

1. Let  $a \in \mathbb{Z}$ . Show that if  $a$  divided by 5 leaves a remainder of 2 then  $5|(a^2 - 4)$ .
2. Let  $m \in \mathbb{Z}$ . Prove if  $3 \nmid m$  then  $3 \nmid m^2$ .
3. Prove or provide a counterexample: Let  $a, b, c \in \mathbb{Z}$ . If  $a|bc$  then either  $a|b$  or  $a|c$ .
4. Let  $a \in \mathbb{Z}$ . Prove that  $a^3 \equiv a \pmod{3}$ .
5. Show that if  $a \in \mathbb{Z}$  then  $a^2 \not\equiv 2 \pmod{4}$  and  $a^2 \not\equiv 3 \pmod{4}$ .