

Practice sheet for Math 3336 Fall 2016

October 24, 2016

1. Define for integers a and b the relation $a|b$.
Prove that $1|a$ and $a|0$.
2. Let a and b be integers and let m be a positive integer. Define that a is congruent to b modulo m . What are the elements congruent to 0? Prove that every integer a is congruent mod m to a unique $0 \leq r < m$.
3. Evaluate these quantities.
 - a. $13 \bmod 3$
 - b. $-97 \bmod 11$
 - c. $155 \bmod 19$
 - d. $-221 \bmod 23$
4. Convert the decimal expansion of each of these integers to a binary expansion.
 - a. 22
 - b. 100
 - c. 60
 - d. 9
5. Express the greatest common divisor of each of these pairs of integers as a linear combination of these integers.
 - a. 10, 11
 - b. 9, 16
 - c. 0, 20
 - d. 99, 101
6. Find all invertible elements and their inverses in
 - a. (\mathbb{Z}_{10}, \cdot)
 - b. (\mathbb{Z}_{11}, \cdot)
7. Solve mod 5 the linear equation $2x + 3 = 1$
8. Which integers leave a remainder 1 when divided by 2 and also leave a remainder 1 when divided by 3.