

**Homework 3**due **in class** Thursday, June 28, 2007

Hand in:

From the Study Guide: page 13, §1.3 #48, 49, 50, 54, 55

48. Solve the following congruence.  $25x \equiv 45 \pmod{60}$
49. Find the additive orders of each of the following elements, by solving the appropriate congruences#.
- (a) 4, 5, 6 modulo 24
  - (b) 4, 5, 6 modulo 25
50. Find the additive orders of each of the following elements, by solving the appropriate congruences.
- (a) 7, 8, 9 modulo 24
  - (b) 7, 8, 9 modulo 25
54. Solve the following system of congruences:

$$x \equiv 13 \pmod{25} \quad x \equiv 9 \pmod{18}$$

55. Solve the following system of congruences:

$$x \equiv 9 \pmod{25} \quad x \equiv 13 \pmod{18}$$

From the Study Guide: pages 15-16, §1.4 #45, 46, 47, 49, 50

45. Find the multiplicative inverses of the given elements (if possible).
- (a) [12] in  $\mathbf{Z}_{15}$
  - (b) [14] in  $\mathbf{Z}_{15}$
  - (c) [7] in  $\mathbf{Z}_{15}$
  - (d) [12] in  $\mathbf{Z}_{23}$
  - (e) [14] in  $\mathbf{Z}_{32}$
46. Find the multiplicative orders of the following elements.
- (a) [5] and [7] in  $\mathbf{Z}_{16}^\times$ .
  - (b) [5] and [7] in  $\mathbf{Z}_{17}^\times$ .
  - (c) [5] and [7] in  $\mathbf{Z}_{18}^\times$ .
47. Find the multiplicative order of each element of  $\mathbf{Z}_8^\times$  and  $\mathbf{Z}_{10}^\times$ .
49. Is  $\mathbf{Z}_{14}^\times$  cyclic?
50. Is  $\mathbf{Z}_{16}^\times$  cyclic?

From the textbook: §1.3 #13 and §1.4 #28