

Name:

Number Theory for Teachers–Practice Exam 2

For full credit, all work must be shown and clearly presented. No calculators.
--

1	
2	
3	
4	
5	

1. Using that 3 is a generator of U_{31} , make a table of logarithms. Use your table of logarithms to solve the following congruence:

$$2x^3 \equiv 4 \pmod{31}$$

(10 points)

2. How many 10th roots of 1 are there mod 151? (Note: 151 is prime. You do not need to find the roots.) Explain your answer. (10 points)

3. How many solutions are there to the following congruences? You do not need to prove your answer, but show all relevant computations. (5 points each)

(a) $15x \equiv 20 \pmod{58}$

(b) $15x \equiv 20 \pmod{57}$

(c) $15x \equiv 21 \pmod{60}$

(d) $6307x \equiv 21 \pmod{6853}$

4. Compute $3^{3^3} \bmod 10$. (Hint: To do this computation, you should consider the exponent mod what number?) (10 points)

5. Clearly state and prove a divisibility test for 11. (10 points)