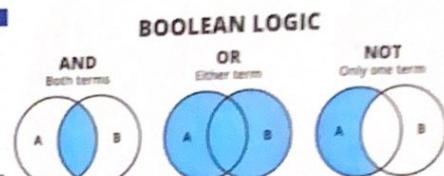
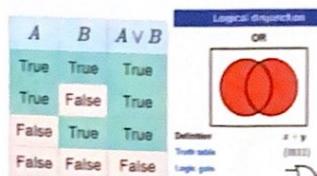


Logical addition (disjunction)

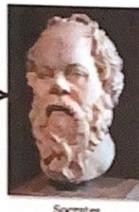
| A | B | $F = A \vee B$ |
|-------|-------|----------------|
| True | True | True |
| True | False | True |
| False | True | True |
| False | False | False |



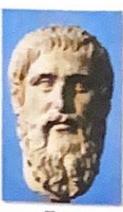
Good logic

Socrates was a philosopher

$$S \in \Phi$$



Socrates



Plato



Aristotle



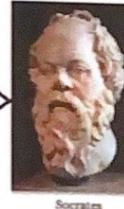
Socrates was a man

$$S \in A$$

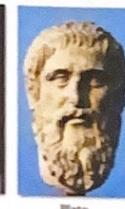
Bad logic

Socrates was a man

$$S \in A$$



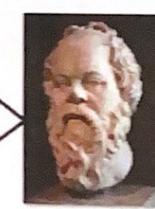
Socrates



Plato



Aristotle

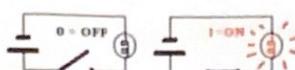


Socrates was a philosopher

$$S \in \Phi$$

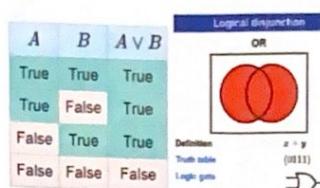


Lecture by Pr. Bob Gallagher
Boole (1815-1864) & Shannon (1916-2001)



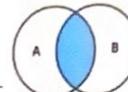
Logical addition (disjunction)

| A | B | $F = A \vee B$ |
|---|---|----------------|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

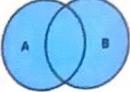


BOOLEAN LOGIC

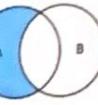
AND
Both terms



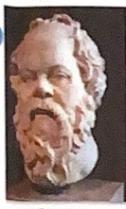
OR
Either term



NOT
Only one term

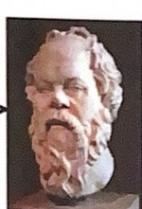


Good logic



Socrates
Socrates was
a philosopher

$$S \in \Phi$$



philosophers are men

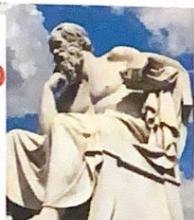
$$\Phi \in A$$



Socrates was
a man

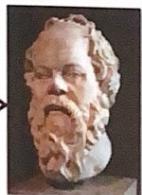
$$S \in A$$

Bad logic



Socrates was
a man

$$S \in A$$



philosophers are men

$$\Phi \in A$$



Socrates was
a philosopher

$$S \in \Phi$$

Resume of Lecture by Pr. Bob Gallagher from MIT

Massachusetts Institute of Technology (MIT)

George Boole (1815-1864) developed Boolean logic

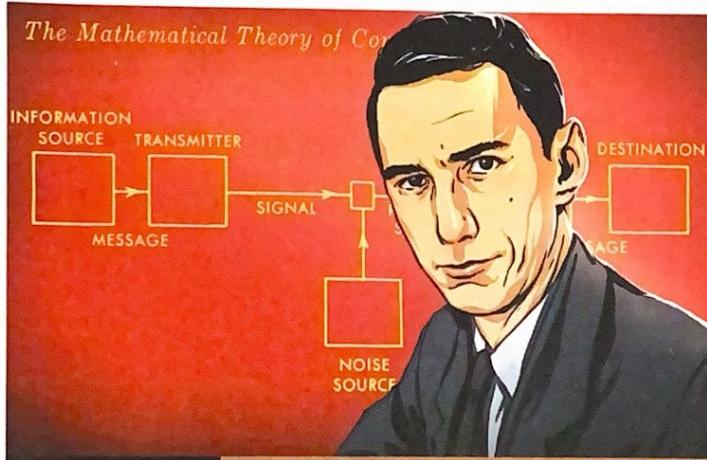
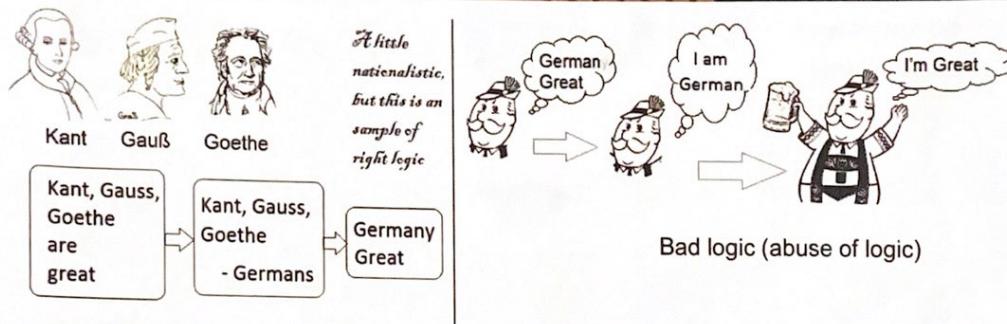
The principles of logical thinking have been understood (and occasionally used) since the Hellenic era.

Boole's contribution was to show how to systemize these principles and express them in equations (called Boolean logic or Boolean algebra).

Claude Shannon (1916-2001) showed how to use Boolean algebra as the basis for switching technology. This contribution systemized logical thinking for computer and communication systems, both for the design and programming of the systems and their applications.

Logic continues to be abused in politics, religion and most non-scientific areas

Logic continues to be abused in politics, religion, and most non-scientific areas.



and that's what Shannon did

Resume of Lecture by Pr. Bob Gallagher from MIT

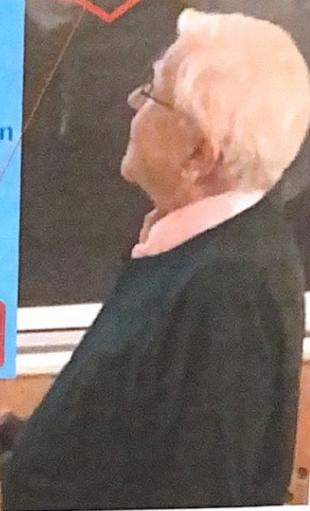
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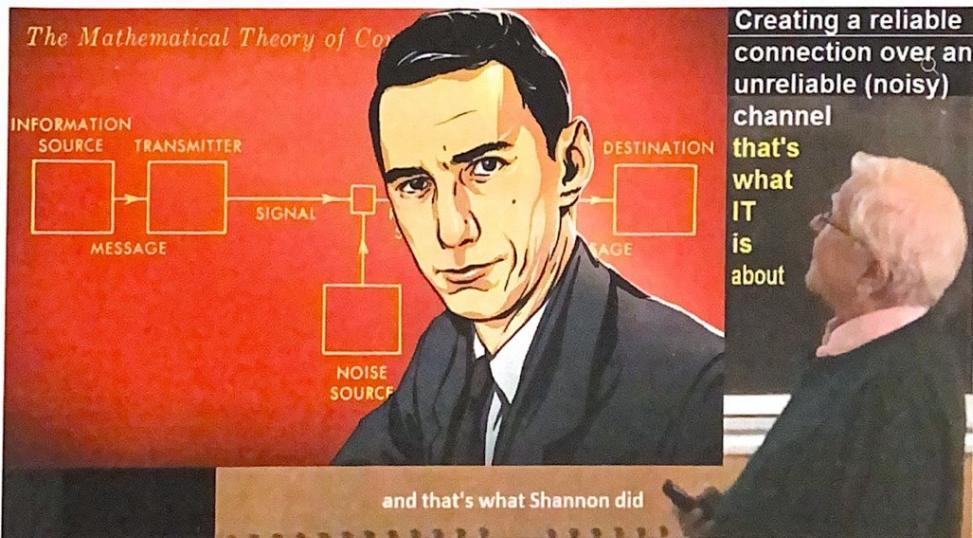
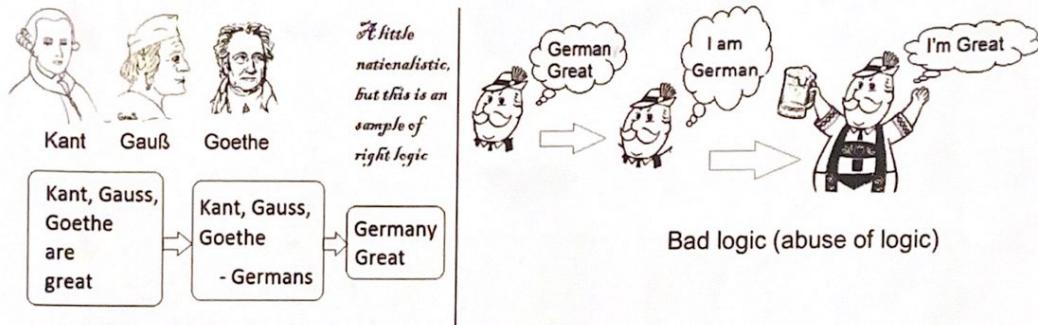
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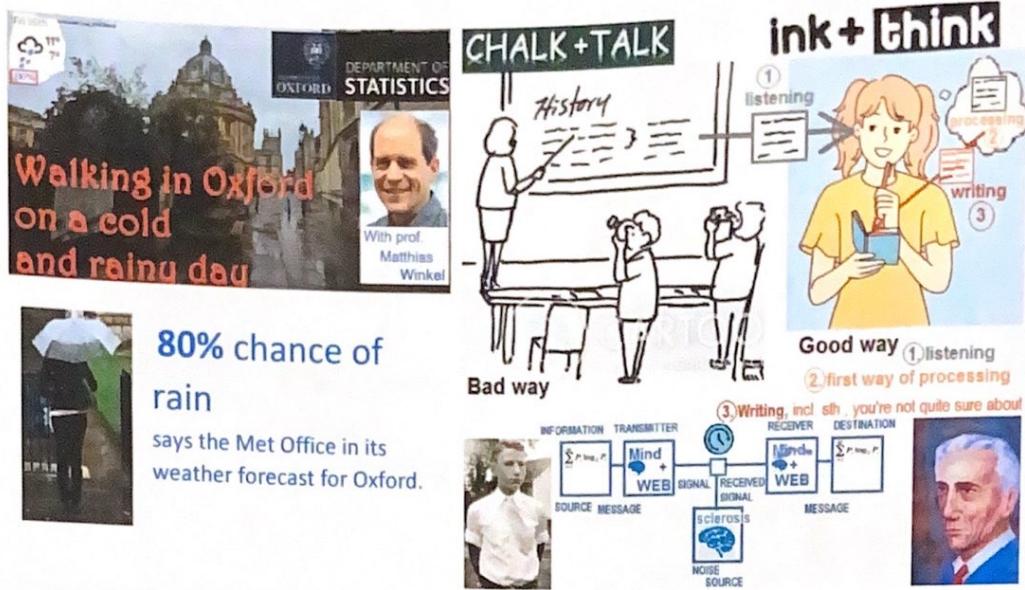
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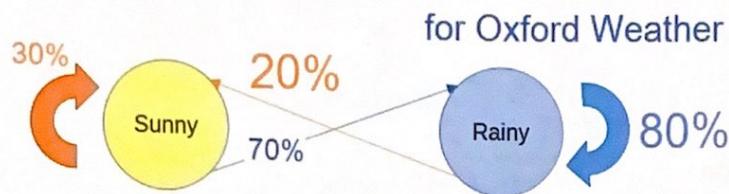


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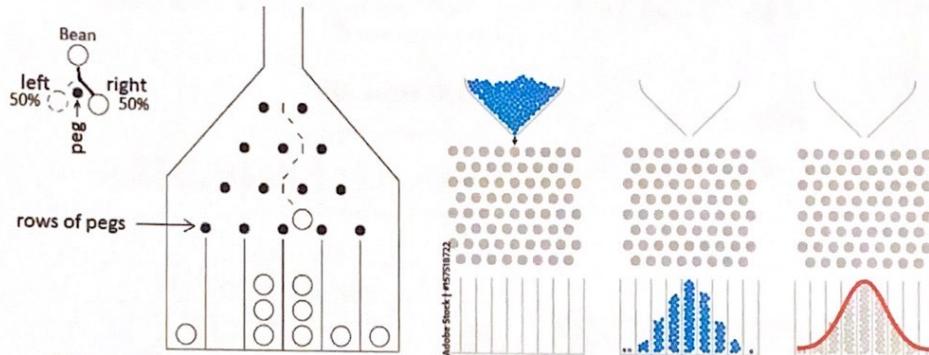




Markoff Chain Probability Model



If it is Rainy today => there is an 80% chance that it will be rainy tomorrow.



School gravity MOTION == formalism ==> University $E=MC^2$ $\#545.6$ $W=24f$ $\$1,105$

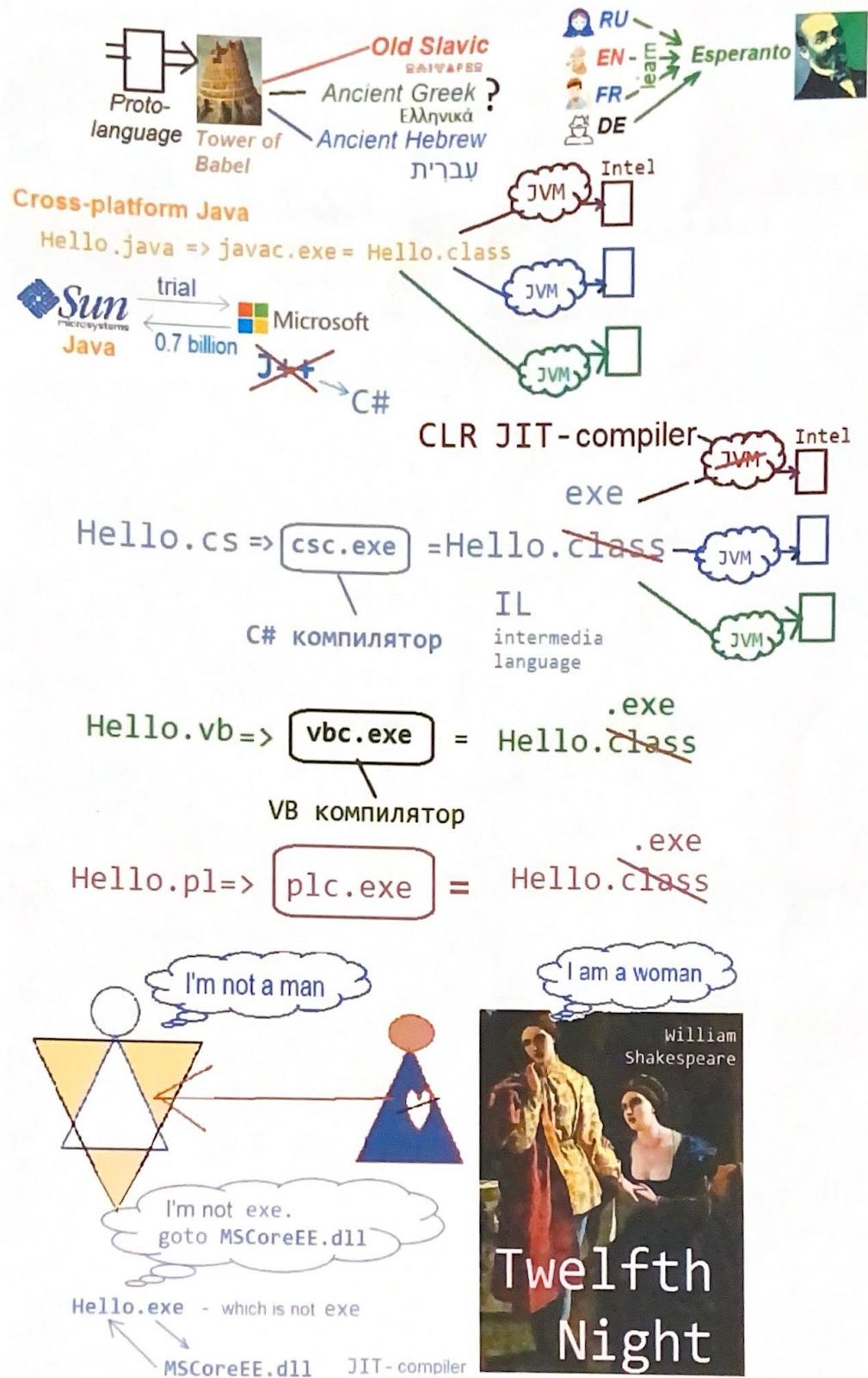
Motivation: 80% chance of rain

Let A_j be the event of rain at 9am on day j of this term, $1 \leq j \leq n$

Suppose the events A_i each have probability P , independently

| Oxford | | | | |
|----------|------------------|-------------------|------------------|-----------|
| Tue 13th | Wed 14th | Thu 15th | Fri 16th | |
| 70% | 10° 9° 70% | 13° 10° 70% | 13° 8° 60% | 11° 7° |

then take notes on the lecture yourself



What should you do at home:
Register free hosting on freeasphosting.net
At home because many hosting services do not register from one IP address.

ASP.NET Hosting .NET 7

SIGN UP FOR FREE

Create Your Free Site

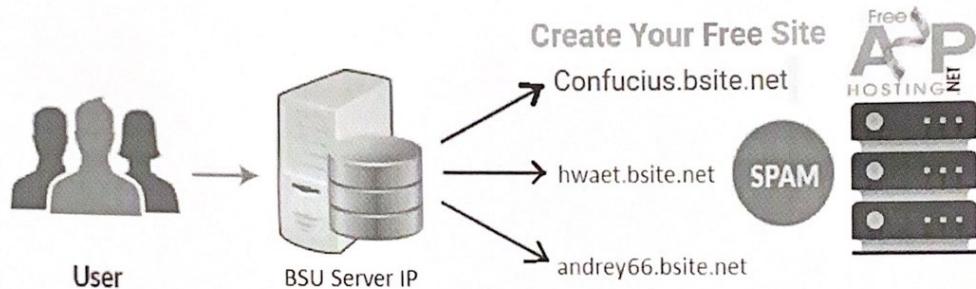
Confucius@studentweb.cc

https://Confucius.bsite.net

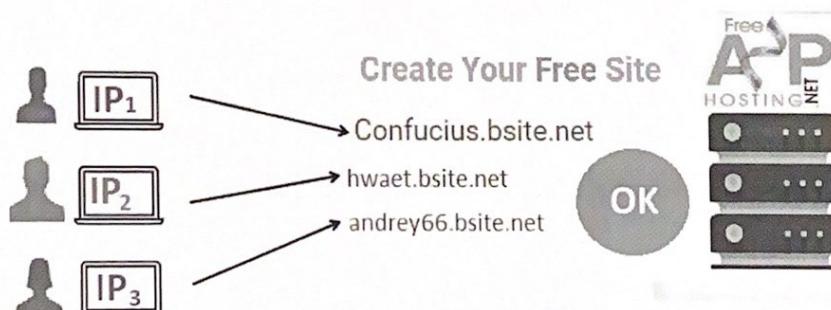
By signing up with our service you agree to our [Terms & Conditions](#).

Create Site

If several dozen hosting attempts to register from one IP address, the freeasphosting.net server may decide that this is a SPAMer and block it.

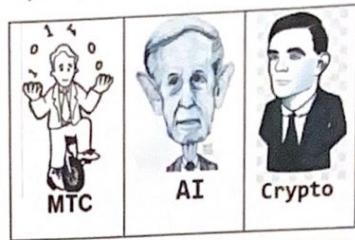


And if registration is carried out from different computers (with different IP addresses), then the freeasphosting.net server does not raise any suspicions.

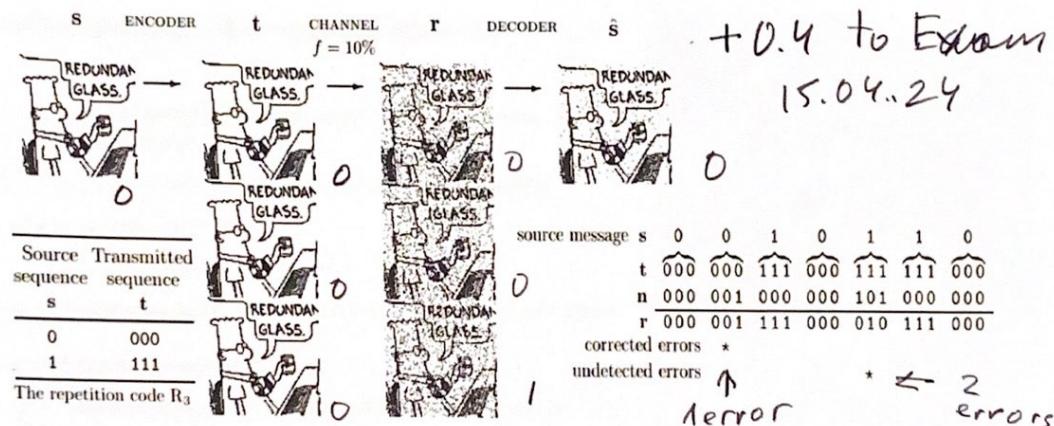


After you have registered on the server, send me your address (which you received during registration) by email.

Sir Dr. D. MacKay,
University of Cambridge
(22 April 1967 – 14 April 2016)

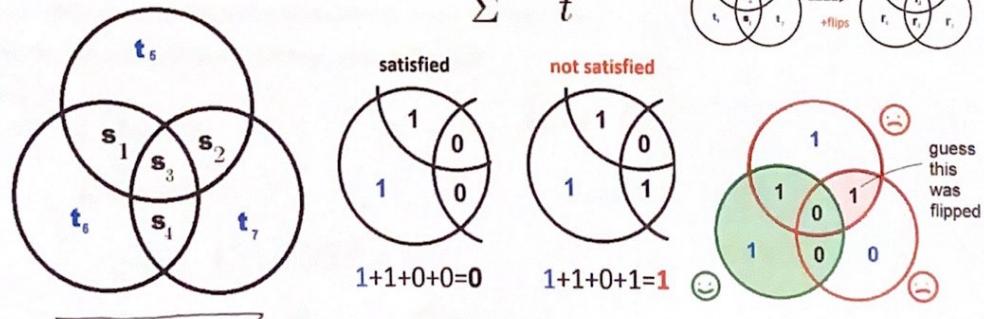


"I believe in clean energy,
but I also believe in mathematics"



7.4. Hamming code.

$$\frac{4}{\sum} \rightarrow \frac{7}{t}$$



width = "150"

What should you do in class: 課堂上你該做什麼:

0. Come up with a good name for your site. 為您的網站取一個好名字。

I came up with a name for my site - Confucius (in my opinion, this is a good name)

www.confucius.bsite.net

我為我的網站想出了一個名字 - Confucius - www.confucius.bsite.net

(在我看來，這是一個很好的網域)

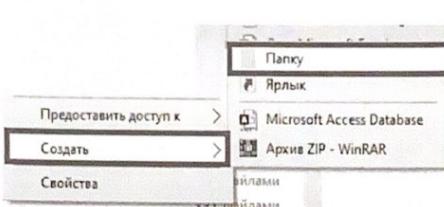
Добавлено примечание ([П1]):

Добавлено примечание ([П2R1]):

Добавлено примечание ([П3R1]):

1. On a HDD-disk or on a flash drive, make a folder that matches the name of the site
www.confucius.bsite.net

Новый том (D):
www.confucius.bsite.net



在 HDD 磁碟或快閃磁碟機上，建立一個與網站名稱相符的資料夾

2. In a folder D:\www.confucius.bsite.net\ create a folder for Projects
D:\www.confucius.bsite.net\Projects

在資料夾 D:\www.confucius.bsite.net\ 中為 Projects 建立一個資料夾
D:\www.confucius.bsite.net\Projects

3. In a folder D:\www.confucius.bsite.net\Projects\ create a folder for Projects Number 0
D:\www.confucius.bsite.net\Projects\0\

在資料夾 D:\www.confucius.bsite.net\Projects\ 中為 Projects Number 0 建立一個資料夾

4. In a folder D:\www.confucius.bsite.net\Projects\0\ create file index.htm

在資料夾 D:\www.confucius.bsite.net\Projects\0\ 中建立檔案

index.htm

<html>

Save As

<Body>

index.htm

<H1> IT </H1>

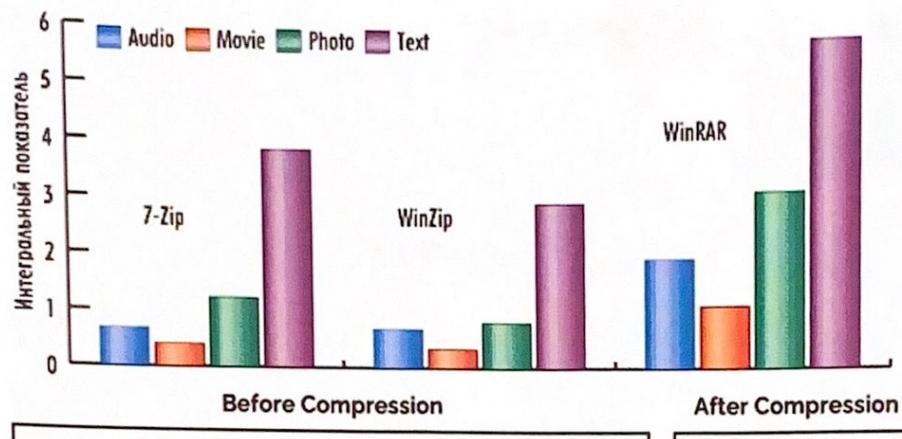
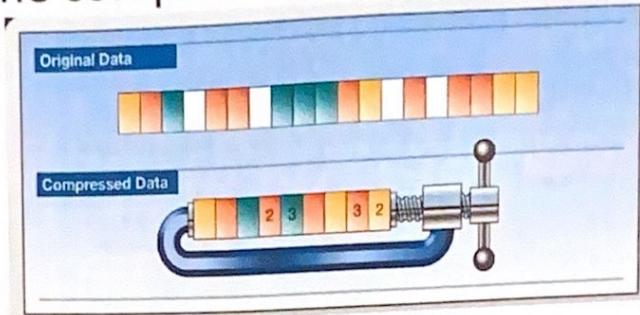
<H3> by Maria </H3>

</Body>

-

</html>

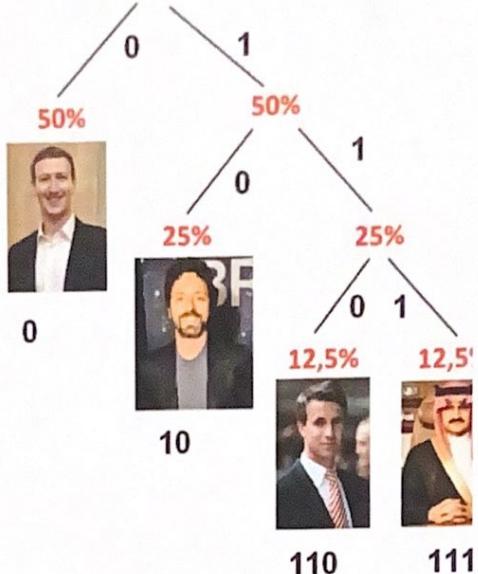
Comparison of the compression ratio of popular archivers



| Data | Symbol | Frequency | Symbol | Bit Code |
|-------------------------|--------|-----------|--------|----------|
| ↓ | A | 7 | A | 00 |
| AAAAAAAABCCCCCCDDEEEEEE | B | 1 | B | 111 |
| → | C | 6 | C | 01 |
| | D | 2 | D | 110 |
| | E | 5 | E | 10 |

Entropy
compression ratio

Before Compression - $21 \times 8 \text{ bits} = 198 \text{ bits}$
After Compression = $7 \times 2 \text{ bits} + 1 \times 3 \text{ bits} + 6 \times 2 \text{ bits} + 2 \times 3 \text{ bits} + 5 \times 2 \text{ bits} = 45 \text{ bits}$



Мама мыла ра

| | |
|---------------------|-------|
| M - 3 — 30% | 1-3 M |
| а - 4 — 40% | 4-7 а |
| ы - 1 — 10% | 8 -ы |
| л - 1 — 10% | 9 -л |
| р - 1 — 10% | 10 -р |
| 10 | |
| лла мам ма р | |

*First-order approximation
symbols independent but with
freeencies of Belarusian text.*



Мама мыла ра

| | |
|-------------|--------|
| Ма - 2 22% | 1-2 ма |
| ам - 2 22% | 3-4 ам |
| мы - 1 11% | 5 мы |
| ыл - 1 11% | 6 ыл |
| ла, - 1 11% | 7 ла |
| а р - 1 11% | 8 ар |
| р а - 1 11% | 9 ра |
| 9 | |

0. 4 6 7 3 1 9 1 6 7 3 5
 / / / / / / / / / /
 ам ыл ла ам ма ра ма ыл ла ам мы
 рама



Second-order approximation (digram (2-symbols) structure as in Belarusian)



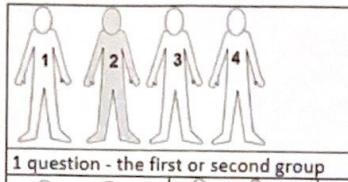
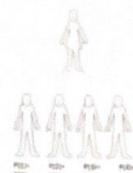
Say **NO** to
the
first



Say **YES** to
the **second**
if it is better
than the
first



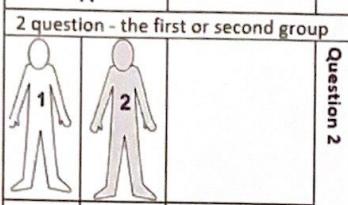
Say **NO** to the
third only if it is
worse than all
the others



1 question - the first or second group



Question 1



Question 2

Average number of questions =

$$2^*0.25 + 2^*0.25 + 2^*0.25 + 2^*0.25 = 2$$

Average number of questions =

$$1^*0.5 + 2^*0.25 + 3^*0.125 + 3^*0.125$$

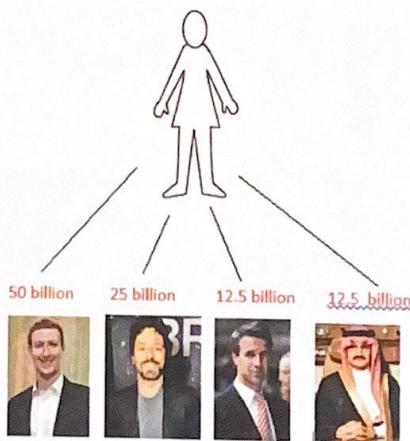


| | | |
|--|--|-------------------|
| Question 1. Is this Zuckerberg? | | 1^*0.5 50% |
| Question 2. Is this Sergey Brin? | | 2^*0.25 25% |
| Question 3. Is this Stefan from BMW? | | 3^*0.125 12,5% |
| So Prince Saud | | 3^*0.125 12,5% |

Average number of questions = **1,75**

Quantifying information

$$S(x) = \sum_{i=1}^n p(i) \log_2 \frac{1}{p(i)}$$



Quantifying information

$$I(x_i) = \log_2 \left(\frac{1}{p_i} \right)$$

number of bits required to encode choice

| | | | |
|---------------------|---------------------|-----------------------|-----------------------|
| Mark Zuckerberg | Sergey Brin | Stefan Quandt | Prince Al Saud |
| P(1)= 50% | P(2)= 25% | P(3)= 12,5% | P(4)= 12,5% |

$$32 \rightarrow f(x) \rightarrow 5$$

$$64 \rightarrow f(x) \rightarrow 6$$

$$\log_b(n) = x \Leftrightarrow b^x = n$$

↑ argument ↑ base ↑ exponent
base exponent argument

ce