Worksheet 09 Memory 3

1. A system uses pure segmentation (no paging). A segment table contains the following segment sizes and starting physical addresses.

	Size	Address
...	...	...
5	830	1640
6	779	1130
7	981	620

Translate each of the following logical addresses (LA) into physical addresses (PA) or enter "illegal" if the LA is not within the segment.

LA = (6, 635)
LA = (7, 1053)

1) segment = 6
offset = 635
offset < size?
635 < 779 ✓

2) segment = 7
offset = 1053
offset < size? : 1053 < 981
Illegal

2. A system uses segmentation with paging. Page size is 512 words. Each segment table entry s contains the size and the frame numbers of the page table (PT) of segment s.

	Size	Frame number of PT
...	...	...
7	...	1
...	...	...
9	...	2

size = 512

For each segment, determine the starting address of PT

For 7 = 1 · 512 = 512 (frame # of PT = 1; size = 512; frame # * size = 512)

For 9 = 2 · 512 = 1024 (" " = 2; " " 4; " " " " = 1024)

3. A system uses segmentation with paging. Page size is 1024 words. A segment table contains the following segment sizes.

	Size	S
...	...	...
3	6080	... 3
...	...	...
5	2700	... 5

S | P | W

Pages rounded up

6080/1024 = 6 — W = 959

2700/1024 = 3 — W = 651

For each segment, determine:

(a) the number of pages occupied by the segment

(b) the largest valid LA = (s, p, w)

6080 − 5 × 1024 = 6080 − 5120 = 960 W = 959

2700 − 2 × 1024 = 2700 − 2048 = 652 W = 651

4. A memory system employs both paging and segmentation:

- The logical address size is 32 bits. $\log_2 32 = 5$
- Page size is 512 words. $\log_2 512 = 9$
- The segment table contains 2^{13} entries. $\log_2 2^{13} = 13$

5	9	13

(a) What is the size of offset (w)?

(b) What is the maximum umber of pages per segment?

a.) $2^{13} \rightarrow$ offset = 13

b.) $2^9 = 512$

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page size = 512 $\therefore$ w = 9 bits

Segment # requires 13 ; offset = 9 bits

32 - 13 - 9 = 10 ; thus each page table contains 2^{10} entries $\Rightarrow$ max # pages per segment