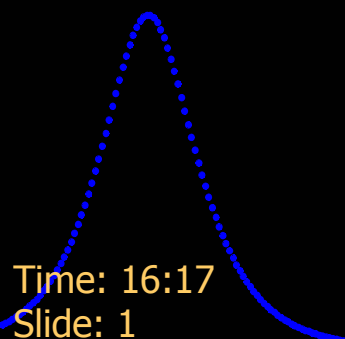


Benefits of Computer-Assisted Assessment in Science Education



Time: 16:17
Slide: 1

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Assessment: Basic questions

- What competences do we try to measure
- How reliable is the instrument (i.e. test)
- Is it applicable for the examinees



Computer-Assisted Assessment (CAA)

- Types of assessment (testing)
 - Grading single student (measure how much student knows)
 - Determining population achievement (describe what students know)
 - Make diagnosis (what students don't know)
 - Misconceptions and typical pitfalls
- Modes of testing
 - Paper & Pencil
 - Computer Assisted

General characteristics of CAA

You can:

- Interact with test examinee
 - Immediately evaluate response and react
 - Give feedback to examinee
- Display multimedia
 - Pictures, sounds, video, animations
- Embed **simulation** in testing

You don't need to:

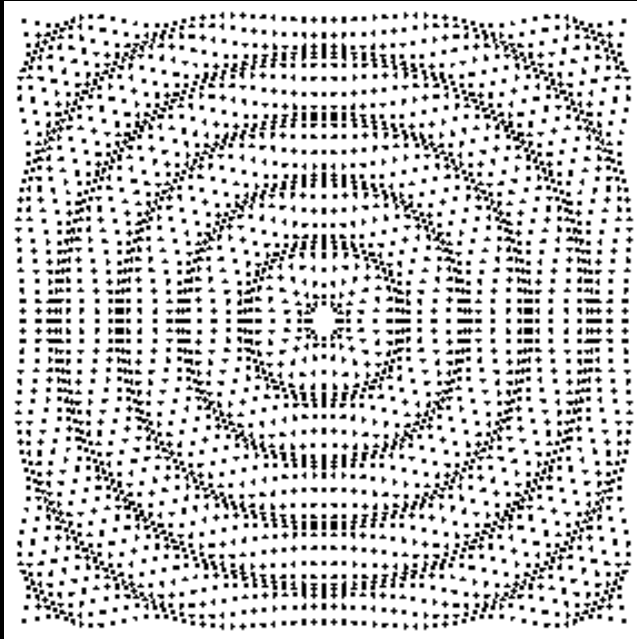
- Print tests
- Distribute & collect booklets
- Score closed answers
- Enter raw results
- Perform preliminary statistical analysis
- ...

Item

- Item is smallest piece of response that we can grade.
 - Questions, tasks, research problems, etc. can have more than one item.
- Item parameters
 - Content category, cognitive category, dimensionality
 - Target group
 - Item type, difficulty, discrimination, informativeness,

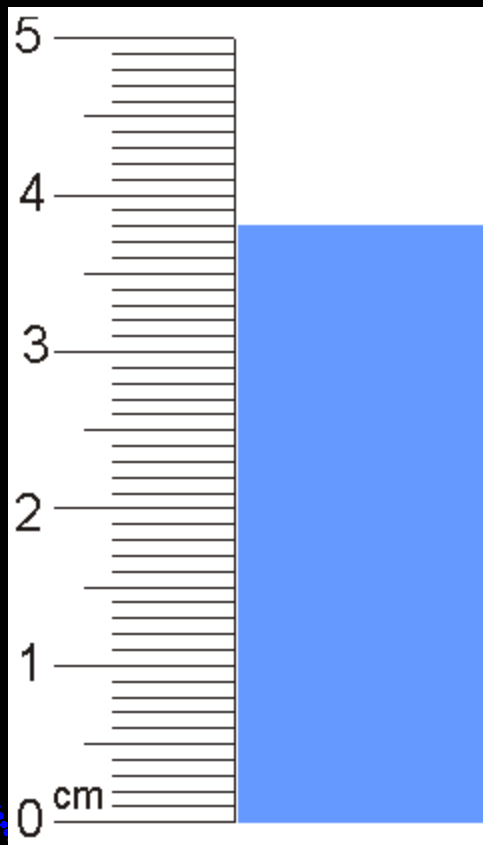
...

What natural phenomenon is displayed at the picture?



- Circulation of matter
- Reflection
- Radiation
- Wave

Water level in a narrow channel presented on the screen is quickly changing. The value of water level can be presented as $4.7 \pm \underline{\hspace{1cm}}$ cm. What is the missing value?



- 0.05 cm
- 0.1 cm
- 0.2 cm
- 0.4 cm

What is the frequency of the faucet dripping presented on the screen?



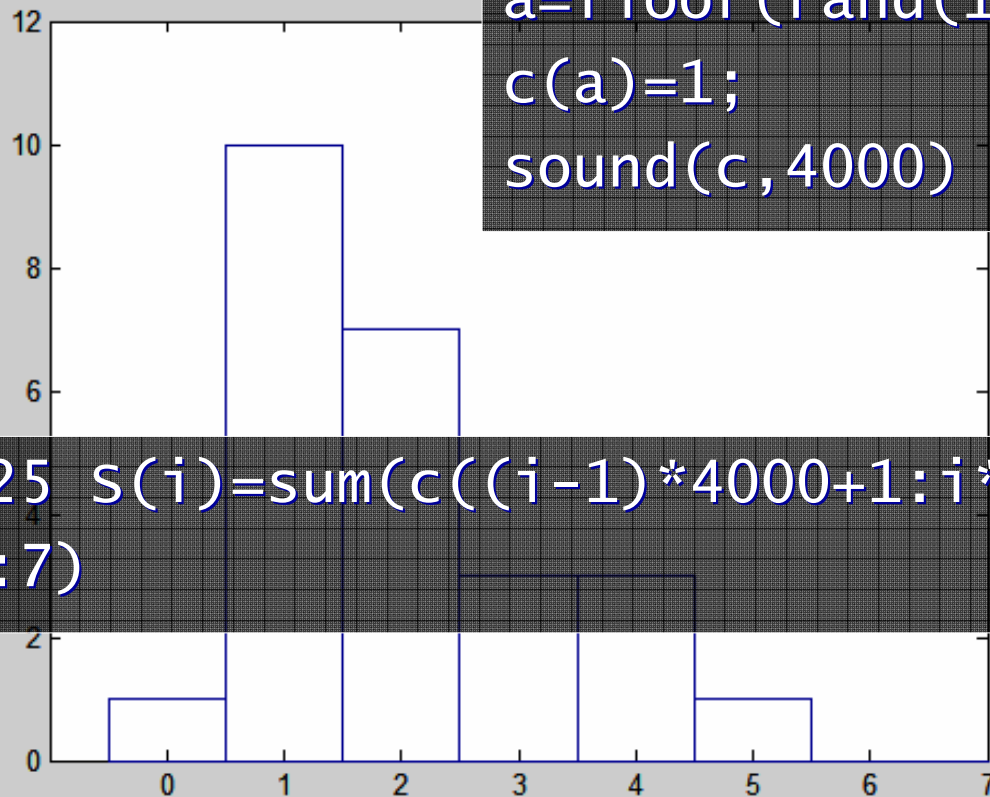
Note: Press the space bar to start the stopwatch.

Answer: _____ Hz

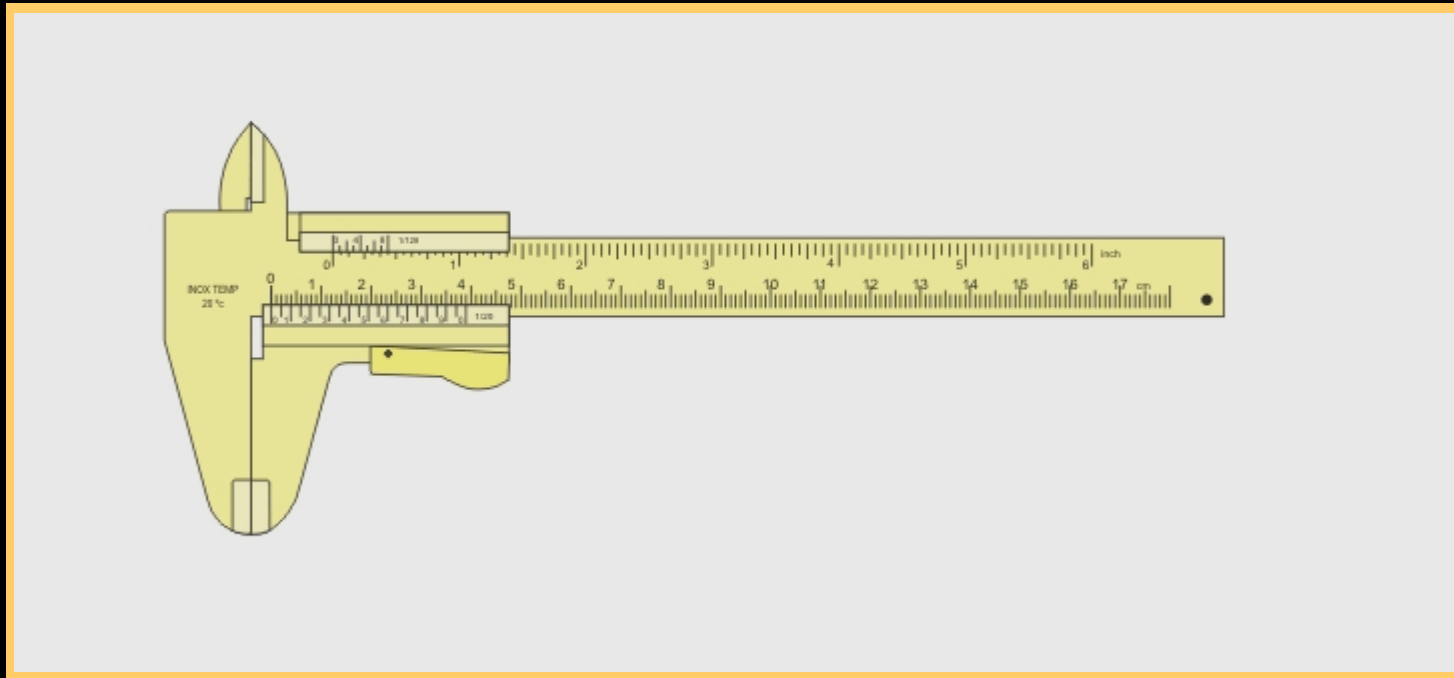
Example of simulation: Randomness of radioactive decay

```
a=floor(rand(1,50)*100000);  
c(a)=1;  
sound(c,4000)
```

```
for i=1:25 s(i)=sum(c((i-1)*4000+1:i*4000)); end  
hist(s,0:7)
```



Example: Animated solution as a feedback

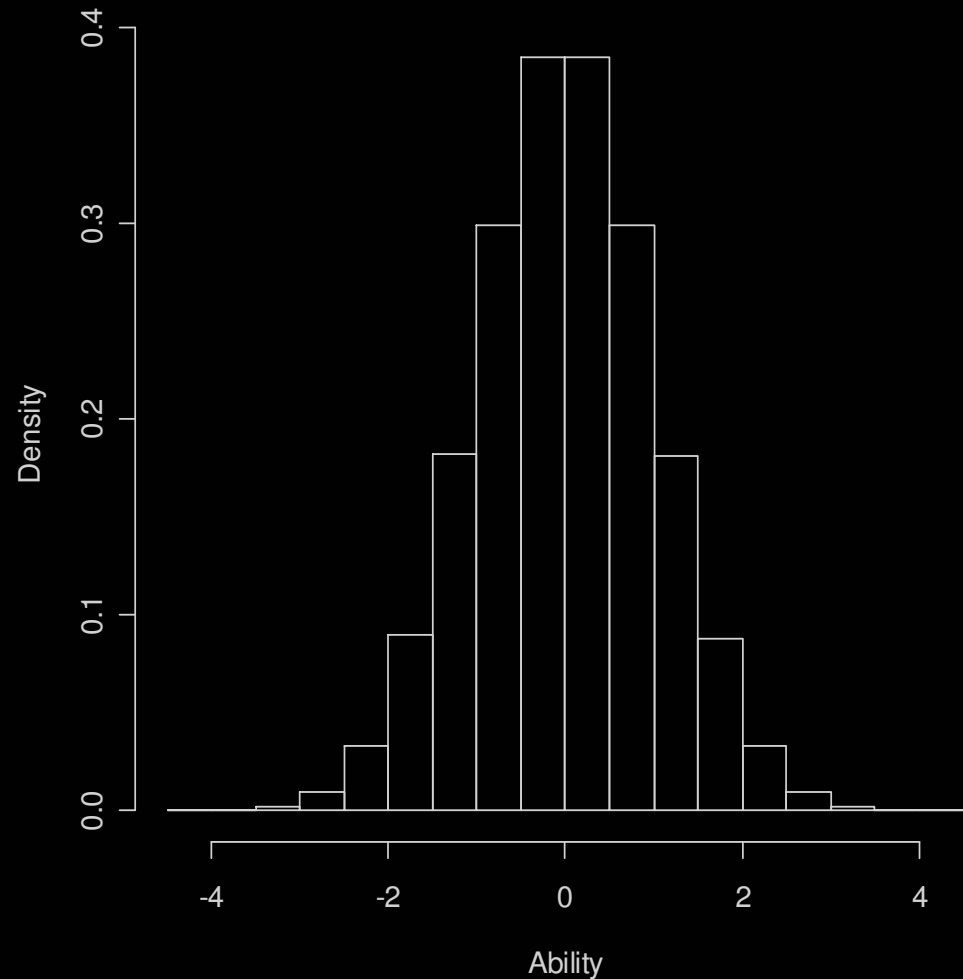


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Common (standard) scale

- Independent of items selection
- Independent of group examined
- Mean 0 with SD 1
- Select the most suitable (informative) item



Game of 20 questions

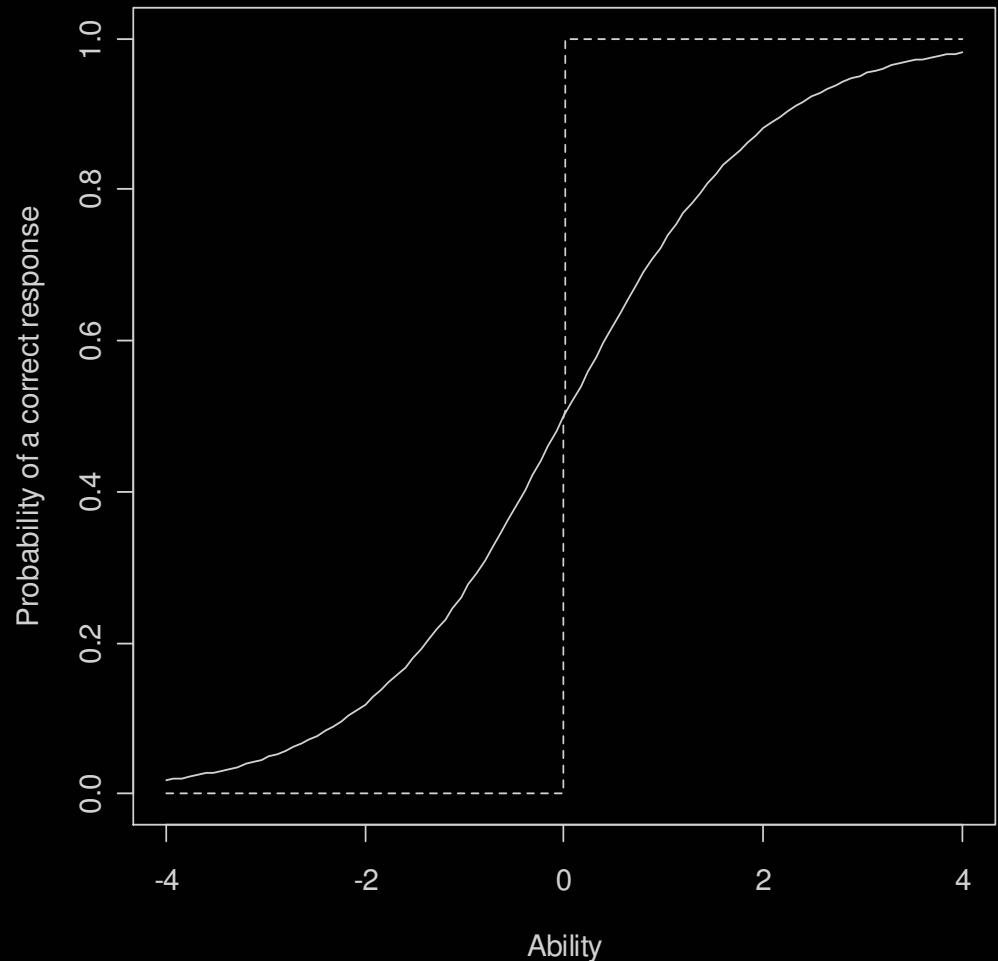
20 T/F questions
 $2^{20} \approx 1\,000\,000$ outcomes

(perfectly discriminative
questions and adaptive selection
of items)

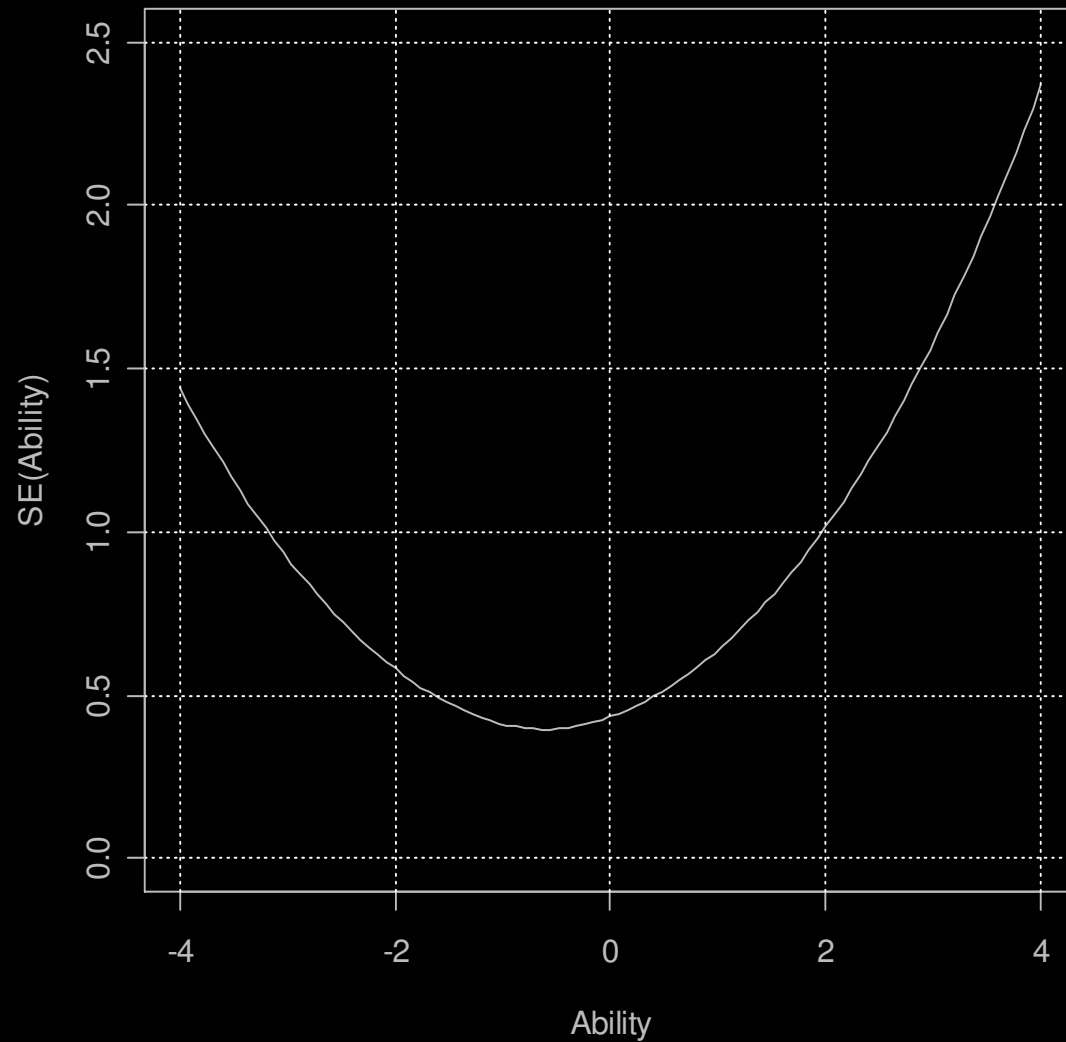
Example:
SAT, 100 items, $SE=0.2$ SD

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Item response function

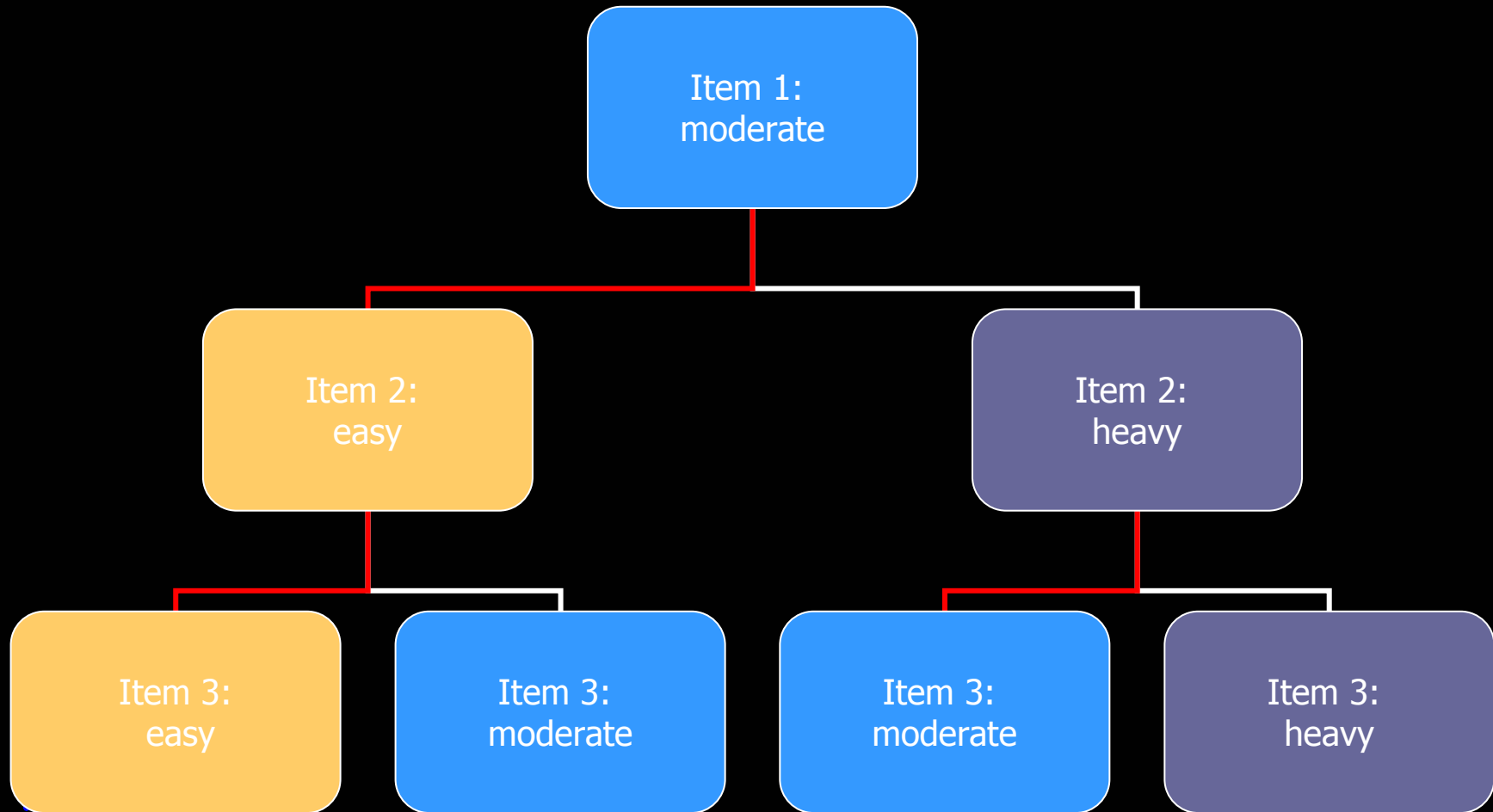


Test Information Function



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Computer Adaptive Testing (CAT)



Gifted students!

- How to measure height of a building using a barometer only
- Inverse problem: extraordinary student's response should be a questions not an answer
 - Scientific question is simple and clean question to Nature.
 - Design of an experiment

Drawbacks off CAA

- you can't easily write formulas
- you can't draw or sketch
- you can't use gestures to explain
- ...

One simple solution: Moodle

- free open-source CMS software
- works on all platforms
- large, growing community
- on- and off-line
- available in 75+ languages

