

Submission 10

9.1.1

```
fmla v8.4s, v0.4s, v4.s[2]
```

Alle Register werden folgend als Arrays mit 4 FP32 Elementen interpretiert.

Bedeutet das die 3. Spalte des Arrays von v4 (v4.s[2]) mit jedem Element aus v0 multipliziert wird und das Ergebnis zur jeweiligen Spalte aus v8 addiert wird.

9.2.1

rspi06

performance:

```
testing gemm_asm_fp_4_4_4 kernel
maximum difference: 0
duration: 5.57768 seconds
GFLOPS: 2.29486
testing gemm_asm_asimd_4_4_4 kernel
maximum difference: 0
duration: 3.72754 seconds
GFLOPS: 3.4339
```

lscpu:

```
Architecture:           aarch64
CPU op-mode(s):         32-bit, 64-bit
Byte Order:              Little Endian
CPU(s):                  4
On-line CPU(s) list:    0-3
Vendor ID:               ARM
Model name:              Cortex-A72
Model:                   3
Thread(s) per core:     1
Core(s) per cluster:    4
Socket(s):               -
Cluster(s):              1
Stepping:                r0p3
CPU max MHz:             1500,0000
CPU min MHz:             600,0000
BogoMIPS:                108.00
Flags:                   fp asimd evtstrm crc32 cpuid
Caches (sum of all):
L1d:                     128 KiB (4 instances)
```

```
L1i:          192 KiB (4 instances)
L2:           1 MiB (1 instance)
Vulnerabilities:
  Itlb multihit: Not affected
  L1tf:          Not affected
  Mds:           Not affected
  Meltdown:      Not affected
  Mmio stale data: Not affected
  Retbleed:      Not affected
  Spec store bypass: Vulnerable
  Spectre v1:     Mitigation; __user pointer sanitization
  Spectre v2:     Vulnerable
  Srbds:         Not affected
  Tsx async abort: Not affected
```

9.2.2

no stack saves \Rightarrow instead only use caller saved registers

performance, optimized:

```
testing gemm_asm_fp_4_4_4 kernel
  maximum difference: 0
  duration: 5.56531 seconds
  GFLOPS: 2.29996
testing gemm_asm_asimd_4_4_4 kernel
  maximum difference: 0
  duration: 2.54585 seconds
  GFLOPS: 5.0278
```

so we achieved roughly a 46% improvement (or took 32% less time)