






Logic and Algorithms – Week 5

Logic:

- Basic symbols include:
 - Logical **AND** (\wedge) – looks like an upside down V
 - Logical **OR** (\vee)
 - Logical **NOT** (\sim or \neg) – represents the negation, or opposite of something
 - Logical \rightarrow – arrow represents “implies,” or “then/so”
 - $A \rightarrow B = \text{“If } A, \text{ then } B\text{”}$
 - Can be nested to form more complex expressions
 - $(p \wedge \sim q) \vee \sim p$
- **Proposition** – a statement/sentence that is either true or false
 - Ex: “Today is cold.”
 - “What’s up?” is not a proposition
- **Symbols to sentences:** Let p and q be propositions, with p being “it is snowing outside” and q being “it is raining outside”
 - $p \vee q$: It is snowing outside or it is raining outside.
 - $p \rightarrow q$: If it is raining outside, then it is snowing outside.
 - $(p \wedge \sim q) \vee \sim p$: It is raining and not snowing outside, or it is not raining.
 - $\sim p \rightarrow q$: If it is not raining outside, then it is snowing outside.
- **Sentences to symbols:** Let r and s be propositions, with r being “you are happy” and s being “you are sad”
 - You are not happy: $\sim r$
 - If you are sad then you are not happy: $s \rightarrow \sim r$
 - You are not sad and you are not happy: $\sim s \wedge \sim r$
 - You are sad or you are happy: $s \vee r$
 - If you are not happy then you are sad: $\sim r \rightarrow s$

Algorithms (flowcharts):

Symbol	Name	Function
	Start/end	An oval represents a start or end point.
	Arrows	A line is a connector that shows relationships between the representative shapes.
	Input/Output	A parallelogram represents input or output.
	Process	A rectangle represents a process.
	Decision	A diamond indicates a decision.

Create a flowchart of ordering fast food!

- Start the billing process
- Order some food (input)
- Calculate the price (process)
- If cost \geq \$10 give a free coupon (decision box with yes), otherwise do nothing (decision box with no)
- Display the cost and whether you got a free coupon (output)
- End process