1. Find the sum and product of the following pair: \((2112)_3, (12021)_3\).

2. Prove that for every positive integer \(n\), there are \(n\) consecutive composite integers.  
   [Hint: Consider the \(n\) consecutive integers starting with \((n + 1)! + 2\)]

3. Determine whether the integers in each of these sets are pairwise relatively prime.  
   Explain.
   
   (a) 21, 34, 55  
   (b) 14, 17, 85

4. What is the greatest common divisor of these integers?  
   \(2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13, 2^{11} \cdot 3^9 \cdot 11 \cdot 17^{14}\)

5. What is the least common multiple of these integers?  
   \(2 \cdot 3 \cdot 5 \cdot 7 \cdot 11 \cdot 13, 2^{11} \cdot 3^9 \cdot 11 \cdot 17^{14}\)

6. Use the Euclidean algorithm to find \(\gcd(1529, 14038)\).

8. Find an inverse of 144 modulo 233 (note that 144 and 233 are relatively prime) by first using the Euclidean algorithm to show the gcd of the two is 1, then reverse the steps to find the Bezout coefficients $a$ and $b$ such that $144a + 233b = 1$. Then $a$ would be the inverse of 144 modulo 233.

9. Solve the following congruence using the inverse found in the previous problem.

$144x \equiv 4 \pmod{233}$
10. Show that the positive integers less than 11, except 1 and 10, can be split into pairs of integers such that each pair consists of integers that are inverses of each other modulo 11.

11. Solve the following system of congruences using the method of back substitution.
\[ x \equiv 1 \pmod{2}, \quad x \equiv 2 \pmod{3}, \quad x \equiv 3 \pmod{5}, \quad x \equiv 4 \pmod{11} \]

12. Which integers are divisible by 5 but leave a remainder of 1 when divided by 3?