



HCI – intelligent *multimodal* interfaces

Human Factors

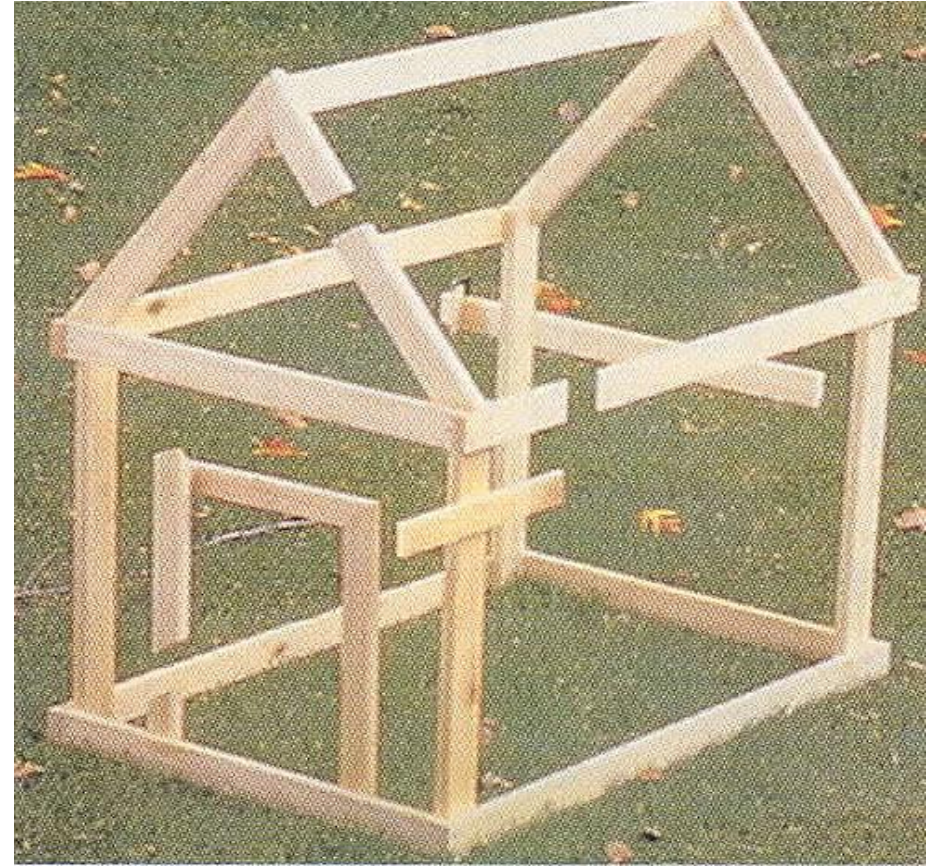
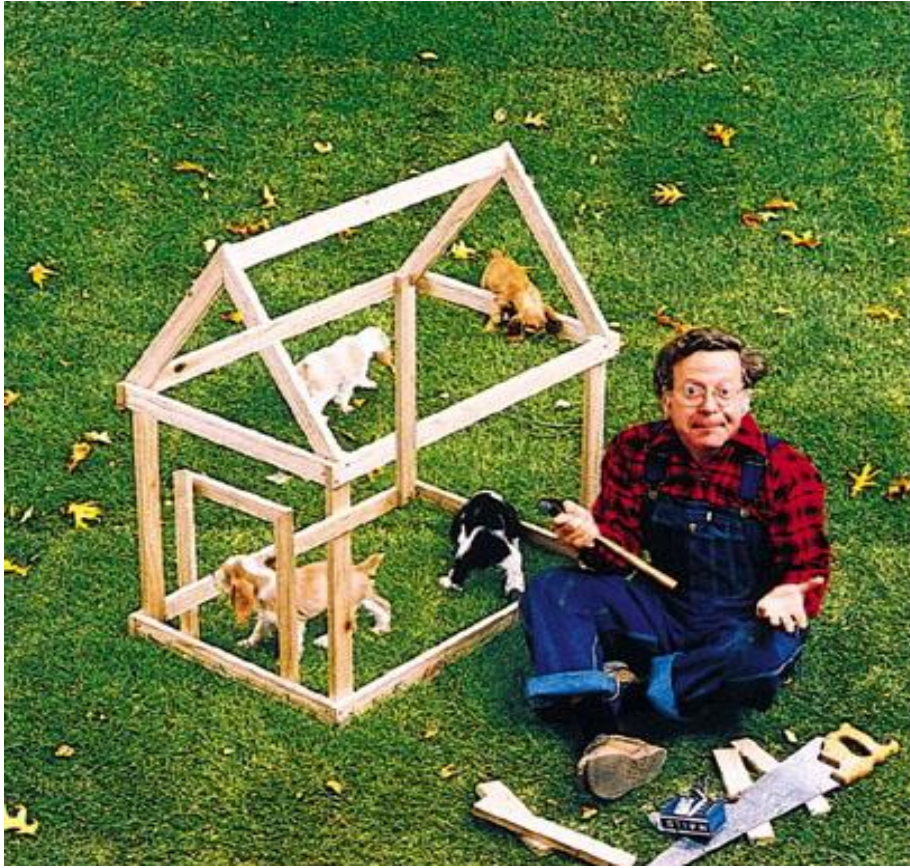
Master program in Artificial Intelligence

Human factors



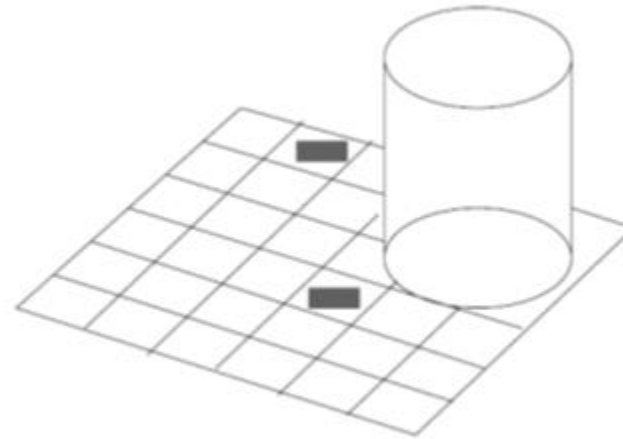
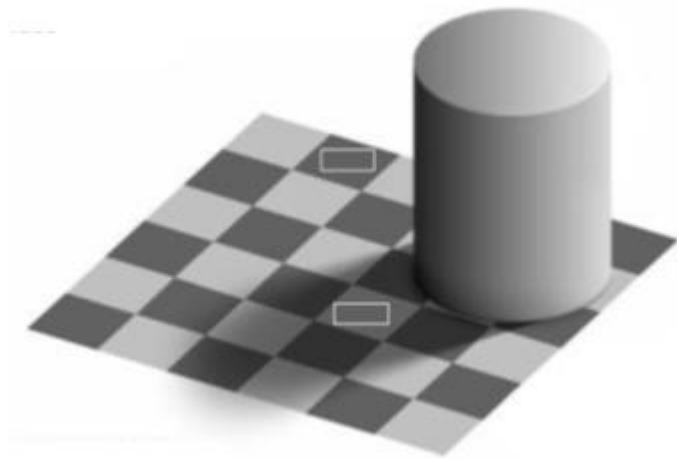
Perceptual aspects

The Whole is not Equal to the Sum of Its Parts



Brightness perception

- **brightness** perception is subjective
- brightness is conditioned by the **quantity of light**
- **contrast** is a function of the object brightness and the background brightness



Brightness perception

- **visual acuity** increases with lighter scenes
 - ➔ flicker effect is perceived in large monitors also for high frequencies



Ability and limitation of vision processing

- The visual system compensates for motion (i.e., image stabilization) and light (or color) variations,



Ability and limitation of vision processing

- Sometimes optical illusions are caused by overcompensation

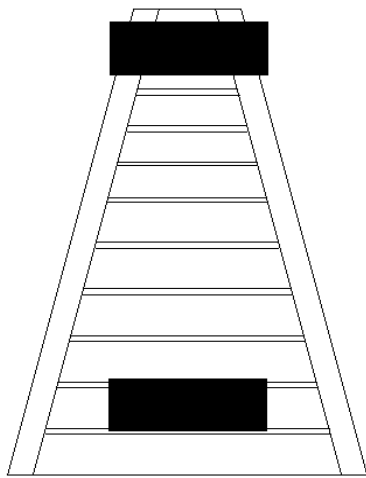


Figure 1: The Ponzo illusion

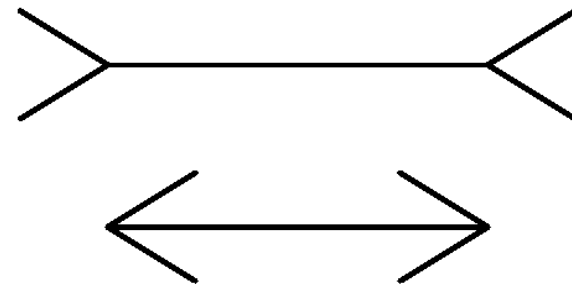
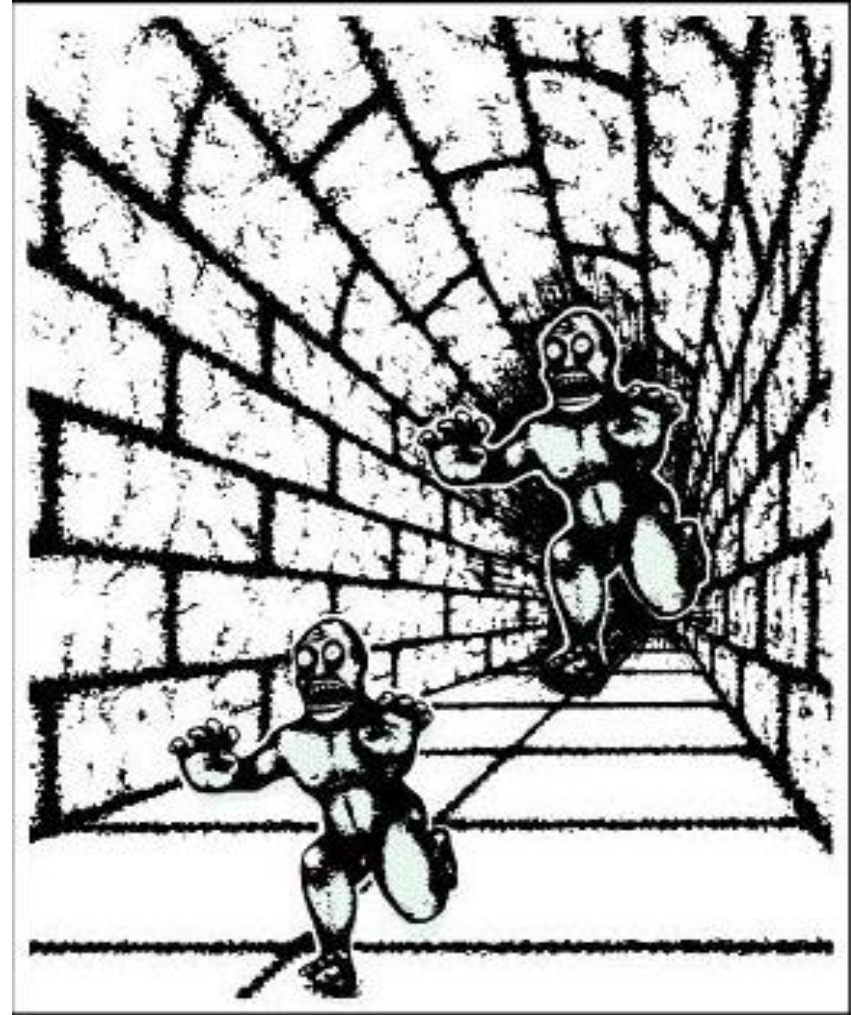
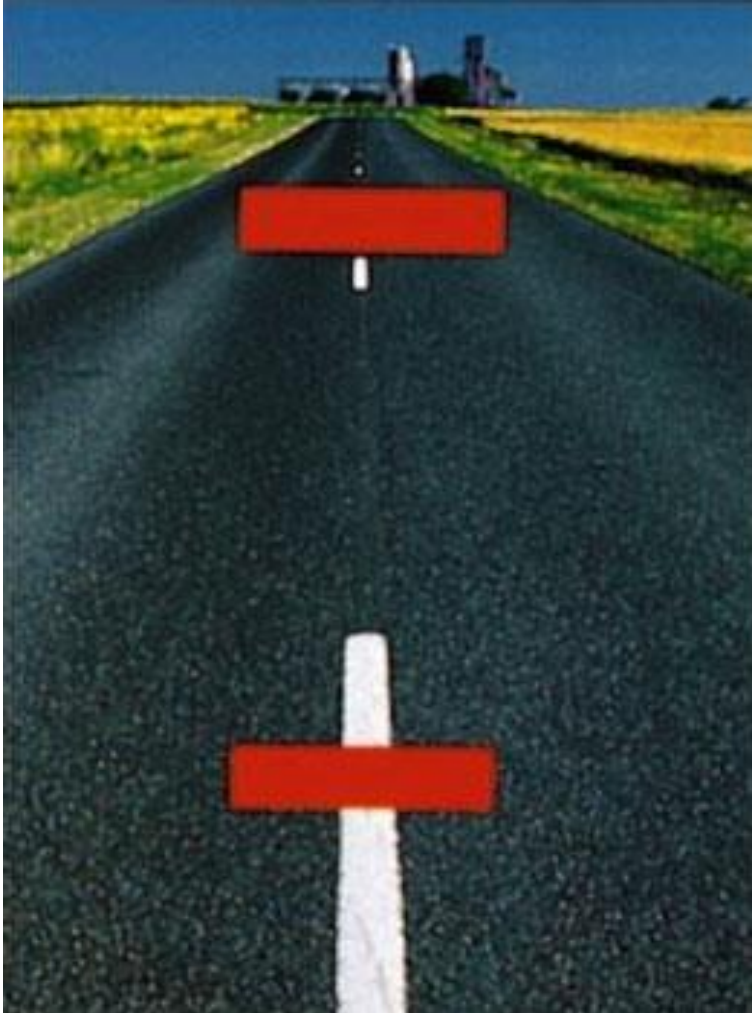
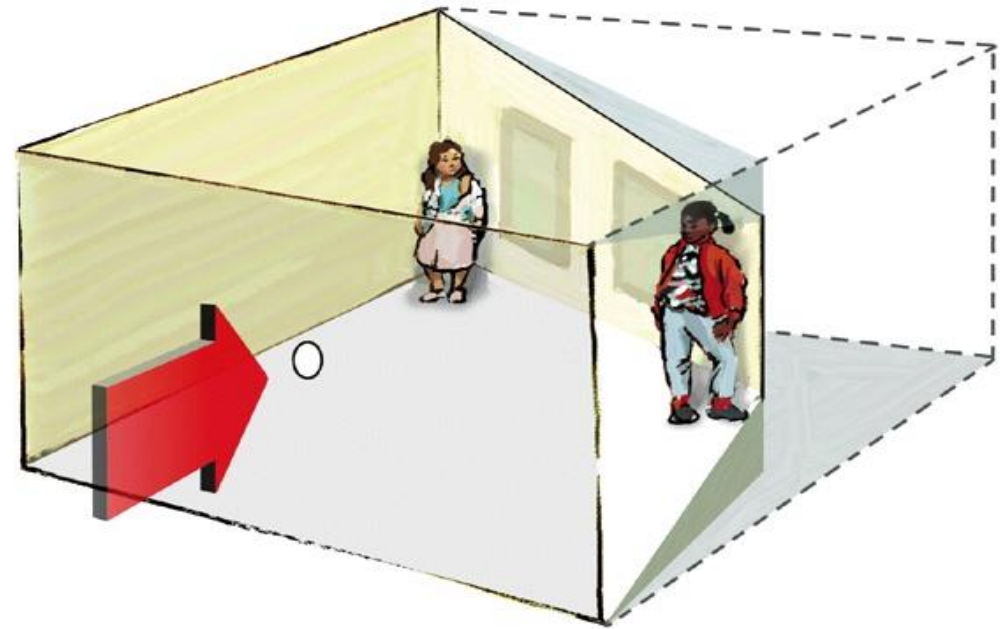


Figure 2: The Muller Lyer illusion

Ponzo illusions



Ames room



Context

- The context helps in solving ambiguities,

|B

A|B|C |2|3|4

Contest and reading

“The quick brown fox jumps over the lazy dog”

Different steps:

1. perception of **visual patterns**...,
2. ... that are decoded using **internal representation** of the language...,
3. ... that are explained using the **sintactic** and **semantic** knowledge (and **pragmatism**)

Contest and reading

“The quick brown fox jumps over the lazy dog”

- Reading is performed by **saccadic eye movements** and **visual fixation**,
- The **shape** of the word is very important for recognition,



THE **SHAPE** OF THE WORD IS VERY IMPORTANT FOR RECOGNITION

*The **shape** of the word is very important for recognition*

The shape of the word is very important for recognition

SECNODO UN PFROSSEORE
DLEL'UNVIESRITA' DI
CMABRDIGE, NON IMORPTA
IN CHE ORIDNE APAPAINO
LE LETETRE IN UNA PAOLRA,
L'UINCA CSOA IMMORPTATE
E' CHE LA PIMRA E L'ULIMTA
LETETRA SINAO NEL PTOSO
GITUSO. IL RIUSTLATO PUO'
SERBMARE MLOTO CNOFSUO,
MA NOONSTATNE TTUTO
SI PUO' LEGERGE SEZNA
MLOTI PRLEOBMI.

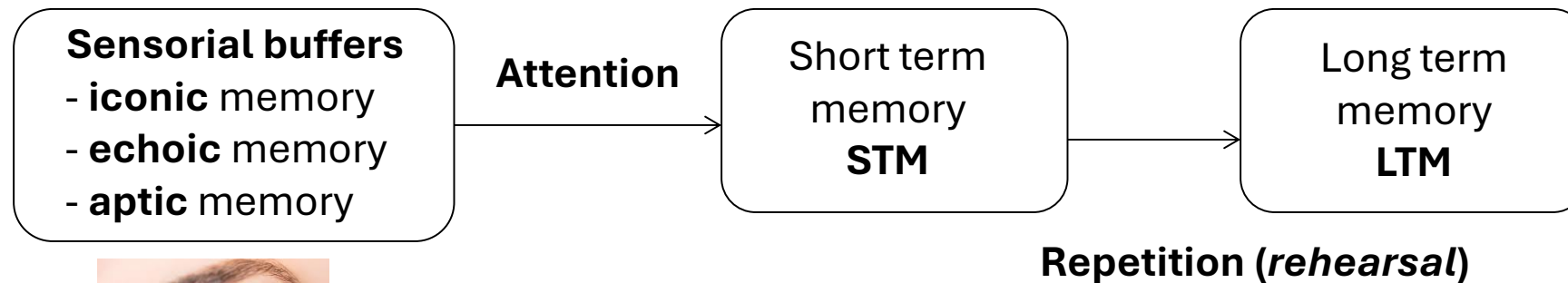
Accdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttar in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht the frist and lsat ltteer be at the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

Cognitive ability

- Short-term memory,
- Long-term memory and learning,
- Problem solving,
- Decision making,
- Attention and dimension of the problem,

Human memory

- Several types of memories that are connected:

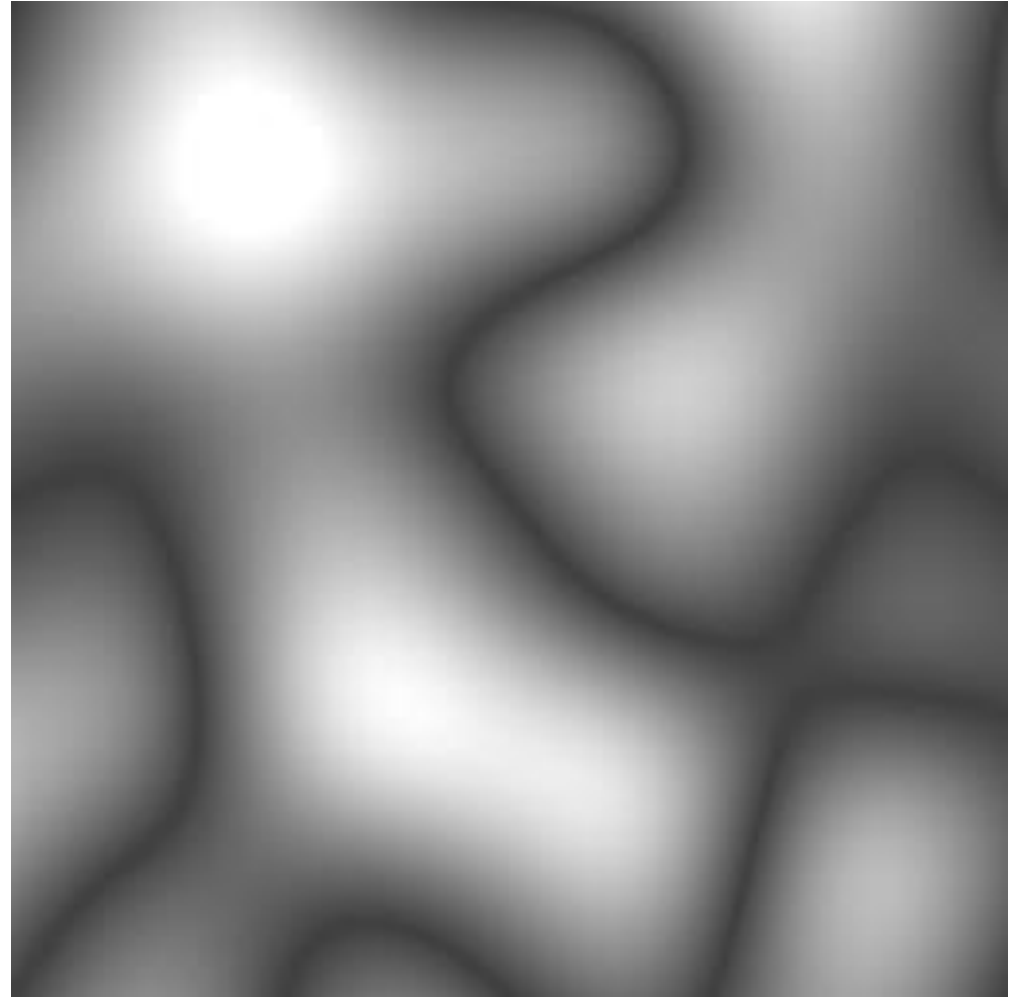


6 letters memory

B X M T L D

Now...

Count down from 16 to 1 by 3



What were the letters?

B X M T L D

Short term memory

- Information get remembered better when organized in groups or chunks,
- The chunk organization is called closure,

The user remembers 7 ± 2 items

- The user expects a closure in a sequence of actions,
E.g., old steps involved in cash withdrawal (user forgot the bank-card because money were provided before)



Deductive reasoning

- Conclusions are derived by the given (logic) hypothesis:

Hp: «if today is Friday then John goes to work»

Is today Friday? Yes

Then John goes to work

Note that conclusions can be logically true but intuitively fake
(who decides the hypothesis?)

Hp: «if it's raining then the grass is dry»

Often the hypothesis are derived by shared knowledge

Inductive reasoning

- Generalization of unseed examples from seen examples:
 - E.g, all cars I have seen have 4 wheels, then all cars has 4 wheels



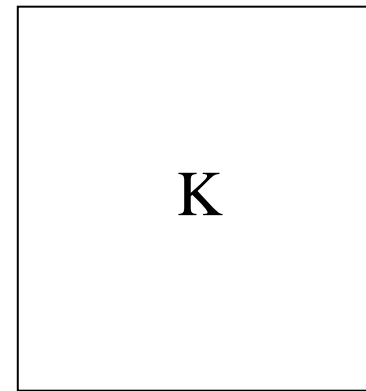
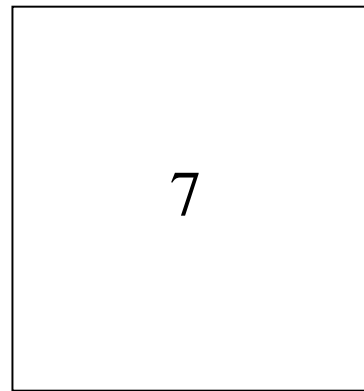
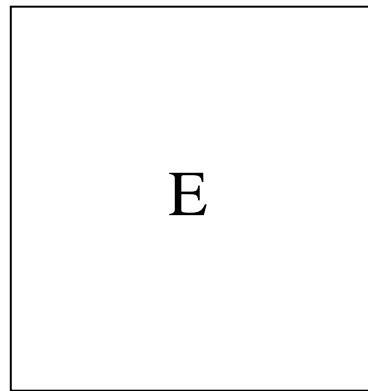
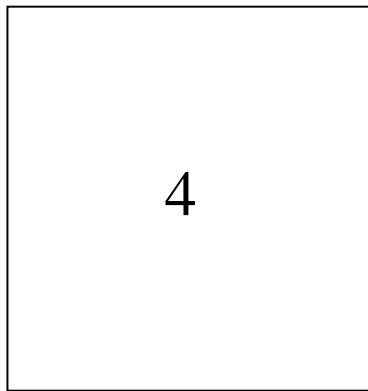
This is not fully reliable, we can proof the false but not the true

But the human is not able to use the negative evidence

Wason selection task (or 4 card test)

Each card has a number on one side and a letter on the other.

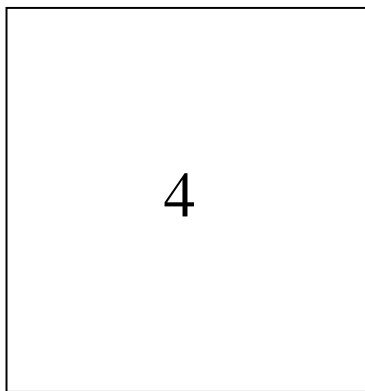
Which card or cards must be turned over to test the truth of the sentence *“if a card shows a vocal letter on one face, then its opposite face is an even number”*



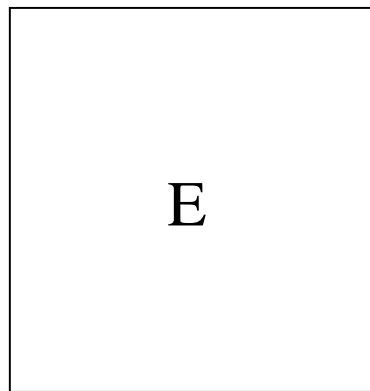
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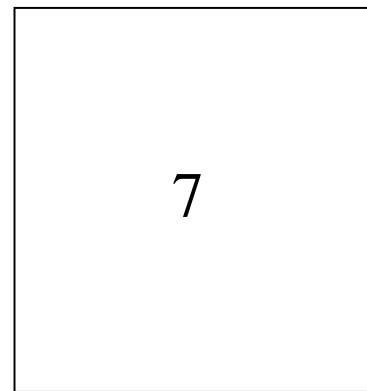
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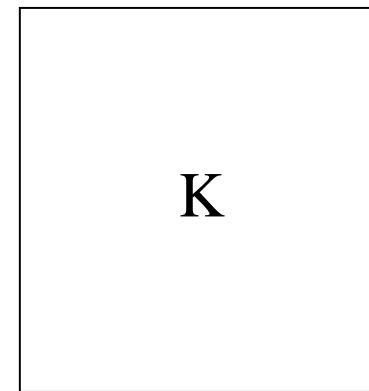
✓ no



✓ si



✓ si



✓ no