

$$\equiv 3 \pmod{5}$$

$\therefore$ 余りは3.

(3)

$$2^3 = 8 \equiv 2 \pmod{6} \text{より,}$$

$$2^{123} = (2^3)^{41}$$

$$\equiv 2^{41} \pmod{6}$$

$$\equiv (2^3)^{13} \times 2^2 \pmod{6}$$

$$\equiv 2^{15} \pmod{6}$$

$$\equiv (2^3)^5 \pmod{6}$$

$$\equiv 2^5 \pmod{6}$$

$$\equiv 2^3 \times 2^2 \pmod{6}$$

$$\equiv 2^3 \pmod{6}$$

$$\equiv 2 \pmod{6}$$

$\therefore$ 余りは2.

(4)

$$2^3 = 8 \equiv 1 \pmod{7} \text{より,}$$

$$2^{123} = (2^3)^{41}$$

$$\equiv 1^{41} \pmod{7}$$

$$\equiv 1 \pmod{7}$$

$\therefore$ 余りは1.

(5)

$$2^5 = 32 \equiv -1 \pmod{11} \text{より,}$$

$$2^{123} = (2^5)^{24} \times 2^3$$

$$\equiv (-1)^{24} \times 8 \pmod{11}$$

$$\equiv 8 \pmod{11}$$

$\therefore$ 余りは8.

問1. 12

(1)

$$2^5 = 32 \equiv 2 \pmod{10} \text{より,}$$

$$2^{100} = (2^5)^{20}$$

$$\equiv 2^{20} \pmod{10}$$

$$\equiv (2^5)^4 \pmod{10}$$