1. [5 points] What is the decimal value of the unsigned hexadecimal number \( \text{A7} \)?

2. [5 points] Write the decimal number \(-108\) as an 8-bit two’s complement binary number.

3. [5 points] Why does the MIPS multiply instruction use two registers, \( \text{HI} \) and \( \text{LO} \), for the result?

4. [5 points] What decimal number does the 16-bit two’s complement number \(1111111111111001\) represent?

5. [5 points] Assume signed integers are 8 bits and two's complement. What is the range of decimal values that can be represented?

6. [5 points] How many bits are required to represent a register number is a MIPS instruction?

7. [20 points] Write a MIPS assembly language program that reads an integer from the user, counts the number of times that integer can be divided by 2 before reaching zero and prints the count to the console. Your program should use prompts for input and output.

8. [20 points] Consider the definition of \texttt{list} below that contains eight numbers.

   ```
   .data
   list: .word 43, 22, 77, 96, 20, -15, 0, 10
   ```

   Write a MIPS program that writes the list in reverse order to the console (10, 0, -15, etc.) Your program should be general and work if I modify the list of numbers.

9. [10 points] Suppose processor \( P_1 \) has a cycle time of 1 nanosecond and processor \( P_2 \) has a cycle time of 0.5 nanoseconds. Furthermore \( P_1 \) has a CPI of 2.5 for a program and \( P_2 \) has a CPI of 5 for the same program. Which machine is faster for the program and by what factor?

10. [10 points] Assume that the execution time of a program \( p \) on a processor is 200 seconds. Also assume that \( p \) spends 20\% of the execution time doing floating-point multiplications. What would the execution time be if we quadrupled (four times) the performance of floating-point multiplication? What is the overall performance improvement of \( p \) running on the modified processor?

11. [5 points] If the clock cycle time for a processor is \( 2 \times 10^{-9} \) seconds what is the clock rate?