

## 4.1 Questions

Q13 (a)  $a \equiv 4 \pmod{13}$ ,  $b \equiv 9 \pmod{13}$   
 $c \equiv 9a \pmod{13}$

$$\begin{aligned} c &\equiv 9a \pmod{13} \\ c &\equiv 9 \cdot 4 \pmod{13} \\ c &\equiv 36 \pmod{13} \end{aligned}$$

$$c \pmod{13} = 36 \pmod{13}$$

$$c \equiv 10 \quad \checkmark$$

$$\begin{array}{r} 0 \\ 13 \overline{)c} \\ \hline c \end{array}$$

b)  $c \equiv 11 \pmod{13}$

$$\begin{aligned} c &\equiv 11 \cdot 9 \pmod{13} \\ c &\equiv 99 \pmod{13} \end{aligned}$$

$$\begin{array}{r} 8 \\ 13 \overline{)99} \\ \hline 91 \\ \hline 8 \end{array}$$

$$c \pmod{13} = 99 \pmod{13}$$

$$c \equiv 8 \quad \checkmark$$

c)  $c \equiv a+b \pmod{13}$

$$a+b \equiv 13 \pmod{13}$$

$$c \equiv a \pmod{13} + b \pmod{13}$$

$$c \equiv 4 \pmod{13} + 9 \pmod{13}$$

$$c \equiv 13 \pmod{13}$$

$$c \pmod{13} = 13 \pmod{13}$$

$$\begin{array}{l} c=13, c=0 \\ \text{out of} \\ \text{range} \end{array}$$

$$\begin{array}{r} 0 \\ 13 \overline{)c \geq 0} \\ \hline 0 \\ \hline c \end{array} \quad \begin{array}{r} 1 \\ 13 \overline{)c = 13} \\ \hline 13 \\ \hline 0 \end{array}$$

d)  $c \equiv 2a+3b \pmod{13}$

$$c \equiv 2(4)+3(9) \pmod{13}$$

$$c \equiv 8+27 \pmod{13}$$

$$c \equiv 35 \pmod{13}$$

$$c \equiv 9 \quad \checkmark$$

e)  $c \equiv a^2+b^2 \pmod{13}$

$$c \equiv 4^2+9^2 \pmod{13}$$

$$c \equiv 16+81 \pmod{13}$$

$$c \equiv 97 \pmod{13} \quad 64$$

$$c \pmod{13} = 97 \pmod{13}$$

$$c \pmod{13} = 6 \rightarrow c \equiv 6$$

Q14 - (a)  $a \equiv 11 \pmod{19}$ ,  $b \equiv 3 \pmod{19}$

$$c \equiv 13a \pmod{19}$$

$$c \equiv 13(11) \pmod{19}$$

$$c \equiv 143 \pmod{19}$$

$$c \pmod{19} = 143 \pmod{19}$$

$$c \equiv 10 \quad \checkmark$$

$$\begin{array}{r} 19 \\ \overline{)143} \\ 13 \\ \hline 10 \\ \hline 10 \\ \hline 0 \end{array}$$

⑥ ::

19

7

133

5

19

6

114

19

7

153

