



UNIVERSITETET I BERGEN

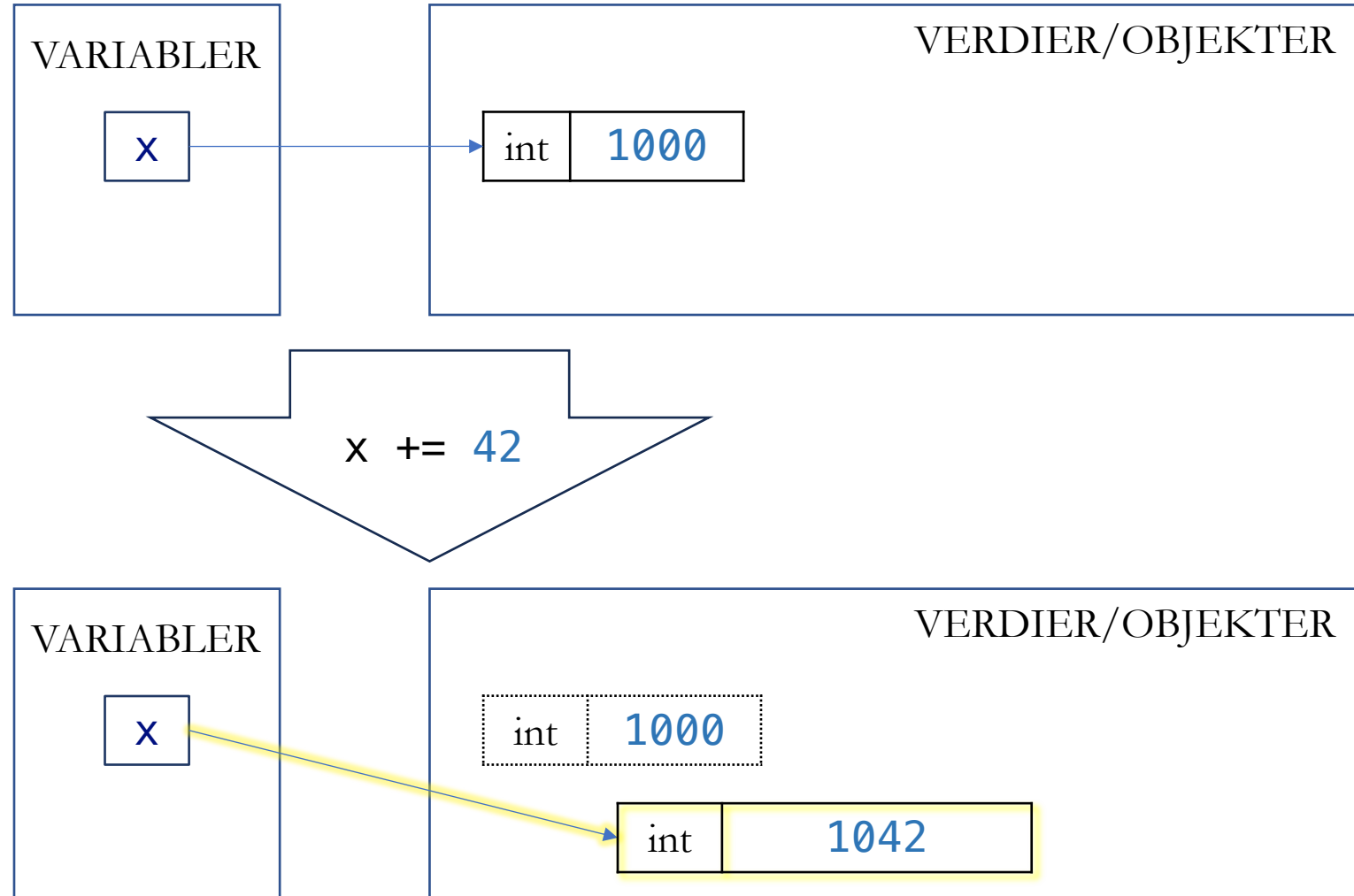
2D-LISTER

INF100

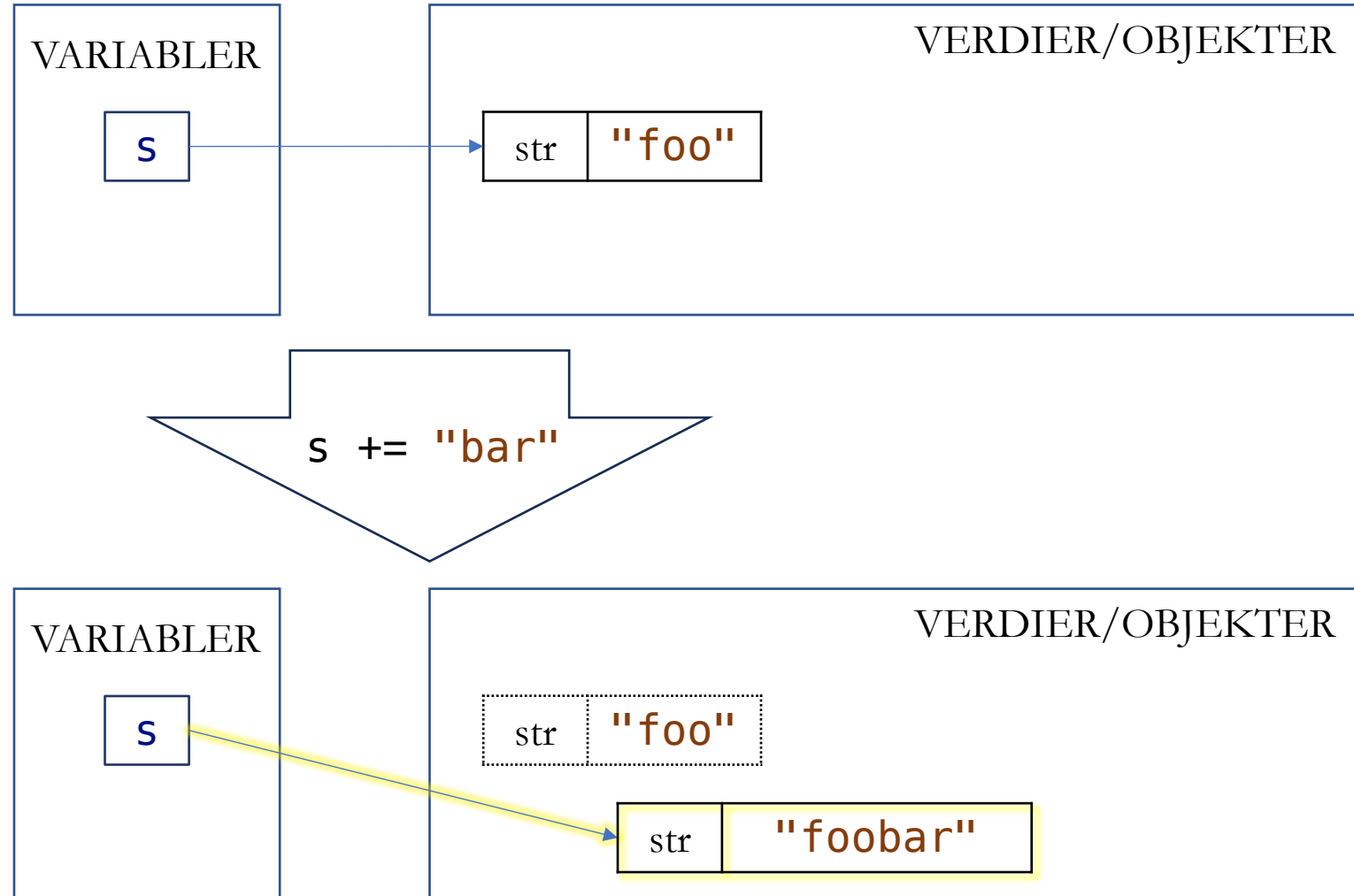
HØST 2023

Torstein Strømme

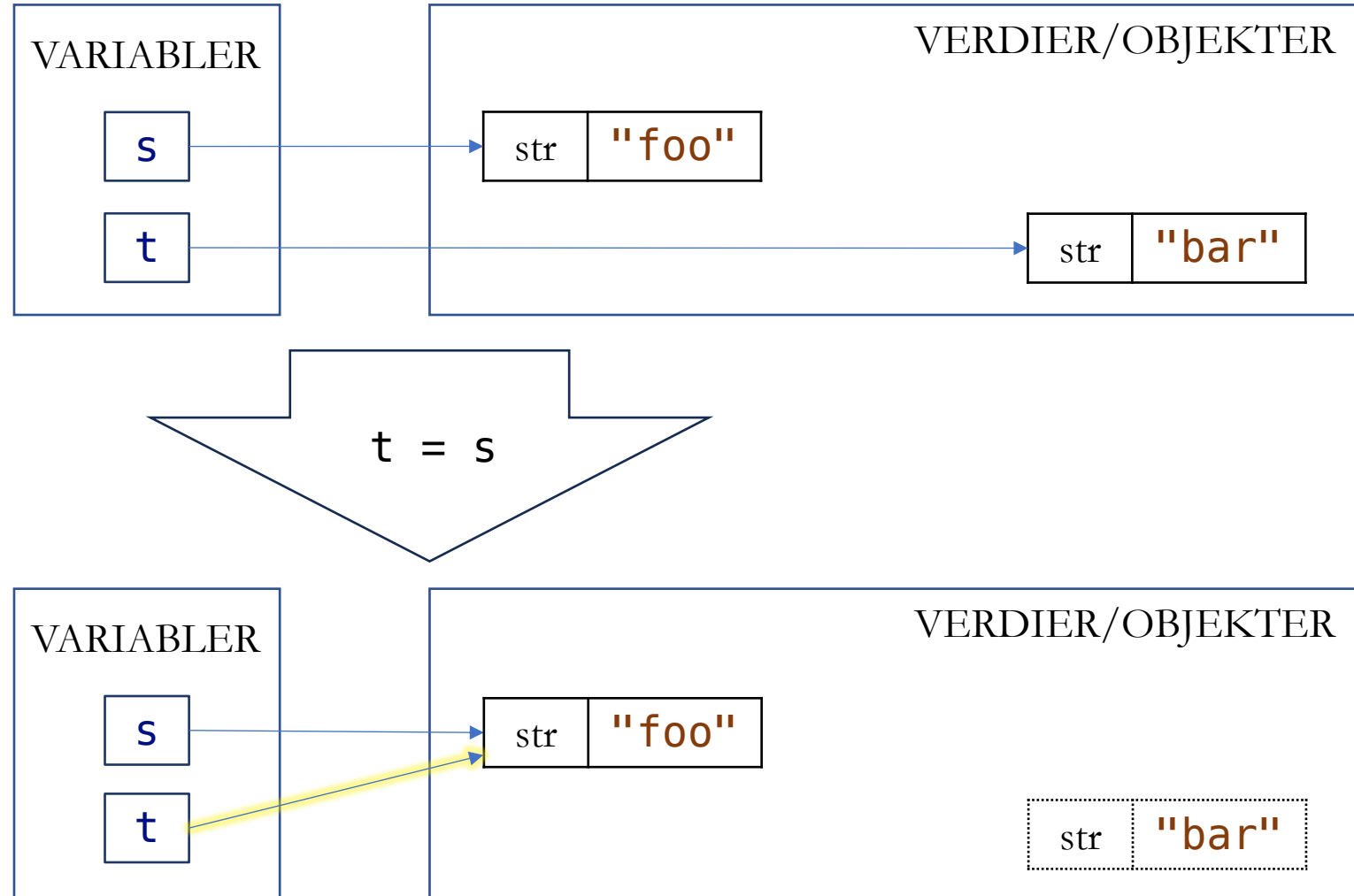
RECAP: VARIABELENDRING (1/4)



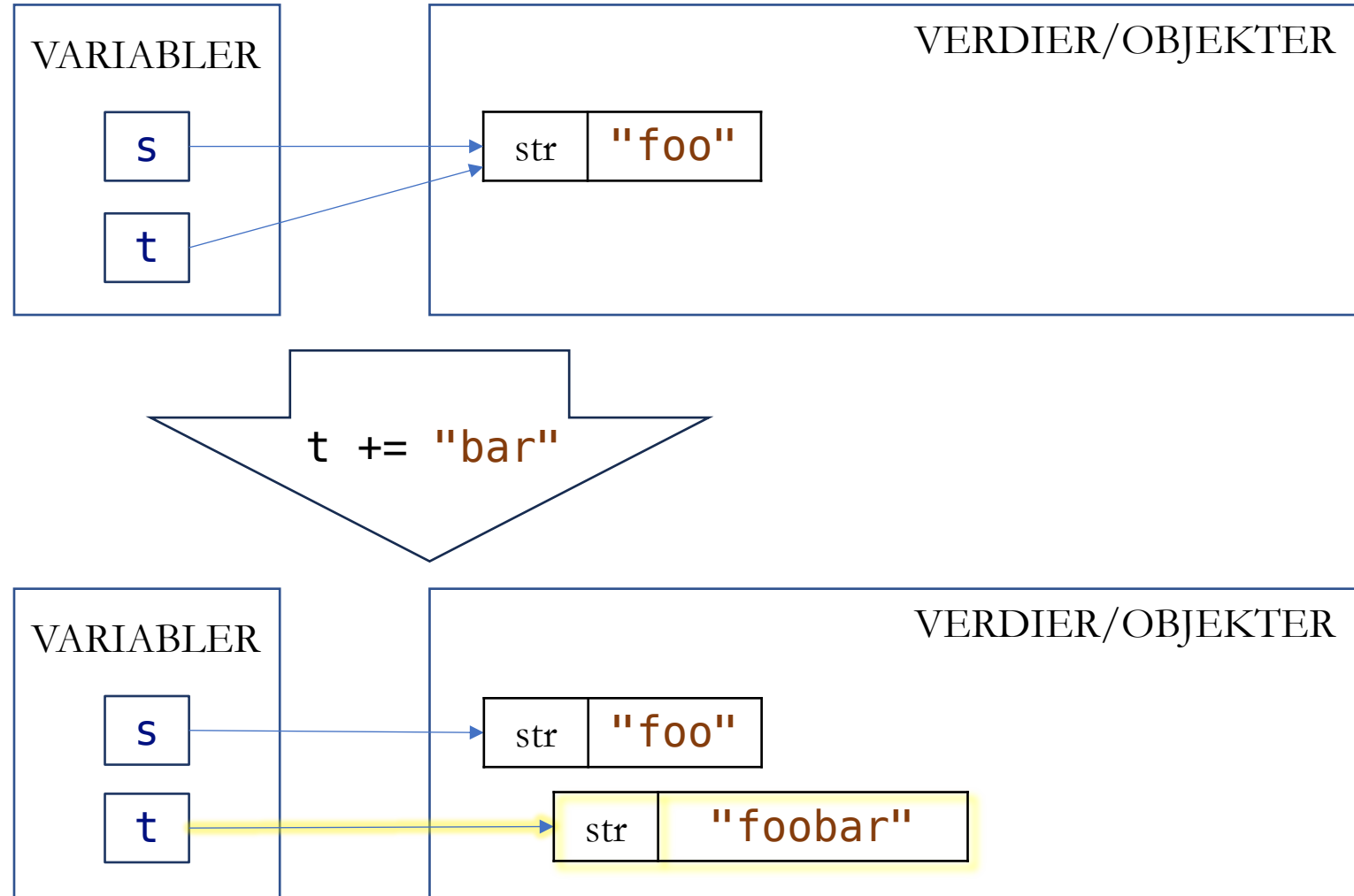
RECAP: VARIABLELENDRING (2/4)



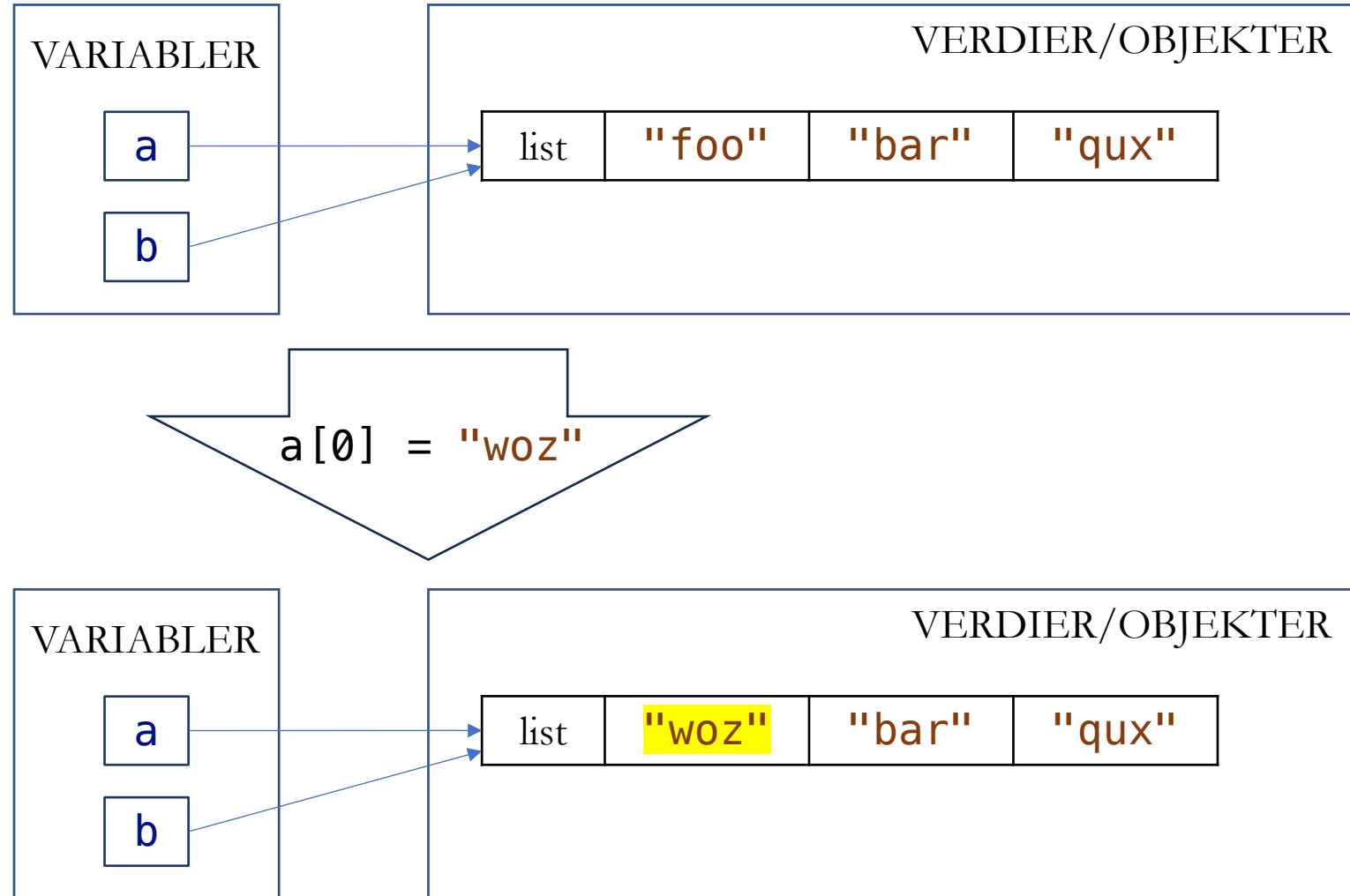
RECAP: VARIABLELENDRING (3/4)



RECAP: VARIABELENDRING (4/4)



RECAP: MUTASJON OG ALIAS



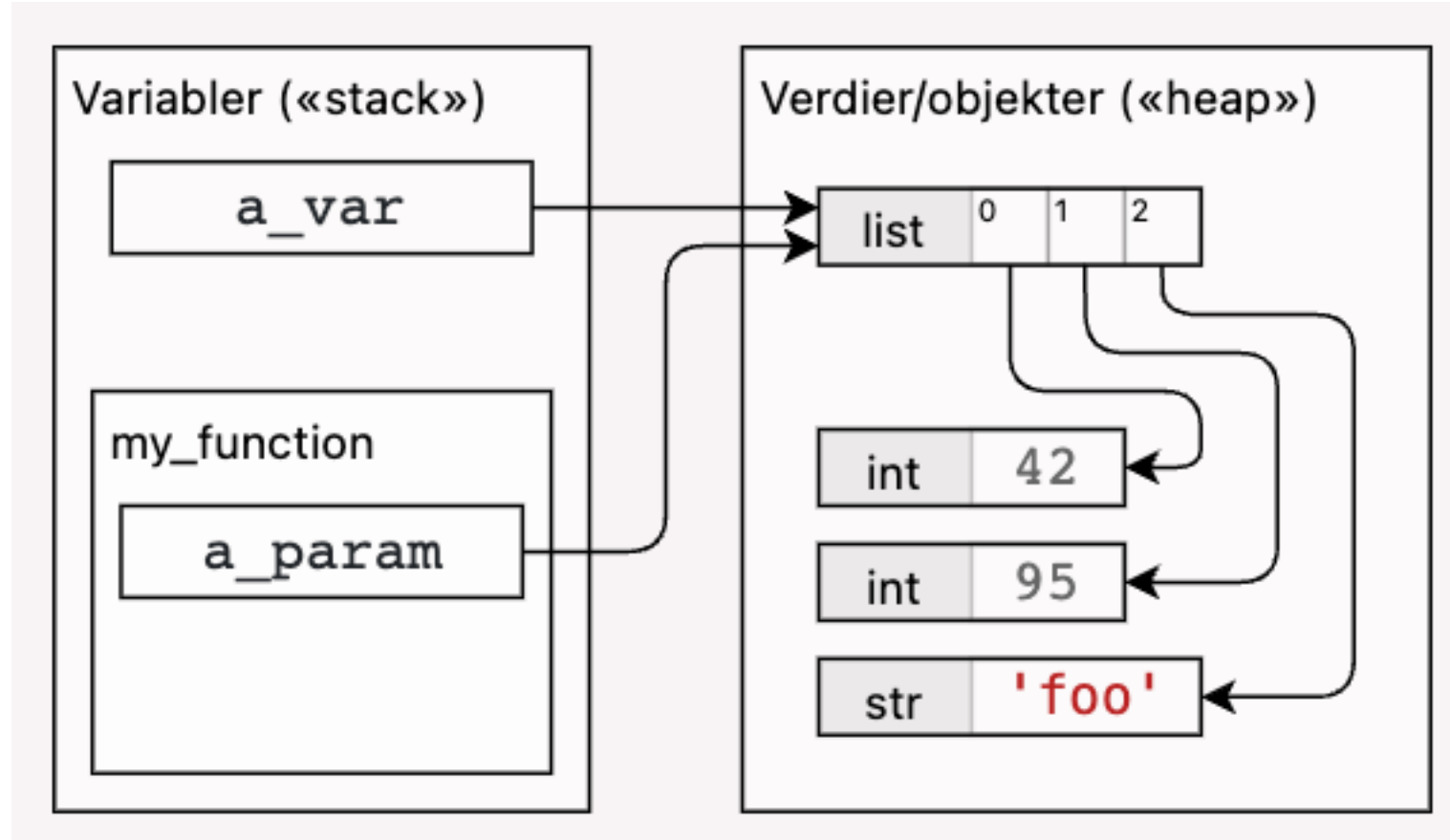
RECAP: PARAMETRE MED ALIAS

- Alias oppstår når vi angir en enkel variabel som argumentuttrykk ved funksjonskall

```
def my_function(a_param):
```

```
    ...
```

```
a_var = [42, 95, 'foo']  
my_function(a_var)
```

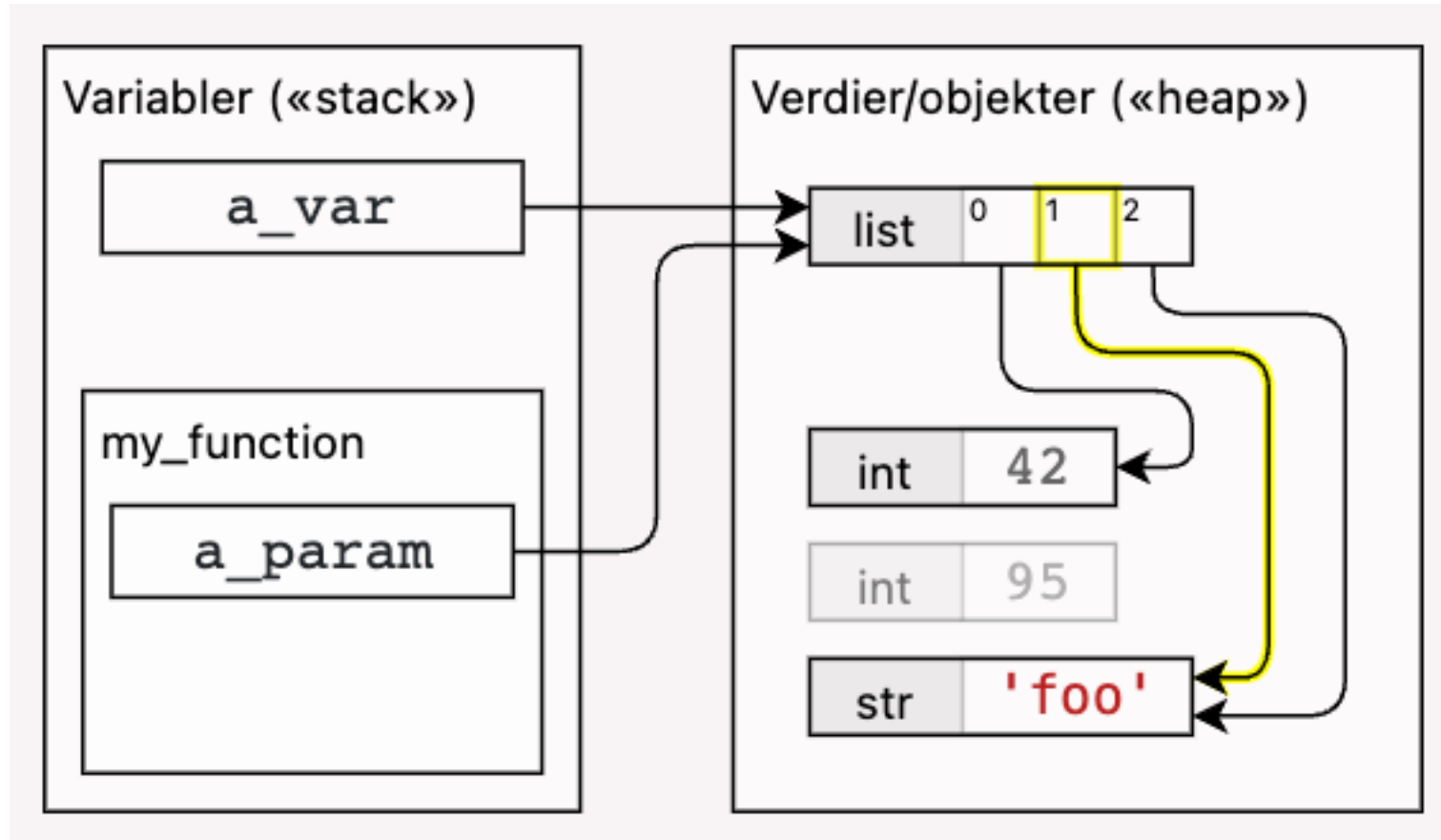


RECAP: DESTRUKTIVE FUNKSJONER

- En funksjon er *destruktiv* hvis den muterer en parameter

```
def my_function(a_param):  
    # muterer  
    a_param[1] = 'foo'
```

```
a_var = [42, 95, 'foo']  
my_function(a_var)
```



RECAP: OPERASJONER PÅ LISTER

Hva?	Destruktiv funksjon	Ikke-destruktivt alternativ
Legge til en ny verdi på slutten av listen	<code>a.append(42)</code>	<code>a = a + [42]</code>
Utvid listen med flere nye elementer på en gang	<code>a.extend([3, 4])</code>	<code>a = a + [3, 4]</code>
Putte inn en verdi på gitt posisjon	<code>a.insert(3, "foo")</code>	<code>a = a[:3] + ["foo"] + a[3:]</code>
Fjerne første forekomst av gitt verdi	<code>a.remove(2)</code>	<code>i = a.index(2)</code> <code>a = a[:i] + a[i + 1:]</code>
Fjerne element på en gitt posisjon	<code>a.pop(5)</code>	<code>a = a[:5] + a[5 + 1:]</code>
Fjerne alle elementer	<code>a.clear()</code>	<code>a = []</code>
Reverser	<code>a.reverse()</code>	<code>a = a[::-1]</code>
Sorter	<code>a.sort()</code>	<code>a = sorted(a)</code>

LIVEKODING

- Input: en liste med tall
- Oppgave A: en funksjon som returnerer ny liste med alle oddetall fjernet
- Oppgave B: en funksjon som fjerner alle oddetall i listen *destruktivt*

RECAP: INDEKSERING

```
s = "abcdef"  
x = s[1]  
print(x)
```

b

```
s = "abcdef"  
x = s[0]  
print(x)
```

a

```
s = "abcdef"  
x = s[-1]  
print(x)
```

f

```
a = [42, 95, 22, 16]  
x = a[2]  
print(x)
```

22

```
a = [42, 95, 22, 16]  
x = a[-2]  
print(x)
```

22

```
a = [42, 95, 22, 16]  
x = a[4]  
print(x)
```

Index
Error

RECAP: INDEKSERING

```
a = ['foo', 'bar', 'quz']  
x = a[1]  
print(x)
```

bar

```
a = ['foo', 'bar', 'quz']  
x = a[1][0]  
print(x)
```

b

```
a = ['foo', 'bar', 'quz']  
x = a[-1][-2]  
print(x)
```

u


2D-LISTER

- En liste som inneholder lister

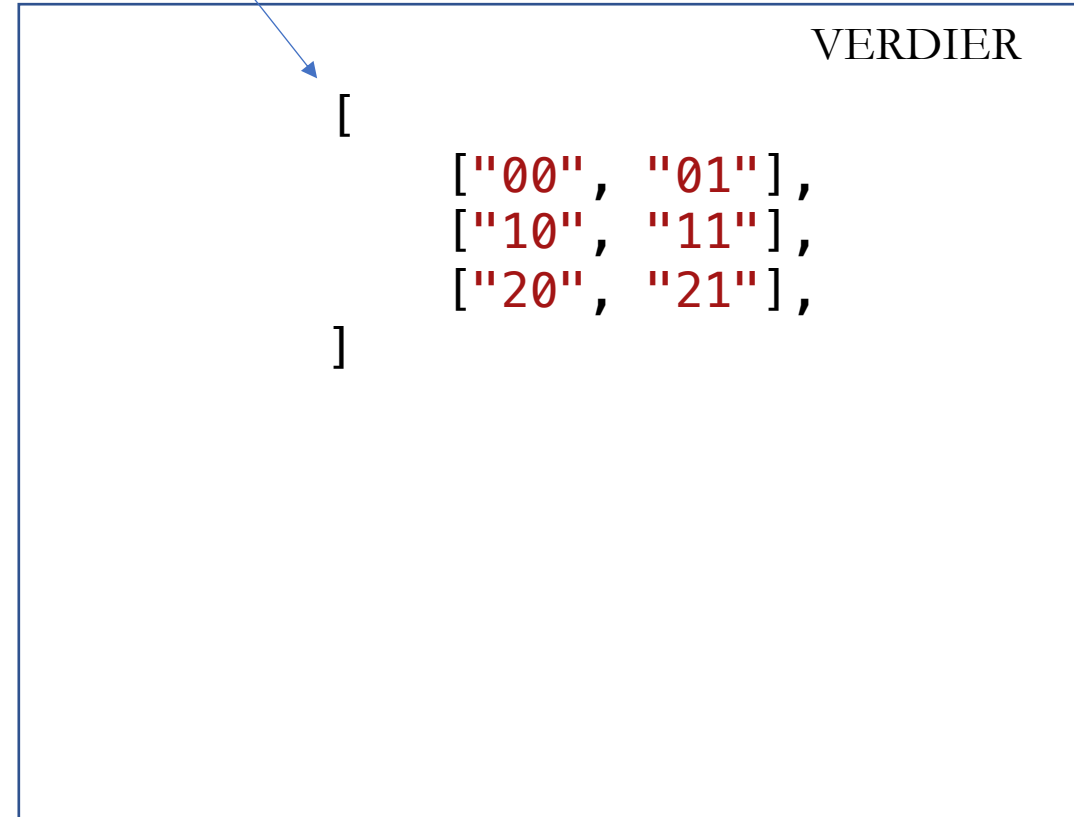
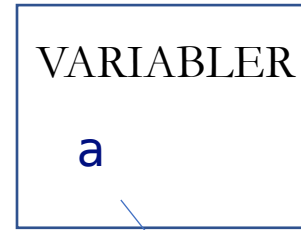
```
table = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]  
  
print(table[2])           # ['20', '21']  
print(table[2][0])       # 20  
  
print(table[2][0][1])    # 0
```

2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```




```
b = a  
b[1][0] = "foo"  
print(a[1][0])
```

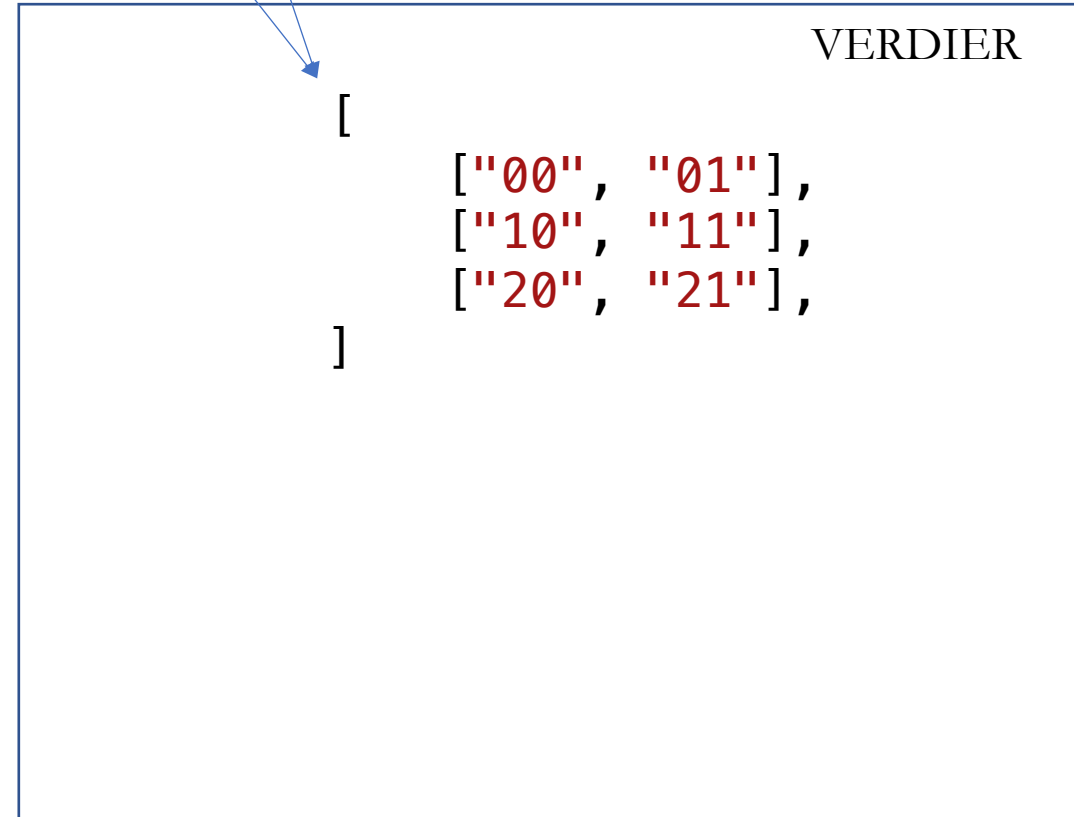
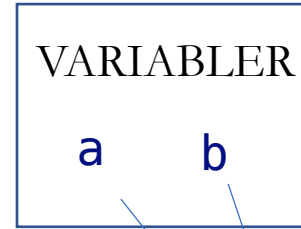


2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



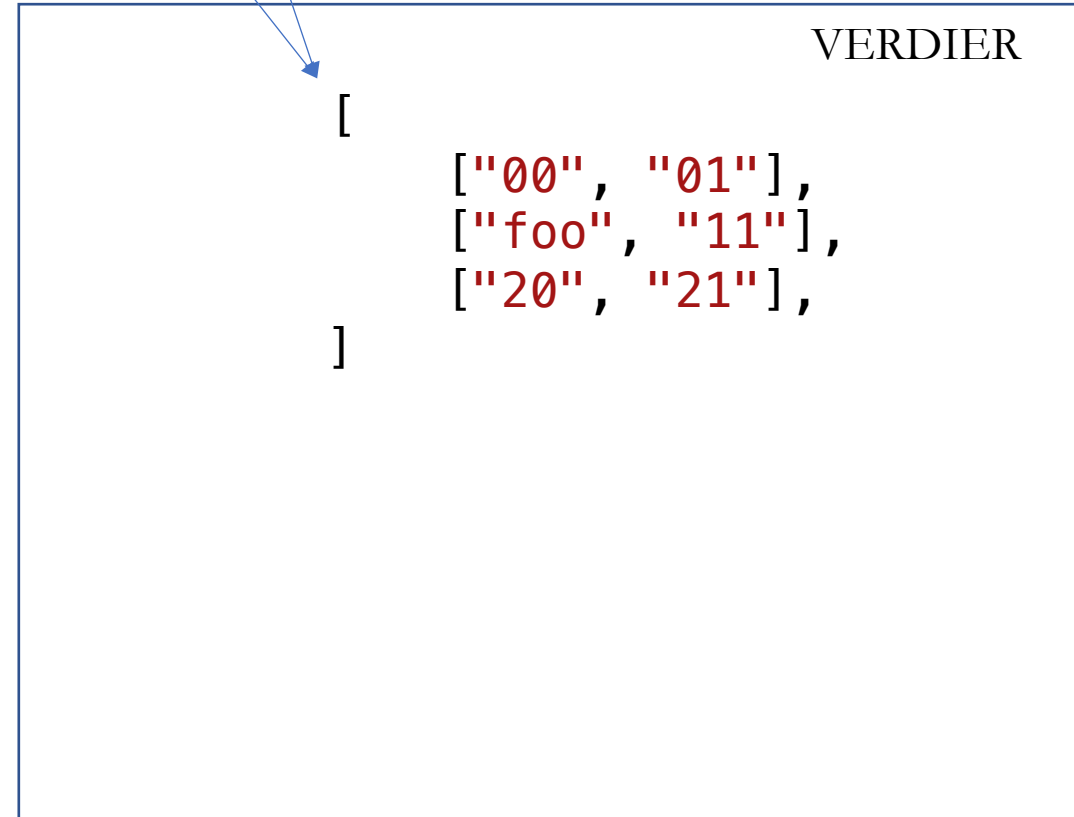
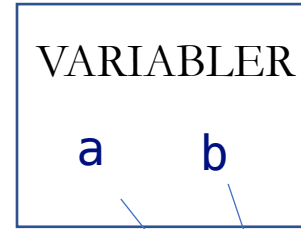
```
b = a  
b[1][0] = "foo"  
print(a[1][0])
```



2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```

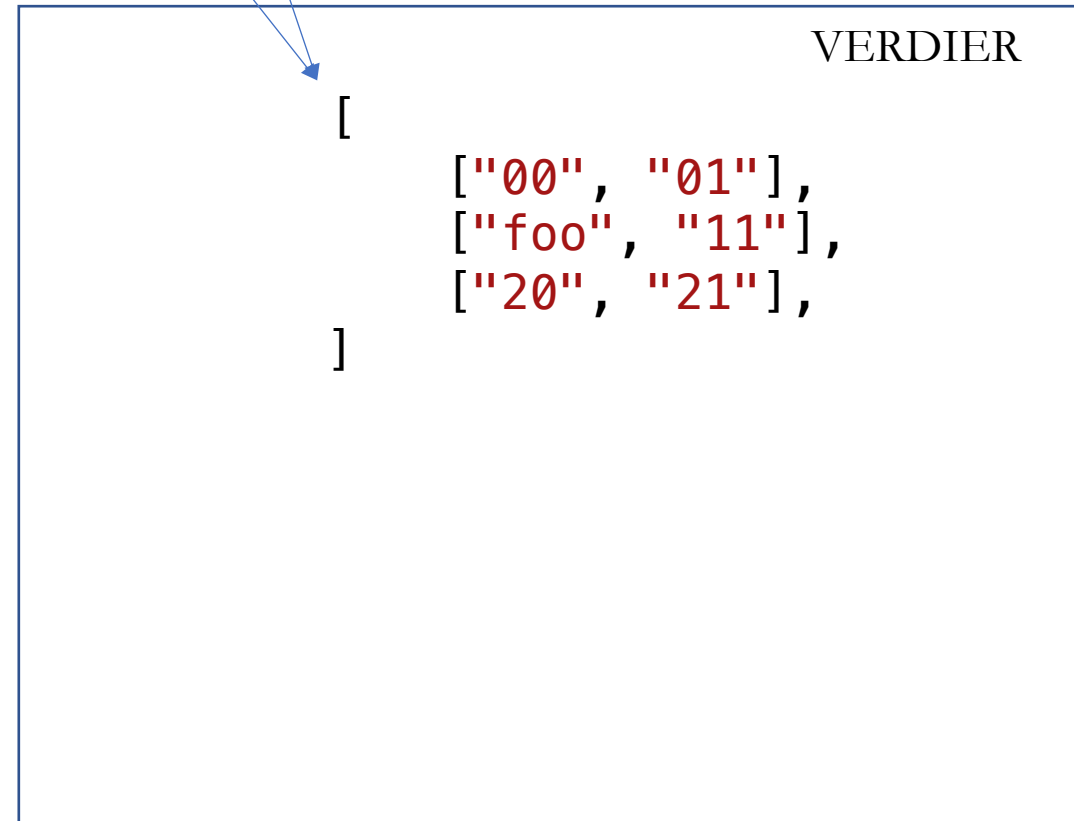
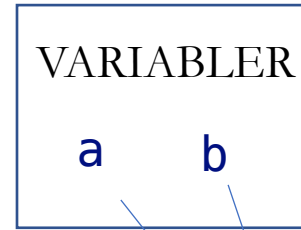
```
b = a  
b[1][0] = "foo"  
print(a[1][0])
```



2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```


```
b = a  
b[1][0] = "foo"  
print(a[1][0])
```



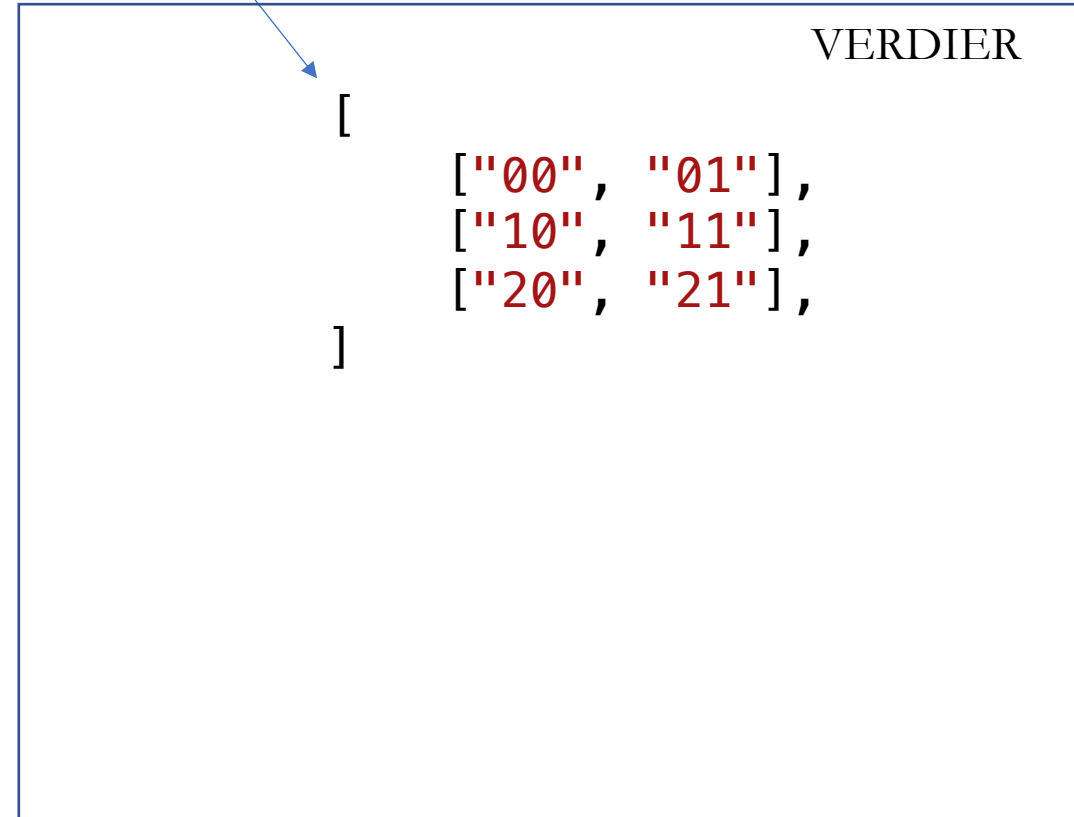
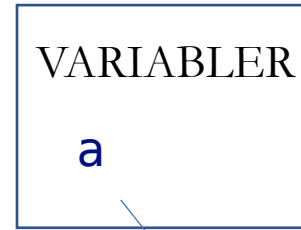
NYTT EKSEMPEL

2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```




```
b = a[1]  
b[0] = "foo"  
print(a[1][0])
```

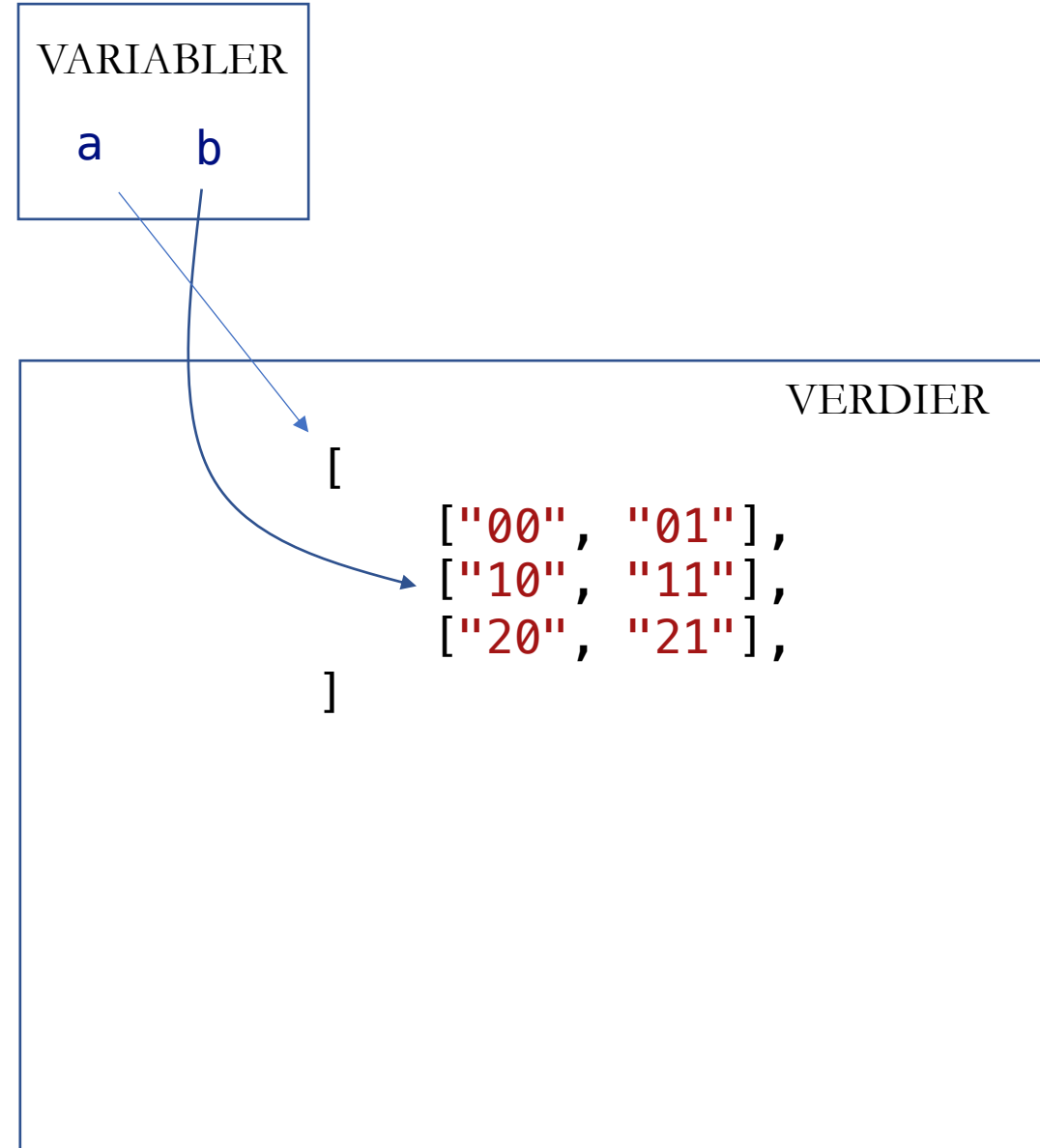


2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



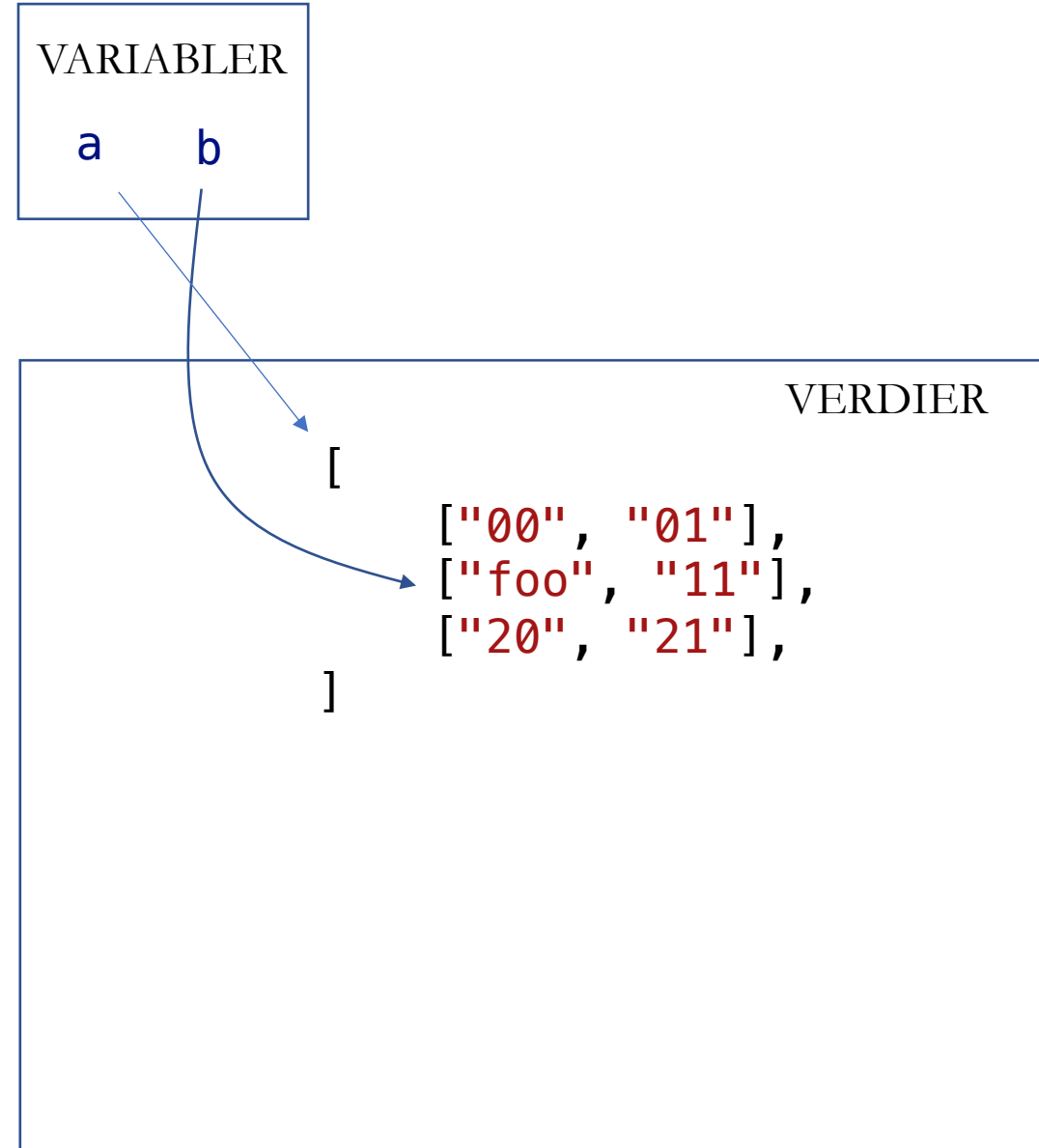
```
b = a[1]  
b[0] = "foo"  
print(a[1][0])
```



2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```

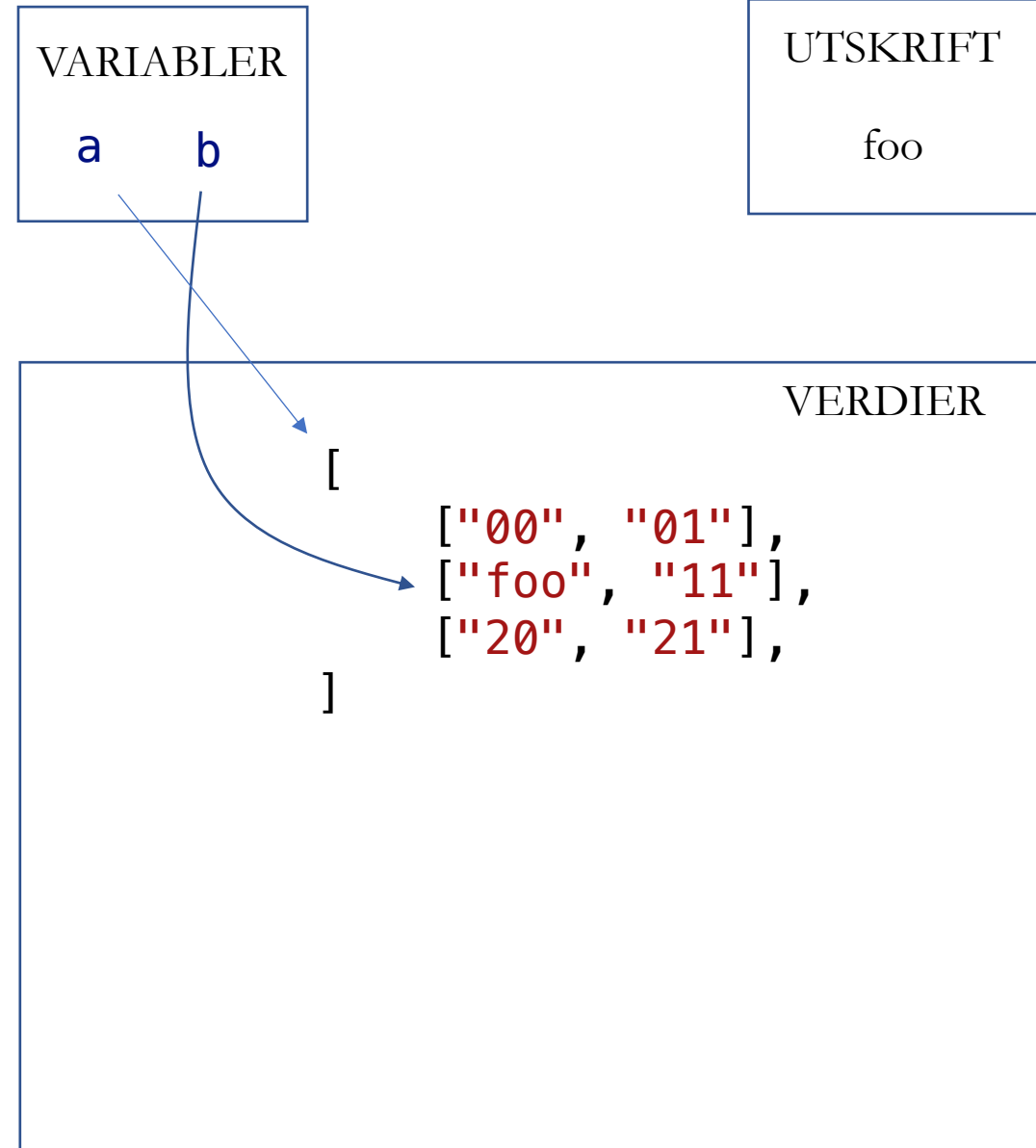
```
b = a[1]  
b[0] = "foo"  
print(a[1][0])
```



2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```


```
b = a[1]  
b[0] = "foo"  
print(a[1][0])
```



NYTT EKSEMPEL

2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



```
b = a[1]  
a[1] = ["HI", "HA"]  
print(a[1][0])  
print(b[0])
```


VARIABLEN
a

VERDIER

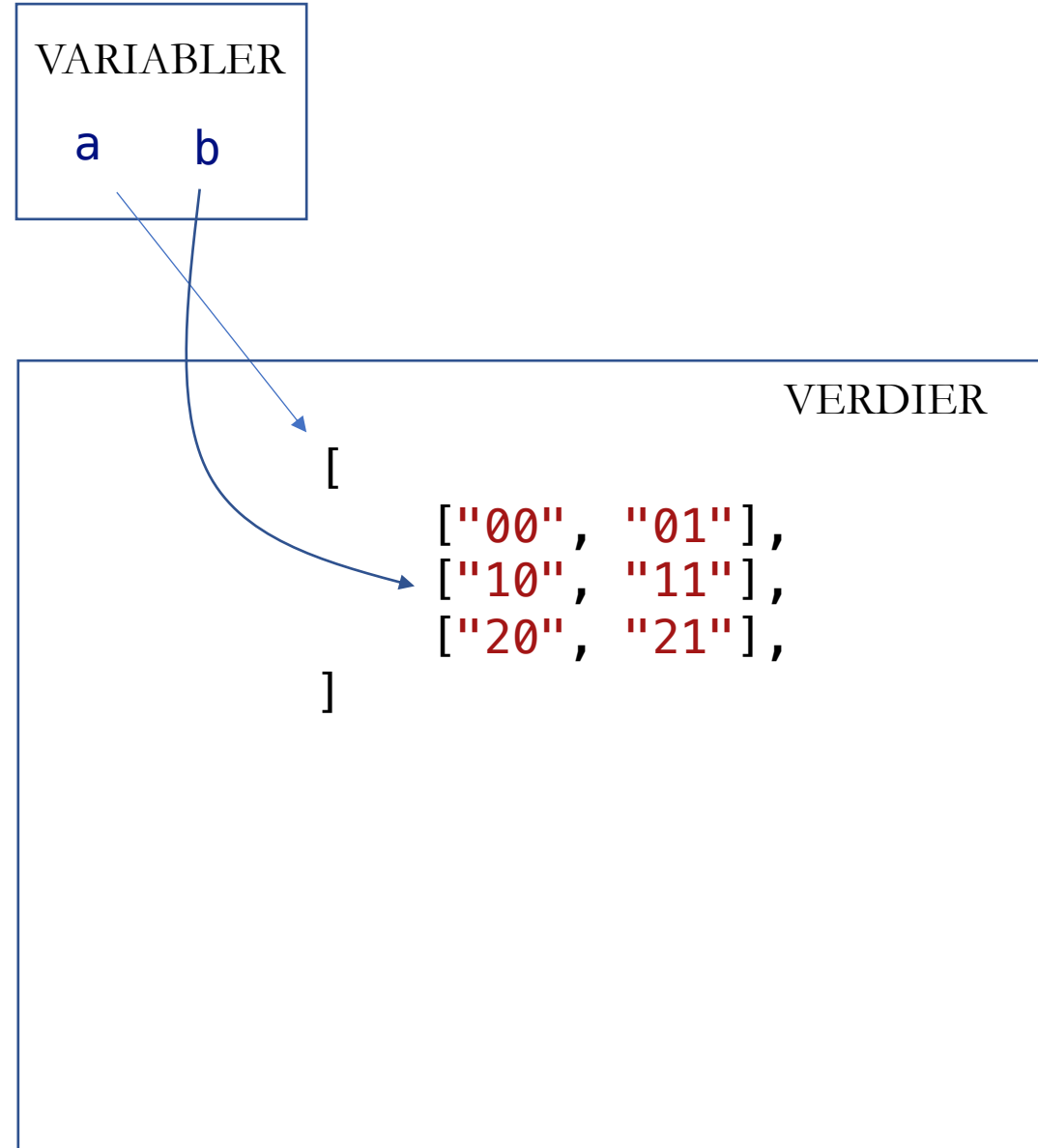
```
[  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```


2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



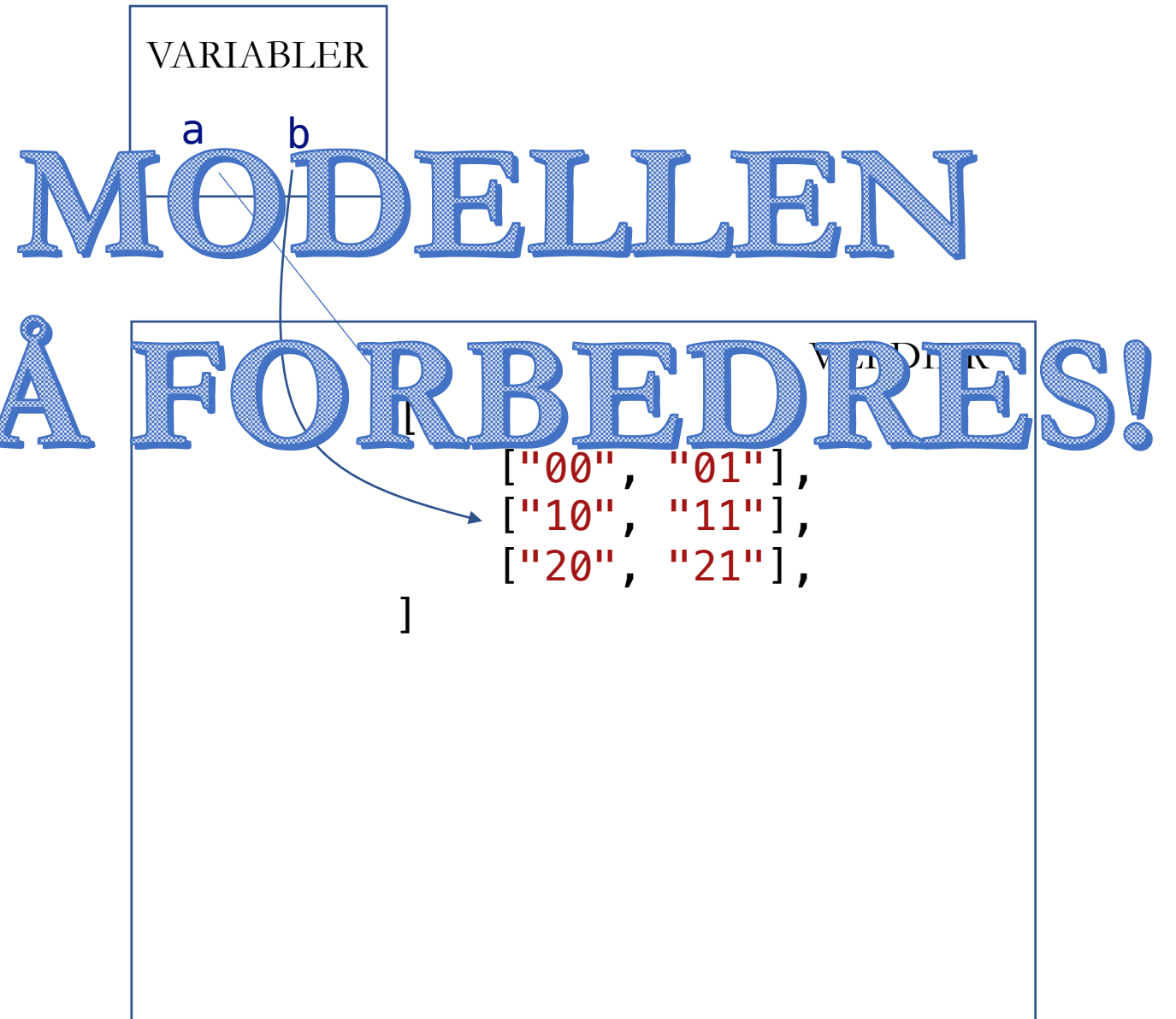
```
b = a[1]  
a[1] = ["HI", "HA"]  
print(a[1][0])  
print(b[0])
```



2D-LISTE

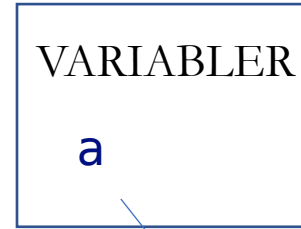
```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```

```
b = a[1]  
a[1] = ["HI", "HA"]  
print(a[1][0])  
print(b[0])
```

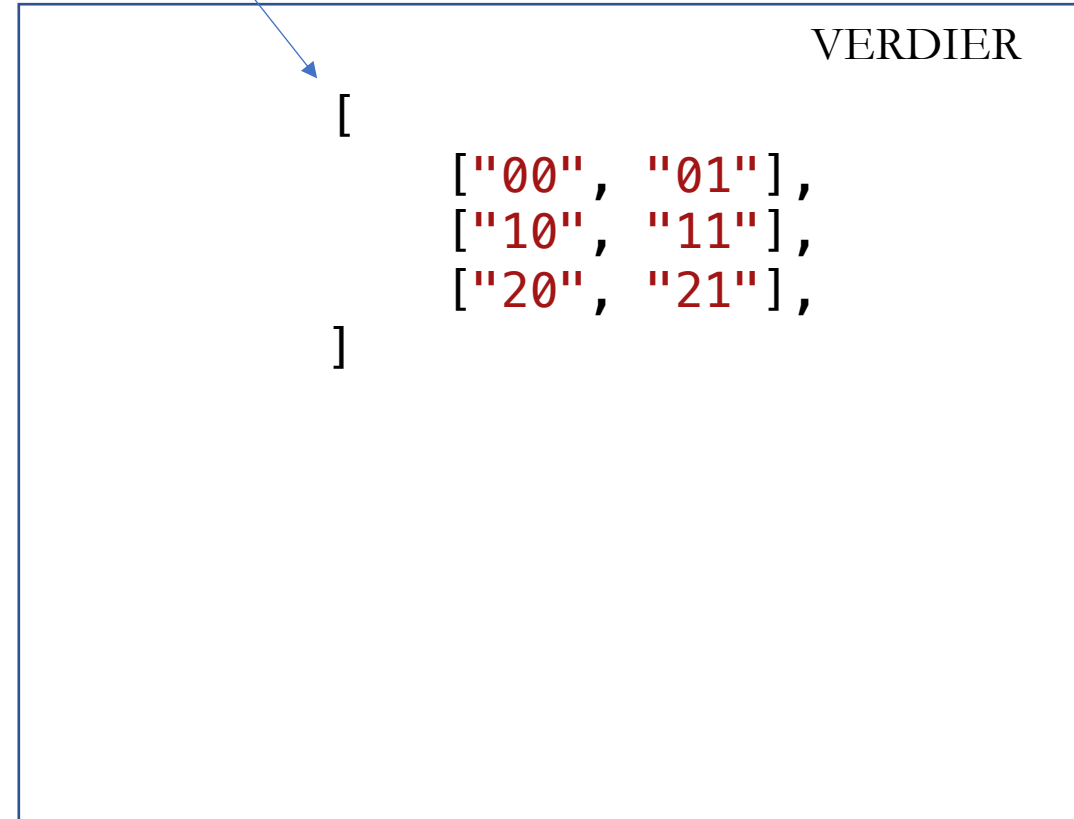


2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```

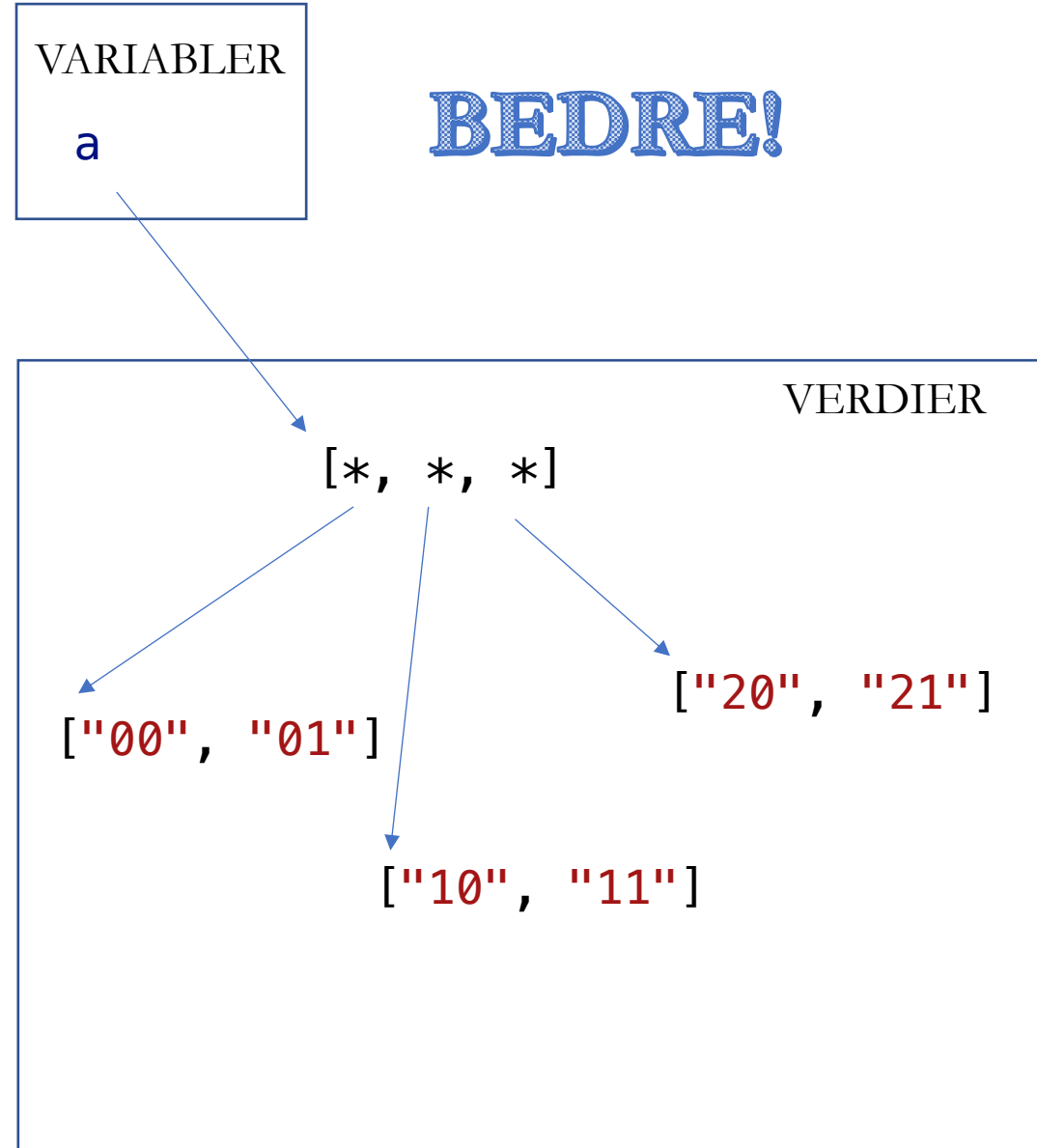


FØR



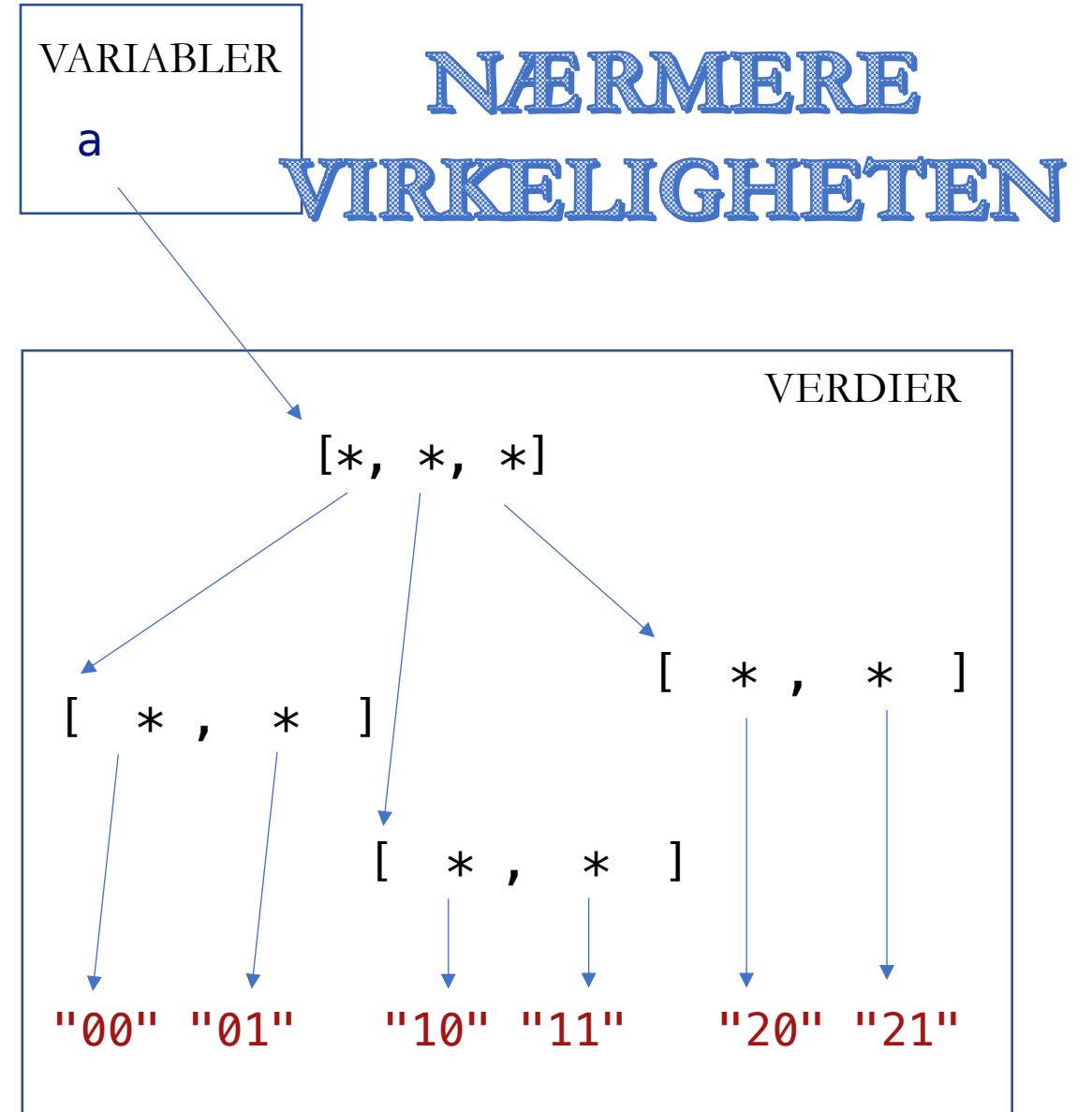
2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```

**ENDA NÆRMERE
VIRKELIGHETEN**

VARIABLER

Variabelnavn	Adresse
a	10240


VERDIER

Adresse	Klasse	Verdi
1024	str	"00"
2048	str	"01"
3072	str	"10"
4096	str	"11"
5120	str	"20"
6144	str	"21"
7168	list	[1024, 2048]
8192	list	[3072, 4096]
9216	list	[5120, 6144]
10240	list	[7168, 8192, 9216]

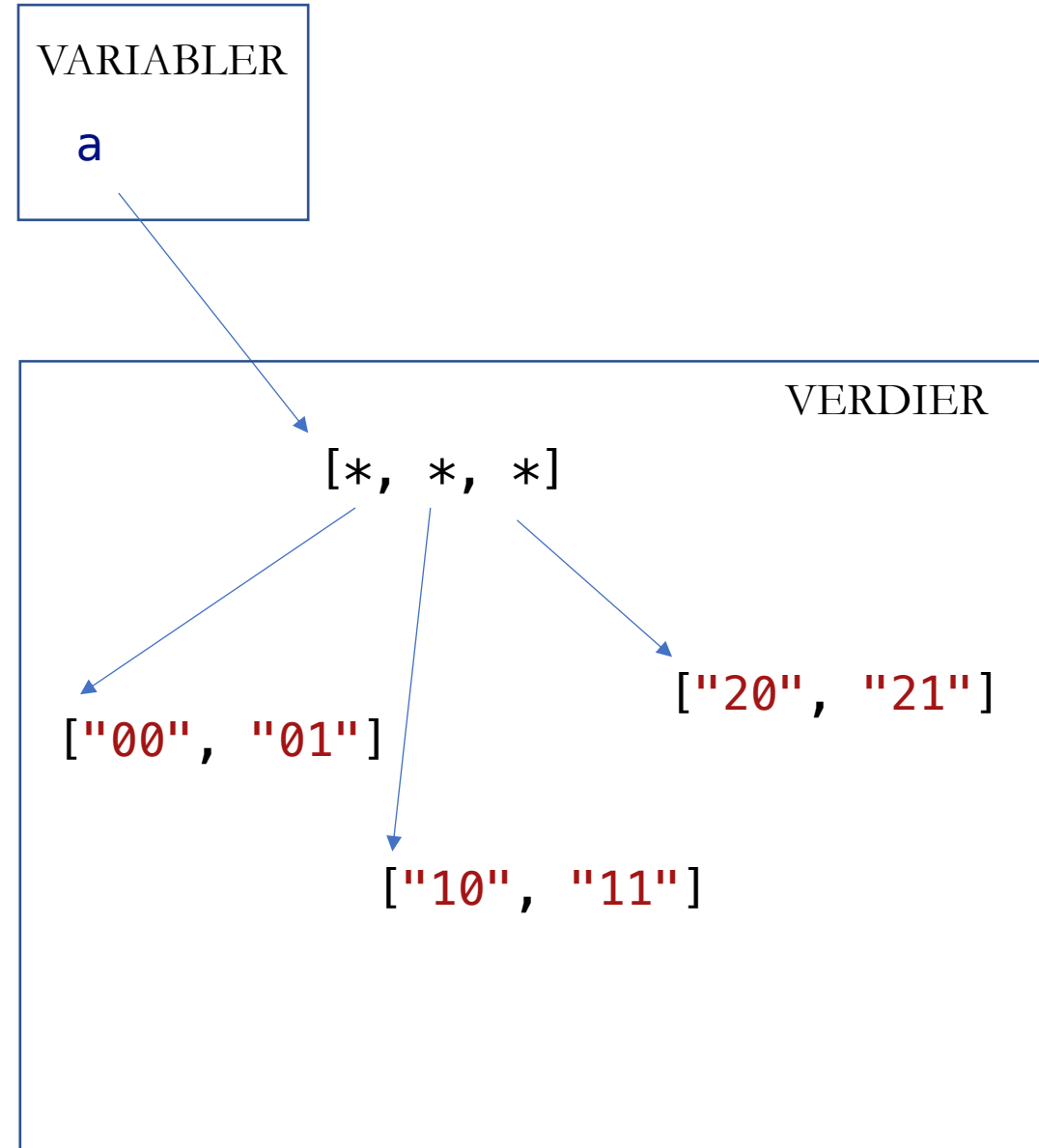
NYTT FORSØK

2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```




```
b = a[1]  
a[1] = ["HI", "HA"]  
print(a[1][0])  
print(b[0])
```

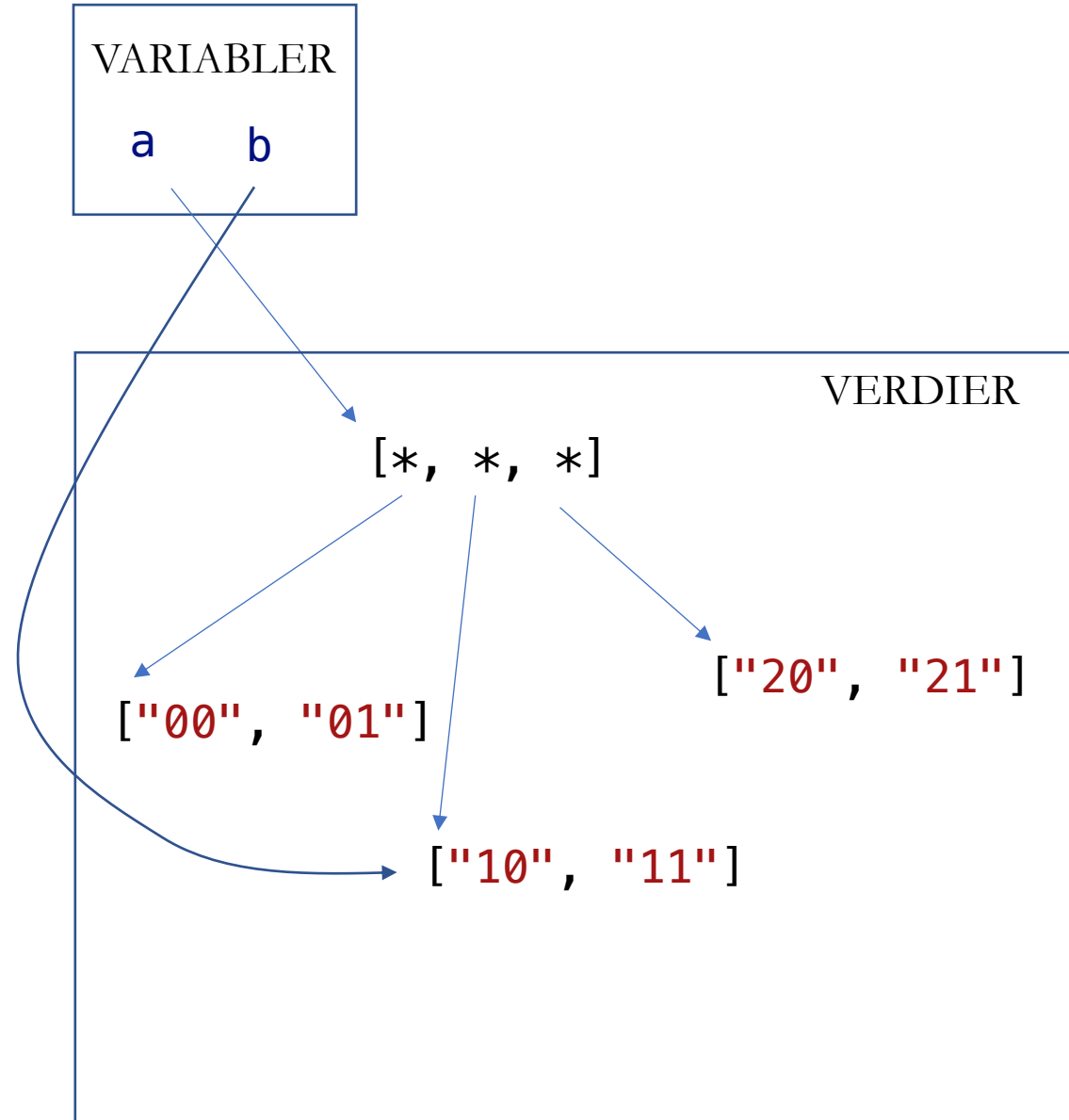


2D-LISTE

```
a = [  
    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```



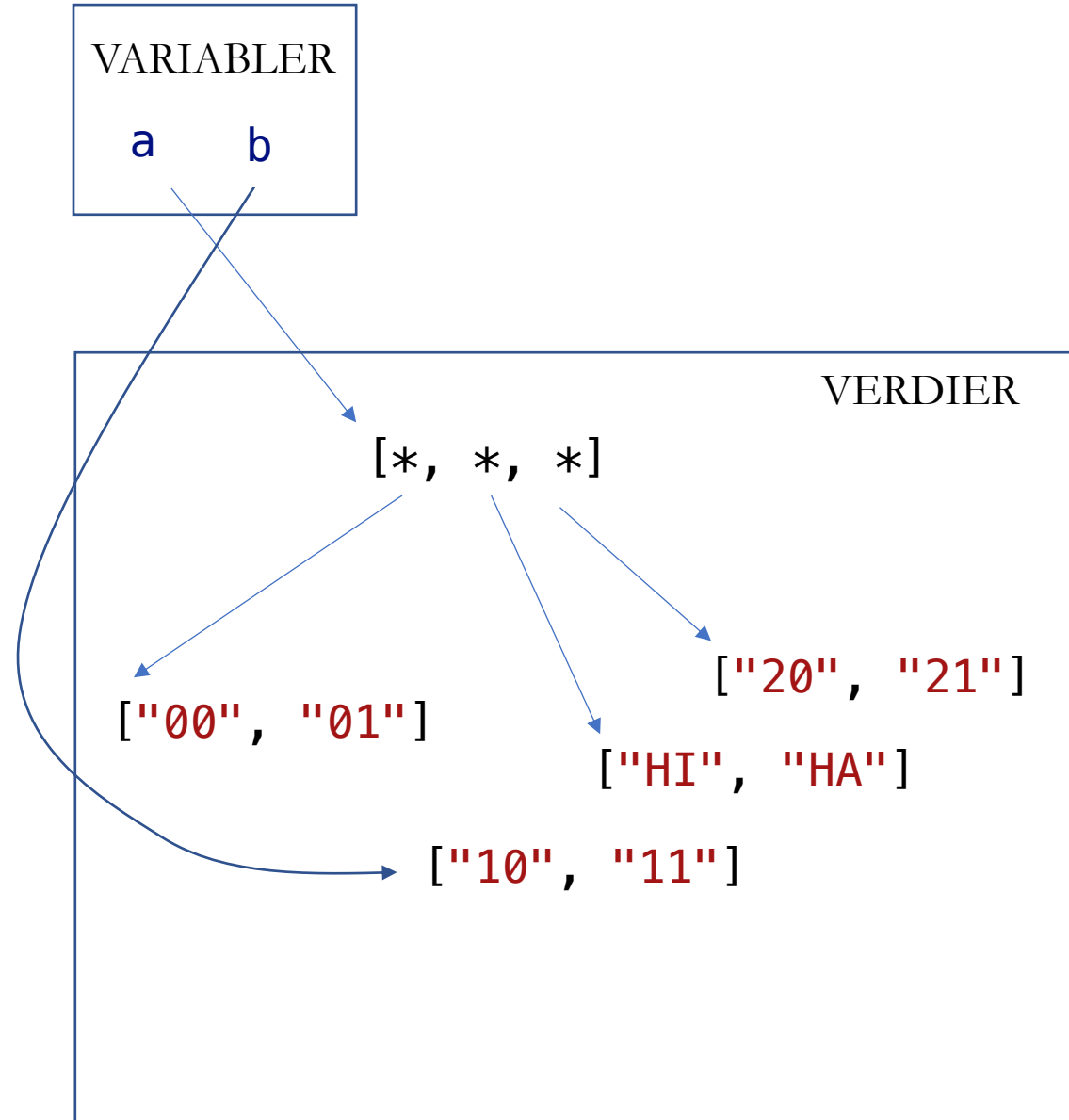
```
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print(a[1][0])  
print(b[0])
```



2D-LISTE

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a = [  
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    ["10", "11"],  
    ["20", "21"],  
]
```

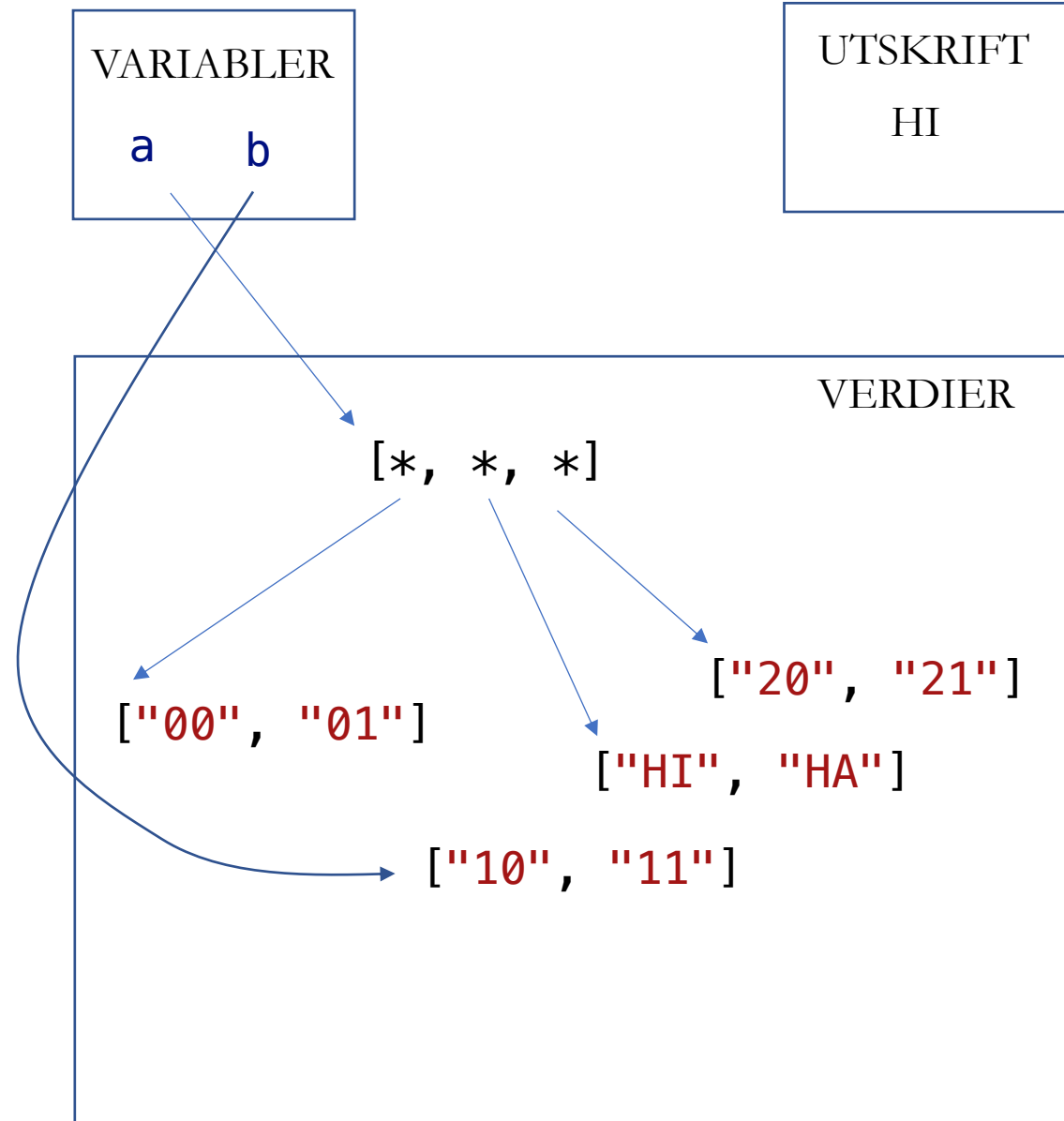
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print(a[1][0])  
print(b[0])
```



2D-LISTE

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    ["10", "11"],  
    ["20", "21"],  
]
```

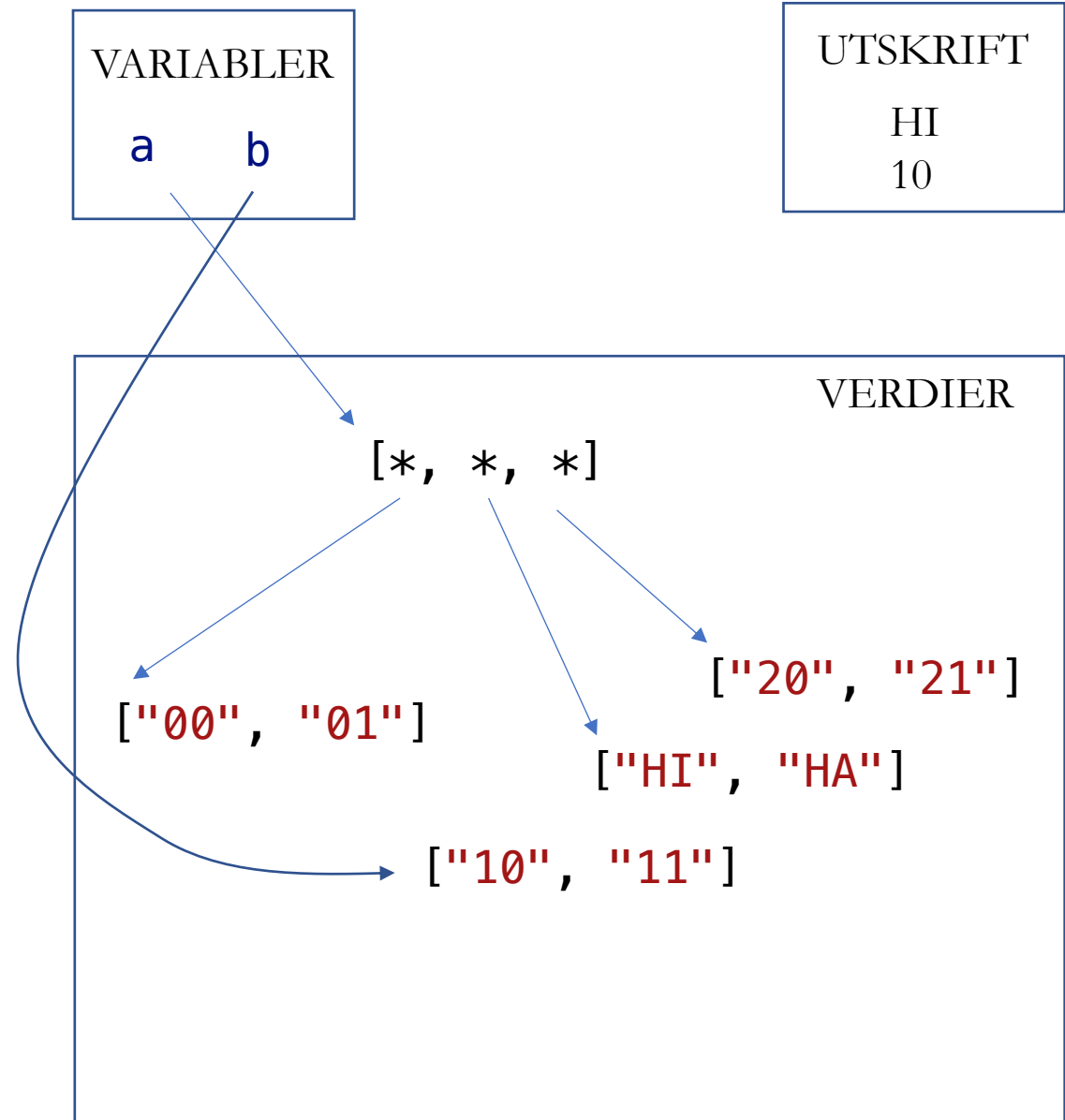
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a[1] = ["HI", "HA"]  
print(a[1][0])  
print(b[0])
```



2D-LISTE

```
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    ["00", "01"],  
    ["10", "11"],  
    ["20", "21"],  
]
```

```
b = a[1]  
a[1] = ["HI", "HA"]  
print(a[1][0])  
print(b[0])
```



PYTHON TUTOR

- Gratis, reklamefinansiert visualiseringsverktøy

<https://pythontutor.com/>