

Discrete Math Quiz: Number Theory

Name and ID:

1. Find the prime factors of the following two numbers:

(a) $360 =$ _____

(b) $97 =$ _____

2. Compute $(n \bmod d)$ for the following n and d .

(a) $(29 \bmod 3) =$ _____

(b) $(29 \bmod 5) =$ _____

(c) $(29 \bmod 7) =$ _____

(d) $(29^2 \bmod 3) =$ _____

(e) $(29^2 \bmod 5) =$ _____

(f) $(29^2 \bmod 7) =$ _____

3. Find, if it exists, $(n^{-1} \bmod d)$ (inverse of n modulo d) for the following n and d .

(a) $(3^{-1} \bmod 5) =$ _____

(b) $(4^{-1} \bmod 5) =$ _____

(c) $(3^{-1} \bmod 4) =$ _____

(d) $(2^{-1} \bmod 4) =$ _____

4. Compute $\varphi(n)$ for the following n .

(a) $\varphi(11) =$ _____

(b) $\varphi(9) =$ _____

(c) $\varphi(10) =$ _____

(d) $\varphi(36) =$ _____

5. Compute $(n^k \bmod d)$ for the following n , k , and d .

(a) $(2^{20} \bmod 3) =$ _____

(b) $(11^{12} \bmod 13) =$ _____

(c) $(1001^2 \bmod 6) =$ _____

6. Find the greatest common divisors for the following set of numbers.

(a) $\gcd(16, 27) =$ _____

(b) $\gcd(14, 21, 35, 42) =$ _____

7. Find the least common multiple in the first part and answer the question in the second part.

(a) $\text{lcm}(14, 21, 35) =$ _____

(b) What is the smallest integer $n > 2$ for which $(n \bmod 4) = (n \bmod 6) = 2$? _____

8. Bonus: Compute $6! \bmod 7 =$ _____