

Odwrócona notacja polska (ONP, RPN)

```
In [1]: from lab3.rpn.reverse_polish_notation import ReversePolishNotation
```

In [2]: `help(ReversePolishNotation)`

Help on class ReversePolishNotation in module lab3.rpn.reverse_polish_notation:

```
class ReversePolishNotation(builtins.object)
| ReversePolishNotation - class converting and explaining convert between s
| tandard math notation
| and reverse polish notation
| author:
|     Pawel Zabczynski
|
| Methods defined here:
|
| __init__(self, expresion:str)
|     Initialize self.  See help(type(self)) for accurate signature.
|
| calculate(self, explain=False) -> float
|     Calculate given algebraic expresion
|     :param explain: if set to `True` then will print step by stem explana
tion
|     :return: result after calculation expresion
|
| convert(self, explain=False) -> str
|     Convert `self.expresion` into expresion
|     Do not support unary operations
|     :param explain: boolean set to true to see in output explain each ste
p
|
|     Returns:
|         :return: str
|     Raises:
|         ValueError: If `self.expresion` is not valid math expresion.
|
| explain(self) -> str
|     Print all steps as values stored in que and stack
|     Returns:
|         :return: explanation as string
|     Raises:
|         ValueError: If `self.expresion` is not valid math expresion.
|
| -----
| Data descriptors defined here:
|
| __dict__
|     dictionary for instance variables (if defined)
|
| __weakref__
|     list of weak references to the object (if defined)
|
| -----
| Data and other attributes defined here:
|
| LEFT_P = {'(', '[', '{'}
|
| RIGHT_P = {')', ']', '}'}
```

1) Wyrażenie: 3+5-2

In [3]: `ReversePolishNotation('3+5-2').calculate(explain=True)`

Step	Input	Operation	Stack
0	, 3	[Empty]	-
1	, 3	, +	-
2	, 3, 5	, +	-
3	, 3, 5, +	, -	-
4	, 3, 5, +, 2	, -	-
5	, 3, 5, +, 2, -	[Empty]	-

Step	Input	Operation	Stack
0	[Empty]	, 3	-
1	[Empty]	, 3, 5	-
2	, [Empty]	, 8.0	-
3	[Empty]	, 8.0, 2	-
4	, [Empty]	, 6.0	-

Out[3]: 6.0

2) Wyrażenie: 3*8-6/3

In [4]: `ReversePolishNotation('3 * 8 - 6 / 3').calculate(explain=True)`

Step	Input	Operation	Stack
0	, 3	[Empty]	-
1	, 3	, *	-
2	, 3, 8	, *	-
3	, 3, 8, *	, -	-
4	, 3, 8, *, 6	, -	-
5	, 3, 8, *, 6	, -, /	-
6	, 3, 8, *, 6, 3	, -, /	-
7	, 3, 8, *, 6, 3, /	, -	-
8	, 3, 8, *, 6, 3, /, -	[Empty]	-

Step	Input	Operation	Stack
0	[Empty]	, 3	-
1	[Empty]	, 3, 8	-
2	, [Empty]	, 24.0	-
3	[Empty]	, 24.0, 6	-
4	[Empty]	, 24.0, 6, 3	-
5	, [Empty]	, 24.0, 2.0	-
6	, [Empty]	, 22.0	-

Out[4]: 22.0

3) Wyrażenie $(3*(2+2)-9)^2$

In [5]: `ReversePolishNotation('(3*(2+2)-9)^2').calculate(explain=True)`

Step	Input	Operation	Stack
0	[Empty]	, (-
1	, 3	, (-
2	, 3	, (, *	-
3	, 3	, (, * , (-
4	, 3 , 2	, (, * , (-
5	, 3 , 2	, (, * , (, +	-
6	, 3 , 2 , 2	, (, * , (, +	-
7	, 3 , 2 , 2 , +	, (, *	-
8	, 3 , 2 , 2 , + , *	, (, -	-
9	, 3 , 2 , 2 , + , * , 9	, (, -	-
10	, 3 , 2 , 2 , + , * , 9 , -	[Empty]	-
11	, 3 , 2 , 2 , + , * , 9 , -	, ^	-
12	, 3 , 2 , 2 , + , * , 9 , - , 2	, ^	-
13	, 3 , 2 , 2 , + , * , 9 , - , 2 , ^	[Empty]	-

Step	Input	Operation	Stack
0	[Empty] , 3		-
1	[Empty] , 3 , 2		-
2	[Empty] , 3 , 2 , 2		-
3	, [Empty] , 3 , 4.0		-
4	, [Empty] , 12.0		-
5	[Empty] , 12.0 , 9		-
6	, [Empty] , 3.0		-
7	[Empty] , 3.0 , 2		-
8	, [Empty] , 9.0		-

Out[5]: 9.0

4) Wyrażenie $\{[(9-7)+(2+3)]-(7-4)\}[(7-5)3-2]$

```
In [6]: ReversePolishNotation('{[(9-7)+(2+3)]-(7-4)}*[(7-5)*3-2]').calculate(explain=True)
```

Step	Input	Operation	S
tack			

0	[Empty]	, {	
	-		
1	[Empty]	, {, [
	-		
2	[Empty]	, {, [, (
	-		
3	, 9	, {, [, (
	-		
4	, 9	, {, [, (, -	
	-		
5	, 9, 7	, {, [, (, -	
	-		
6	, 9, 7, -	, {, [
	-		
7	, 9, 7, -	, {, [, +	
	-		
8	, 9, 7, -	, {, [, +, (
	-		
9	, 9, 7, -, 2	, {, [, +, (
	-		
10	, 9, 7, -, 2	, {, [, +,	
	(, + -		
11	, 9, 7, -, 2, 3	, {, [, +,	
	(, + -		
12	, 9, 7, -, 2, 3, +	, {, [, +	
	-		
13	, 9, 7, -, 2, 3, +, +	, {	
	-		
14	, 9, 7, -, 2, 3, +, +	, {, -	
	-		
15	, 9, 7, -, 2, 3, +, +	, {, -, (
	-		
16	, 9, 7, -, 2, 3, +, +, 7	, {, -, (
	-		
17	, 9, 7, -, 2, 3, +, +, 7	, {, -, (, -	
	-		
18	, 9, 7, -, 2, 3, +, +, 7, 4	, {, -, (, -	
	-		
19	, 9, 7, -, 2, 3, +, +, 7, 4, -	, {, -	
	-		
20	, 9, 7, -, 2, 3, +, +, 7, 4, -, -	[Empty]	
	-		
21	, 9, 7, -, 2, 3, +, +, 7, 4, -, -	, *	
	-		
22	, 9, 7, -, 2, 3, +, +, 7, 4, -, -	, *, [
	-		
23	, 9, 7, -, 2, 3, +, +, 7, 4, -, -	, *, [, (
	-		
24	, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7	, *, [, (
	-		
25	, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7	, *, [, (, -	
	-		
26	, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5	, *, [, (, -	

```

|-
27 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -      |, *, [
|-
28 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -      |, *, [, *
|-
29 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -, 3    |, *, [, *
|-
30 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -, 3, * |, *, [, -
|-
31 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -, 3, *, 2 |, *, [, -
|-
32 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -, 3, *, 2, - |, *
|-
33 |, 9, 7, -, 2, 3, +, +, 7, 4, -, -, 7, 5, -, 3, *, 2, -, * |[Empty]
|-

```

Step	Input	Operation	Stack
0	[Empty]	, 9	-
1	[Empty]	, 9, 7	-
2	, [Empty]	, 2.0	-
3	[Empty]	, 2.0, 2	-
4	[Empty]	, 2.0, 2, 3	-
5	, [Empty]	, 2.0, 5.0	-
6	, [Empty]	, 7.0	-
7	[Empty]	, 7.0, 7	-
8	[Empty]	, 7.0, 7, 4	-
9	, [Empty]	, 7.0, 3.0	-
10	, [Empty]	, 4.0	-
11	[Empty]	, 4.0, 7	-
12	[Empty]	, 4.0, 7, 5	-
13	, [Empty]	, 4.0, 2.0	-
14	[Empty]	, 4.0, 2.0, 3	-
15	, [Empty]	, 4.0, 6.0	-
16	[Empty]	, 4.0, 6.0, 2	-
17	, [Empty]	, 4.0, 4.0	-
18	, [Empty]	, 16.0	-

Out[6]: 16.0

5) Wyrażenie $[(9-2)3-(9-3)^2/(23)]*(6-4)$

In [7]: `ReversePolishNotation('[(9-2)*3-(9-3)^2/(2*3)]*(6-4)').calculate(explain=True)`

Step	Input	Operation	S
tack			

0	[Empty]	, [
	-		
1	[Empty]	, [, (
	-		
2	, 9	, [, (
	-		
3	, 9	, [, (, -	
	-		
4	, 9, 2	, [, (, -	
	-		
5	, 9, 2, -	, [
	-		
6	, 9, 2, -	, [, *	
	-		
7	, 9, 2, -, 3	, [, *	
	-		
8	, 9, 2, -, 3, *	, [, -	
	-		
9	, 9, 2, -, 3, *	, [, -, (
	-		
10	, 9, 2, -, 3, *, 9	, [, -, (
	-		
11	, 9, 2, -, 3, *, 9	, [, -, (, -	
	-		
12	, 9, 2, -, 3, *, 9, 3	, [, -, (, -	
	-		
13	, 9, 2, -, 3, *, 9, 3, -	, [, -	
	-		
14	, 9, 2, -, 3, *, 9, 3, -	, [, -, ^	
	-		
15	, 9, 2, -, 3, *, 9, 3, -, 2	, [, -, ^	
	-		
16	, 9, 2, -, 3, *, 9, 3, -, 2, ^	, [, -, /	
	-		
17	, 9, 2, -, 3, *, 9, 3, -, 2, ^	, [, -, /, (
	-		
18	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2	, [, -, /, (
	-		
19	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2	, [, -, /,	
	(, * -		
20	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3	, [, -, /,	
	(, * -		
21	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *	, [, -, /	
	-		
22	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -	[Empty]	
	-		
23	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -	, *	
	-		
24	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -	, *, (
	-		
25	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -, 6	, *, (
	-		
26	, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -, 6	, *, (, -	

```
| -
27 |, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -, 6, 4      |, *, (, -
| -
28 |, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -, 6, 4, -    |, *
| -
29 |, 9, 2, -, 3, *, 9, 3, -, 2, ^, 2, 3, *, /, -, 6, 4, -, *  |[[Empty]]
| -
```

Step	Input	Operation	Stack
0	[[Empty]]	, 9	-
1	[[Empty]]	, 9, 2	-
2	, [[Empty]]	, 7.0	-
3	[[Empty]]	, 7.0, 3	-
4	, [[Empty]]	, 21.0	-
5	[[Empty]]	, 21.0, 9	-
6	[[Empty]]	, 21.0, 9, 3	-
7	, [[Empty]]	, 21.0, 6.0	-
8	[[Empty]]	, 21.0, 6.0, 2	-
9	, [[Empty]]	, 21.0, 36.0	-
10	[[Empty]]	, 21.0, 36.0, 2	-
11	[[Empty]]	, 21.0, 36.0, 2, 3	-
12	, [[Empty]]	, 21.0, 36.0, 6.0	-
13	, [[Empty]]	, 21.0, 6.0	-
14	, [[Empty]]	, 15.0	-
15	[[Empty]]	, 15.0, 6	-
16	[[Empty]]	, 15.0, 6, 4	-
17	, [[Empty]]	, 15.0, 2.0	-
18	, [[Empty]]	, 30.0	-

Out[7]: 30.0

Inne materiały

- [Reverse Polish Notation and The Stack - Computerphile \(https://www.youtube.com/watch?v=7ha78yWRDIE\)](https://www.youtube.com/watch?v=7ha78yWRDIE)