
II.1. Grundelemente der Programmierung

- 1. Erste Schritte
- 2. Einfache Datentypen
- 3. Anweisungen und Kontrollstrukturen
- 4. Verifikation
- 5. Arrays

5. Arrays

folge:

14	1	0	8
----	---	---	---

```
folge [0] == 14, ..., folge [3] == 8
```

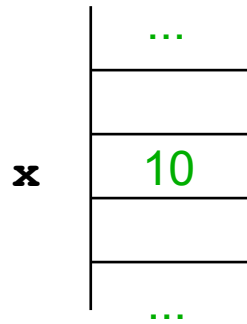
bestand:

		Ort				
		0	1	2	3	...
Artikel	0	5	0	10	7	
	1	1	3	2	0	
	2	2	17	1	1	
	3	14	1	0	8	
	...					

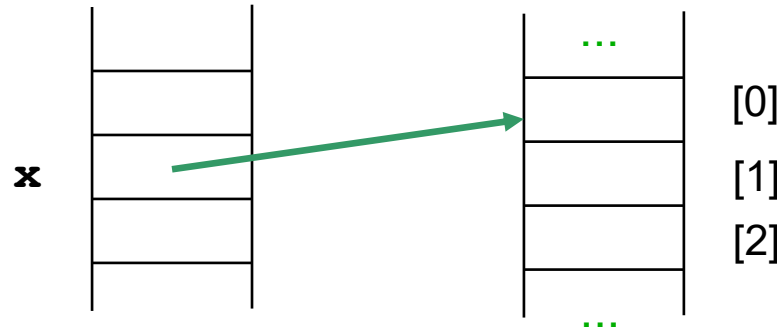
```
bestand [0] [0] == 5, bestand [0] [1] == 0,  
bestand [0] [2] == 10, ...
```

Wert- und Referenzvariablen

```
int x;  
x = 10;
```



```
int [] x;  
x = new int [3];  
x [0] = 14;  
x [1] = 2;  
x [2] = 5;
```

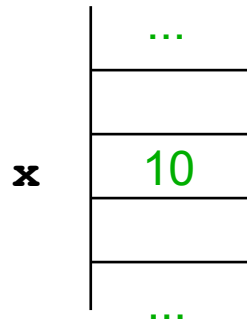


Primitive Datentypen: Variablen speichern Werte

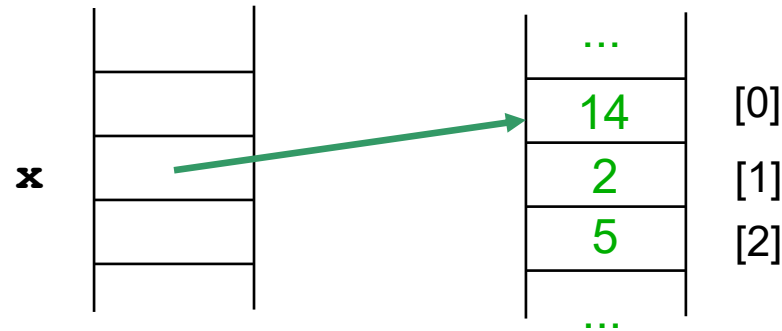
Andere Datentypen (Arrays, Strings, ...): Variablen speichern Verweise

Wert- und Referenzvariablen

```
int x;  
x = 10;
```



```
int [] x;  
x = new int [3];  
x [0] = 14;  
x [1] = 2;  
x [2] = 5;
```



Primitive Datentypen: Variablen speichern Werte

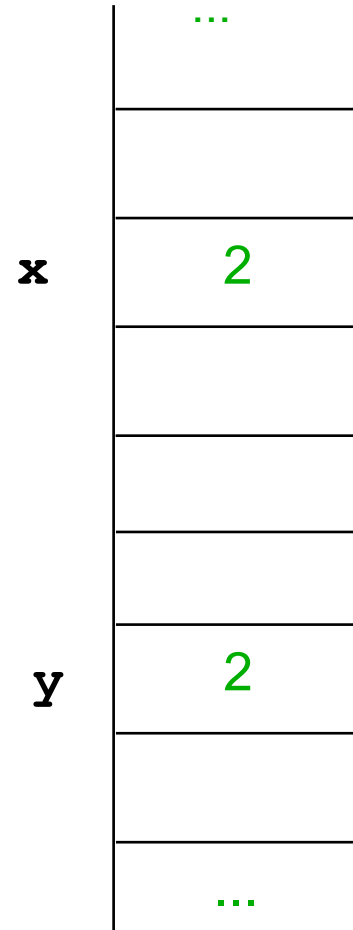
Andere Datentypen (Arrays, Strings, ...): Variablen speichern Verweise

Zuweisung bei Wertvariablen

```
int x = 2;
```

```
int y = x;
```

```
y = 8;
```

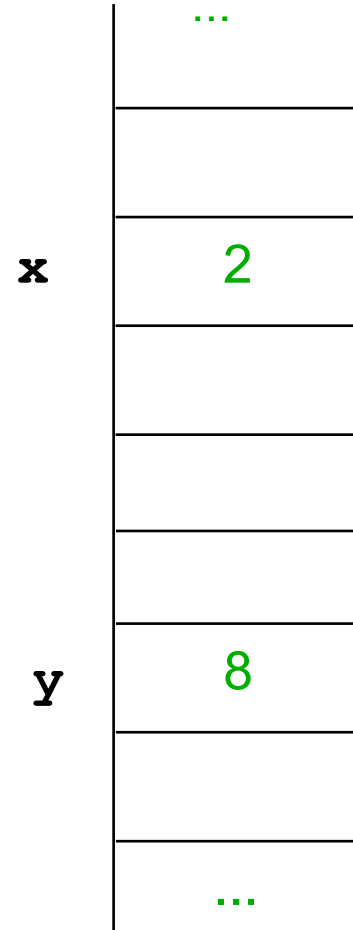


Zuweisung bei Wertvariablen

```
int x = 2;
```

```
int y = x;
```

```
y = 8;
```



Zum Schluss: **x == 2**

Zuweisung bei Referenzvariablen

```
int [] x = new int [3];
```

```
x [0] = 14;
```

```
x [1] = 2;
```

```
x [2] = 5;
```

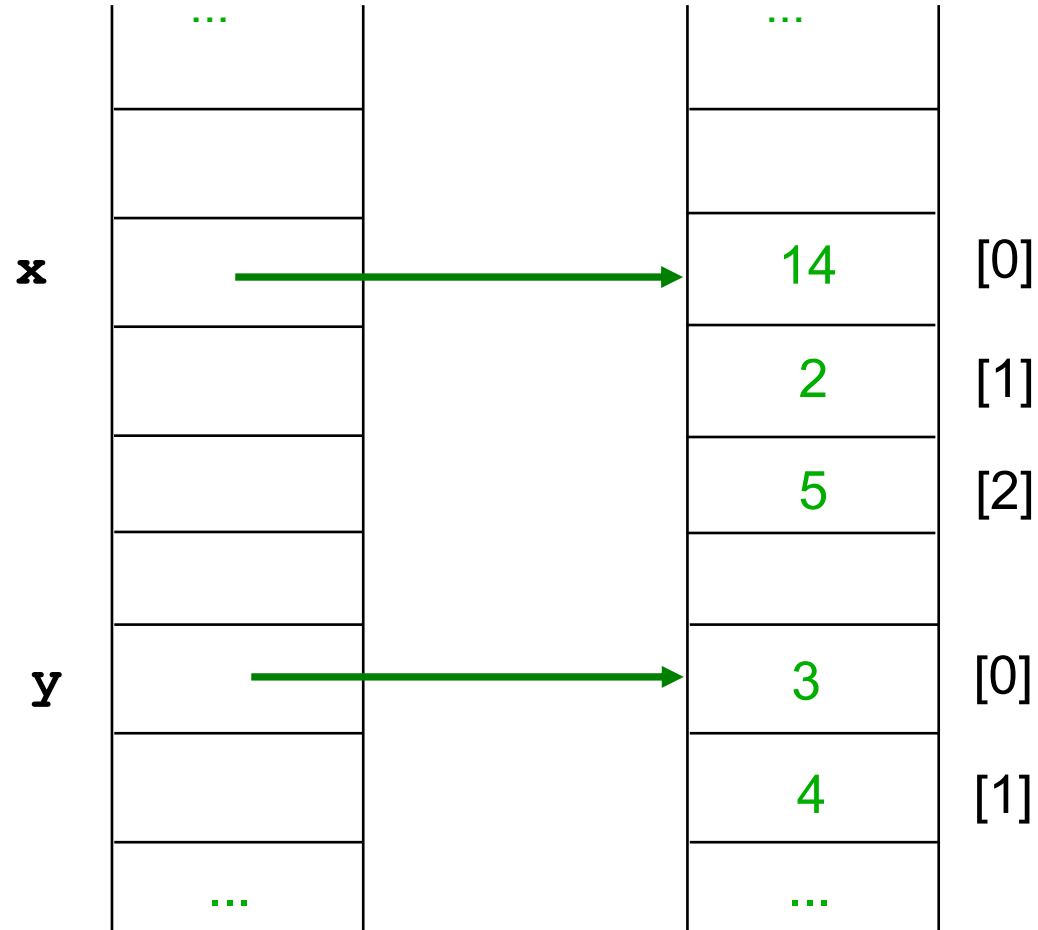
```
int [] y = new int [2];
```

```
y [0] = 3;
```

```
y [1] = 4;
```

```
y = x;
```

```
y [1] = 8;
```



Zuweisung bei Referenzvariablen

```
int [] x = new int [3];
```

```
x [0] = 14;
```

```
x [1] = 2;
```

```
x [2] = 5;
```

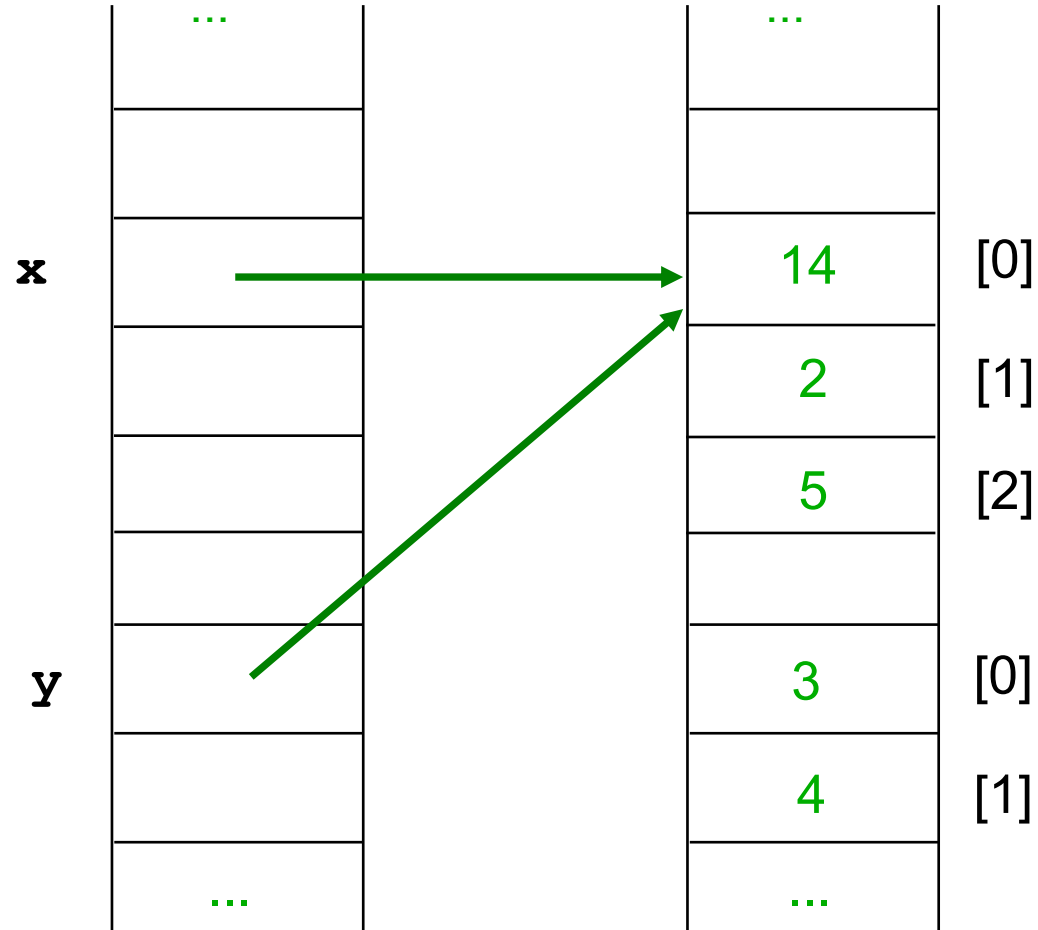
```
int [] y = new int [2];
```

```
y [0] = 3;
```

```
y [1] = 4;
```

```
y = x;
```

```
y [1] = 8;
```



Zuweisung bei Referenzvariablen

```
int [] x = new int [3];
```

```
x [0] = 14;
```

```
x [1] = 2;
```

```
x [2] = 5;
```

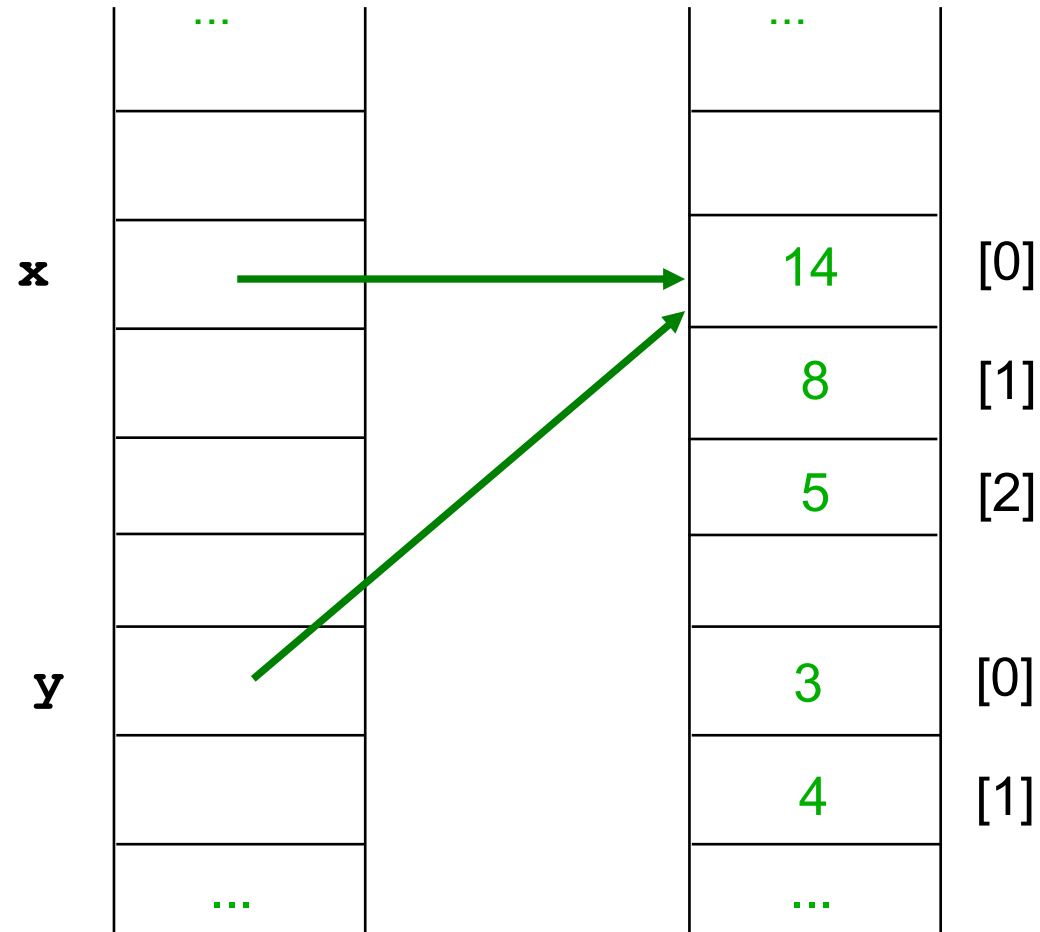
```
int [] y = new int [2];
```

```
y [0] = 3;
```

```
y [1] = 4;
```

```
y = x;
```

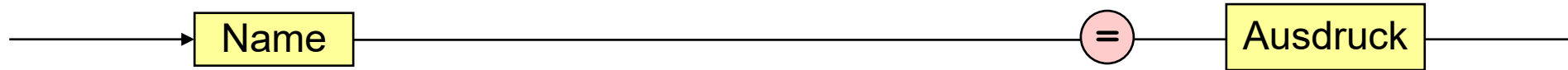
```
y [1] = 8;
```



Zum Schluss: `x [1] == 8`

Zuweisung, Typ

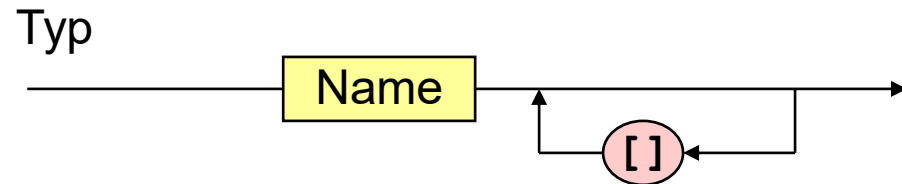
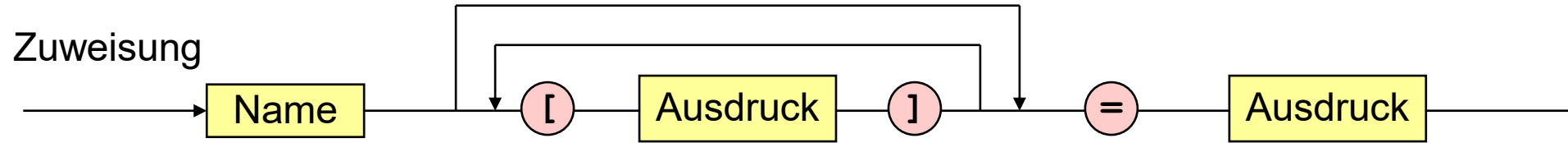
Zuweisung



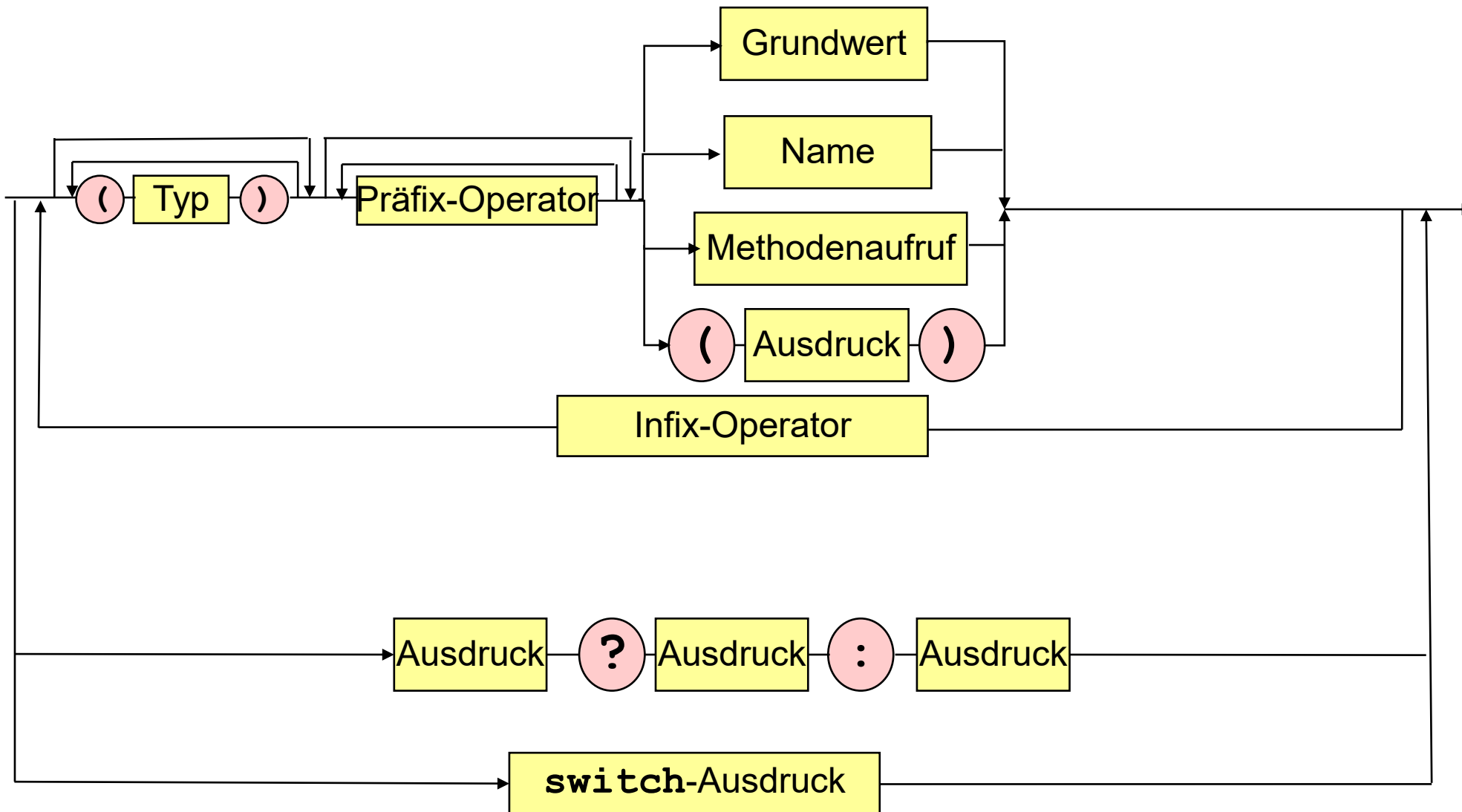
Typ



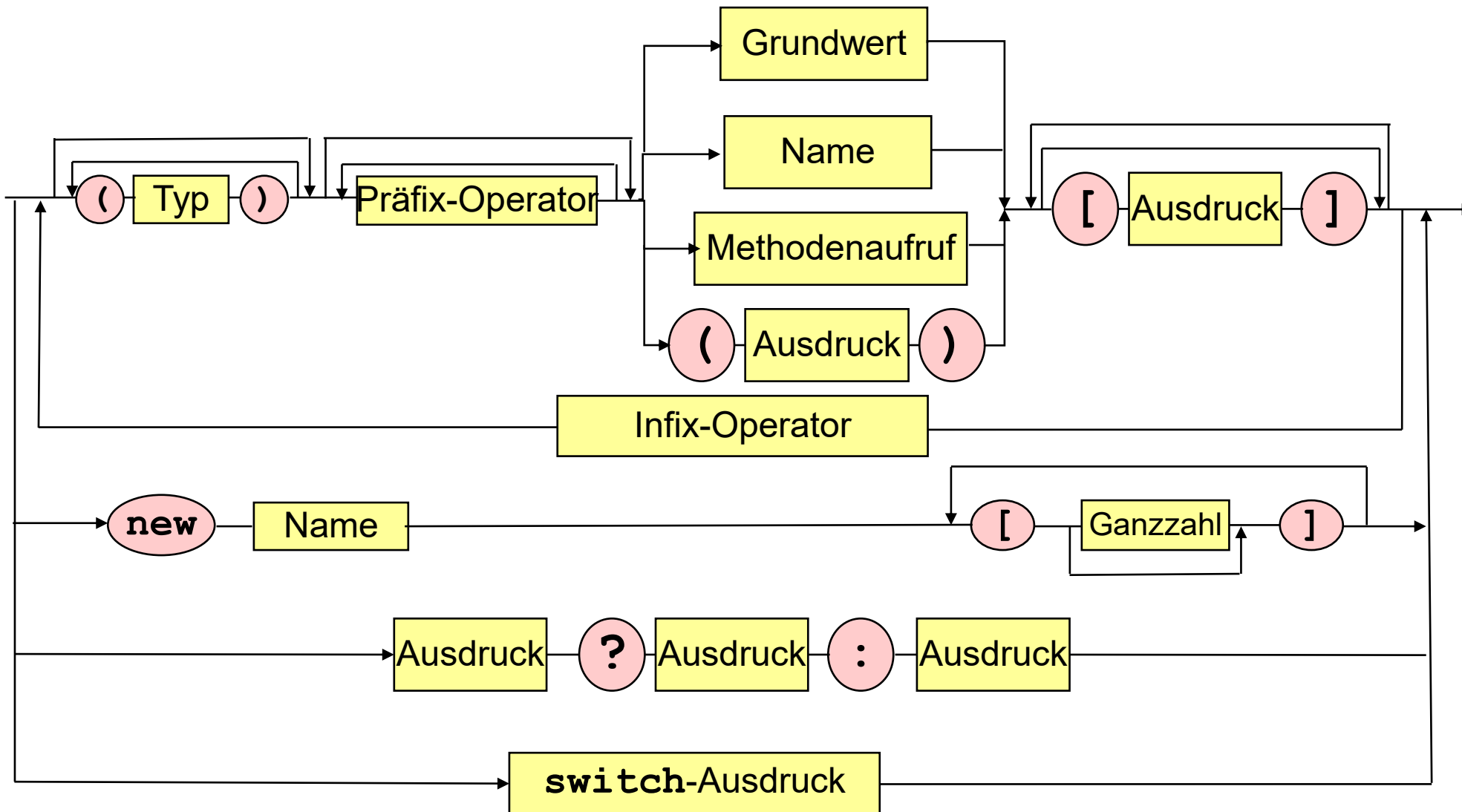
Zuweisung, Typ



Ausdruck



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Palindrom-Programm mit Arrays

```
void main (String [] args) {  
  
    char [] wort = args[0].toCharArray();  
    boolean palindrom = true;  
  
    for (int i = 0;  
        i <= (wort.length - 2) / 2 && palindrom;  
        i++)  
  
        palindrom = wort [i] == wort [wort.length - 1 - i];  
  
    IO.println(palindrom);  
  
}
```

Sort-Programm mit Arrays

```
void main () {
    int i,j,z;
    int n = Integer.parseInt(IO.readLine("Wieviele Zahlen sortieren? "));
    int [] a = new int[n];

    //Lies Elemente ein
    for (i = 0; i < n; i++)
        a[i] = Integer.parseInt(IO.readLine("Gib eine Zahl ein: "));

    //Sortiere Elemente
    for (i = 0; i < n-1; i++)

        //Vertausche a[i] mit kleinstem Nachfolger
        for (j = i+1; j < n; j++)

            if (a[i] > a[j]) { //Nachfolger kleiner als a[i]?
                //Vertausche a[i] und a[j]
                z = a[i]; a[i] = a[j]; a[j] = z;
            }

    //Gib sortierte Elemente aus
    String result = "";
    for (i = 0; i < n; i++)    result = result + a[i] + " ";

    IO.println(result);    }
```

foreach Schleife

Array `a` vom Typ `int []`

```
for (int i = 0; i < a.length; i++) {  
    int x = a[i];  
  
    IO.print(x) ;  
  
}
```

```
for (int x : a) {  
  
    IO.print(x) ;  
  
}
```

foreach Schleife

Array **a** vom Typ **type** []

```
for (int i = 0; i < a.length; i++) {  
    type x = a[i];  
  
    ...  
  
}
```

```
for (type x : a) {  
  
    ...  
  
}
```

Sort-Programm mit Arrays

```
void main () {
    int i,j,z;
    int n = Integer.parseInt(IO.readLine("Wieviele Zahlen sortieren? "));
    int [] a = new int[n];

    //Lies Elemente ein
    for (int x : a)
        x = Integer.parseInt(IO.readLine("Gib eine Zahl ein: "));

    //Sortiere Elemente
    for (i = 0; i < n-1; i++)

        //Vertausche a[i] mit kleinstem Nachfolger
        for (j = i+1; j < n; j++)

            if (a[i] > a[j]) { //Nachfolger kleiner als a[i]?
                //Vertausche a[i] und a[j]
                z = a[i]; a[i] = a[j]; a[j] = z;
            }

    //Gib sortierte Elemente aus
    String result = "";
    for (int x : a) result = result + x + " ";
    IO.println(result);
}
```

Unbenannte Variablen

Array `a` vom Typ `int []`

```
int count = 0;
for (int element : a) {
    count++;
}
```

Auf Variable `element` wird nie zugegriffen

→ braucht keinen Namen

```
int count = 0;
for (int _ : a) {
    count++;
}
```

Auf unbenannte Variablen kann nicht zugegriffen werden

→ mehrfache Vorkommen gelten als verschiedene Variablen