

21 Nov '24

# Decimal arithmetic operations (+, -, ×, ÷)

$$23.2 = \frac{232}{10}$$

$$23.22 = \frac{2322}{100}$$

$\downarrow$        $\downarrow$   
10<sup>th</sup> part   100<sup>th</sup> part

1.0 → 1 apple

$\frac{1}{10} = 0.1$  → 1 tenth part  
of an apple

$\frac{2}{10} = 0.2$  → 2 tenth parts  
of an apple

$\frac{1}{100} = 0.01$  → 1 hundredth  
part of an apple

$\frac{5}{100} = 0.05$  → 5 hundredth  
parts of an

$\frac{15}{100} = 0.15$  → 15 hundredth  
parts of an  
apple

This is the same as  
1 tenth part & 5 hundredth  
parts

+,- of decimals :

(1) Align the decimal point, units place,  
tens place etc. and tenths parts, hundredths  
parts etc. for both the numbers

$$2 \cdot 3$$

$$4 \cdot 6 2$$

(2) Add extra zeros if needed (leftmost  
before decimal, or rightmost after decimal)

$$2 \cdot 3 0$$

$$4 \cdot 6 2$$

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$$6 \cdot 9 2$$

(3) Then addition / subtraction are similar  
to natural numbers.

Ex:

$$\begin{array}{r} 2.34 + 6.973 \\ \hline 2.340 \\ + 6.973 \\ \hline 9.313 \end{array}$$

Ex:

$$2.34 - 6.973$$

(answer is -ve)

$$\begin{array}{r} 6.973 & (\text{bigger number}) \\ - 2.340 \\ \hline 4.633 \\ \hline \end{array}$$

Answer is = - 4.633

Ex:

$$9.313 - 6.973$$

$$\begin{array}{r} \overline{9.313} \\ - 6.973 \\ \hline 2.340 \end{array}$$

\* / of decimals :

Ex:

$$23.4 \times 32.2$$

$$= \frac{234}{10} \times \frac{322}{10} = \frac{234 \times 322}{10 \times 10} = \frac{75348}{100}$$

$$= 753.48$$

Ex:  $23 \cdot 4 \div 2 \cdot 3$

$$= \left( \frac{234}{10} \right) \div \left( \frac{23}{10} \right)$$

$$\left( \frac{a}{b} \right) \times \left( \frac{c}{d} \right) = \frac{a \times c}{b \times d}$$

$$\left( \frac{a}{b} \right) \div \left( \frac{c}{d} \right) = \frac{a}{b} \times \frac{d}{c}$$

$$\rightarrow (6) \div \left( \frac{6}{2} \right) = 6 \times \left( \frac{2}{6} \right) = \frac{12}{6} = 2$$

$$= 6 \div 3$$

$$= 2$$

$$23.4 \div 2.3$$

$$= \frac{\underline{234}}{10} \div \frac{23}{10} = \frac{\underline{234}}{10} \times \frac{10}{23}$$

$$= \frac{\underline{234}}{23}$$

$$\begin{array}{r} 10.17\dots \\ \hline 23 \sqrt{234.00000} \\ -23 \\ \hline 04 \\ -00 \\ \hline 40 \\ -23 \\ \hline 170 \\ -161 \\ \hline 9 \end{array}$$

Quotient = 10

Reminder = 4

But if you do decimal division, you can add decimal point to your dividend followed by zeros.

When doing decimal division, sometimes the number of decimals in your quotient is infinite (never ending). So you can stop the computation after the first few decimal places. [When the number of decimals is infinite but repeating like in  $\frac{1}{3}$  below, it's still rational. If they are not repeating then it's irrational like in  $\sqrt{2}$ .  
 $= 1.\overline{4}14\cdots$ ]

Eg:

$$1 \div 3$$

0.333.....

$$3 \overline{)1.00000000}$$

$$\begin{array}{r} 9 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 10 \\ 9 \\ \hline 10 \end{array}$$

The answer is

$$0.333\bar{3} \dots$$

$$= 0.\bar{3}$$

(0.3 bar - means 3 is repeating infinite times)

Ex:

$$12.5 \div 5$$

$$\begin{array}{r} 2.5 \\ \hline 5 \sqrt{12.5} \\ 10 \\ \hline 2.5 \\ 2.5 \\ \hline 0 \end{array}$$

Verification

$$5 \times 2.5 + 0$$

$$2.5 = \frac{25}{10}$$

$$\begin{array}{r} 2 \\ \hline 25 \times 5 = 125 \\ 10 \qquad \qquad \qquad \overline{125} \\ \hline 125 \end{array}$$

$$= 12.5$$

HW: (1)  $2.35 + 0.0732$

(2)  $3.69 - 5.0123$

(3)  $23.96 + 43.21 - 5.64$

(4)  $2.3 \times 4.6$

(5)  $62 \div 12$

(6)  $72.6 \times 43.2 + 12.6 - 2.3 \times 5.1$

(7)  $43.2 \div 2 + 21.1 - 3.6$

(8)  $10 \div 7$

Do these manually and in python also.