

1. What is Wolfram Alpha?

Enter <http://www.wolframalpha.com/> - it's a website that performs calculations, shows statistical data, solves equations, etc... First, the user needs to enter mathematical formulas or some other input and then Wolfram Alpha makes calculations and produces the answer, often accompanied by a visual interpretation.

Wolfram Alpha requires the user to have an up-to-date internet browser. In case of older browsers, it may incorrectly display both the input and the results.

Exercise 1. Input the expression $17*11/121$ and press Enter. Have a look at the results – you can find the exact result, the result written as a decimal fraction, etc.... Next, try out expressions: 3.2 and $3,2$. Remember that fractions should be written with a dot, not with a comma!

2. Basic algebraic operations

Exercise 2. Try out the following commands, pressing Enter each time. Notice how the location of brackets affects the result.

$2+2*2$
 $(2+2)*2$
 $2+3/7$
 $(2+3)/7$
 $3/7+2$
 $3/(7+2)$

Exercise 3a. Input $2+1/(2+1/(2+1/(2+1)))$ and press Enter.

Exercise 3b. Input appropriate commands that will display the following results:

a)

Input:

$$x + \frac{y}{x + y + \frac{z}{x+y+\frac{z}{xy}}}$$

b)

Input:

$$a + \frac{a + \frac{a+b}{b}}{b}$$

You can find answers to some exercises at the end of this chapter.

Exercise 4. Symbol \wedge („hat”) raises the expression to a certain power. Try out the following inputs one by one, pressing Enter each time. Again, pay attention to brackets!

2^3
 $3/2^3$
 $3^2/3$
 $3^{(2/3)}$
 $(3/2)^3$
 $(3/2)^{-2}$
 $(2/3)^{(1/3)}$ - this is actually the third root of $2/3$
 $\text{Sqrt}[2/3]$ - command $\text{Sqrt}[]$ calculates only the square root. It's a built-in function, so the argument $2/3$ must be surrounded with square brackets.

Exercise 5a. Try out more complicated inputs:

$\text{Sqrt}[2*\text{Sqrt}[3*\text{Sqrt}[5]]]$
 $(64*8^{(1/3)})^{(1/7)}$
 $1/(1+\text{Sqrt}[2]+\text{Sqrt}[3])$
 $\text{Sqrt}[6-\text{Sqrt}[11]]*(6+\text{Sqrt}[11])*(\text{Sqrt}[22]-\text{Sqrt}[2])$

Exercise 5b. Enter an appropriate command that displays the following expression:

a)

Input:

$$\sqrt[4]{\frac{2\sqrt[3]{16}}{\sqrt{32}}}$$

b)

Input:

$$\frac{3^{2/3}}{\frac{1}{\sqrt{3}}\sqrt[3]{9}}$$

c)

Input:

$$\left(\left(a^{\frac{1}{m-n}} \right)^{1-\frac{m^2}{n^2}} \right)^{\frac{n^3}{m+n}}$$

3. Simplification and expansion of algebraic expressions

Exercise 6a. Try out the following input:

Factorize[x²-y²]
Factorize[x²+x]
Simplify[(x+y)³]
Expand[(x²-1)¹²]

Exercise 6b. Enter an appropriate command that will simplify the following expression:

$$(x+1)^4 - 2(x^2-1)^2 + (x-1)^4$$

4. Factorial and the Newton symbol

Exercise 7. Try out the following input:

4!
5 choose 2 - this input computes the Newton symbol
n choose 0
n choose (n-2)

5. Important constants – e and π

Exercise 8. Try out the following input:

Pi/4
Sin[Pi/3]
E
Log[E]
Log[10,E]

6. Answers to some exercises

3b(a) $x + y/(x+y+z/(x+y+z/(x*y)))$

3b(b) $a+((a+(a+b)/b)/b)/b$

5b(a) $((2*16^{1/3})/\text{Sqrt}[32])^{1/4}$

5b(b) $(3^{2/3})/((1/\text{Sqrt}[3]) * 9^{1/3})$

5b(c) $((a^{1/(m-n)})^{1-m^2/n^2})^{n^3/(m+n)}$

6b **Simplify**[(x+1)⁴ - 2(x²-1)²+(x-1)⁴]