1. *A grocer orders apples and oranges at a total cost of \$8.39. If apples cost 25 cents each and oranges cost 18 cents each, how many of each type of fruit did the grocer order? Is there more than one possibility? Explain.*

   Your answer here...

2. *Define the set*

$$\mathbb{Z}\Big/_{m\mathbb{Z}} := \{0, 1, 2, \ldots, m-1\}$$

(pronounced "zee mod m zee" in America and "zed mod m zed" in some other parts of the English-speaking world). For any $a, b \in \mathbb{Z}/m\mathbb{Z}$, define $a+b$ to be the unique element in $\mathbb{Z}/m\mathbb{Z}$ which is congruent to $a+b$ (usual addition in $\mathbb{Z}$) modulo m. Define $a \cdot b$ to be the unique element in $\mathbb{Z}/m\mathbb{Z}$ which is congruent to ab (usual multiplication in $\mathbb{Z}$) modulo m.

(a) *Fill out the following table of addition for $\mathbb{Z}/5\mathbb{Z}$. In the row corresponding to a and column corresponding to b, put $a+b$. You can just fill out the table, you don't have to show work here.*

$+$	0	1	2	3	4
0					
1					
2					
3					
4					

(b) *Fill out the following table of multiplication for $\mathbb{Z}/5\mathbb{Z}$. In the row corresponding to a and column corresponding to b, put $a \cdot b$. You can just fill out the table, you don't have to show work here.*

$\cdot$	0	1	2	3	4
0					
1					
2					
3					
4					

3. *Show that if* $a \equiv b \mod m$ *and* $d \mid m$*, then* $a \equiv b \mod d$*. Show that it is not the case that if* $a \equiv b \mod d$*, then* $a \equiv b \mod kd$*.*

   Your answer here...

4. *Suppose that* $a, b, c, d, m \in \mathbb{Z}$ *with* $a \equiv b \mod m$ *and* $c \equiv d \mod m$. *Show that* $ac \equiv bd \mod m$.

   Your answer here...

5. *Suppose that* $a, b, k, m \in \mathbb{Z}$ *with* $k \geq 0$ *and* $m \geq 1$. *Show that if* $a \equiv b \mod m$, *then* $a^k \equiv b^k \mod m$. *You may use the result of the previous problem even if you were unable to prove it.*

   Your answer here...

6. *Show that, for* $n \geq 0$,

$$7^n \equiv \begin{cases} 1 \mod 100 & \text{if } n \equiv 0 \mod 4 \\ 7 \mod 100 & \text{if } n \equiv 1 \mod 4 \\ 49 \mod 100 & \text{if } n \equiv 2 \mod 4 \\ 43 \mod 100 & \text{if } n \equiv 3 \mod 4 \end{cases}$$

Your answer here...