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 UI/MS 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(N) / \log(M)

placemat math (iii)

- \( T_{\text{total}} \) - time to find an item
  \( = ( T_{\text{display}} + T_{\text{select}} ) \times d \)
- \( T_{\text{display}} \) - time to display screen (fixed)
- \( T_{\text{select}} \) - time to select menu item
  \( = A + B \log(M) \) (Fitts’ Law)

- \( T_{\text{total}} = ( T_{\text{display}} + A + B \log(M) ) \times \log(N) / \log(M) \)
  \( \text{cancel} \)
  \( = ( ( T_{\text{display}} + A ) \times \log(N) ) / \log(M) + B \log(N) \)
**best menu size?**

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

- 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

**what to model**

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

**what to model**

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

**types of system model**

- **dialogue – main modes**
  - specific system
- **full state definition**
- **abstract interaction model**
  - generic issues