

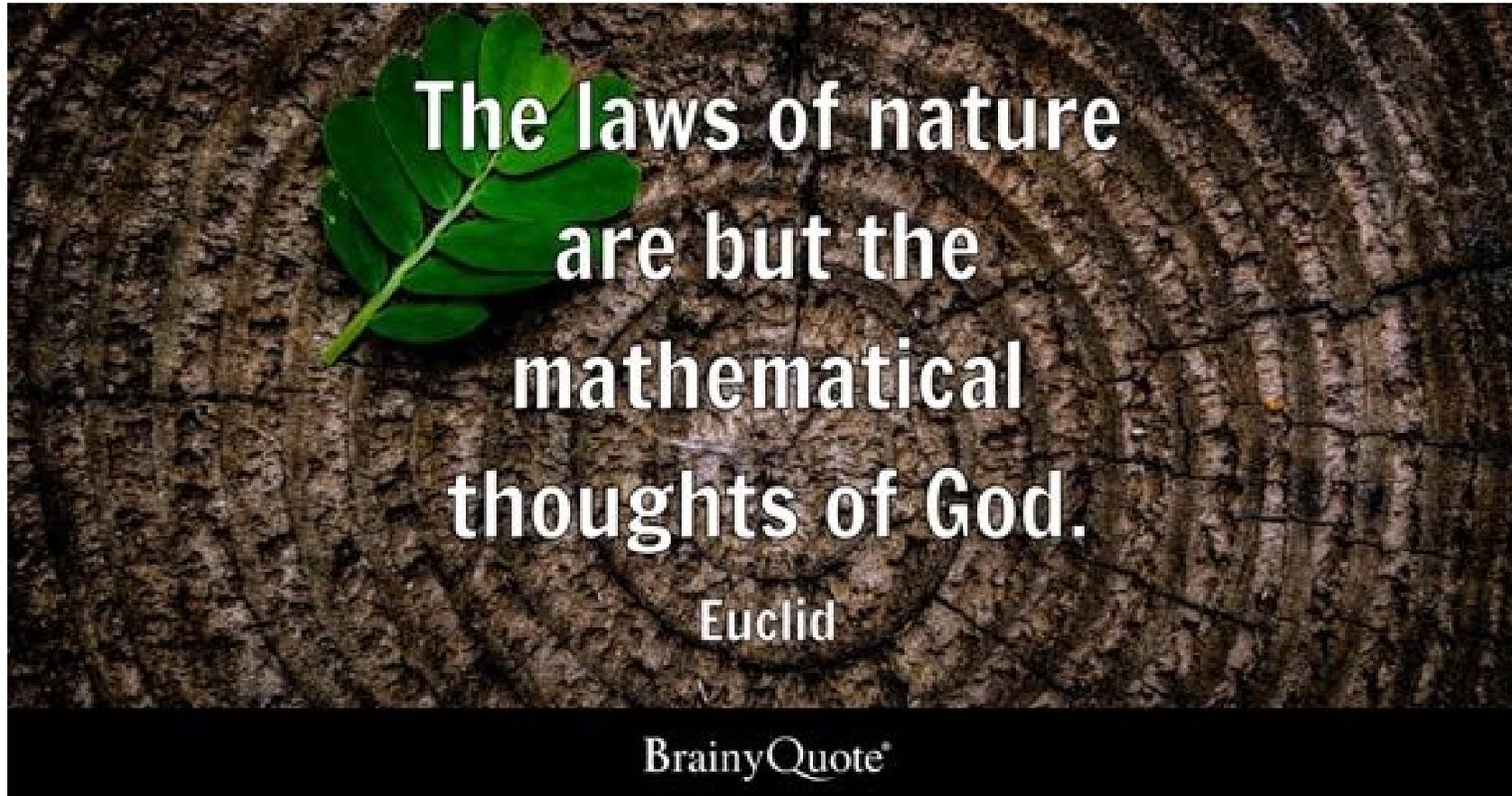
Mathematics education in the age of AI

Junaid Mubeen

fjmubeen@gmail.com

www.fjmubeen.com

The why of mathematics: v1



Human-machine collaboration



ChatGPT

LLMs are math olympians

July 21, 2025 Research

Advanced version of Gemini with Deep Think officially achieves gold-medal standard at the International Mathematical Olympiad

Thang Luong and Edward Lockhart

2025 IMO Problem 1

A line in the plane is called *sunny* if it is **not** parallel to any of the x -axis, the y -axis, or the line $x + y = 0$.

Let $n \geq 3$ be a given integer. Determine all nonnegative integers k such that there exist n distinct lines in the plane satisfying both of the following:

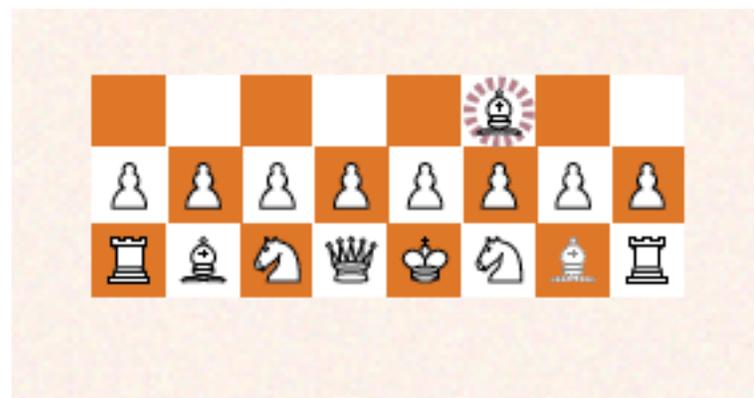
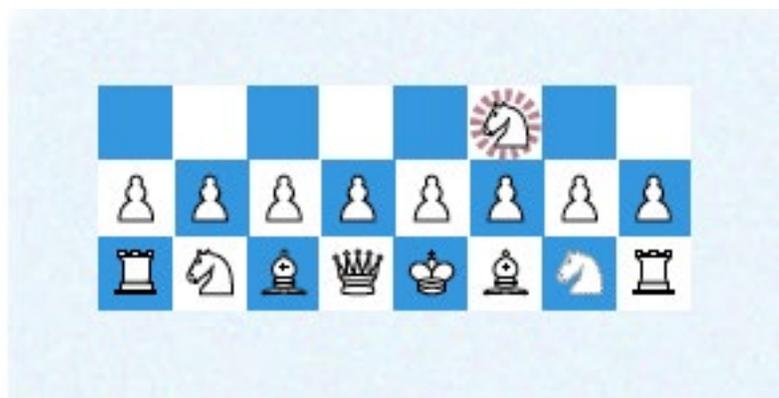
- for all positive integers a and b with $a + b \leq n + 1$, the point (a, b) lies on at least one of the lines; and
- exactly k of the n lines are sunny.

LLMs are built differently to humans



GSM-SYMBOLIC: UNDERSTANDING THE LIMITATIONS OF MATHEMATICAL REASONING IN LARGE LANGUAGE MODELS

Iman Mirzadeh¹ **Keivan Alizadeh¹** **Hooman Shahrokhi^{2*}**
Oncel Tuzel¹ **Samy Bengio¹** **Mehrdad Farajtabar^{1†}**
¹Apple ²Washington State University



A → B



Who is Tom Cruise's mother?



Tom Cruise's mother is Mary Lee Pfeiffer [...]



B → A



Who is Mary Lee Pfeiffer's son?



As of [...] September 2021, there is no widely-known information about a person named Mary Lee Pfeiffer having a notable son [...]



OpenAI Hit With First Defamation Suit Over ChatGPT Hallucination

ChatGPT: US lawyer admits using AI for case research

Elections in UK and US at risk from AI-driven disinformation, say experts

AI: Smart + Stupid + Confident

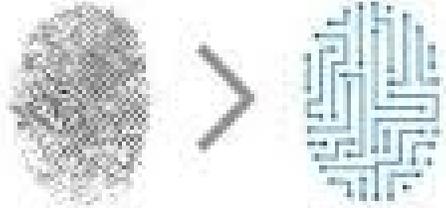
Humans

AI: Smart + Stupid + Confident

(but we can do better by thinking mathematically)

A version of mathematics that...

A STORY OF
HUMAN SUPERIORITY
OVER MACHINES

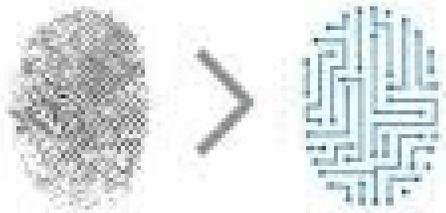


MATHEMATICAL
INTELLIGENCE

JUNAID MUBEEN

- Is not easily automated
- Complements machine intelligence
- Plays to our human strengths

A STORY OF
HUMAN SUPERIORITY
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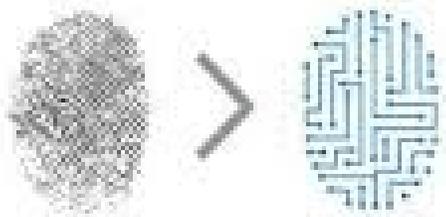


MATHEMATICAL
INTELLIGENCE

JUNAID MUBEEN

- Estimation
- Representations
- Reasoning
- Imagination
- Questioning
- Temperament
- Collaboration

A STORY OF
HUMAN SUPERIORITY
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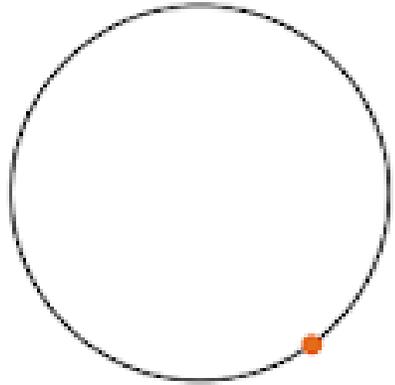


MATHEMATICAL
INTELLIGENCE

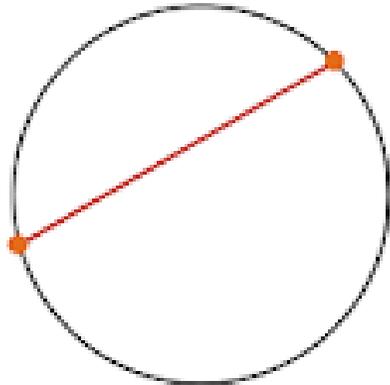
JUNAID MUBEEN

- Estimation
- Representations
- **Reasoning**
- Imagination
- Questioning
- Temperament
- Collaboration

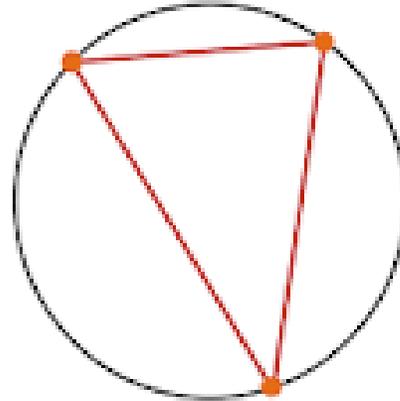
How many regions in the circle?



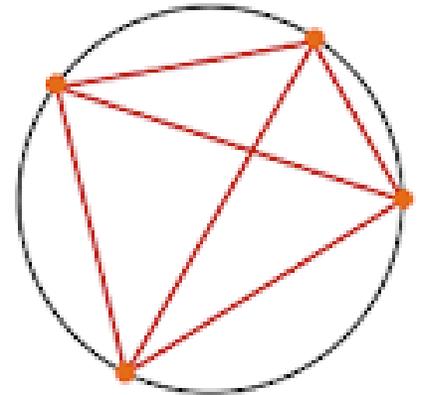
1



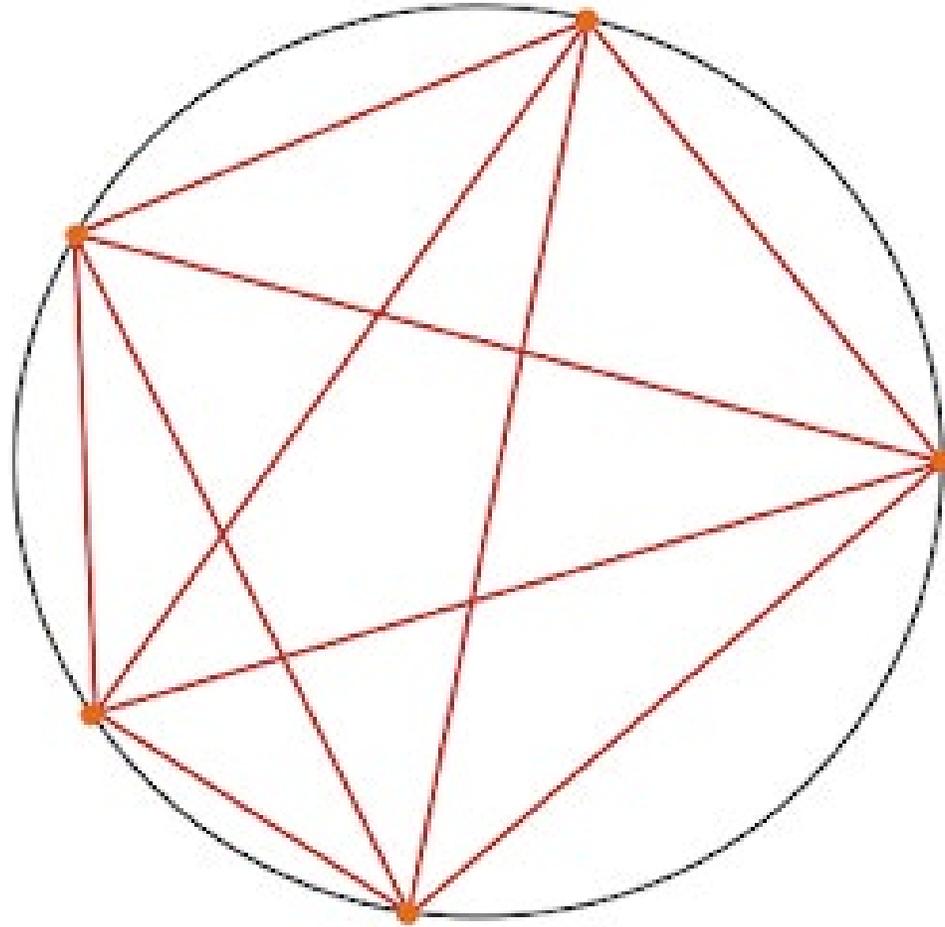
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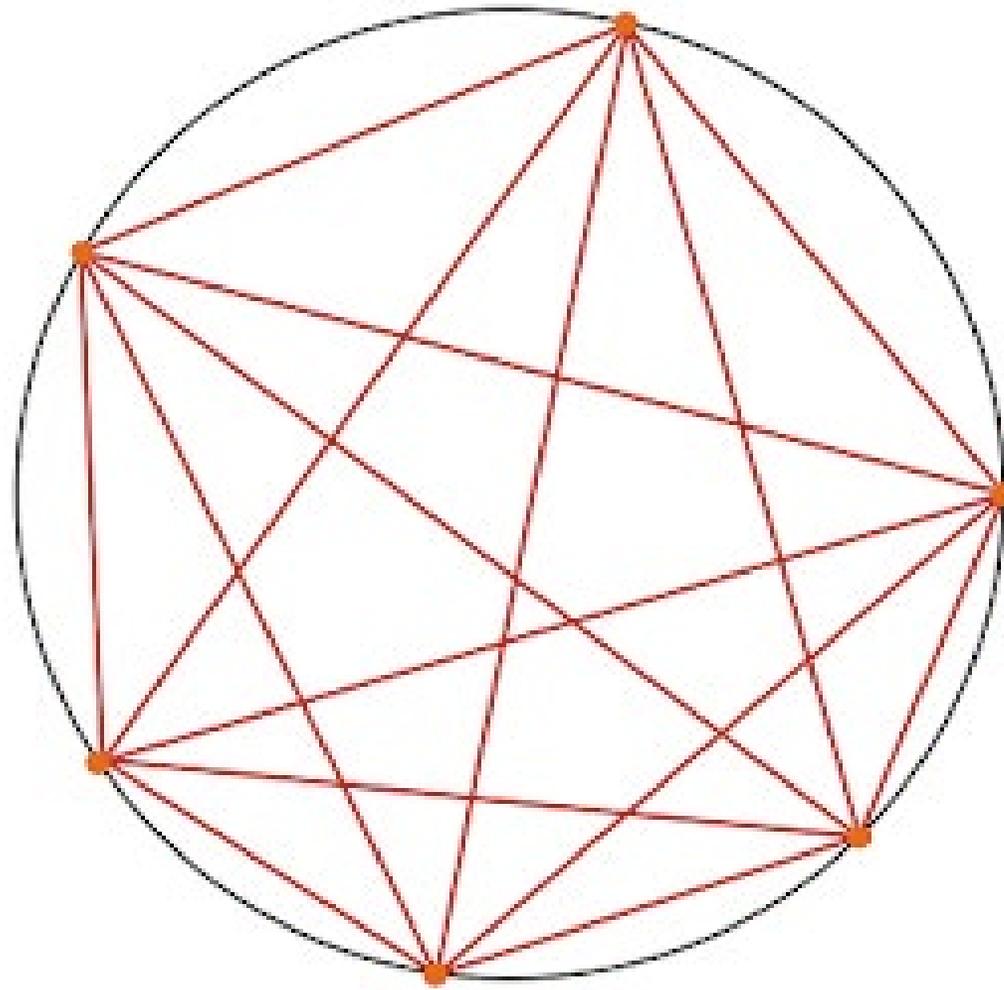
4



8

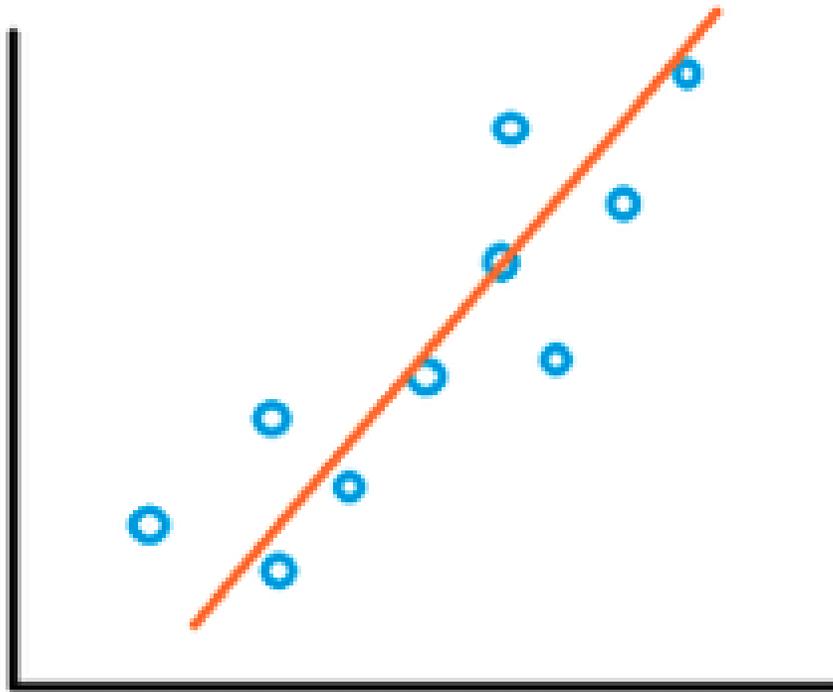


16



31

Number of regions for n points:
 $(n^4 - 6n^3 + 23n^2 - 18n + 24)/24$



Jerry Saltz ✓
@jerrysaltz



Ladies and Gentlemen; All the Vice-Presidents of The United States of America.



Math by doing



parallel
by Simon Singh

25.1 A die has the shape of a regular tetrahedron, with the four faces having 1, 2, 3 and 4 pips. The die is placed with 4 pips 'face down' in one corner of the triangular grid shown, so that the face with 4 pips precisely covers the triangle marked with 4 pips.



The die is now 'rolled', by rotating about an edge without slipping, so that 1 pip is face down. It is rolled again, so that 2 pips are face down, as indicated. The rolling continues until the die rests on the shaded triangle in the opposite corner of the grid.

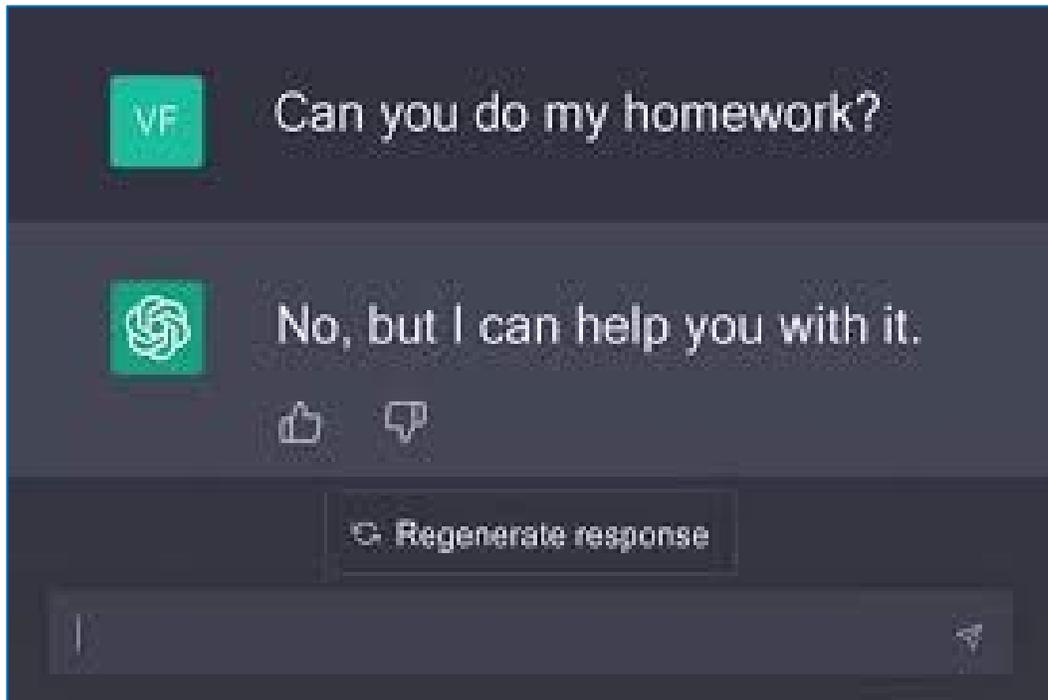
How many pips are now face down?

A ● 1 B ● 2 C ● 3 D ● 4
E ● it depends on the route taken

Go to www.slido.com (code: monthlymaths7)

<https://parallel.org.uk>

When AI overreaches

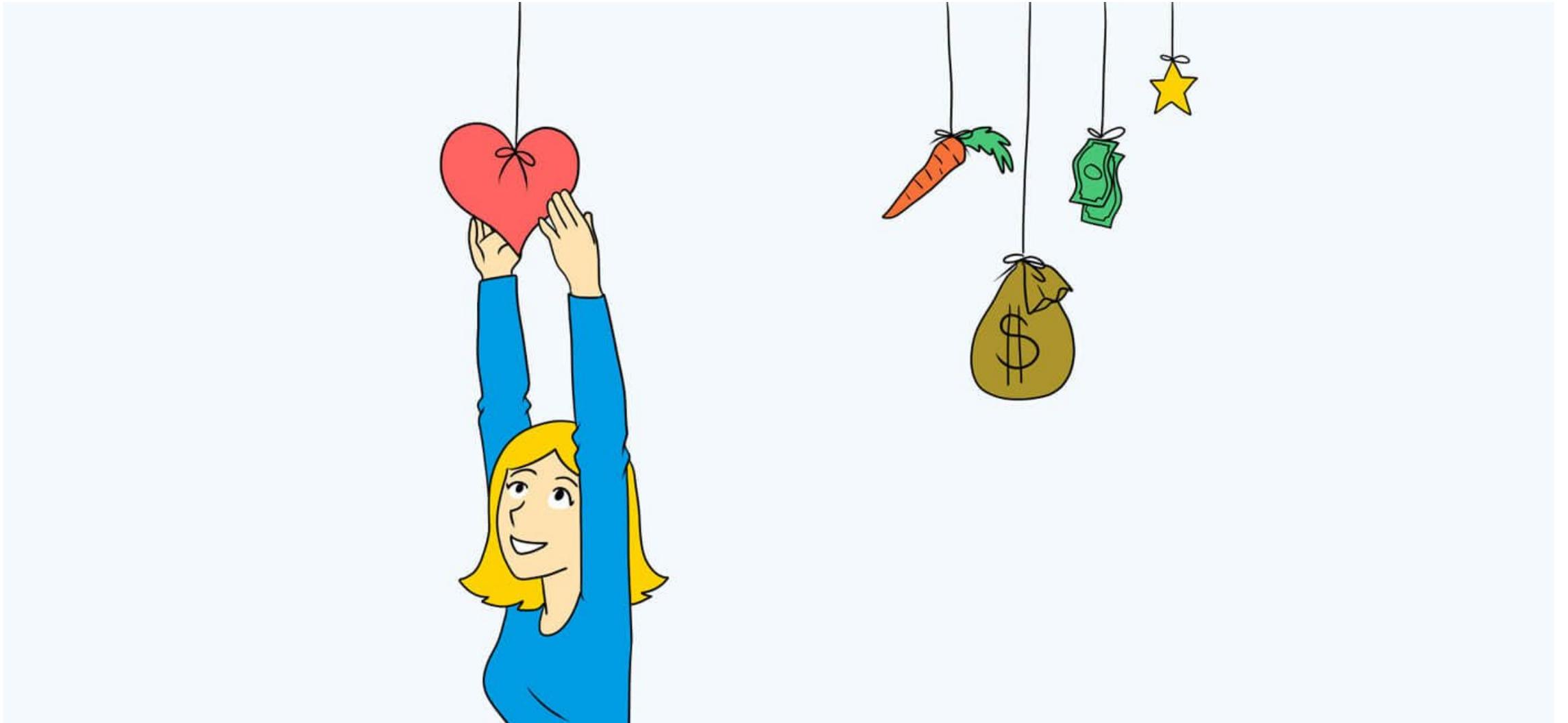


Hope



Reality

Learning as an end in itself



“Being a lawyer, an accountant, a project manager, a marketing person- most of those tasks will be fully automated by AI within 12 to 18 months.”

Mustafa Suleyman, CEO of Microsoft AI

“AI will eliminate 50% of entry-level white-collar jobs.”

Dario Amodei, CEO of Anthropic

“Some areas, I think just like totally, totally gone.”

Sam Altman, CEO of OpenAI

“Every job will be affected, and immediately. It is unquestionable.”

Jensen Huang, CEO of Nvidia

“AI and robots will replace all jobs. Working will be optional”

Elon Musk

Teach U.S. kids to write computer code

Douglas Rushkoff, Special to CNN

🕒 4 min read · Published 8:43 AM EST, Mon December 10, 2012

2012: The year that coding became de rigueur

News Analysis

Dec 24, 2012 · 4 mins



INDEPENDENT PREMIUM

IN FOCUS

‘Learn to code’ is dead. So what the heck should you actually teach your kids in the age of AI?

BEFORE

StackExchange

I have to develop a class that creates new files. If a file with the given name be renamed by addition of the timestamp to the file name. The file name should be readable, so I can use neither UUID nor `createTempFile`. The code works, I

```
public class FileBackup {  
    /**  
     * Creates new file. If file with given name exists, then ba  
     * it by renaming and adding time stamp to file name;  
     *  
     * @param filePath the fully qualified name of file  
     *  
     * @return the file on success; otherwise returns null  
     *  
     * @throws IOException  
     */  
    public static File backupA  
        File fileToCreate = ne  
        boolean backupRequired
```



AFTER



D Can you provide a Python function that calculates the sum of two numbers?

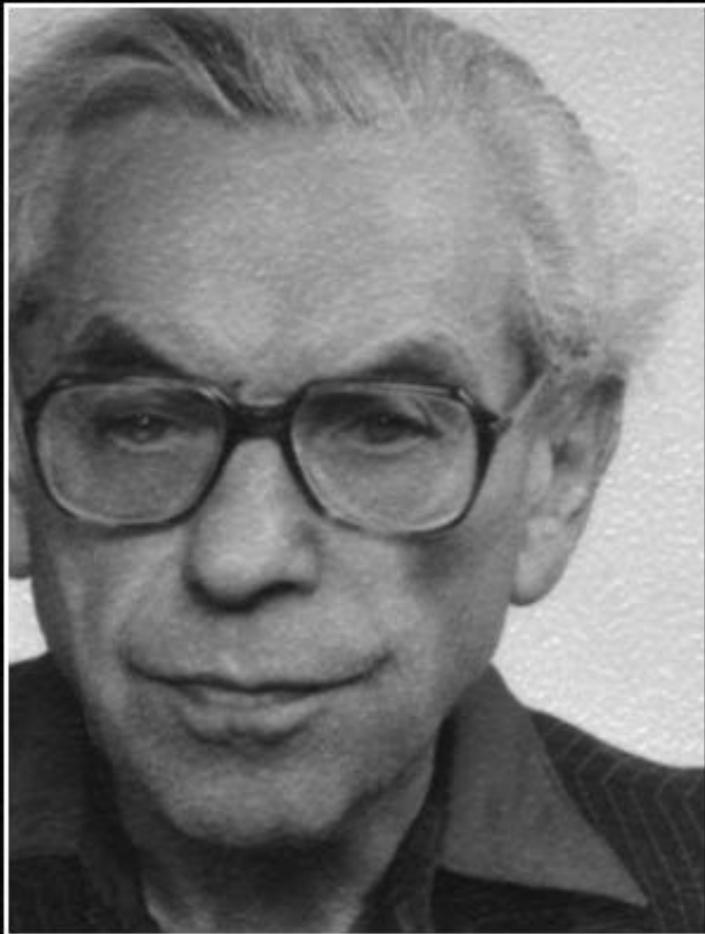
GPT-4o Certainly! Here's an example of a Python function that calculates the sum of two numbers:

```
python Copy code  
def add_numbers(a, b):  
    sum = a + b  
    return sum
```

This function takes two numbers as input, adds them together and stores the result in a variable named 'sum'. It then returns the value of 'sum'.



The why of mathematics: v2



Why are numbers beautiful? It's like asking why is Beethoven's Ninth Symphony beautiful. If you don't see why, someone can't tell you. I know numbers are beautiful. If they aren't beautiful, nothing is.

— *Paul Erdős* —

AZ QUOTES

Thank you!