Solutions to Attendance Quiz # 9 for Dr. Z.'s Number Theory Course for Oct. 3, 2013

1. Find $31 + 3 + 14 + 34 + 23 \pmod{35}$

Sol. to 1: $31 + 3 \equiv 34 \pmod{35}$, $34 + 14 = 48 \equiv 13 \pmod{35}$, $13 + 34 \equiv 12 \pmod{35}$, $12 + 23 = 35 \equiv 0 \pmod{35}$.

Ans. to 1: $0 \pmod{35}$

2. Find the last (decimal) digit of 7^{40}

Sol. to 2: $40 = 32 + 8$.

$7^1 \equiv 7 \pmod{10}$,

$7^2 \equiv 9 \pmod{10}$,

$7^4 \equiv 9^2 \pmod{10} = 1 \pmod{10}$,

$7^8 \equiv 1^2 \pmod{10} = 1 \pmod{10}$,

$7^{16} \equiv 1^2 \pmod{10} = 1 \pmod{10}$,

$7^{32} \equiv 1^2 \pmod{10} = 1 \pmod{10}$.

So

$$7^{40} \pmod{10} \equiv 7^{32} \cdot 7^8 \equiv 1 \cdot 1 \pmod{10} \equiv 1 \pmod{10}$$

.

Ans. to 2: 1

Second way: Since $7^4 \equiv 1 \pmod{10}$, we have: $7^{40} \equiv 1^{10} \pmod{10} = 1$.