

# Decimals

From: *A Maths Dictionary for Kids* by Jenny Eather at [www.amathsdictionaryforkids.com](http://www.amathsdictionaryforkids.com)

A decimal is any number in our number system, a decimal base 10 place value system where each place is 10x bigger than the place to its right.

A decimal point is used to separate whole numbers from decimal fractions.

Whole numbers

Decimal fractions

Hundreds	Tens	Ones	Decimal Point • • •	Tenths	Hundredths	Thousandths	
		0			5		
	1	0			2	5	
6	3	4			3	7	5

EXAMPLES: Fractions converted to decimal fractions.

$$\frac{1}{2} = \frac{5}{10} = 0.5$$

$$10 \frac{1}{4} = 10 \frac{25}{100} = 10.25$$

$$634 \frac{3}{8} = 634 \frac{375}{1000} = 634.375$$



The way decimals are read varies between countries. Some examples below.

**0.5** • zero point five  
• five tenths

**10.25** • ten point two five  
• ten and twenty-five hundredths  
• ten and two tenths and five hundredths

**634.375**

- six hundred and thirty-four point three seven five
- six hundred thirty-four and three seventy-five thousandths
- six hundred thirty-four and three tenths, seven hundredths and five thousandths

# Ordering decimals

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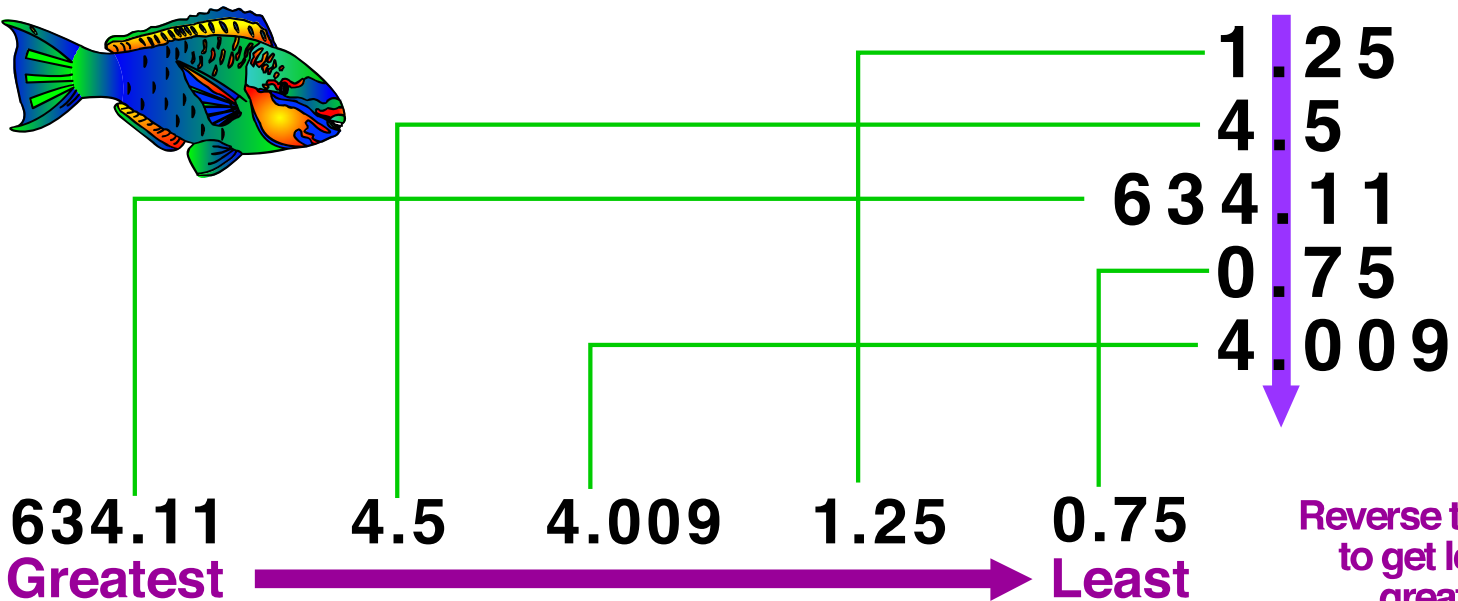
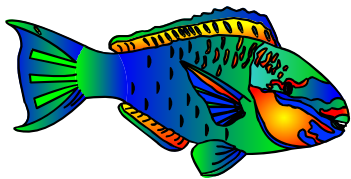
Decimals can be ordered according to their place value. In the decimal place value system, each place is 10x larger than the space to its right.



Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths
		1	•	2	5	
		4	•	5		
6	3	4	•	1	1	
		0	•	7	5	
		4	•	0	0	9

List the numbers making sure the decimal points are exactly underneath each other.

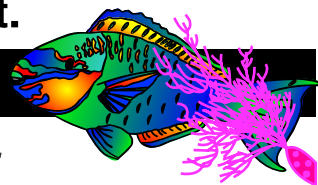
To order decimals from greatest to least, order the left column (the largest numbers) first, then move right column by column.



When two or more digits in a column are the same - look for their largest digit in the next column right.

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# Expanding decimals

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Expanded notation is a way of writing decimals to show place value.

Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths
		0	•	2	5	
		0	•	3	7	5
		4	•	3	2	
	3	4	•	0	5	
9	6	7	•	1	2	3

**EXAMPLES:** Two forms of writing expanded notation are shown.

$$0.25 = (2 \times \frac{1}{10}) + (5 \times \frac{1}{100})$$

$$0.25 = 0.2 + 0.05$$

$$0.375 = (3 \times \frac{1}{10}) + (7 \times \frac{1}{100}) + (5 \times \frac{1}{1000})$$

$$0.375 = 0.3 + 0.07 + 0.005$$

$$4.32 = (4 \times 1) + (3 \times \frac{1}{10}) + (2 \times \frac{1}{100})$$

$$4.32 = 4 + 0.3 + 0.02$$

$$34.05 = (3 \times 10) + (4 \times 1) + (5 \times \frac{1}{100})$$

$$34.05 = 30 + 4 + 0.05$$

$$967.123 = (9 \times 100) + (6 \times 10) + (7 \times 1) + (1 \times \frac{1}{10}) + (2 \times \frac{1}{100}) + (3 \times \frac{1}{1000})$$

$$967.123 = 900 + 60 + 7 + 0.1 + 0.02 + 0.003$$



# Adding decimals

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To add decimals vertical or column addition can be used. Numbers are written underneath each other according their place value.

Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths
		1	•	2	5	
		4	•	5		
6	3	4	•	1	1	
		0	•	7	5	
		4	•	0	0	9

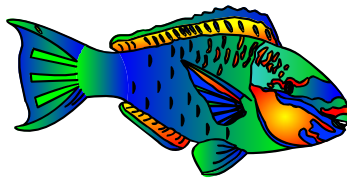
List the numbers making sure the decimal points are exactly underneath each other.

The numbers are added vertically, starting with the right column then moving left column by column.

**Without trading**  
(carrying, regrouping)

$$\begin{array}{r}
 1 \quad 2 \quad 5 \\
 2 \quad 2 \quad 5 \\
 6 \quad 3 \quad 0 \quad . \quad 1 \quad 1 \\
 0 \quad . \quad 1 \quad 2 \\
 4 \quad . \quad 0 \quad 0 \quad 9 \\
 \hline
 6 \quad 5 \quad 7 \quad . \quad 9 \quad 8 \quad 9
 \end{array}$$

Empty places are treated as zero.



Don't forget to put the decimal point in the answer.

**With trading**  
(carrying, regrouping)

$$\begin{array}{r}
 1 \quad 1 \quad 1 \\
 1 \quad 2 \quad 5 \\
 4 \quad 5 \\
 6 \quad 3 \quad 4 \quad . \quad 1 \quad 1 \\
 0 \quad . \quad 7 \quad 5 \\
 4 \quad . \quad 0 \quad 0 \quad 9 \\
 \hline
 6 \quad 4 \quad 4 \quad . \quad 6 \quad 1 \quad 9
 \end{array}$$

When a column adds up to more than ten, the tens go into the next column left and the ones stay in their own column.

# Subtracting decimals

From: *A Maths Dictionary for Kids* by Jenny Eather at [www.amathsdictionaryforkids.com](http://www.amathsdictionaryforkids.com)

To subtract decimals vertical or column subtraction can be used. Numbers are written underneath each other according to their place value.

## EXAMPLES:

$$689.785 - 22.25 =$$

$$689.785 - 92.99 =$$

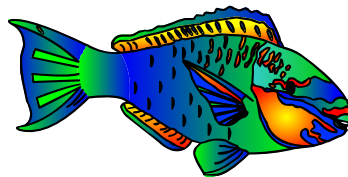
When writing the numbers make sure the decimal points are exactly underneath each other.

The numbers are subtracted vertically, starting with the right column then moving left column by column.

Without trading  
(borrowing, regrouping)

$$\begin{array}{r} 689.785 \\ - 22.25 \\ \hline 667.535 \end{array}$$

Empty places are treated as zero.



Don't forget to put the decimal point in the answer.

With trading  
(borrowing, regrouping)

$$\begin{array}{r} 18 \quad 16 \quad 18 \\ \cancel{6}58 \quad \cancel{9}8 \quad \cancel{7}68 \quad 5 \\ - 92 \quad 99 \\ \hline 596.795 \end{array}$$

When the bottom digit is greater than the top digit, trade (borrow) a ten from the next column left and  $\diagdown$  mark that digit down by one.

# Multiplying decimals

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To multiply decimals, ignore the decimal point and multiply as if they were whole numbers.

To insert the decimal point in the answer, add up the number of decimal places in both numbers.

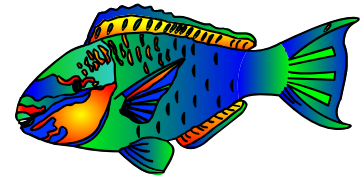
Place the decimal point that many places from the right.

## EXAMPLES:

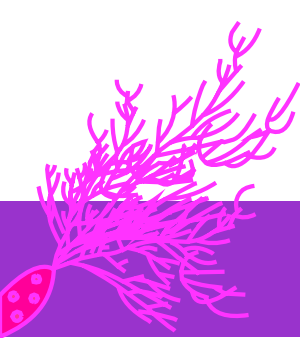
$$0.8 \times 0.2 =$$

$$0.3 \times 0.2 =$$

$$4.65 \times 2.3 =$$



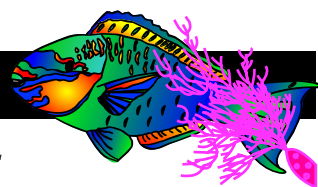
The number of decimal places is the number of digits on the right of a decimal point.


$$\begin{array}{r} 0.8 \text{ (1 decimal place)} \\ \times 0.2 \text{ (1 decimal place)} \\ \hline 0.16 \text{ (2 decimal places)} \end{array}$$

$$\begin{array}{r} 0.3 \text{ (1 decimal place)} \\ \times 0.2 \text{ (1 decimal place)} \\ \hline 0.06 \text{ (2 decimal places)} \end{array}$$

**NOTE:**  
0 is needed here  
to make 2  
decimal places.

$$\begin{array}{r} 4.65 \text{ (2 decimal places)} \\ \times 5.3 \text{ (1 decimal place)} \\ \hline 1395 \\ 23250 \\ \hline 24.645 \text{ (3 decimal places)} \end{array}$$



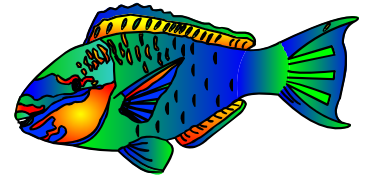
# Dividing decimals

From: A Maths Dictionary for Kids by Jenny Eather at [www.amathsdictionaryforkids.com](http://www.amathsdictionaryforkids.com)

To divide decimals by a whole number, ignore the decimal point and divide as if they were whole numbers.

$$\begin{array}{r} 2.3 \\ 3 \overline{) 6.9} \end{array}$$

divisor 3      quotient (answer) 2.3  
dividend 6.9



Insert the decimal point in the answer exactly above the decimal point in the dividend.

## EXAMPLES:

**Short Division**  
(for smaller numbers)

$$13.84 \div 4 =$$

$$\begin{array}{r} 3.46 \\ 4 \overline{) 13.84} \end{array}$$

**Long Division**  
(for larger numbers)

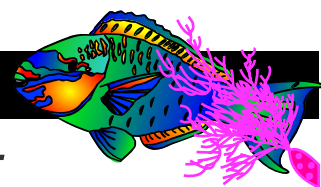
$$343.46 \div 26 =$$

$$\begin{array}{r} 13.21 \\ 26 \overline{) 343.46} \\ \underline{-26} \phantom{.46} \\ 83 \phantom{.46} \\ \underline{-78} \phantom{.46} \\ 54 \phantom{.46} \\ \underline{-52} \phantom{.46} \\ 26 \phantom{.46} \end{array}$$

To divide by a decimal, convert the divisor to a whole number so the number can be divided as shown above.

Multiply the divisor and dividend by 10 (by moving the decimal place to the right) until the divisor is a whole number.

$$235.375 \div 0.25 = 23537.5 \div 25 = 941.5$$





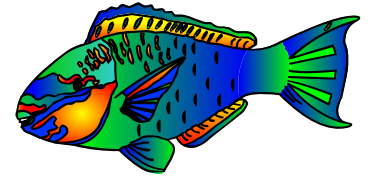
# Rounding decimals

From: *A Maths Dictionary for Kids* by Jenny Eather at [www.amathsdictionaryforkids.com](http://www.amathsdictionaryforkids.com)

Numbers are rounded to change them to a more convenient value.

← whole numbers      decimal fractions →

Thousands	Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths	Ten-thousandths
6	9	4	5	.	3	7	2	8



The number of decimal places is the number of digits to the right of a decimal point.

A rounding instruction tells how many digits to keep.

1. Look at **the digit in the place value** to be rounded to.
2. Increase it by 1 if the **digit to the right of it** is 5 or more.
3. Leave it the same if the **digit to the right of it** is less than 5.
4. Remove everything to the right of the digit.

**Round to the nearest ...**

3 decimal places	6945.37 <b>28</b>	6945.37 <b>3</b>
2 decimal places	6945.3 <b>728</b>	6945.3 <b>7</b>
1 decimal place	6945. <b>3728</b>	6945. <b>4</b>
whole number	694 <b>5.3728</b>	694 <b>5</b>

When rounding to 10 or above there's an important change to step 4.

4. Replace whole numbers to the right of the digit with zero(s), then remove everything to their right.

**Round to the nearest ...**

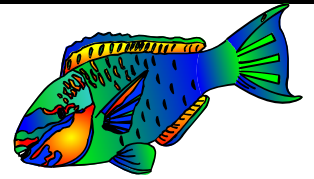
ten	69 <b>45.3728</b>	69 <b>50</b>
hundred	6 <b>945.3728</b>	6 <b>900</b>
thousand	<b>6945.3728</b>	<b>7000</b>



# Rounding examples

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Original number



**35276.538479**

Rounded to

**10**



**35280**

**100**



**35300**

**1000**



**35000**

**1 decimal place**



**35276.5**

**2 decimal places**



**35276.54**

**3 decimal places**



**35276.538**

**4 decimal places**



**35276.5385**

The number of decimal places is the number of digits to the right of a decimal point.

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# Decimals, percentages, fractions ... conversions.

From: A Maths Dictionary for Kids by Jenny Eather at [www.amathsdictionaryforkids.com](http://www.amathsdictionaryforkids.com)

## Fraction to Decimal

Divide the numerator by the denominator.

$$\frac{1}{4} \quad 4 \overline{) 1.00} \quad \begin{matrix} 0.25 \\ \phantom{0.} \end{matrix}$$

## Decimal to Fraction

Write the decimal over the number of its place value, then simplify (reduce).

$$0.25 = \frac{25}{100} = \frac{1}{4}$$

## Fraction to Percent

Multiply the fraction by 100, simplify (reduce), add the % symbol.

$$\frac{1}{4} \times \frac{100}{1} = \frac{100}{4} = 25\%$$

## Percent to Fraction

Remove the % symbol, write as a fraction with a denominator of 100, then simplify (reduce).

$$25\% = \frac{25}{100} = \frac{1}{4}$$

With a decimal percentage, first multiply the numerator and the denominator by 10 until the numerator is a whole number.

$$2.5\% = \frac{25}{1000} = \frac{1}{40}$$

## Percent to Decimal

Remove the % symbol, divide the number by 100.

$$25\%$$

$$25 \div 100 = 0.25$$

## Decimal to Percent

Multiply by 100, add the % symbol.

$$0.25$$

$$0.25 \times 100 = 25\%$$

# Decimals, percentages, fractions

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Decimal	Percent	Fraction	Equivalent Fractions				
0.01	1%	$\frac{1}{100}$	$\frac{2}{200}$	$\frac{3}{300}$	$\frac{4}{400}$	$\frac{5}{500}$	$\frac{10}{1000}$
0.1	10%	$\frac{1}{10}$	$\frac{2}{20}$	$\frac{3}{30}$	$\frac{4}{40}$	$\frac{5}{50}$	$\frac{10}{100}$
$0.\bar{1}$	11.1%	$\frac{1}{9}$	$\frac{2}{18}$	$\frac{3}{27}$	$\frac{4}{36}$	$\frac{10}{90}$	$\frac{20}{180}$
0.125	12.5%	$\frac{1}{8}$	$\frac{2}{16}$	$\frac{3}{24}$	$\frac{4}{32}$	$\frac{10}{80}$	$\frac{20}{160}$
$0.\overline{142857}$	14.3%	$\frac{1}{7}$	$\frac{2}{14}$	$\frac{3}{21}$	$\frac{4}{28}$	$\frac{10}{70}$	$\frac{20}{140}$
$0.1\bar{6}$	16.7%	$\frac{1}{6}$	$\frac{2}{12}$	$\frac{3}{18}$	$\frac{4}{24}$	$\frac{10}{60}$	$\frac{20}{120}$
0.2	20%	$\frac{1}{5}$	$\frac{2}{10}$	$\frac{3}{15}$	$\frac{4}{20}$	$\frac{10}{50}$	$\frac{20}{100}$
$0.\bar{2}$	22.2%	$\frac{2}{9}$	$\frac{4}{18}$	$\frac{6}{27}$	$\frac{8}{36}$	$\frac{20}{90}$	$\frac{40}{180}$
0.25	25%	$\frac{1}{4}$	$\frac{2}{8}$	$\frac{3}{12}$	$\frac{4}{16}$	$\frac{10}{40}$	$\frac{25}{100}$
$0.\bar{3}$	33.3%	$\frac{1}{3}$	$\frac{2}{6}$	$\frac{3}{9}$	$\frac{4}{12}$	$\frac{10}{30}$	$\frac{30}{90}$
0.375	37.5%	$\frac{3}{8}$	$\frac{6}{16}$	$\frac{9}{24}$	$\frac{12}{32}$	$\frac{30}{80}$	$\frac{60}{160}$
$0.\bar{4}$	44.4%	$\frac{4}{9}$	$\frac{8}{18}$	$\frac{12}{27}$	$\frac{16}{36}$	$\frac{40}{90}$	$\frac{80}{180}$
0.5	50%	$\frac{1}{2}$	$\frac{2}{4}$	$\frac{3}{6}$	$\frac{5}{10}$	$\frac{10}{20}$	$\frac{50}{100}$
$0.\bar{5}$	55.5%	$\frac{5}{9}$	$\frac{10}{18}$	$\frac{15}{27}$	$\frac{20}{36}$	$\frac{50}{90}$	$\frac{100}{180}$
0.6	60%	$\frac{3}{5}$	$\frac{6}{10}$	$\frac{9}{15}$	$\frac{12}{20}$	$\frac{30}{50}$	$\frac{60}{100}$
0.625	62.5%	$\frac{5}{8}$	$\frac{10}{16}$	$\frac{15}{24}$	$\frac{20}{32}$	$\frac{50}{80}$	$\frac{100}{160}$
$0.\bar{6}$	66.6%	$\frac{2}{3}$	$\frac{4}{6}$	$\frac{6}{9}$	$\frac{8}{12}$	$\frac{20}{30}$	$\frac{60}{90}$
0.75	75%	$\frac{3}{4}$	$\frac{6}{8}$	$\frac{9}{12}$	$\frac{12}{16}$	$\frac{30}{40}$	$\frac{75}{100}$
$0.\bar{7}$	77.8%	$\frac{7}{9}$	$\frac{14}{18}$	$\frac{21}{27}$	$\frac{28}{36}$	$\frac{70}{90}$	$\frac{140}{180}$
0.8	80%	$\frac{4}{5}$	$\frac{8}{10}$	$\frac{12}{15}$	$\frac{16}{20}$	$\frac{40}{50}$	$\frac{80}{100}$
$0.8\bar{3}$	83.3%	$\frac{5}{6}$	$\frac{10}{12}$	$\frac{15}{18}$	$\frac{20}{24}$	$\frac{50}{60}$	$\frac{100}{120}$
$0.\bar{8}$	88.9%	$\frac{8}{9}$	$\frac{16}{18}$	$\frac{24}{27}$	$\frac{32}{36}$	$\frac{80}{90}$	$\frac{160}{180}$

A horizontal bar over a digit in a decimal means that digit repeats forever, eg,  $0.\bar{3} = 0.3333333333 \dots$

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