Lehrstuhl für Softwaretechnik und Programmiersprachen
Professor Dr. Michael Leuschel

# Compilerbau - Wintersemester 2021/22

## Übungsblatt 11 - Musterlösung

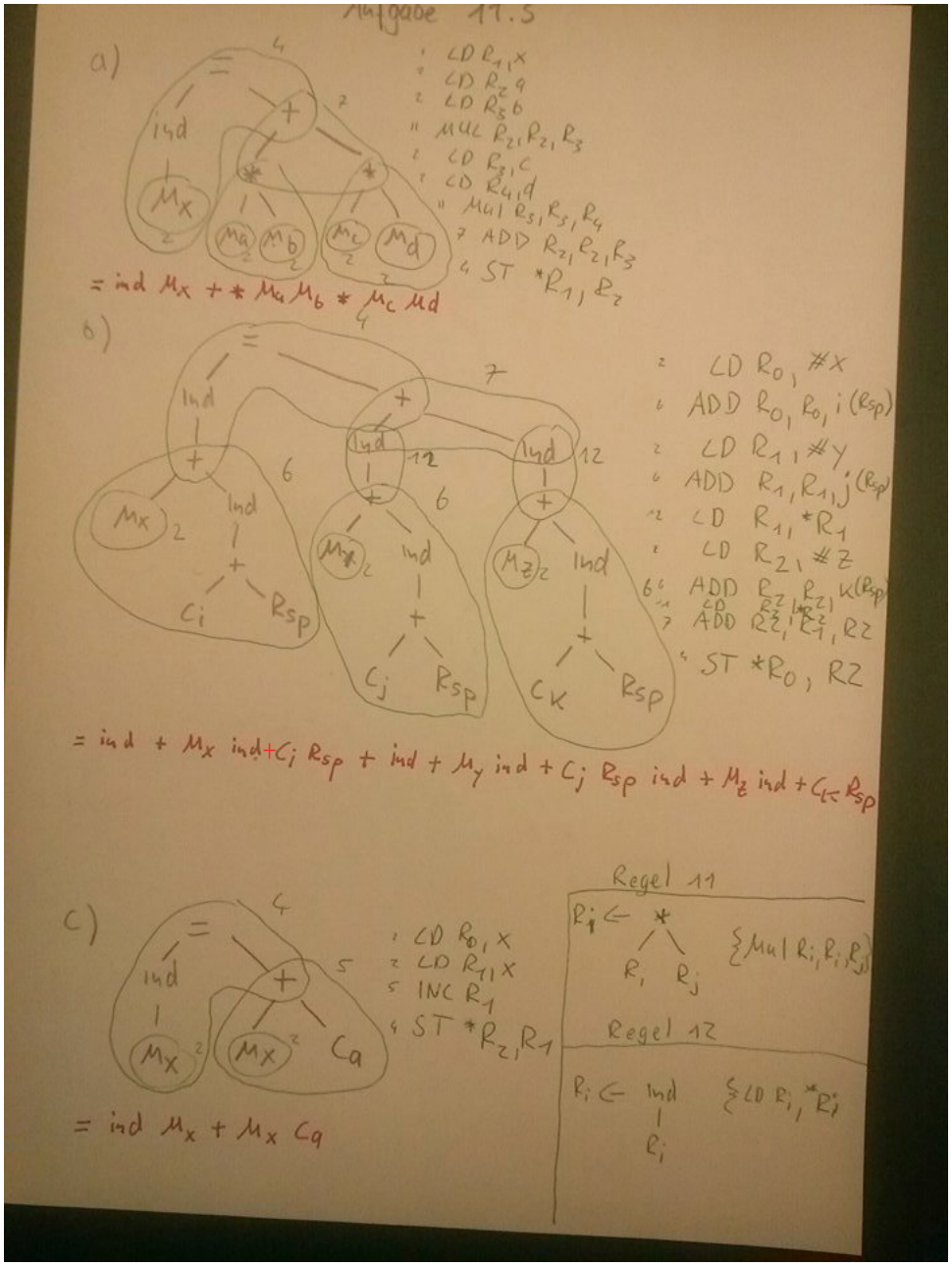


Abbildung 1: *Kachelung und Code*

**Aufgabe 11.1**

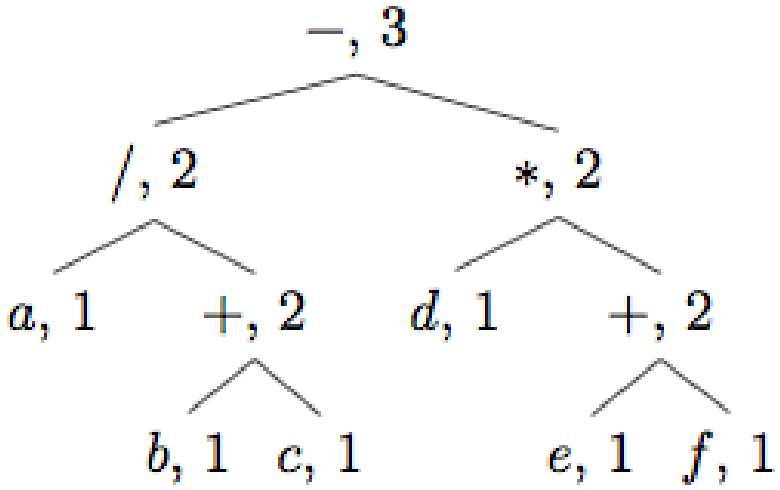


Abbildung 2: $a/(b+c) - d * (e+f)$

**Aufgabe 11.2**
3 Register:
1.
LD R3, f
LD R2, e
ADD R3, R2, R3
LD R2, d
MUL R3, R2, R3
LD R2, c
LD R1, b
ADD R2, R1, R2
LD R1, a
DIV R2, R1, R2
SUB R3, R2, R3

2.
LD R2, e
LD R1, d
ADD R2, R1, R2
LD R1, c
MUL R2, R1, R2
LD R1, b

```
MUL R2, R1, R2
LD R1, a
ADD R2, R1, R2
```

3.

```
LD R3, q
LD R3, *R3
LD R2, b
SUB R3, R2, R3
LD R2, c
NEG R2, R2
DIV R3, R3, R2
LD R2, r
LD R2, *R2
ADD R3, R3, R2
LD R2, p
LD R2, *R2
LD R1, a
NEG R1, R1
ADD R2, R1, R2
MUL R3, R2, R3
```

2 Register:

1.

```
LD R2, f
LD R1, e
ADD R2, R1, R2
LD R1,d
MUL R2, R1, R2
ST Memory[temp], R2
LD R2, c
LD R1, b
ADD R2, R1, R2
LD R1, a
DIV R2, R1, R2
LD R1, Memory[temp]
SUB R2, R2, R1
```

2.

siehe 3 Register

3.

```
LD R2, q
LD R2, *R2
LD R1, b
SUB R2, R1, R2
LD R1, c
NEG R1, R1
DIV R2, R2, R1
LD R1, r
LD R1, *R1
ADD R2, R2, R1
ST Memory[temp], R2
LD R2, p
LD R2, *R2
LD R1, a
NEG R1, R1
ADD R2, R1, R2
LD R1, Memory[temp]
MUL R2, R2, R1
```

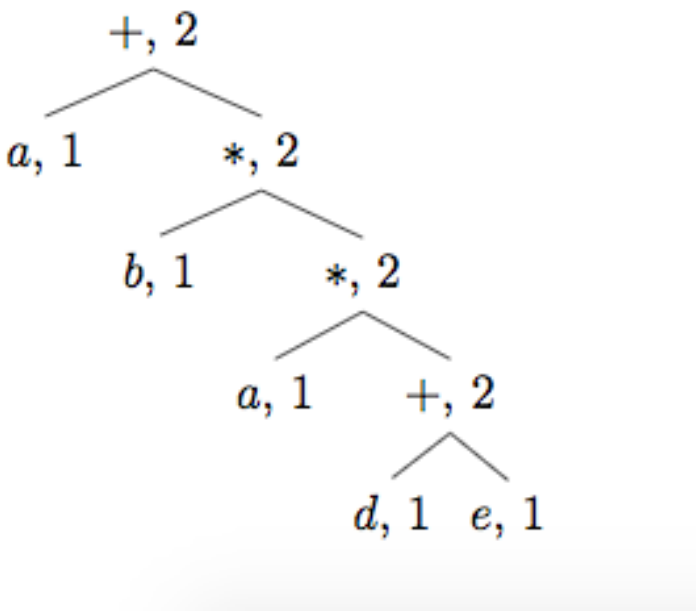


Abbildung 3: $a + b * (c * (d + e))$

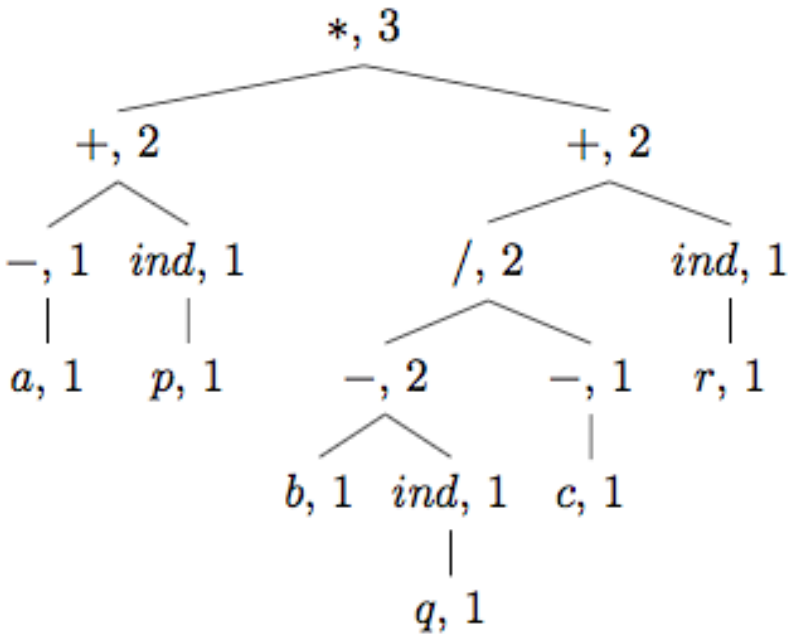


Abbildung 4: $(-a + *p) * ((b - *q)/ - c + *r)$

**Aufgabe 11.3**

a)
LD R0, #1
ST x, R0

b)
LD R0, a
ST x, R0

c)
LD R0, a
LD R1, #1
ADD R0, R0, R1
ST x, R0

d)
LD R0, a
LD R1, b
ADD R0, R0, R1
ST x, R0

e)
LD R0, b
LD R1, c
MUL R0, R0, R1
ST x, R0
LD R1, a
ADD R0, R1, R0
ST y, R0

**Aufgabe 11.4**
a)
LD R0, i
LD R1, #4
MUL R0, R0, R1
LD R1, a(R0)
ST x, R1
LD R0, j
LD R1, #4
MUL R0, R0, R1
LD R1, b(R0)
ST y, R1
LD R0, y
LD R1, i
LD R2, #4
MUL R1, R1, R2
ST a(R1), R0
LD R0, x
LD R1, j
LD R2, #4
MUL R1, R1, R2
ST b(R1), R0

b)
LD R0, i
LD R1, #4
MUL R0, R0, R1
LD R1, a(R0)
ST x, R1
LD R0, i
LD R1, #4
MUL R0, R0, R1
LD R1, b(R0)
ST y, R1

```
LD R0, x
LD R1, y
MUL R0, R0, R1
ST z, R0
```

c)

```
LD R0, i
LD R1, #4
MUL R0, R0, R1
LD R1, a(R0)
ST x, R1
LD R0, x
LD R1, #4
MUL R0, R0, R1
LD R1, b(R0)
ST y, R1
LD R0, y
LD R1, i
LD R2, #4
MUL R1, R1, R2
ST a(R1), R0
```

**Aufgabe 11.5**

```
  ldc 10
  istore 1
  ldc 1
  istore 2
labelWhile:
  iload 1
  ifle labelEnd
  iload 2
  iload 1
  iload 1
  imul
  iadd
  istore 2
  iload 1
  ldc 1
  isub
  istore 1
  goto labelWhile
labelEnd:
```

**Aufgabe 11.6**

```
  iload 1
  iload 2
  if_icmpge labelElse
  ldc 2
  ldc 7
  imul
  ldc 1
  iadd
  istore 3
  goto labelEnd
labelElse:
  iload 3
  ldc 1
  iadd
  istore 3
labelEnd:
  iload 3
  ldc 1
  iadd
  istore 4
```