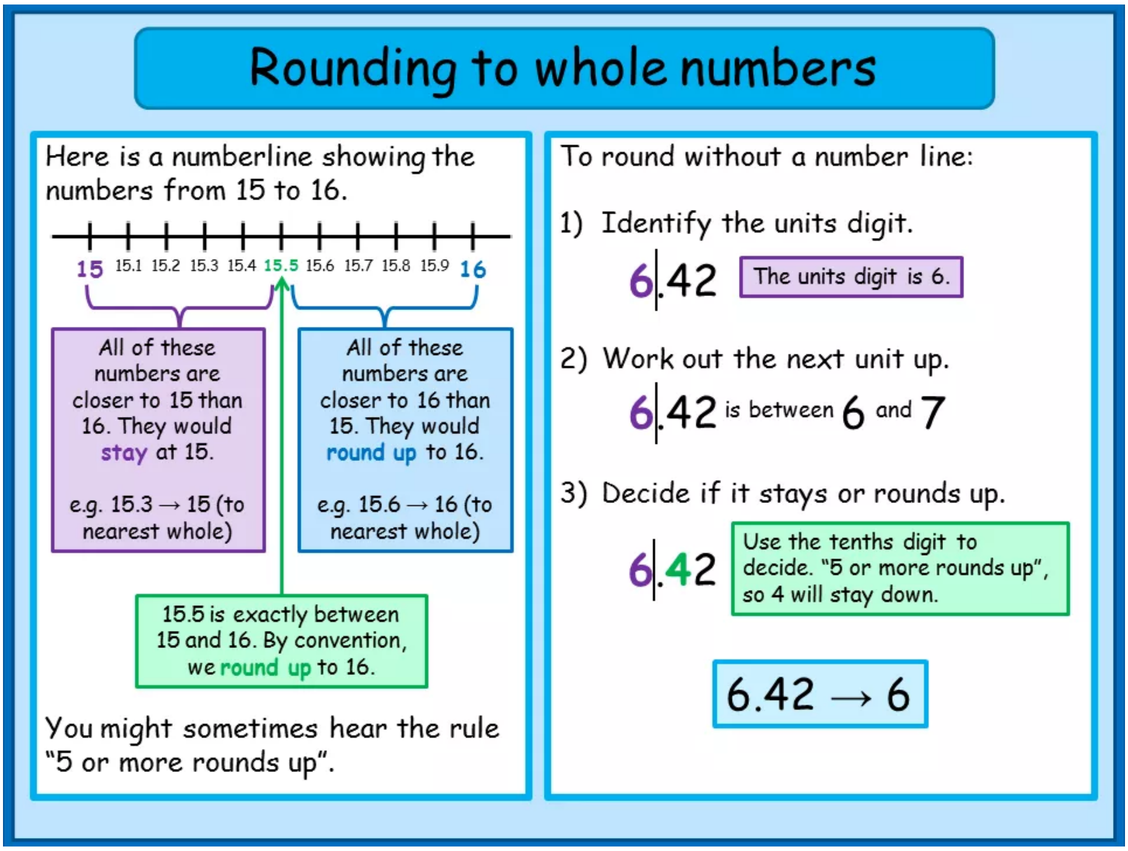
But if number 15 is considered, which is at equal distance from both 10 and 20, it is also rounded off to 20.

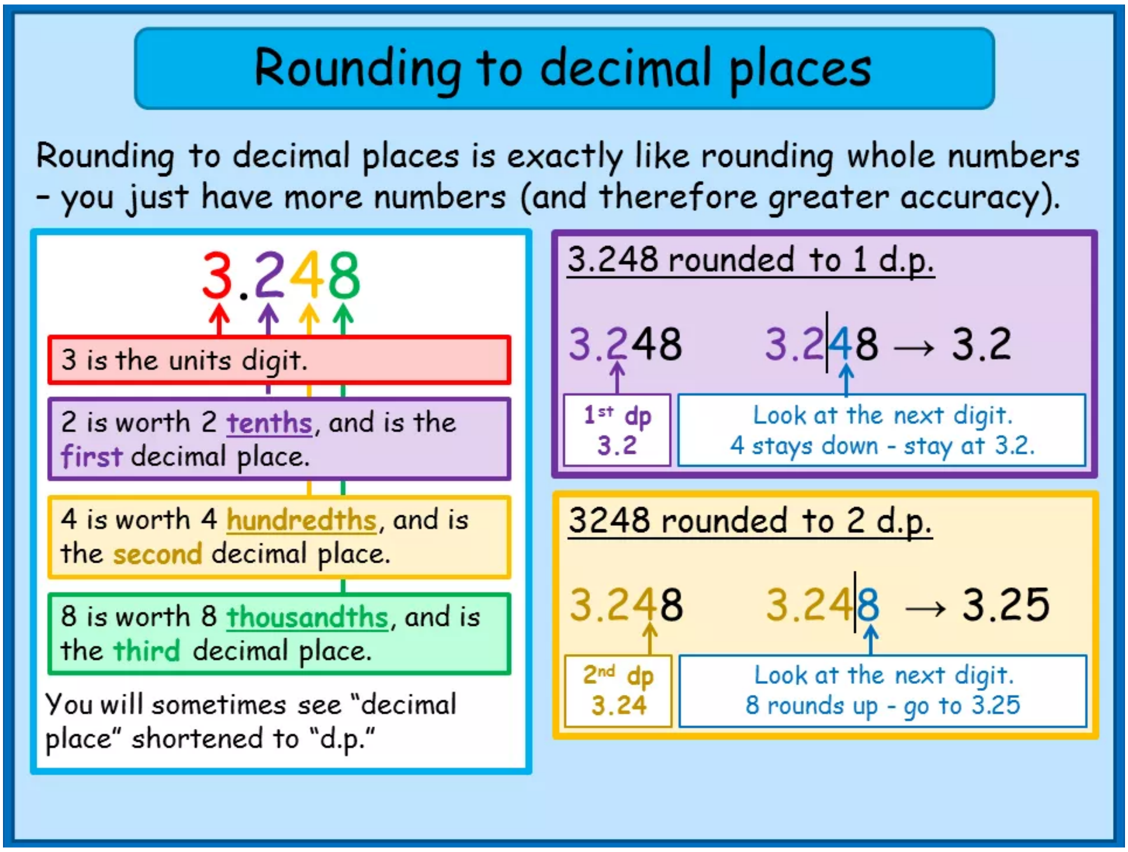


(iii)

Similarly,

1. In 46, the digit in the ones place is 6. Hence, 46 rounded off to the nearest ten is 50.
2. In 251, the digit in the ones place is 1. Hence, 251 rounded off to the nearest ten is 250.
3. In 345, the digit in the tens place is 4. Hence, 345 rounded off to the nearest hundred is 300.
4. In 9157, the digit in the tens place is 5. Hence, 9157 rounded off to the nearest hundred is 9200.
5. In 5473, the digit at the hundreds place is 4. Hence, 5473 rounded off to the nearest thousand is 5000.





Rounding off a number to the nearest ten thousand

1. Consider the digit in thousands place of the given number.
2. If it is less than 5, replace the digits in thousands, hundreds, tens, and ones by 0, keeping the digits in other places as they are.

3. If it is 5 or more than 5, replace the digits in thousands, hundreds, tens, and ones by 0 and increase the digit in ten thousands by 1.

Examples

1. In number 18785, the digit in thousands place is 8 and 8 > 5, so when rounded off the number nearest to ten thousand is 20000.
2. In number 73568, the digit in thousands place is 3 and 3 < 5, so when rounded off the number nearest to ten thousand is 70000.

Rounding off a number to the nearest lakh

1. Consider the digit in ten thousands place of the given number.
2. If it is 5 or more than 5, replace the digits in ten thousands, thousands, hundreds, tens, and ones by 0 and increase the digit in lakhs by 1.
3. If it is less than 5, replace the digits in ten thousands, thousands, hundreds, tens, and ones by 0 keeping the digits in other places as they are.

Examples

1. In number 560712, the digit in ten thousands place is 6, and 6 > 5, so the rounded off number is 600000.
2. In number 821058, the digit in ten thousands place is 2, and 2 < 5, so the rounded off number is 800000.

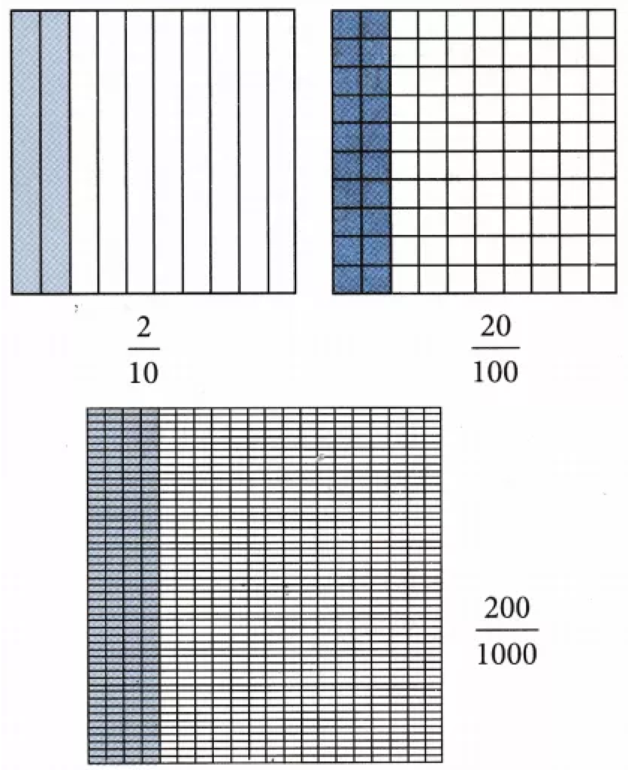
What is the Definition of an Equivalent Decimal

Equivalent Decimals

Decimals are a type of fractional number. The decimal 0.2 represents the fraction $\frac{2}{10}$. We know $\frac{2}{10}$ is equivalent to $\frac{1}{5}$, since $\frac{1}{5}$ times of $\frac{2}{2}$ is $\frac{2}{10}$.

Therefore, the decimal 0.2 is equivalent to $\frac{1}{5}$ or $\frac{2}{10}$ or $\frac{20}{100}$ or $\frac{200}{1000}$ etc.

Observe the following diagrammatic representation:



2 tenths = 20 hundredths = 200 thousandths

$$\frac{2}{10} = \frac{20}{100} = \frac{200}{1000}$$

0.2 = 0.20 = 0.200

All these three decimals i.e., 0.2, 0.20, and 0.200, have the same value and so they are called equivalent decimals.

Example 1: Give next two decimal numbers in the sequence:

(a) 1.32, 1.42, 1.52, …, …

(b) 1.14,1.25, 1.36, …, …

Solution:

(a) 1.32,1.42,1.52,1.62,1.72

(b) 1.14,1.25,1.36,1.47,1.58

Writing or removing zeros at the end of the decimal does not change its value.
Examples
0. 5 =0.50 = 0.500
= 0.5000 = 0.50000
6.2 = 6.20 = 6.200
= 6.2000 = 6.2000

Example 2: Write the number name for 207.652.
Solution: 207.652 = Two hundred seven point six five two

Example 3: Write the decimal fraction 35.439 in expanded form.
Solution:

$$35.439 = 30 + 5 + \frac{4}{10} + \frac{3}{100} + \frac{9}{1000} \quad \text{(fractional form)}$$

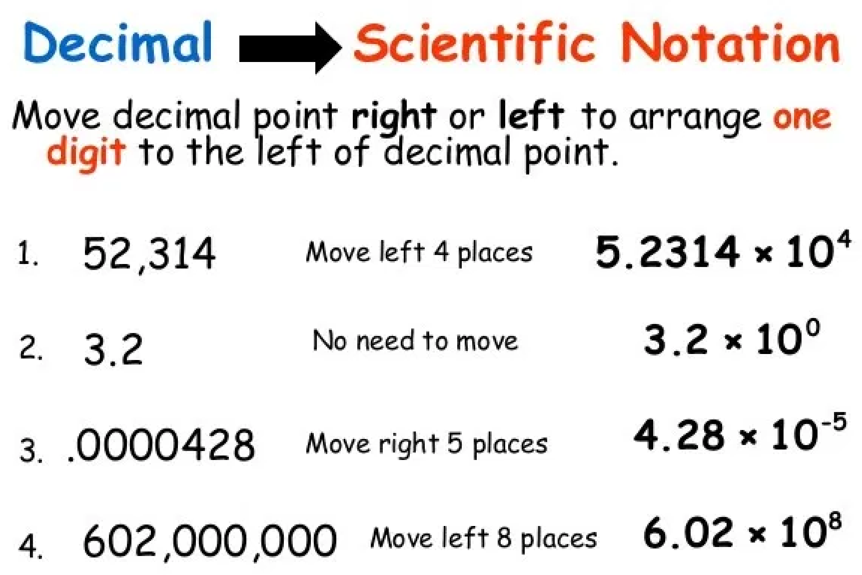
$$35.439 = 30 + 5 + 0.4 + 0.03 + 0.009 \quad \text{(decimal form)}$$

Converting To and From Scientific Notation

Converting To Scientific Notation

To Change from Standard Form to Scientific Notation:

1. Place the decimal point such that there is one non-zero digit to the left of the decimal point.
2. Count the number of decimal places the decimal has “moved” from the original number. This will be the exponent of the 10.
3. If the original number was less than 1, the exponent is negative; if the original number was greater than 1, the exponent is positive.



Examples:

1. **Given: 4,750,000**
   4.75 (moved decimal point 6 decimal places)
   Answer: 4.75×10^{6}
   The original number was greater than 1 so the exponent is positive.
2. **Given: 0.000789**
   7.89 (moved decimal point 4 decimal places)
   Answer: 7.89×10^{-4}
   The original number was less than 1 so the exponent is negative.

Converting From Scientific Notation

To Change from Scientific Notation to Standard Form:

1. Move the decimal point to the right for positive exponents of 10. The exponent tells you how many places to move.
2. Move the decimal point to the left for negative exponents of 10. Again, the exponent tells you how many places to move.

Standard Form

Positive Power = Large Number

$$4.3 \times 10^{6} = 4\,300\,000$$

Negative Power = Small Number

$$2.1 \times 10^{-3} = 0.021$$

Examples:

1. **Given:** 1.015×10^{-8}
   Answer: 0.00000001015 (moved decimal 8 places left)
   Negative exponent moves decimal to the left.
2. **Given:** 5.024×10^{3}
   Answer: 5,024 (move decimal 3 places right)
   Positive exponent moves decimal to the right.

What is the Difference between Ascending and Descending Order

Ascending order:

When numbers are written from the smallest number to the largest number, then the numbers are in ascending order.

Example: Four numbers 42,130; 5,781; 4,25,806 and 35,601 if written in ascending order, would have the following order:

5,781 (smallest); 35,601; 42,130; 4,25,806 (largest)

Descending order:

When numbers are written from the largest number to the smallest number, then the numbers are in descending order.

Example: Four numbers 1,40,673; 5,078; 1,42,560 and 35,746 if written in descending order, would have the following order:

1,42,560 (largest); 1,40,673; 35,746; 5,078 (smallest)

Addition and Subtraction of Decimals

For addition/subtraction of decimals, we have to follow these steps:

Step 1: Change the given decimals into like decimals.
Step 2: Write the numbers in columns, so that decimal points should come in one column and tenths comes under tenths, hundredths comes under hundredths, and so on.
Step 3: Now, add or subtract the decimals, as we add or subtract the whole numbers.
Step 4: Put the decimal in the sum or difference directly under the decimal points of all the decimals.

Example 1: Add 3.85 and 2.5.
Solution: Converting into like decimals

3.85 → 3.85
2.5 → 2.50

	3	·	8	5
+	2	·	5	0
	6	·	3	5

∴ 3.85 + 2.5 = 6.35

Example 2: Subtract 41.715from 63.2.
Solution: Converting into like decimals

63.2 → 63.200
41.715 → 41.715

	6	3	.	2	0	0
−	4	1	.	7	1	5
	2	1	.	4	8	5

∴ 63.2-41.715 = 21.485

Example 3: Add 41.8, 39.24, 5.01, and 62.6.
Solution: Converting into like decimals

41.8 → 41.80
39.24 → 39.24
5.01 → 5.01
62.6 → 62.60

	4	1	.	8	0
	3	9	.	2	4
		5	.	0	1
+	6	2	.	6	0
1	4	8	.	6	5

∴ 41.8 + 39.24 + 5.01 + 62.6 = 148.65

Example 4: Surajgot Rs 15.50 from his mother and Rs 30.05 from his father. How much money did he get?
Solution:

From mother, Suraj got	₹ 15.50
From father, Suraj got	+ ₹ 30.05
Total money he got	₹ 45.55

Example 5: The sum of two numbers is 100. If one of them is 78.67, find the other.
Solution:

Sum of two numbers	= 100.00
One number	= – 78.67
Other number	= 21.33

Note:

- Fractions with denominators 10,100,1000, etc. are known as decimal fractions or decimals.
- Decimal number has whole number part and decimal part separated by a decimal point.
- Zeros to the extreme right side of the decimals does not have any value.
- Two decimals having the same number of decimal places are like decimals and decimals having different decimal places are unlike decimals.
- To add or subtract decimals, it is easier to convert them as like decimals and then add or subtract as we do for whole numbers.

How do you Multiply and Divide Decimals?

Multiplication of a decimal by 10, 100, 1000 etc.:

Method:

On multiplying a decimal number by 10, 100, 1000, … the decimal point is shifted to the right by one, two, three, … places respectively.
For example,

$$673.234 \times 10 = 673.234 = 6732.34$$

$$673.234 \times 100 = 673.234 = 67323.4$$

$$673.234 \times 1000 = 673.234 = 673234.0$$

Multiplication of a decimal by a whole number:

Method :
Multiply the whole number by decimal (without the decimal point). Mark the decimal point in the product from right side to have as many decimals as there are in the given decimal.
For example, 12 × 3.82
First find the product of 12 and 382
(ignoring decimal) 382 × 12

```
   3 8 2
   × 1 2
 -------
   7 6 4
 3 8 2 ×
 -------
 4 5 8 4
```

Now, 3.82 × 12 = 45.84 (mark the point after two digits from right).

Multiplication of a decimal by a decimal:

Method :
1. Multiply the decimal numbers as of ordinary number (ignoring decimal points)
2. Mark the decimal point in the product after as many places (from the right) as the sum of the decimal places in the each number.
For example, 82.53 × 7.4
First find the product of 8253 and 74 (ignoring decimal point)

$$
\begin{array}{r}
8\ 2\ 5\ 3 \\
\times \quad 7\ 4 \\
\hline
3\ 3\ 0\ 1\ 2 \\
5\ 7\ 7\ 7\ 1\ \times \\
\hline
6\ 1\ 0\ 7\ 2\ 2 \\
\hline
\end{array}
$$

Now, 82.53 × 7.4 = 610.722 (mark the decimal point after (2 + 1 = 3) digits from right).

Multiplication of Decimal Numbers Problems with Solutions

1. Multiply : (i) 1.6 by 0.3 (ii) 8.03 by 2.9 (iii) 0.657 by 27
Solution:

(i) We write it as 1.6×0.3

$$= \frac{16}{10} \times \frac{3}{10} = \frac{48}{100} = 0.48$$

Hence, $1.6 \times 0.3 = 0.48$

(ii) We write it as 8.03×2.9

$$= \frac{803}{100} \times \frac{29}{10} = \frac{23287}{1000} = 23.287$$

Hence, $8.03 \times 2.9 = 23.287$

(iii) We write it as 0.657×27

$$= \frac{657}{1000} \times 27 = \frac{657 \times 27}{1000}$$

$$= \frac{17739}{1000} = 17.739$$

Hence, $0.657 \times 27 = 17.739$

2. Find the following products :
(i) 23.25 × 5 (ii) 2.325 × 25
Solution:
(i) 23.25 × 5

$$
\begin{array}{r}
2325 \\
\times\ 5 \\
\hline
11625 \\
\hline
\end{array}
$$

So, 23.25 × 5 = 116.25
Step 1 :
Multiply the multiplicand by the multiplier without bothering about the decimal point.
Step 2 :
Count the number of digits in the multiplicand after decimal point. It is 2 in this case. Count two digits from the unit place in the product and put a decimal point.
Therefore, 23.25 × 5 = 116.25

(ii) 2.325 × 25

$$\begin{array}{r} 2325 \\ \times 25 \\ \hline 11625 \\ 46500 \\ \hline 58125 \\ \hline \end{array}$$

So, 2.325 × 25 = 58.125
Step 1 :
Multiply the multiplicand by the multiplier without bothering about the decimal point.
Step 2 :
The multiplicand has 3 places of decimal. Count three digits from the unit place of the product and put the decimal point.
Therefore, 2.325 × 25 = 58.125

3. Multiply 6.7 × 4.25 × 12.3
Solution:
(i) 6.7 × 4.25 × 12.3 = (6.7 × 4.25) × 12.3
= 28.475 × 12.3 = 350.2425

$$\begin{array}{r} 67 \\ \times 425 \\ \hline 335 \\ +1340 \\ +26800 \\ \hline 28475 \\ \hline \end{array} \qquad \begin{array}{r} 28475 \\ \times 123 \\ \hline 85425 \\ +569500 \\ +2847500 \\ \hline 3502425 \\ \hline \end{array}$$

Also we can make the grouping as
(ii) 6.7 × 4.25 × 12.3
= 6.7 × (4.25 × 12.3) = 6.7 × 52.275
= 350.2425

$$\begin{array}{r} 425 \\ \times 123 \\ \hline 1275 \\ +8500 \\ +42500 \\ \hline 52275 \\ \hline \end{array} \qquad \begin{array}{r} 52275 \\ \times 67 \\ \hline 365925 \\ +3136500 \\ \hline 3502425 \\ \hline \end{array}$$

We find that
(6.7 × 4.25) × 12.3 = 6.7 × (4.25 × 12.3)
Hence,
To find the product of three decimal fractions, we can regroup them in any order, the result is the same in both cases. Thus, multiplication of decimals is associative.

4. Find (i) 10.05 × 1.05 (ii) 100.01 × 1.1
Solution:
(i) First multiply 1005 by 105

$$\begin{array}{r} 1005 \\ \times 105 \\ \hline 5025 \\ 0000\times \\ 1005\times\times \\ \hline 105525 \\ \hline \end{array}$$

Sum of decimal places in the given decimal
= (2 + 2) = 4
So, product will contain 4 places of decimals from the right side.
10.05 × 1.05 = 10.5525

(ii) 100.01 × 1.1

$$\begin{array}{r} 10001 \\ \times 11 \\ \hline 10001 \\ 10001\times \\ \hline 110011 \\ \hline \end{array}$$

First multiply 10001 by 11.
Sum of decimal places in the given decimals
= (2 + 1) = 3
So, product will contain 3 places of decimals from the right side.
100.01 × 1.1 = 110.011

Division of Decimal Numbers

Dividing a decimal by 10, 100, 1000 etc.:

Method:
On dividing a number by 10, 100, 1000, … the digits of the number and quotient are same but the decimal point in the quotient shifts to left by one, two, three, … places.
For example,
3.27 ÷ 10 = 0.327
3.27 ÷ 100 = 0.0327
3.27 ÷ 1000 = 0.00327

Dividing a decimal by a whole number:

Method:

(i) Divide the dividend considering it as a whole number.

(ii) When the division of whole-number part of the dividend is complete, mark the decimal point in the quotient and proceed with the division as in case of whole number.
For example,

$$149.236 \div 8$$

$$\begin{array}{r|l} & \quad 18.6545 \\ 8 & \; 149.236 \\ & \; 8 \\ \hline & \; 69 \\ & -64 \\ \hline & \; 52 \\ & -48 \\ \hline & \; 43 \\ & -40 \\ \hline & \; 36 \\ & -32 \\ \hline & \; 40 \\ & -40 \\ \hline & \; 0 \end{array}$$

Dividing a decimal by a decimal:

Method:

(i) Convert the divisor into a whole number by multiplying it by 10, 100, 1000, … etc, depending upon the number of decimal places in it. Also we multiply the dividend by the same multiplier.
(ii) Divide the new dividend by the whole number obtained above.

For example, 22.08 ÷ 1.5

$$= \frac{22.08}{1.5} = \frac{2208 \times 10}{100 \times 15} = \frac{220.8}{15}$$

$$\begin{array}{r} 14.72 \\ 15 \overline{) \; 220.8} \\ -15 \\ \hline 70 \\ -60 \\ \hline 108 \\ -105 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

Division of Decimal Numbers Problems with Solutions

1. Find 15.225 ÷ 0.35
Solution:

We can write it as

$$= \frac{15225}{1000} \div \frac{35}{100}$$

[Writing decimal fractions as fractions]

[Change ÷ by × and replace the divisor by its reciprocal]

$$= \frac{15225}{1000} \times \frac{100}{35} = 1522.5 \div 35$$

Thus, we note that
15.225 ÷ 0.35 = 1522.5 ÷ 0.35 = 1522.5 ÷ 35
Thus if the decimal point is moved to two places towards right in the divisor then the decimal point is also moved to the right in dividend by same number of places.

2. Find 50.76 ÷ 9.4
Solution:

$$= \frac{5076}{100} \div \frac{94}{10} = \frac{5076}{100} \times \frac{10}{94} = \frac{5076}{10} \times 94 = 507.6 \div 94$$

Hence, 50.76 ÷ 9.4 = 507.6 ÷ 94
Thus, we note that we can make the divisor as a whole number by shifting the decimal point to right by as many places as the number of the decimal places in the divisor. This way, the divisor is changed into a whole number.

3. Divide (i) 15.225 by 0.35 (ii) 50.76 ÷ 9.4
Solution:

(i) $15.225 \div 0.35 = 1522.5 \div 35$

$$\begin{array}{r|l} & \ \ 43.5 \\ \hline 35 & 1522.5 \\ & -140 \\ \hline & \ \ 122 \\ & -105 \\ \hline & \ \ \ 175 \\ & \ -175 \\ \hline & \ \ \times \end{array}$$

Thus, $15.225 \div 0.35 = 43.5$

(ii) $50.76 \div 9.4 = 507.6 \div 94$

$$\begin{array}{r|l} & \ \ 5.4 \\ \hline 94 & 507.6 \\ & -470 \\ \hline & \ \ 376 \\ & -376 \\ \hline & \ \ \times \end{array}$$

Thus, $50.76 \div 9.4 = 5.4$

4. Find the quotient of 0.06688 ÷ 0.038
Solution:
Make the divisor a whole number by shifting the decimal point in dividend to the right by three places,

$= 0.06688 \div 0.038 = 66.88 \div 38$

$$\begin{array}{r|l} & \ \ 1.76 \\ \hline 38 & 66.88 \\ & -38 \\ \hline & \ \ 288 \\ & -266 \\ \hline & \ \ \ 228 \\ & \ -228 \\ \hline & \ \ \times \end{array}$$

5. Find 0.024 ÷ 0.6
Solution:

$$0.024 \div 0.6 = \frac{0.024}{0.6}$$

$$= \frac{0.24}{6} = 0.04$$

$$\begin{array}{r|l} & \ \ 0.04 \\ \hline 6 & \ \ 0.24 \\ & -0.24 \\ \hline & \ \ \times \end{array}$$

5. Find 64 ÷ 0.08
Solution:

$$64 \div 0.08 = \frac{64.00}{0.08} = \frac{64.00 \times 100}{0.08 \times 100}$$

$$= \frac{6400}{8}$$

$$= 800$$

[Shift the decimal points two places to the right in both the numbers]

Dividing of a whole number by a decimal:
For example,

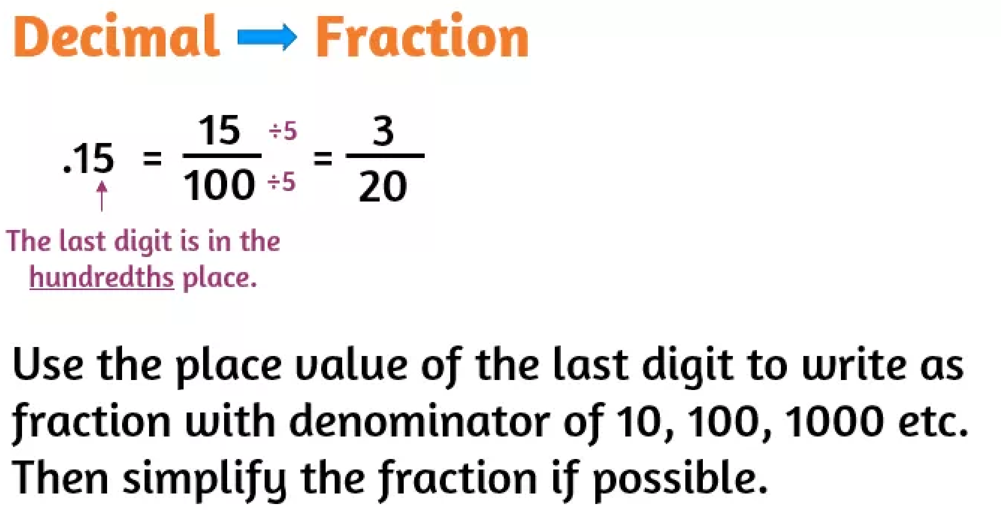
$$= \frac{9}{0.3} = \frac{9 \times 10}{3}$$

$$= \frac{90}{3} = 30$$

$$9 \div 0.3 = 30$$

How do you Convert Fractions into Decimals and Vice Versa

To change a decimal into a fraction, we have to follow the following steps:
Step 1: Write the given number without decimal point as the numerator of the fraction.
Step 2: Write 1 in the denominator followed by as many zeros as the number of decimal places in the given number.
Step 3: Reduce the fraction into the lowest form and if required change into mixed numeral.



Example 1: Convert 14.25 into a fraction.
Solution:
(i) Numerator of fraction = 1425
(ii) Denominator of fraction =100
(Because decimal places are 2, therefore we put 2 zeros after 1.)

$$\text{So, } 14.25 = \frac{1425}{100} = 14\frac{25}{100} = 14\frac{1}{4}$$

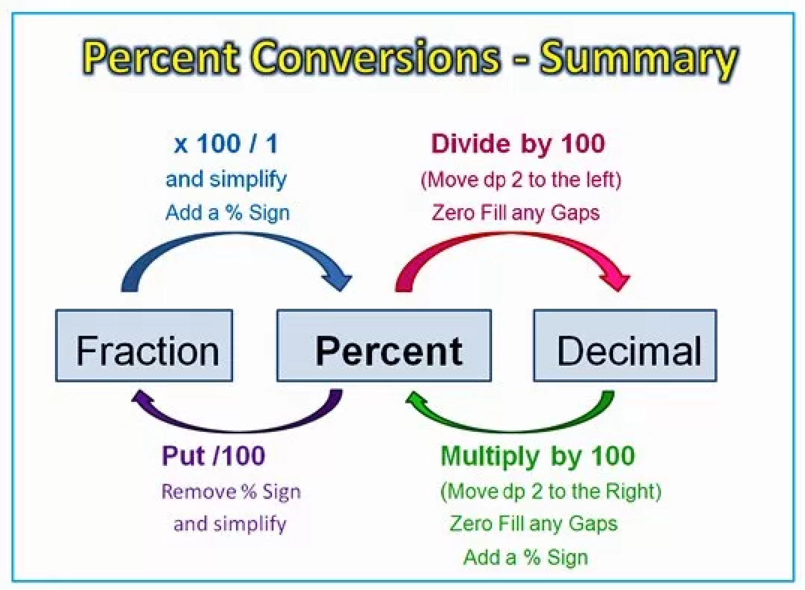
Example 2: Convert 1.356 into a fraction.
Solution:
(i) Numerator of fraction = 1356

(ii) Denominator of fraction = 1000
(Because decimal places are 3, therefore we put 3 zeros ofter 1.)

(*ii*) 0.6 1.23 6.512
(Unlike decimals)
↓ ↓ ↓
0.600 1.230 6.512
(Like decimals with three decimal places)

Conversion of Fraction into Decimal

To change a fraction into decimal, we have to follow the following steps:
Step 1: First, change the given fraction into an equivalent fraction with denominators 10, 100, 1000, etc.
Step 2: Count the number of zeros in the denominator after 1. Put the decimal in the numerator, start from the extreme right, and move the decimal point to the left equal the number of zeros



Example 3: Convert the following into decimals.
(i) $\frac{3}{4}$ (ii) $5\frac{1}{2}$
Solution:

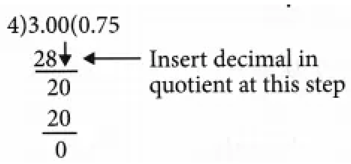
(*i*) $\frac{3}{4} = \frac{3 \times 25}{4 \times 25} = \frac{75}{100} = 0.75$

(*ii*) $5\frac{1}{2} = \frac{11}{2} = \frac{11 \times 5}{2 \times 5} = \frac{55}{10} = 5.5$

Conversion by long division method
We can change a fraction into decimal by using the long division method. For that, we have to follow these steps:
Step 1: Convert the dividend to a suitable equivalent decimal.
Step 2: When a digit to the right of the decimal point is brought down, insert a decimal point in the quotient.

Example 4: Convert $\frac{3}{4}$ into decimals.

Solution: In $\frac{3}{4}$, since 3 is less than 4, it cannot be divided by 4.
But 3 = 3.00, which can be divided by 4.
Now,



Thus $\frac{3}{4}$ = 0.75

How do you Convert Unlike Decimals into Like Decimals

Like decimals:

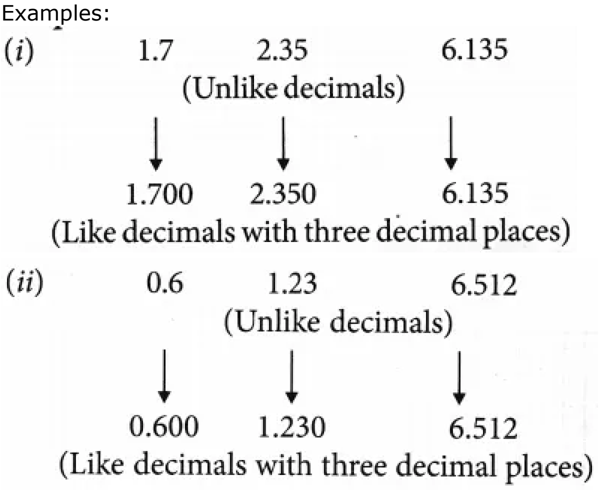
Decimals with the same number of decimal places are called like decimals.
Examples: 0.6, 3.5, 6.1 (one decimal place)
2.15,0.78,26.11 (two decimal places)

Unlike decimals:
Decimals having different number of decimal places are called unlike decimals.
Examples: 0.7, 2.12, 6J25 are unlike decimals 3.12, 0.8, 13.856 are unlike decimals

Converting Unlike Decimals into Like Decimals

We can convert unlike decimals into like decimals by adding zeros to the right of decimal point or by finding their equivalent decimal.

Note:
Unlike decimals can also be equivalent decimals. Examples: 0.3, 0.30, 0.3000 are unlike but equivalent decimals.
Examples:

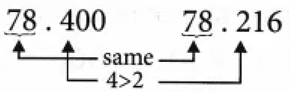


Comparing Decimals

To compare the decimals, we have to follow the following steps:

1. Convert unlike decimals into like decimals.
2. Compare the whole number part. The decimals with greater whole number part is greater.
3. If the whole number part is equal, then compare the digits in the tenth place. The decimal with greater digit in the tenth place is greater.
4. If digits in the tenth place are also equal, then compare the digits in the hundredth place and so on.

Example: Which decimal is greater, 78.40 or 78.216?
Solution:
Converting the given decimals into like decimals
78.40 = 78.400
78.216 = 78.216



∴ 78.400 >78.216
so, 78.40 >78.216