

Datenstrukturen (Stack)

Prüfungsvorbereitung

Aufgabe 1

Nenne drei Anwendungen für Stacks in der Informatik.

Aufgabe 1

Hier ein paar Anwendungen für Stacks:

- ▶ History-Funktion (zurück/vor) in einem Browser
- ▶ Undo-Funktion in einem Anwendungsprogramm
- ▶ Überprüfung von Klammerausdrücken
- ▶ Berechnung von Postfix-Ausdrücken

Aufgabe 2

Wofür steht die Kurzformel LIFO bei Stacks?

Aufgabe 2

Last In - First Out

Aufgabe 3

Welche Ausgaben macht das folgende Python-Modul?

```
1 from stack import Stack
2
3 s = Stack()
4 s.push(5)
5 s.push(2)
6 s.push(4)
7 a = s.pop()
8 s.push(7)
9 s.push(1)
10 b = s.peek()
11 s.push(8)
12
13 print(a)
14 print(b)
15 print(s.size())
```

Aufgabe 3

```
1  from stack import Stack
2
3  s = Stack()      # []
4  s.push(5)       # [5]
5  s.push(2)       # [5, 2]
6  s.push(4)       # [5, 2, 4]
7  a = s.pop()     # [5, 2] a=4
8  s.push(7)       # [5, 2, 7]
9  s.push(1)       # [5, 2, 7, 1]
10 b = s.peek()   # [5, 2, 7, 1] b=1
11 s.push(8)       # [5, 2, 7, 1, 8]
12
13 print(a)        # => 4
14 print(b)        # => 1
15 print(s.size()) # => 5
```

Aufgabe 4

Es sei s eine Instanz der Klasse `Stack`. Was ist

- (a) die Gemeinsamkeit
- (b) der Unterschied

zwischen den Ausdrücken `s.peek()` und `s.pop()`?

Aufgabe 4

- (a) Gemeinsamkeit: beide Methoden geben das oberste Element des Stacks zurück.
- (b) Unterschied: `s.pop()` entfernt das oberste Element, `s.peek()` entfernt es nicht.
to peek: forschend blicken, spähen, gucken

Aufgabe 6

Angenommen, ein Programm führt eine Folge von push- und pop-Operationen in einer bestimmten Reihenfolge auf einem Stack aus. Die push-Operationen legen dabei die ganzen Zahlen von 0 bis 9 in dieser Reihenfolge auf den Stack ab. Die pop-Operationen geben den Rückgabewert aus. Welche der folgenden Output-Sequenzen kann es dabei nicht geben?

- (a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
- (b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
- (c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 1

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
0 1

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 1

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7

0 ~~1~~

1

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9

0 ~~1~~

1

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2

0 ~~1~~

1

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2
1

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
0 ~~1~~ 2
1

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2
1

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3
1

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
0 ~~1~~ 2 3
1

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3
1

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3 4
1

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
0 ~~1~~ 2 ~~3~~
1 3

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 4
1

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3 4 5
1

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
0 ~~1~~ ~~2~~ ~~3~~
1 3 2

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 4 5
1

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3 4 ~~5~~
1 5

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~
1 3 2 0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 4 ~~5~~
1 5

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3 ~~4~~ ~~5~~
1 5 4

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4
1 3 2 0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 4 ~~5~~ 6
1 5

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3 ~~4~~ ~~5~~ 6
1 5 4

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5
1 3 2 0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 4 ~~5~~ ~~6~~
1 5 6

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~
1 5 4 6

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5 6
1 3 2 0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~
1 5 6 4

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ 2 ~~3~~ ~~4~~ ~~5~~ ~~6~~
1 5 4 6 3

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5 6 7
1 3 2 0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~ 7
1 5 6 4

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7

0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~

1 5 4 6 3 2

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9

~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5 6 7 8

1 3 2 0

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2

0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~ ~~7~~

1 5 6 4 7

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7
1 5 4 6 3 2

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5 6 7 ~~8~~
1 3 2 0 8

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~ ~~7~~ 8
1 5 6 4 7

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 8
1 5 4 6 3 2

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5 6 ~~7~~ ~~8~~
1 3 2 0 8 7

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~ ~~7~~ 8 9
1 5 6 4 7

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 8 9
1 5 4 6 3 2

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 5 ~~6~~ ~~7~~ ~~8~~
1 3 2 0 8 7 6

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~ ~~7~~ 8 ~~9~~
1 5 6 4 7 9

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 8 ~~9~~
1 5 4 6 3 2 9

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ 4 ~~5~~ ~~6~~ ~~7~~ ~~8~~
1 3 2 0 8 7 6 5

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 3 ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 5 6 4 7 9 8

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 ~~8~~ ~~9~~
1 5 4 6 3 2 9 8

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~
1 3 2 0 8 7 6 5 4

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 5 6 4 7 9 8 3

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 ~~8~~ ~~9~~
1 5 4 6 3 2 9 8 False

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ 9
1 3 2 0 8 7 6 5 4

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 5 6 4 7 9 8 3 False

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 ~~8~~ ~~9~~
1 5 4 6 3 2 9 8 False

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 3 2 0 8 7 6 5 4 9

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 5 6 4 7 9 8 3 False

Aufgabe 6

(a) 1, 5, 4, 6, 3, 2, 9, 8, 0, 7
0 ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ 7 ~~8~~ ~~9~~
1 5 4 6 3 2 9 8 False

(b) 1, 3, 2, 0, 8, 7, 6, 5, 4, 9
~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 3 2 0 8 7 6 5 4 9 True

(c) 1, 5, 6, 4, 7, 9, 8, 3, 0, 2
0 ~~1~~ 2 ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~
1 5 6 4 7 9 8 3 False

Aufgabe 8

Zeige, wie der Postfix-Ausdruck

8 1 2 + - 6 * 9 7 - /

mit einem Stack ausgewertet wird und gib das Resultat an.

--	--	--	--	--	--	--	--	--	--	--	--	--	--

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

--	--	--	--	--	--	--	--	--	--	--	--	--

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8												
---	--	--	--	--	--	--	--	--	--	--	--	--

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1											
---	---	--	--	--	--	--	--	--	--	--	--	--

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2											
---	---	---	--	--	--	--	--	--	--	--	--	--	--

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3											
---	---	---	---	--	--	--	--	--	--	--	--	--	--	--

+

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5									
---	---	---	---	---	--	--	--	--	--	--	--	--	--

+

-

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6								
---	---	---	---	---	---	--	--	--	--	--	--	--	--

+ -

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6	30						
			+	-		*						

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6	30	9					
			+	-		*						

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6	30	9	7				
			+	-		*						

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6	30	9	7	2			
			+	-		*			-			

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6	30	9	7	2	15		
			+	-		*			-	/		

Aufgabe 8

8 1 2 + - 6 * 9 7 - /

8	1	2	3	5	6	30	9	7	2	15		
			+	-		*			-	/		

Resultat: 15