MAΘ HW Set 11

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Problem 1. Convert the following numbers into base 6:

1. 57_8
2. E_{16}
3. 15_{10}

Problem 2. What is the greatest 3-digit base 8 positive integer that is divisible by 5, expressed in base 8?

Problem 3. If A and B are positive integers such that $132_A + 43_B = 69_{A+B}$, find A and B.

Problem 4. For how many positive integers b does the base-b representation of 2013 end in the digit 3?

Problem 5. Let N be the number of positive integers that are less than or equal to 2026 and whose base-2 representation has more 1's than 0's. Find N.

Problem 6. For positive integer N, $N!$ has exactly 21 terminating zeroes when expressed in base 8. Find the largest value of N.

Problem 7. There exist r unique nonnegative integers such that $n_1 > n_2 > \cdots > n_r$ and r unique integers $a_k (1 \leq k \leq r)$ with each a_k either 1 or -1 such that

$$a_1^3 n_1 + a_2 3^{n_2} + \cdots + a_r 3^{n_r} = 2008$$

Find $n_1 + n_2 + \cdots n_r$.