

Exercises: Modular arithmetic part 1

1. Which of these congruences are true?

(a) $5 \equiv 29 \pmod{12}$ True

(b) $33 \equiv 2 \pmod{15}$ False

(c) $-3 \equiv 30 \pmod{11}$ True

(d) $-2 \equiv -50 \pmod{26}$ False

(e) $50 \equiv 24 \pmod{26}$ True

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

(a) $19 \equiv 4 \pmod{5}$;

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

(b) $200 \equiv 50 \pmod{15}$;

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

(c) $-10 \equiv 2 \pmod{3}$;

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

(d) $-20 \equiv -6 \pmod{7}$;

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

(e) $72 \equiv 20 \pmod{26}$;

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

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

(a) $40 \equiv 4 \pmod{9}$;

(b) $312 \equiv 12 \pmod{15}$;

(c) $312 \equiv 4 \pmod{7}$; (correction to video solution)

(d) $-1 \equiv 25 \pmod{26}$;

(e) $55 \equiv 3 \pmod{26}$.

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

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

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

(c) $27 \equiv \quad \text{mod } 26$. 1, 27, 53 (correction to video solution)

5. Write out all the possible remainders modulo 7.

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