Solution to 3rd Quiz:

Compute the following modulo 17, giving your answer as a number between 0 and 16 (inclusive)

$8+19 \mod 17$
$8-19 \mod 17$
$8 \times 19 \mod 17$
$8/19 \mod 17$.

Answer: 1) $(8+19) = 27 \equiv 27-17 \mod 17$
$\equiv 10 \mod 17$

or $(8+19) \mod 17$
$\equiv (8 \mod 17) + (19 \mod 17) \mod 17$
$\equiv 8 + 2 \mod 17$
$\equiv 10 \mod 17$

2) $(8-19) = (-11) \equiv -11+17 = 6 \mod 17$

OR $8-19 \equiv x \mod 17$
means $8-19-x$ is divisible by 17
which is same as saying $-8+19+x$ is divisible by 17
so $11+x$ is divisible by 17
x must be a positive number, or 0. the only value with $0 \le x \le 16$ is $x = 6$. since $11+6$ is divisible by 17

OR $(8-19) \mod 17 \equiv (8 \mod 17) - (19 \mod 17) \mod 17$
$\equiv 8 - 2 \mod 17$
$\equiv 6 \mod 17$

3) $8 \times 19 = 152 = 17 \times 8 + 16 \equiv 16 \mod 17$

or $8 \times 19 \bmod 17 \equiv (8 \bmod 17) \times (19 \bmod 17)$

$\equiv (8 \bmod 17) \times (2 \bmod 17)$

$\equiv 16 \mod 17.$

(note, $16 \equiv -1 \mod 17$, but question asks for a positive number)

4) $8/19 \equiv x \mod 17$

means $8 \equiv 19 \times x \mod 17$, so $19x - 8$ is divisible by

can try values of x on calculator

$19 \times 1 - 8 = 11$

$19 \times 2 - 8 = 38 - 8 = 30 = 17 + 13$

$19 \times 3 - 8 = 57 - 8 = 49 = 17 \times 2 + 11$

$19 \times 4 - 8 = 76 - 8 = 68 = 17 \times 4$

since $19 \times 4 - 8$ is divisible by 17, $8/19 \equiv 4 \mod 17$

or $(8/19) \bmod 17 \equiv \dfrac{8 \bmod 17}{19 \bmod 17} \equiv \dfrac{8}{2} \bmod 17 \equiv 4 \mod 17$

or $8/19 \equiv x \mod 17$

means $8 \equiv x \times 19 \mod 17$

mean $8 \bmod 17 \equiv (x \bmod 17) \times (19 \bmod 17)$

$8 \bmod 17 \equiv (x \bmod 17) \times (2 \bmod 17)$

$8 \equiv x \times 2 \mod 17$

this has a solution $x = 4$.

Summary solutions are

$10 \mod 17$, $6 \mod 17$, $16 \mod 17$, $4 \mod 17$