

# mathWithPython\_algebra1\_expandTerms

April 16, 2025

## 1 COURSE: Master math by coding in Python

## 2 SECTION: Algebra 1

## 3 VIDEO: Expanding terms

**3.0.1** <https://www.udemy.com/course/math-with-python/?couponCode=202312>

**INSTRUCTOR:** Mike X Cohen (<http://sincxpress.com>) This code roughly matches the code shown in the live recording: variable names, order of lines, and parameter settings may be slightly different.

[ ]:

```
[1]: # import libraries
import sympy as sym
import numpy as np
from IPython.display import display, Math

[2]: # define our terms
from sympy.abc import x

term1 = (4*x + 5)
term2 = x

print( term1*term2 )
print( sym.expand(term1*term2) )
print( Math(sym.latex(sym.expand(term1*term2))) )
```

```
x*(4*x + 5)
4*x**2 + 5*x
<IPython.core.display.Math object>
```

```
[3]: term3 = x - 7 # note that parentheses are not necessary!

display(Math( sym.latex(term1*term3) ))
display(Math( sym.latex( sym.expand(term1*term3) )))
```

```
(x - 7)(4x + 5)
```

$$4x^2 - 23x - 35$$

```
[4]: # with two variables
y = sym.symbols('y')

expr = x*(2*y**2 - 5*x/x)
sym.expand(expr)
```

[4]:  $-5x + 2xy^2$

```
[5]: # three expressions and three variables!!
# but first, what variables have we already created??
%whos
```

Variable	Type	Data/Info
Math	type	<class 'IPython.core.display.Math'>
display	function	<function display at 0x000001CD1A72D080>
expr	Mul	$x*(-5*x/x + 2*y**2)$
np	module	<module 'numpy' from 'C:\<...>ges\\numpy\\__init__.py'>
sym	module	<module 'sympy' from 'C:\<...>ges\\sympy\\__init__.py'>
term1	Add	$4*x + 5$
term2	Symbol	$x$
term3	Add	$x - 7$
x	Symbol	$x$
y	Symbol	$y$

```
[6]: z = sym.symbols('z')

term1 = (3 + x)
term2 = (y - 4*z)
term3 = (5/z + 3*x)

display(Math(sym.latex(term1*term2*term3)))
display(Math(sym.latex(sym.expand(term1*term2*term3))))
display(Math(sym.latex(sym.simplify(sym.expand(term1*term2*term3)))))
```

$$(x + 3) \left( 3x + \frac{5}{z} \right) (y - 4z)$$

$$3x^2y - 12x^2z + 9xy + \frac{5xy}{z} - 36xz - 20x + \frac{15y}{z} - 60$$

$$\frac{5xy + 15y + z(3x^2y - 12x^2z + 9xy - 36xz - 20x - 60)}{z}$$

[ ]:

## 4 Exercises

```
[7]: # a function of two variables
Fxy = (4+x)*(2-y)
print(Fxy.subs({x:2,y:-2}))
```

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```
[8]: numrange = range(0,3)
for i in numrange:
    for j in numrange:
        print('When x=%g and y=%g, f(x,y)=%g' %(i,j,Fxy.subs({x:i,y:j})))
```

```
When x=0 and y=0, f(x,y)=8
When x=0 and y=1, f(x,y)=4
When x=0 and y=2, f(x,y)=0
When x=1 and y=0, f(x,y)=10
When x=1 and y=1, f(x,y)=5
When x=1 and y=2, f(x,y)=0
When x=2 and y=0, f(x,y)=12
When x=2 and y=1, f(x,y)=6
When x=2 and y=2, f(x,y)=0
```

```
[ ]:
```