Exercises: Modular arithmetic part 1

1. Which of these congruences are true?

   (a) $5 \equiv 29 \mod 12$ True

   (b) $33 \equiv 2 \mod 15$ False

   (c) $-3 \equiv 30 \mod 11$ True

   (d) $-2 \equiv -50 \mod 26$ False

   (e) $50 \equiv 24 \mod 26$ True

2. Write these congruences, $a \equiv b \mod m$, in the form $a = qm + b$.

   (a) $19 \equiv 4 \mod 5$;

   $19 = (3)(5) + 4$

   (b) $200 \equiv 50 \mod 15$;

   $200 = (10)(15) + 50$

   (c) $-10 \equiv 2 \mod 3$;

   $-10 = (-4)(3) + 2$

   (d) $-20 \equiv -6 \mod 7$;

   $-20 = (-2)(7) - 6$

   (e) $72 \equiv 20 \mod 26$;

   $72 = (2)(26) + 20$

3. Complete the following congruences with the smallest positive solution.

   (a) $40 \equiv 4 \mod 9$;

   (b) $312 \equiv 12 \mod 15$;

   (c) $312 \equiv 11 \mod 7$;

   (d) $-1 \equiv 25 \mod 26$;

   (e) $55 \equiv 3 \mod 26$.

4. Write three possible solutions for each of these congruences:

   (a) $2 \equiv \quad \mod 16$; 2, 18, 34

   (b) $-60 \equiv \quad \mod 26$; -60, -35, -10

   (c) $27 \equiv \quad \mod 26$. 1, 27, 43

5. Write out all the possible remainders modulo 7.

   0, 1, 2, 3, 4, 5, 6.