using formalism in HCI
from cognitive models to placemats

what to model

- users
  - cognitive models
  - task models
- system
  - behaviour
  - architectural structure
- world
  - domain models

notations

- graphical
  - digital watch STNs, Petri Nets, CTT, UML
- textual
  - production rules (used in UIMS and cog. models)
  - mathematical formulae, process algebras
- plain old sums
  - back of the envelope/placemat calculations
placemat math - menu sizes

- on-screen menus
  - e.g. web site navigation
- how many items per screen?
- frequent misapplication of Miller 7±2
- but how many is right?

placemat math (ii)

- menu tree has N items
- number of items per screen = M (breadth)
- depth (d) = \( \log_2(N) / \log_2(M) \)

\[
\text{depth (d)} = \frac{\log_2(N)}{\log_2(M)}
\]

placemat math (iii)

\[
T_{\text{total}} = \text{time to find an item} = (T_{\text{display}} + T_{\text{select}}) \times d
\]

\[
T_{\text{display}} = \text{time to display screen (fixed)}
\]

\[
T_{\text{select}} = \text{time to select menu item}
= A + B \log(M)
\quad \text{(Fitts' Law)}
\]

\[
T_{\text{total}} = (T_{\text{display}} + A + B \log(M)) \times \frac{\log(N)}{\log(M)}
\]

\[
= \left( \frac{T_{\text{display}} + A}{\log(M)} \times \log(N) \right) + B \log(N)
\]

\]
best menu size?

\[ T_{\text{total}} = \left\{ \frac{ (T_{\text{display}} + A) \times \log(N) }{ \log(M) } + B \log(N) \right\} \]

- larger \( M \) means shorter total time
- the bigger the better!

N.B. other factors
- visual search (linear if not expert)
- error rates
- minimum selectable size
- effective organisation of menu items

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types of system model

- dialogue – main modes
- full state definition
- abstract interaction model