Problem 28.
For all integers a, b, and c, if $a \mid bc$ then $a \mid b$ or $a \mid c$.
False

Counter-example. Let $a = 4$, $b = 6$, $c = 10$

$$a \mid bc = 4|60$$
$$4 \nmid 6 \;\&\; 4 \nmid 10$$

$\therefore$ by counter-example, the statement is false.

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Problem 29.
Theorem: For all integers a and b, if $a \mid b$ then $a^2 \mid b^2$.

Proof. Let $a, b \in \mathbb{Z} \ni a$ divides b
By definition of divisibility, $\exists\, k \in \mathbb{Z} \ni b = ak$

$$b^2 = a^2k^2 \qquad \text{by substitution}$$

Let $t = (k^2)$, $t \in \mathbb{Z}$ by the closure of integers by multiplication
Therefore, $a^2 \mid b^2$ by definition of divisibility since $b^2 = a^2t$ where $t \in \mathbb{Z}$ by substitution

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