9.65: November 28, 2001 Reasoning Handout

Outline:

Logical reasoning:
1. Syllogisms and problems with them:
-Atmosphere effect
-Conversion error
-Belief bias
2. Mental models in reasoning (Venn diagrams)
3. The Wason "Selection problem"
-modus ponens
-modus tollens
-meaningfulness?
-permission schemas/detect cheaters
4. Hypothesis testing:
-confirmation bias
5. Utility theory
-costs and benefits
-probability of outcomes
-choices between bets
-subjective utility
-risk aversion for gains, risk-taking for losses
6. Are we rational?

Logical reasoning:

1. Syllogisms and problems with them:

All X are Y
All Y are Z

All X are Z

-Atmosphere effect:

All A are B
All C are B

All C are A?

-Conversion error:

Some P are not Q
All P are R

Some Q are not R?

-Belief bias

All robins are birds
Some birds eat worms

Some robins eat worms?

2. Mental models in reasoning (Venn diagrams)

3. The Wason "Selection problem"

-modus ponens

If X then Y
X is true

Y is true

-modus tollens

If X then Y
Y is false

X is false

Difficulty with negative statements, in general

-meaningfulness? Two other Wason problems

-permission schemas/detect cheaters

4. Hypothesis testing:

The 2, 4, 6 problem: What is the rule?

-confirmation bias

5. Utility theory: Rational decision-making

-costs and benefits, probability of outcomes

	OUTCOME		EXPECTED
	Rain P(.40)	No rain P(.60)	VALUE
Take umbrella			
Don't take umbrella			

-choices between bets (**framing effects**)

H: 8/9 chance to win $4

L: 1/9 chance to win $40

Another choice:

A: Sure chance of gaining $100

B: .50 of gaining $200, .50 gain nothing

Versus:
You are given $200:
A: Sure chance of losing $100.
B. .50 chance of losing $200, .50 of losing nothing.

-risk aversion for gains, risk-taking for losses

Subjective utility:

Loss aversion: gains considered less attractive than losses are considered aversive.

6. Are we rational?

Utility theory versus justification-seeking

E.g., sunk costs.