Cognition

PSYC 2040

L0 to L6: Review

logistics: midterm 1

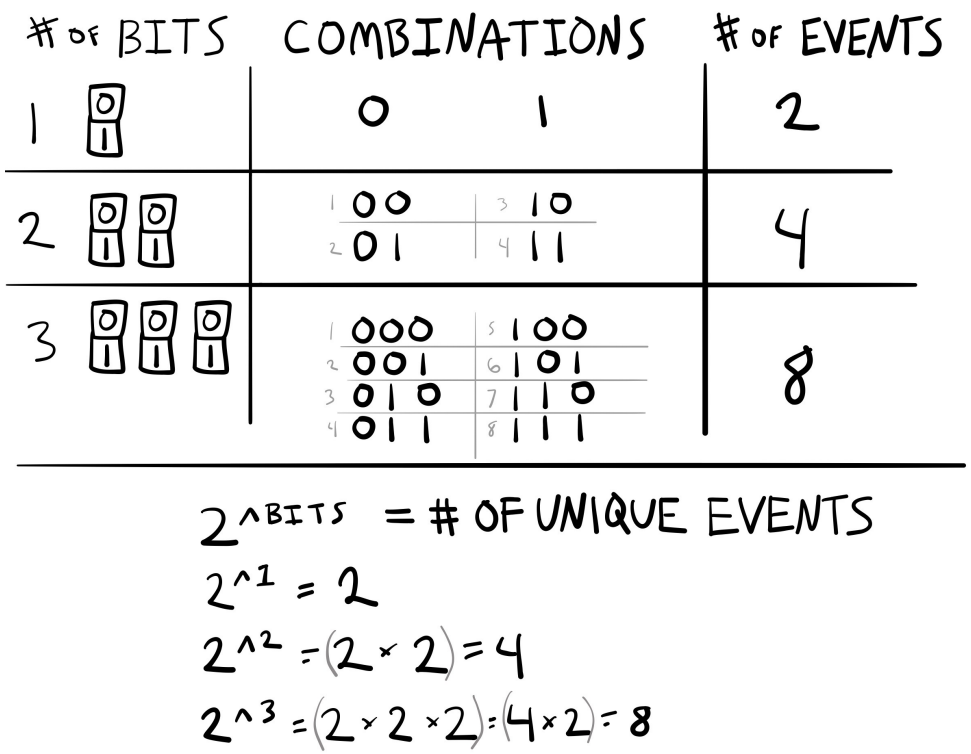
- complete short answer portion first
- then go to Canvas and complete multiple-choice portion
- both assessments are closed-book
- you may bring ONE help sheet
- calculator will not be required but is allowed

today’s agenda

- L6 recap
- module review
- class survey discussion

recap: bits of information

- shannon's H (entropy) uses a base 2 logarithm to produce a number in the unit of bits
- bits refer to the total number of discrete events in a system of messages, **it is a unit of information**
- one bit has two states: 0 or 1
  - it could be used to represent two events/states
  - e.g., heads or tails, on or off
- general formula
  - number of events = 2^{bits}

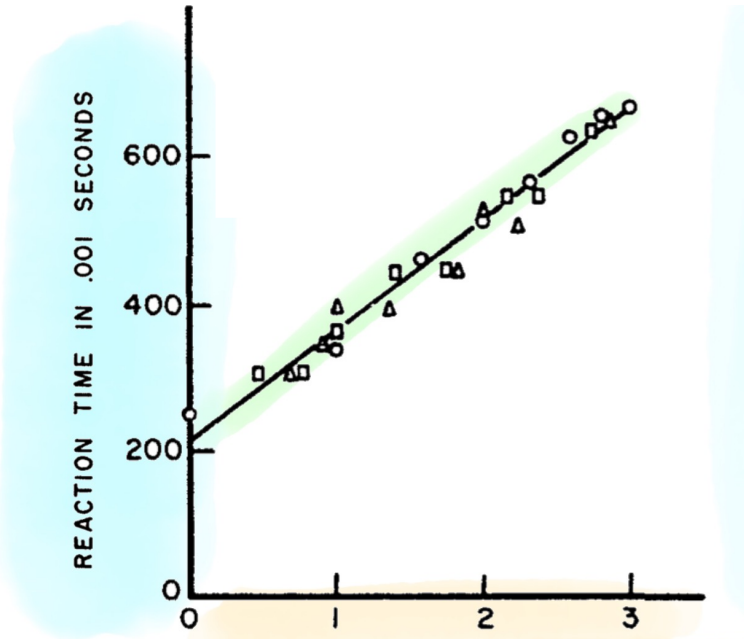


recap: set size effects

- set size effect: choice reaction time increased as the number of alternatives increased
  - RTs were faster in two vs. four-alternative tasks
  - how many bits to represent two alternatives vs. four alternatives?
- but why? was it the number of alternatives (2 vs 4) or the amount of information (bits) carried within the alternatives (1 vs 2)?

recap: Hick Hyman's experiment 1

- design: choice reaction time task
  - 8 conditions corresponding to different number of alternatives (1 to 8)
- results
  - RT increased as number of alternatives increased (set size effect)
- problem:
  - 1 alternative = 0 bits (2^0),
  - 2 alternatives = 1 bit (2^1)
  - alternatives and bits were both increasing
  - alternatives were confounded with bits



recap: Hick Hyman's experiment 2

- design: choice reaction time task
  - systematically varied both number of alternatives AND bits by modifying the predictability of the alternatives
- results
  - RT increased as number of bits increased (Hick Hyman Law)

TABLE 1

THE EIGHT CONDITIONS FOR EXPERIMENT II AND THE CORRESPONDING AMOUNTS OF INFORMATION IN BITS PER STIMULUS PRESENTATION

Cond.	Number of Alternatives	Probability of Occurrence	Log₂ 1/p	Av. Amount of Information in Cond.
1	2 { 1	9/10	0.15	0.47
	1	1/10	3.32	
2	2 { 1	8/10	0.32	0.72
	1	2/10	2.32	
3	4 { 1	13/16	0.30	0.99
	3	1/16	4.00	
4	6 { 1	15/20	0.42	1.39
	5	1/20	4.32	
5	4 { 1	4/8	1.00	1.75
	1	2/8	2.00	
	2	1/8	3.00	
6	6 { 1	5/10	1.00	2.16
	5	1/10	3.32	
7	8 { 1	8/16	1.00	2.38
	1	2/16	3.00	
	6	1/16	4.00	
8	8 { 2	4/16	2.00	2.75
	2	2/16	3.00	
	4	1/16	4.00	

SAME # OF ALTERNATIVES (2)
DIFFERENT AMOUNT OF BITS

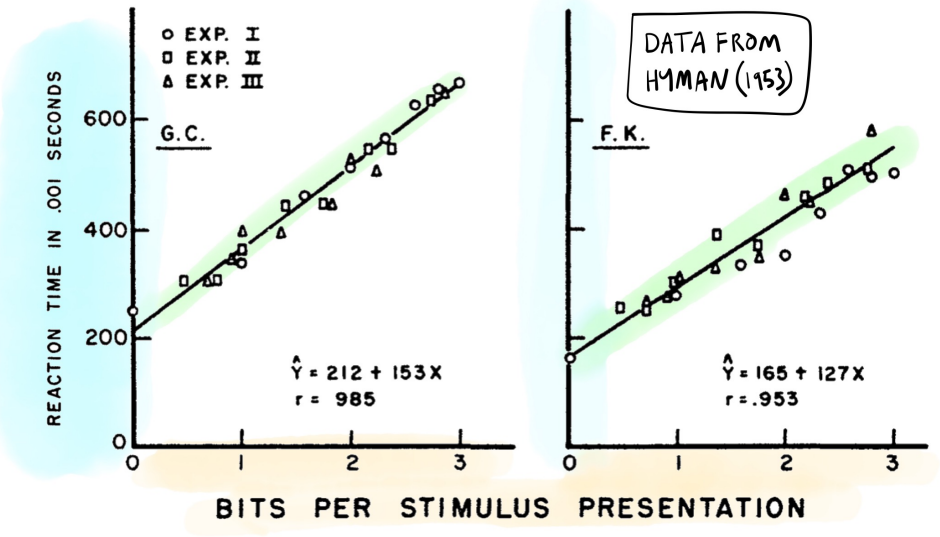
PREDICTION:
REACTION TIME WILL ↑
AS BITS ↑
NOT AS
OF ALTERNATIVES ↑

recap: Hick Hyman's experiment 2

- design: choice reaction time task
  - systematically varied both number of alternatives AND bits by modifying the predictability of the alternatives
- results
  - RT increased as number of bits increased (Hick Hyman Law) NOT as the number of alternatives increased

HICK-HYMAN LAW

CHOICE REACTION TIME INCREASES AS A LINEAR FUNCTION OF THE INFORMATION (BITS) IN THE STIMULUS SET



recap: Hick Hyman's findings' explanations

- match to template hypothesis
  - individuals had "mental templates" of each alternative and were serially comparing the presented stimulus to the templates
  - could not account for the bits/uncertainty of alternatives
- binary logic hypothesis
  - dividing the set of options by half each time
  - popular way to sort numbers in computers (binary sort)
- repetition priming: potential confound
  - fewer alternatives/bits meant more repetitions of the more predictable options

questions

review

L0: effective study strategies

L1: what is cognition?

L2: mental imagery

L3: eugenics and intelligence testing

L4: associations

L5: behaviorism

L6: information processing

review each module

- what are the big ideas/theories in this module?
- which empirical studies provide evidence for/against these ideas?
- what is the design of the studies (IV/DV/finding/inference)?

next class

- **before** class:
  - *complete*: practice assessment 1 / reviewing material
  - *attend*: review session
- **during** class:
  - assessment 1