4.1 Questions

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

$c \equiv 9a \pmod{13}$

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

$c \equiv 36 \pmod{13}$

$c \bmod 13 = 36 \bmod 13$

$c = 10$ ✓

$13 \overline{)\, c}$, 0, c

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

$c \equiv 11 \cdot 9 \pmod{13}$

$c \equiv 99 \pmod{13}$

$\rightarrow 8$

$c \bmod 13 = 99 \bmod 13$

$13 \overline{)\, 99}$, 7, 91

$c = 8$ ✓

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

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

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

$c \equiv 13 \pmod{13}$

$c \bmod 13 = 13 \bmod 13$

$= 0$

$c = 13$ ✗ out of range , $c = 0$ ✓

$13 \overline{)\, c = 0}$, 0, 0 $\quad$ $13 \overline{)\, c = 13}$, 1, 13, 0

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

$c \equiv 2(4) + 3(9) \bmod 13$

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

$c \equiv 35 \pmod{13}$

$c = 9$ ✓

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

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

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

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

$c \bmod 13 = 97 \bmod 13$

$c \bmod 13 = 6 \rightarrow c = 6$

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

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

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

$c \equiv 143 \pmod{19}$

$19 \overline{)\, 143}$, 7, 133, 10

$c \bmod 19 = 143 \bmod 19$

$= 10$

$c = 10$ ✓

③ 19, 7, 133

⑤ 19, 6, 114

⑦ 19, 7, 133