1. 1. a. $9 \mod 4 = [1]_4$
      b. $29 \mod 5 = [4]_5$
      c. $24 \mod 9 = [6]_9$
   2. a. $49 \equiv 7k \mod 7 \; \forall \; k \in \mathbb{Z}$
      b. $80 \equiv 15k + 5 \mod 15 \; \forall \; k \in \mathbb{Z}$
      c. $43 \equiv 7k + 1 \mod 7 \; \forall \; k \in \mathbb{Z}$
   3. a. $-18 \;\text{tmod}\; 7 \equiv \text{undefined}$
      b. $63 \equiv \text{undefined} \;\text{tmod}\; 5$
      c. $-12 \;\text{tmod}\; 14 = 2$

2. - $195 \equiv 6 \mod 10$ is false
   - $195 \equiv 5 \mod 10$‘′ is true
   - $195 \equiv -6 \mod 10$ is false
   - $(195 \mod 10) = 5$ is true
   - $(195 \mod 10) = -5$ is false
   - $(195 \;\text{tmod}\; 10) = -5$ is true

3. -
   $$\begin{aligned} maxint + 1 \;\text{tmod}\; K &= (\frac{K}{2} - 1) + 1 \;\text{tmod}\; K \\ &= \frac{K}{2} \;\text{tmod}\; K \\ &= -\frac{K}{2} \\ &= minint \end{aligned}$$
   -
   $$\begin{aligned} -minint \;\text{tmod}\; K &= -(-\frac{K}{2}) \;\text{tmod}\; K \\ &= \frac{K}{2} \;\text{tmod}\; K \\ &= -\frac{K}{2} \\ &= minint \end{aligned}$$

4. a. $[1100111] = -25$
   b. $[011110] = 30$
   c. $[11111111111111111110111110110] = -266$

5.
$$\langle a \rangle - \langle b \rangle = \langle a \rangle + \langle \bar{b} \rangle + 1$$

If we try to subtract $\langle 0010 \rangle$ from $\langle 0100 \rangle$ with the given formula, we get

$$\begin{aligned} \langle 0100 \rangle - \langle 0010 \rangle &= \langle 0100 \rangle + \langle \overline{0010} \rangle + 1 \\ &= \langle 0100 \rangle + \langle 1101 \rangle + 1 \\ = \langle 0100 \rangle + \langle 1110 \rangle &= \langle 10010 \rangle \implies \\ 4 - 2 &= 18 \end{aligned}$$

which clearly, is not true, therefore the above equation is not true for all $a, b \in \mathbb{B}^n$.

6. a.

$$\begin{aligned}\langle 1001101\rangle - \langle 0111101\rangle &= \langle 1001101\rangle + \langle\overline{0111101}\rangle + 1 \mod 2^7\\ &= \langle 1001101\rangle + \langle 1000010\rangle + 1\\ &= \langle 1001101\rangle + \langle 1000011\rangle\\ &= \langle 0010000\rangle = 16_{10}\end{aligned}$$

b.

$$\begin{aligned}\langle 101111\rangle - \langle 110\rangle &= \langle 101111\rangle - \langle 000110\rangle\\ &= \langle 101111\rangle + \langle\overline{000110}\rangle + 1 \mod 2^6\\ &= \langle 101111\rangle + \langle 111001\rangle + 1\\ &= \langle 101111\rangle + \langle 111010\rangle\\ &= \langle 101001\rangle = 41_{10}\end{aligned}$$

c.

$$\begin{aligned}\langle 110011\rangle - \langle 01111\rangle &= \langle 110011\rangle - \langle 001111\rangle\\ &= \langle 110011\rangle + \langle\overline{001111}\rangle + 1 \mod 2^6\\ &= \langle 110011\rangle + \langle 110000\rangle + 1\\ &= \langle 110011\rangle + \langle 110001\rangle\\ &= \langle 100100\rangle = 36_{10}\end{aligned}$$

7. $7 \cdot 3$