8. True or False. If true, **prove** it. If false, then give a **counterexample**. For all integers a, and b, if $a|10b$, then $a|10$ or $a|b$.

False

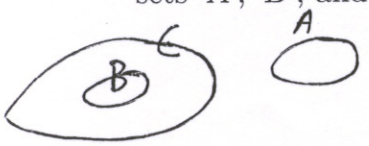
Take $a=20$ and $b=2$

then $a|10b$ (because $20|20$)

but $a \nmid 10$ (because $20 \nmid 10$)

and $a \nmid 2$ (because $20 \nmid 2$).

9. True or False. If true, **prove** it. If false, then give a **counterexample**. For all sets A, B, and C, if $B \subseteq C$ and $A \cap C = \emptyset$, then $A \cap B = \emptyset$.



True

Proof by contradiction.

Suppose $A \cap B \neq \emptyset$. Then

that is an element $x \in A \cap B$

So $x \in A$ and $x \in B$

but $B \subseteq C$ so $x \in C$

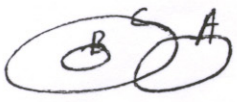
Thus $x \in A$ and $x \in C$

$\therefore x \in A \cap C = \emptyset$ ⁂

This contradiction shows that the supposition $A \cap B \neq \emptyset$ is false

Thus $A \cap B = \emptyset$.

10. True or False. If true, **prove** it. If false, then give a **counterexample**. For all sets A, B, and C, if $B \subseteq C$ and $A \cap B = \emptyset$, then $A \cap C = \emptyset$.



False

Take $B = \{1\}$

$C = \{1, 2\}$

$A = \{2\}$

Observe that $B \subseteq C$ because $1 \in C$

$A \cap B = \emptyset$

but $A \cap C \neq \emptyset$ because $2 \in A \cap C$.