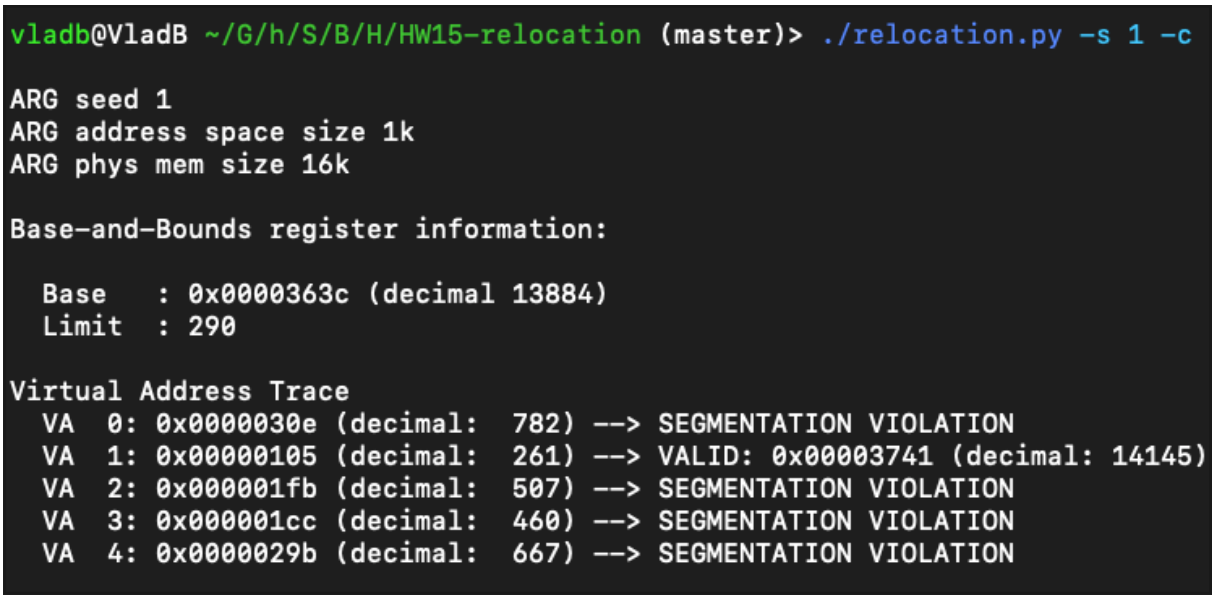
#uni/semester3/Betriebssysteme/chapter15/simulator-fragen

1. Run with seeds 1, 2, and 3, and compute whether each virtual address generated by the process is in or out of bounds. If in bounds, compute the translation.



```
vladb@VladB ~/G/h/S/B/H/HW15-relocation (master)> ./relocation.py -s 1 -c

ARG seed 1
ARG address space size 1k
ARG phys mem size 16k

Base-and-Bounds register information:

  Base   : 0x0000363c (decimal 13884)
  Limit  : 290

Virtual Address Trace
  VA  0: 0x0000030e (decimal:  782) --> SEGMENTATION VIOLATION
  VA  1: 0x00000105 (decimal:  261) --> VALID: 0x00003741 (decimal: 14145)
  VA  2: 0x000001fb (decimal:  507) --> SEGMENTATION VIOLATION
  VA  3: 0x000001cc (decimal:  460) --> SEGMENTATION VIOLATION
  VA  4: 0x0000029b (decimal:  667) --> SEGMENTATION VIOLATION
```

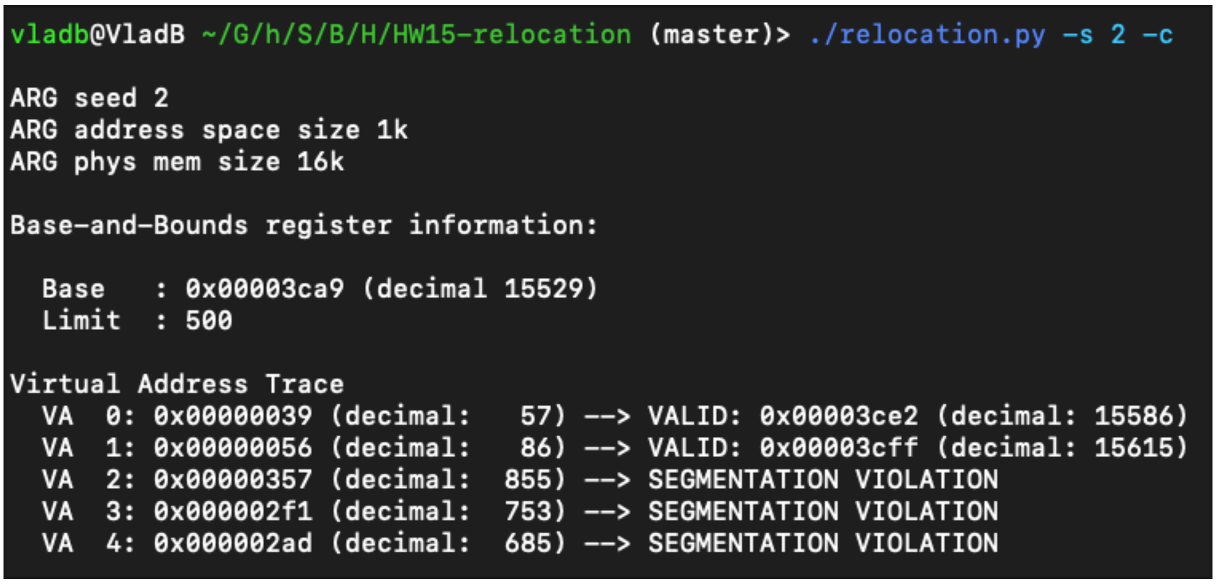
→ Segmentation violation

→ valid; 14145 (base + size virtuelle adresse)

→ Segmentation violation

→ Segmentation violation

→ Segmentation violation



```
vladb@VladB ~/G/h/S/B/H/HW15-relocation (master)> ./relocation.py -s 2 -c

ARG seed 2
ARG address space size 1k
ARG phys mem size 16k

Base-and-Bounds register information:

  Base   : 0x00003ca9 (decimal 15529)
  Limit  : 500

Virtual Address Trace
  VA  0: 0x00000039 (decimal:   57) --> VALID: 0x00003ce2 (decimal: 15586)
  VA  1: 0x00000056 (decimal:   86) --> VALID: 0x00003cff (decimal: 15615)
  VA  2: 0x00000357 (decimal:  855) --> SEGMENTATION VIOLATION
  VA  3: 0x000002f1 (decimal:  753) --> SEGMENTATION VIOLATION
  VA  4: 0x000002ad (decimal:  685) --> SEGMENTATION VIOLATION
```

→ valid; 15586

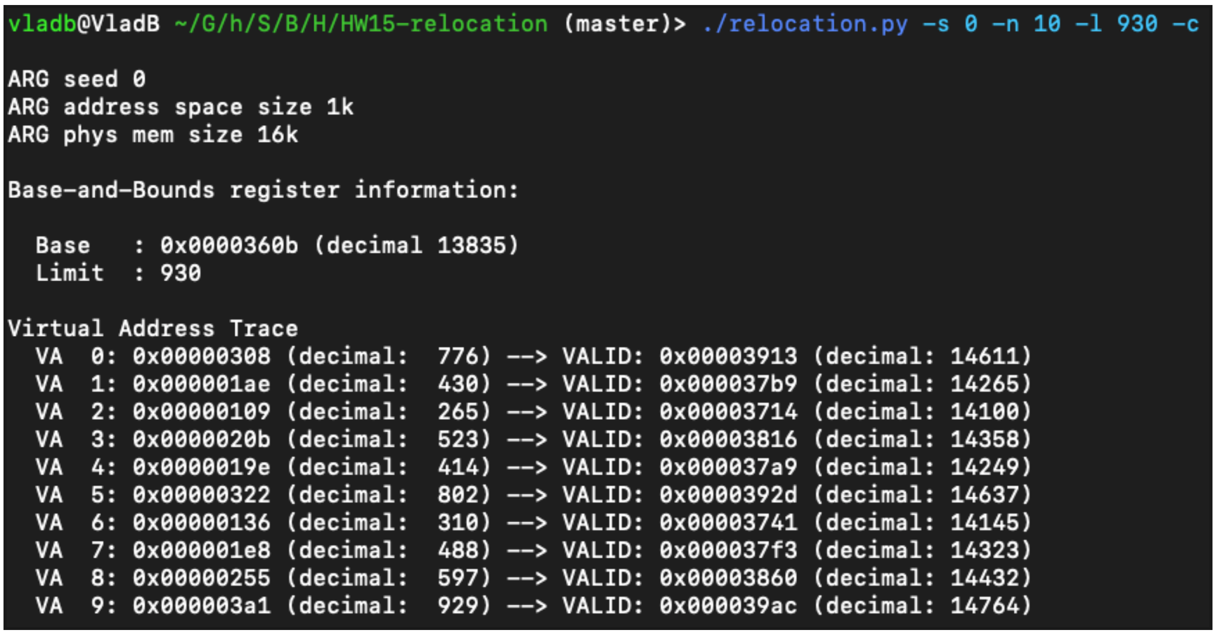
→ valid; 15615

➜ segmentation violation

➜ segmentation violation

➜ segmentation violation

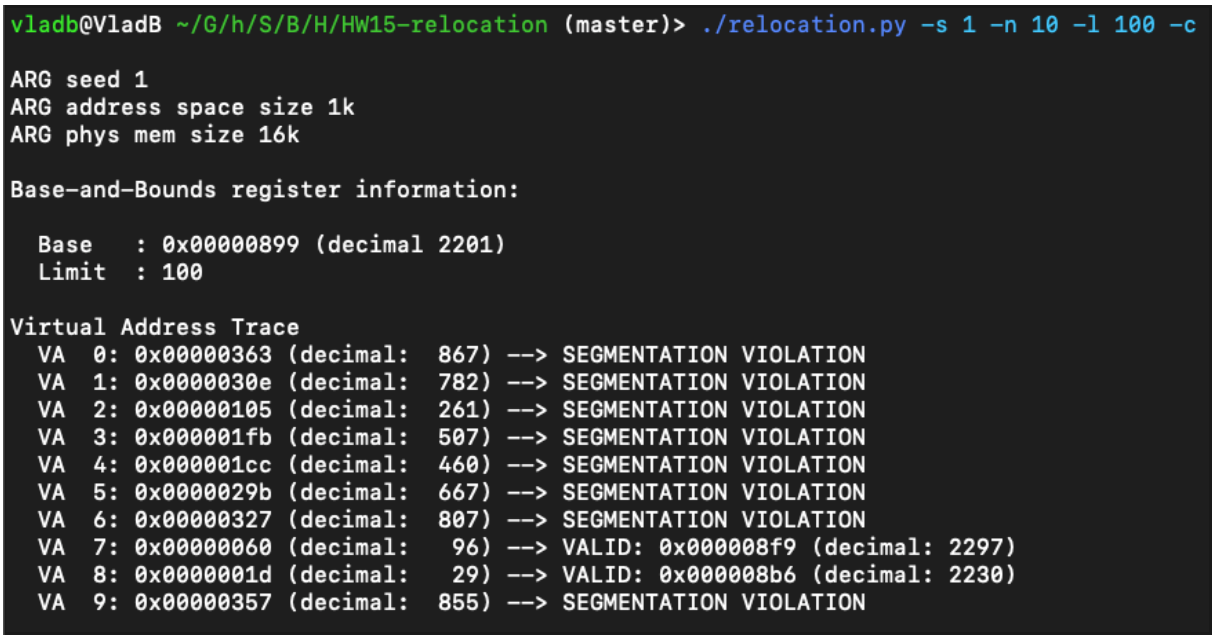
2. Run with these flags: -s 0 -n 10. What value do you have set -l (the bounds register) to in order to ensure that all the generated virtual addresses are within bounds?



```
vladb@VladB ~/G/h/S/B/H/HW15-relocation (master)> ./relocation.py -s 0 -n 10 -l 930 -c

ARG seed 0
ARG address space size 1k
ARG phys mem size 16k

Base-and-Bounds register information:

  Base   : 0x0000360b (decimal 13835)
  Limit  : 930

Virtual Address Trace
  VA  0: 0x00000308 (decimal:  776) --> VALID: 0x00003913 (decimal: 14611)
  VA  1: 0x000001ae (decimal:  430) --> VALID: 0x000037b9 (decimal: 14265)
  VA  2: 0x00000109 (decimal:  265) --> VALID: 0x00003714 (decimal: 14100)
  VA  3: 0x0000020b (decimal:  523) --> VALID: 0x00003816 (decimal: 14358)
  VA  4: 0x0000019e (decimal:  414) --> VALID: 0x000037a9 (decimal: 14249)
  VA  5: 0x00000322 (decimal:  802) --> VALID: 0x0000392d (decimal: 14637)
  VA  6: 0x00000136 (decimal:  310) --> VALID: 0x00003741 (decimal: 14145)
  VA  7: 0x000001e8 (decimal:  488) --> VALID: 0x000037f3 (decimal: 14323)
  VA  8: 0x00000255 (decimal:  597) --> VALID: 0x00003860 (decimal: 14432)
  VA  9: 0x000003a1 (decimal:  929) --> VALID: 0x000039ac (decimal: 14764)
```

➜ Base muss 930 sein, also Prozess mit größtem size + 1

3. Run with these flags: -s 1 -n 10 -l 100. What is the maximum value that base can be set to, such that the address space still fits into physical memory in its entirety?



```
vladb@VladB ~/G/h/S/B/H/HW15-relocation (master)> ./relocation.py -s 1 -n 10 -l 100 -c

ARG seed 1
ARG address space size 1k
ARG phys mem size 16k

Base-and-Bounds register information:

  Base   : 0x00000899 (decimal 2201)
  Limit  : 100

Virtual Address Trace
  VA  0: 0x00000363 (decimal:  867) --> SEGMENTATION VIOLATION
  VA  1: 0x0000030e (decimal:  782) --> SEGMENTATION VIOLATION
  VA  2: 0x00000105 (decimal:  261) --> SEGMENTATION VIOLATION
  VA  3: 0x000001fb (decimal:  507) --> SEGMENTATION VIOLATION
  VA  4: 0x000001cc (decimal:  460) --> SEGMENTATION VIOLATION
  VA  5: 0x0000029b (decimal:  667) --> SEGMENTATION VIOLATION
  VA  6: 0x00000327 (decimal:  807) --> SEGMENTATION VIOLATION
  VA  7: 0x00000060 (decimal:   96) --> VALID: 0x000008f9 (decimal: 2297)
  VA  8: 0x0000001d (decimal:   29) --> VALID: 0x000008b6 (decimal: 2230)
  VA  9: 0x00000357 (decimal:  855) --> SEGMENTATION VIOLATION
```

➜ Frage ist, base so maximal ändern, damit die zwei die valid sind, danach immer noch valid sind

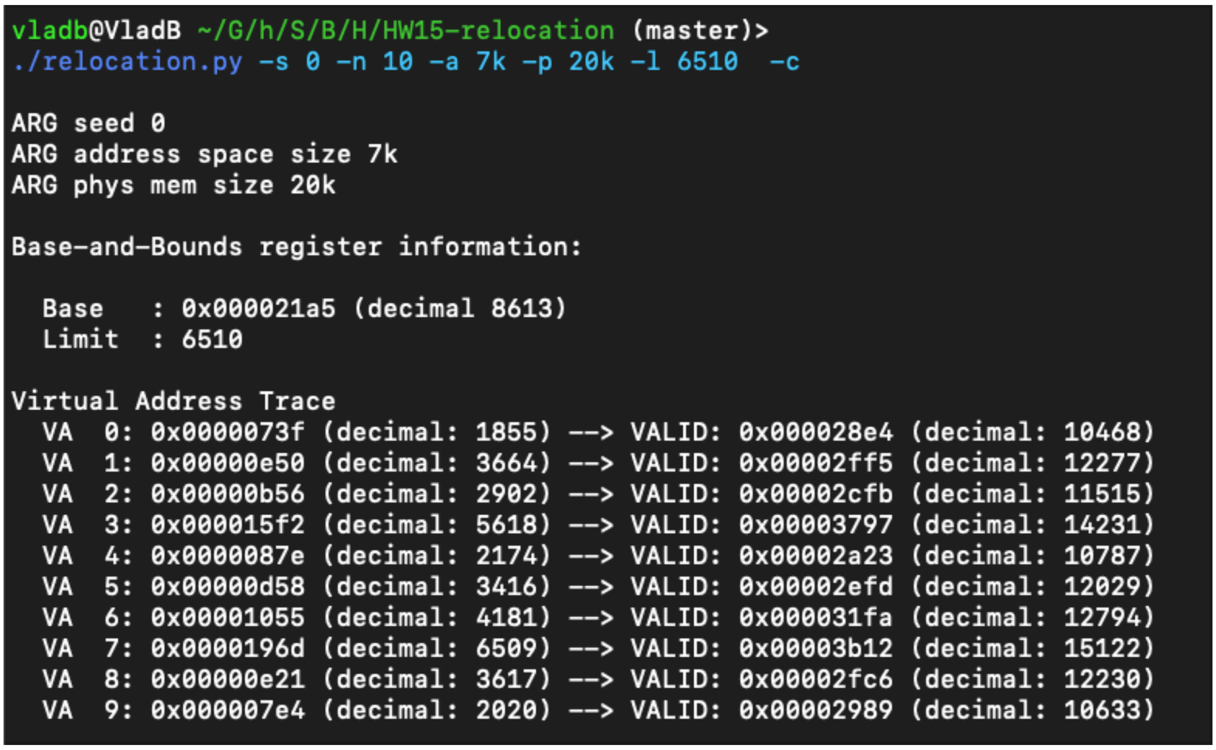
➜ physischen Speicher ist 16 * 1024 Byte = 16384 Byte

➜ 16384 - 100 = 16284 ➜ hier ist ab wo der erste Speicher anfangen soll

Maximales base = physical memory - limit

4. Run some of the same problems above, but with larger address spaces (-a) and physical memories (-p).

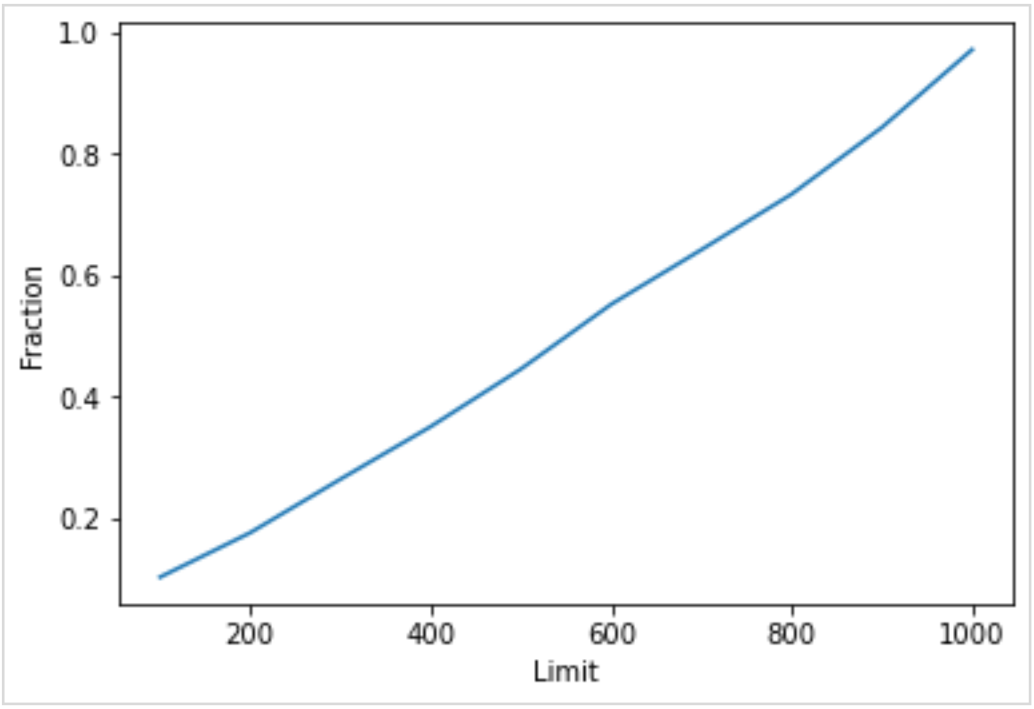
   Limit so auswählen, dass alle virtuellen Adressen valid werden.



```
vladb@VladB ~/G/h/S/B/H/HW15-relocation (master)>
./relocation.py -s 0 -n 10 -a 7k -p 20k -l 6510  -c

ARG seed 0
ARG address space size 7k
ARG phys mem size 20k

Base-and-Bounds register information:

  Base   : 0x000021a5 (decimal 8613)
  Limit  : 6510

Virtual Address Trace
  VA  0: 0x0000073f (decimal: 1855) --> VALID: 0x000028e4 (decimal: 10468)
  VA  1: 0x00000e50 (decimal: 3664) --> VALID: 0x00002ff5 (decimal: 12277)
  VA  2: 0x00000b56 (decimal: 2902) --> VALID: 0x00002cfb (decimal: 11515)
  VA  3: 0x000015f2 (decimal: 5618) --> VALID: 0x00003797 (decimal: 14231)
  VA  4: 0x0000087e (decimal: 2174) --> VALID: 0x00002a23 (decimal: 10787)
  VA  5: 0x00000d58 (decimal: 3416) --> VALID: 0x00002efd (decimal: 12029)
  VA  6: 0x00001055 (decimal: 4181) --> VALID: 0x000031fa (decimal: 12794)
  VA  7: 0x0000196d (decimal: 6509) --> VALID: 0x00003b12 (decimal: 15122)
  VA  8: 0x00000e21 (decimal: 3617) --> VALID: 0x00002fc6 (decimal: 12230)
  VA  9: 0x000007e4 (decimal: 2020) --> VALID: 0x00002989 (decimal: 10633)
```

   ➜ Es hat sich nichts geändert an der Formel, da der Adressbereich und der physikalische Speicher nicht den limit beeinflussen. Also max(limit) + 1 = 6510

5. What fraction of randomly-generated virtual addresses are valid, as a function of the value of the bounds register? Make a graph from running with different random seeds, with limit values ranging from 0 up to the maximum size of the address space.


1.0
0.8
0.6
0.4
0.2
Fraction
200
400
600
800
1000
Limit