Thinking

- Cognition
  - The mental activities associated with thinking, knowing, remembering, and communicating
- Covering:
  - Conceptual Thought
  - Solving Problems
  - Making Decisions and Forming Judgments
  - Belief Biases

Concepts

- Mental groupings of similar objects, events and people
- Categories
  - Hierarchy

Prototypes

- The best example of a category
- Name a type of bird
- Now draw a bird
  - More likely to name and draw a robin or sparrow than an ostrich or kiwi

Solving Problems

- Algorithms
  - Step by step procedure to guarantee getting the correct answer
- Heuristics
  - A strategy that allows us to make judgments that aid us to find the answer
  - Not guaranteed to find the answer though

Example

- Unscramble this:
  - S P L O Y O C H Y G
- Algorithms: use all 907,000 combinations to find the answer
- Heuristics: don’t use the YY combinations
- Don’t forget insight:
  - A HA! It’s Psychology!
Try this

- Find the rule that generated these three numbers:
  - 2 – 4 – 6

Problems solving problems

- Confirmation bias
  - Search for information that confirms your own preconceived ideas
- Functional Fixedness
  - Problems seeing things in a new perspective

Matchstick problem

- Can you arrange these to form four equilateral triangles?

Answer:

Mount the candle to the board using these items:

Answer:

- Solving this problem requires recognizing that a box need not always serve as a container
Availability Heuristic
- Tendency to estimate the likelihood of events based on their availability in memory
- Fear of flying
- Road rage

Fundamentals of Language Organization

What Language is NOT
- Language ≠ Communication
- Language ≠ Speech
- Language ≠ Thought

Language ≠ Communication
- Communication happens without language
- Facial expression, posture, hand gestures, physical appearance
- Language sometimes fails to communicate
  - E.g., many lectures you’ve heard
  - Wernicke’s aphasia: “The kids aren’t right here because they don’t just say one here and one here — that’s all right, although the fellow here is breakin’ between the two of them, they’re comin’ around too.” (From Goodglass & Kaplan, 1976, p. 61.)

Language ≠ Speech
- Developmental dysarthria
- Loss of motor control results in a deficit for producing intelligible speech
- Sign language

Language ≠ Thought
- Thinking can be fast, language is slow
- Thoughts are often hard to express through language
- Language is often ambiguous, thoughts are not
- Feeding sharks can be dangerous
The Study of Language

Why should we care?
Because it’s fascinating!

Language processing is a hugely complex computational task…

- Other intelligent critters (e.g., chimps, gorillas) fail to learn language except at the most rudimentary levels
- Computers fail miserably
- (Scientists still don’t understand fully how we do it)

The Neuroscience of Language

Why should we care?
Because it’s fascinating!

Language processing is hugely complex computational task, yet…

- Every normal human child in every culture acquires sophisticated linguistic competence before the age of 5
- This learning occurs simply by exposure to language, and does not require explicit instruction (unlike reading or math)
- And, it can emerge spontaneously in children with minimal linguistic exposure

Language Development

- Babbling Stage
  - beginning at 3 to 4 months
  - the stage of speech development in which the infant spontaneously utters various sounds at first unrelated to the household language
- One-Word Stage
  - from about age 1 to 2
  - the stage in speech development during which a child speaks mostly in single words
- Two-Word Stage
  - beginning about age 2
  - the stage in speech development during which a child speaks in mostly two-word statements
- Telegraphic Speech
  - early speech stage in which the child speaks like a telegram—“go car”—using mostly nouns and verbs and omitting “auxiliary” words

Understanding Language

How complex?

Word boundaries are not evident in the acoustic waveform
Understanding Language

How complex? ...comprehending

1 see

The WHITE house is under attack. (physically)
The WHITE house is under attack. (metaphorically)
The white HOUSE is under attack. (phys or metaph)
The white house is under a tack.

Ambiguity is pervasive in language:
Visiting relatives can be boring
I saw the man with binoculars
The stuffy nose vs. The stuff he knows

Understanding Language

Parts of Language

How complex? ...linguistic knowledge

Language is more than just words

Words + Grammar

Parts of Language

How complex? ...linguistic knowledge

Words
(& their meaning)

Broca’s Aphasia
Speech production problems

Wernicke’s Aphasia
Speech perception problems
Problems producing speech as well