
Math 218: Elementary Number Theory

HOMEWORK 14 : DUE NOVEMBER 20

- 3.1 #2. Find the solution(s) of the following congruences by hand (don't just search for solutions, be clever!)
- (a) $5x \equiv 6 \pmod{21}$
 - (b) $47x \equiv -15 \pmod{21}$
 - (c) $7x \equiv 3 \pmod{50}$
 - (d) $11x \equiv 21 \pmod{59}$
- 3.1 #4. Read Example 3.1.5 on page 107 in the book.
- (a) Describe carefully what went wrong in this problem.
 - (b) How can you choose a different factor to multiply by to fix the problem in (a)?
- 3.1 #5. We can count the total number of possible congruences of the form $ax \equiv b \pmod{24}$ to be $23 \cdot 24$ since we can pick 23 values for a and 24 values for b .
- (a) How many of these $23 \cdot 24$ possible congruence have at least one solution?
 - (b) How many of those in (a) have a unique solution?
- 3.1 #7. Use the congruence $612x \equiv 156 \pmod{84}$ to find *integer* solutions x and y to the equation $612x + 84y = 156$.
- 3.1 #8. Use Theorem 3.1.1 to formulate a condition for when the equation $ax + by = n$ has a solution.