

Proof Types

, e.g. stamp

(I will tell you which type for this exam, or it will be obvious)

• Direct:  $P \rightarrow Q$ .• Contrapositive: Want  $P \rightarrow Q$ . Prove  $\neg Q \rightarrow \neg P$ • Induction:  $\forall x \in S, x \geq B \rightarrow P(x)$ . 4 Parts: ① Intro  
②  $P(B)$   
③  $P(k) \rightarrow P(k+1) \forall k \geq B$   
④ Conclusion

★ Extra tool:

- Proof by cases.

↳ If see For all \_\_\_\_\_, \_\_\_\_\_. If direct / contrapositive not working, divide all into several cases.Technique

Explain... Explain

① Convert to math  $(5|x \equiv \exists m \in \mathbb{Z}: 5m = x)$  $(x \text{ is odd} \equiv \exists m \in \mathbb{Z}: 2m+1 = x)$ 

② Combine, substitute math equations until you get math equation you need to convert back to English.

If P then Q

You can't invent unless you are creative.

→ True or False?

2 options

If you invent, then you are creative.

If you are creative, then you invent.

If P True, Q Must be True

English To Math

• For all A such that B, ...

=  $\forall A, B \rightarrow \dots$

•  $\forall \underline{x \in S}$  ← must be a Set

$\exists \underline{x \in S}$  ←

• A  $\wedge$  B    A, B must be statements/predicates

• Test special cases     $S_1 \neq S_2, \quad x < y \quad \forall y < x$