ÇANKAYA UNIVERSITY
Department of Mathematics and Computer Science

MATH 365
Elementary Number Theory I
Second Midterm Practice Exam D

December 17, 2007
16:40 – 18:00

Solve the systems of the first 12 problems.

1.
$$\begin{aligned} z &\equiv 20 \pmod 9 \\ z &\equiv -3 \pmod{10} \end{aligned}$$
$0 \leq z < 90$

2.
$$\begin{aligned} z &\equiv -2 \pmod 8 \\ z &\equiv 4 \pmod{11} \end{aligned}$$
$0 \leq z < 88$

3.
$$\begin{aligned} z &\equiv 2 \pmod 9 \\ x &\equiv -2 \pmod{11} \end{aligned}$$
$0 \leq x < 150$

4.
$$\begin{aligned} x &\equiv 8 \pmod{13} \\ x &\equiv 10 \pmod 5 \end{aligned}$$
$0 \leq x < 50$

5.
$$\begin{aligned} x &\equiv 2 \pmod 3 \\ x &\equiv 5 \pmod 5 \\ x &\equiv 2 \pmod 7 \end{aligned}$$
$0 < x < 200$

6.
$$\begin{aligned} x &\equiv 3 \pmod 4 \\ x &\equiv 3 \pmod 5 \\ x &\equiv 7 \pmod 7 \end{aligned}$$
$0 < x < 200$

7.
$$\begin{aligned} x &\equiv 1 \pmod 5 \\ x &\equiv -2 \pmod 7 \\ x &\equiv 7 \pmod 2 \end{aligned}$$
$0 \leq x < 70$

8.
$$\begin{aligned} t &\equiv 2 \pmod 3 \\ t &\equiv 1 \pmod 4 \\ t &\equiv -1 \pmod 5 \\ 0 &\le t < 60 \end{aligned}$$

9.
$$\begin{aligned} z &\equiv 3 \pmod 2 \\ z &\equiv 1 \pmod 3 \\ z &\equiv -1 \pmod 5 \\ z &\equiv -4 \pmod 7 \\ 0 &\le z < 210 \end{aligned}$$

10.
$$\begin{aligned} q &\equiv 1 \pmod 3 \\ q &\equiv 2 \pmod 4 \\ q &\equiv -5 \pmod 5 \\ q &\equiv 5 \pmod 7 \\ 0 &\le q < 420 \end{aligned}$$

11.
$$\begin{aligned} q &\equiv 3 \pmod 4 \\ q &\equiv 5 \pmod 7 \\ q &\equiv -3 \pmod{11} \\ 0 &\le q < 502 \end{aligned}$$

12.
$$\begin{aligned} e &\equiv 3 \pmod 8 \\ e &\equiv 6 \pmod 7 \\ e &\equiv 2 \pmod 5 \\ 0 &\le e < 316 \end{aligned}$$

In the next six problems, tell whether the given list is a reduced residue system modulo 5.

13. $-1, 0, 1, 2$

14. $-2, 0, 2, 4$

15. $2, 4, 6, 8$

16. $4, 6, -4, 2$

17. $7, 14, 21$

18. $2, 4, 6, 8, 12$

19. Solve
$$\begin{aligned} x &\equiv 2 \pmod 8 \\ x &\equiv 1 \pmod 7 \\ x &\equiv 3 \pmod 6 \\ 0 &\le x < 336 \end{aligned}$$

20. Solve

$$
\begin{aligned}
3x &\equiv 9 \pmod{6} \\
2x &\equiv 1 \pmod{5} \\
x &\equiv 2 \pmod{7} \\
0 &\leq x < 210
\end{aligned}
$$