For questions 1 through 4, assume a demand paged virtual memory system with a page size of 100 words (decimal values throughout). A process running on this system generates a sequence of logical addresses, given in the table below.

| 10 | 11 | 104 | 170 | 73 | 309 | 185 | 245 | 246 | 434 | 458 | 364 |

Assume the process is allotted exactly two page frames, and that none of its pages are resident (in page frames) when the process begins execution.

1. Determine the page number corresponding to each logical address and fill them into the table below. This is often called a reference string for the process.

   | | | | | | | | | | | |

2. Consider the reference string determined in problem 1. Determine which references result in page faults, assuming FIFO page replacement is used, indicating your conclusions by placing Fs in the corresponding cells in the table below.

   | | | | | | | | | | | |

   The page fault rate is the number of page faults divided by the total number of references made. What is the page fault rate for this case? Round your answer to an integer percentage.

3. Considering the same reference string, determine which references result in page faults, assuming LRU page replacement is used, indicating your conclusions by placing Fs in the corresponding cells in the table below.

   | | | | | | | | | | | |

   What is the page fault rate for this case? Round your answer to an integer percentage.

4. Considering the same reference string, determine which references result in page faults, assuming optimal page replacement is used, indicating your conclusions by placing Fs in the corresponding cells in the table below.

   | | | | | | | | | | | |

   What is the page fault rate for this case? Round your answer to an integer percentage.
5. How many pages of virtual memory does this system have? Give a simplified decimal answer.

6. How many page frames does this system have? Give a simplified decimal answer.

In each of the following questions you are given a logical address generated by this process. Determine the virtual and physical addresses that correspond to each logical address. If there is no valid virtual or physical address indicate why. Express both physical and virtual addresses in hexadecimal.

7. 3F1 virtual: ________ physical: ________

8. 214 virtual: ________ physical: ________

9. A90 virtual: ________ physical: ________