

**Demo:**

**<http://118.89.117.111/solvegpt/index.html>**



# **AI Smart Math Teacher**

**AI & GPT Hackathon Pitching Day**

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**2023.8.15**

# Demo



SolveGPT — AI集智数学老师 高级设置

支持模型列表:

gpt-4-0613

答案语种设置

英文

使用年龄阶段选项

小学生

问题:

There are several chickens and rabbits. They have 88 heads and 244 feet. How many chickens and rabbits each has?

上传图像:

选择文件 鸡兔同笼问题——英文版.png

图片转文字 一键解题

**Adversarial Learning**

**Personalize Input**

Accuracy: 100%

Accuracy Analysis

## Knowledge Explain

### Definition

#### Chicken

A chicken is a type of domesticated bird. In the context of this problem, a chicken has 1 head and 2 feet.

#### Rabbit

A rabbit is a type of animal. In the context of this problem, a rabbit has 1 head and 4 feet.

### Theorem

#### Simultaneous Linear Equations

Simultaneous equations are a set of equations containing multiple variables. They are 'simultaneous' in that the equations are all satisfied together. In this context, the number of heads and the number of feet provide two equations that can be solved simultaneously to find the number of chickens and rabbits.

### Answer

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Subtract the first equation from the simplified second one, we get  $y = 34$ .  
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So there are 54 chickens and 34 rabbits.

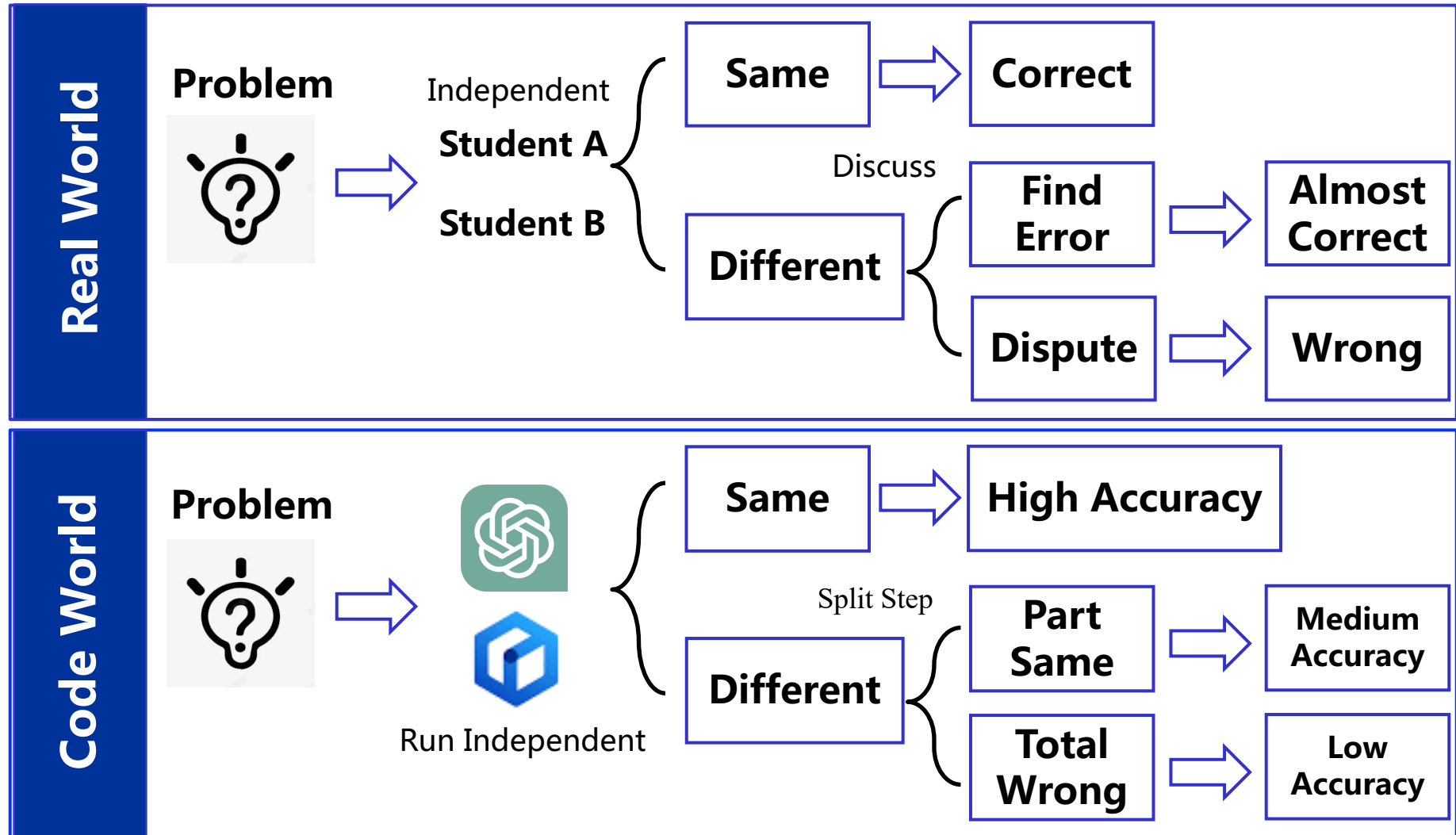
**AI Smart Math Teacher — Personal Teacher!**  
Applied for two Chinese invention patents

# Demo



# Product Feature

## Accuracy — Comparison



# Product Feature

## ❑ Personal Math Teacher——Lecture Note

### Problem

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### Lecture Note : Definition, Theorem, Answer

#### Definition

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#### Answer

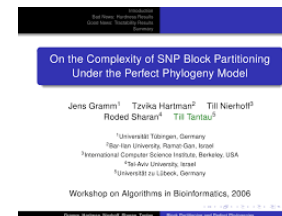
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## 1. Automatic Generation



## 2. Academic Template



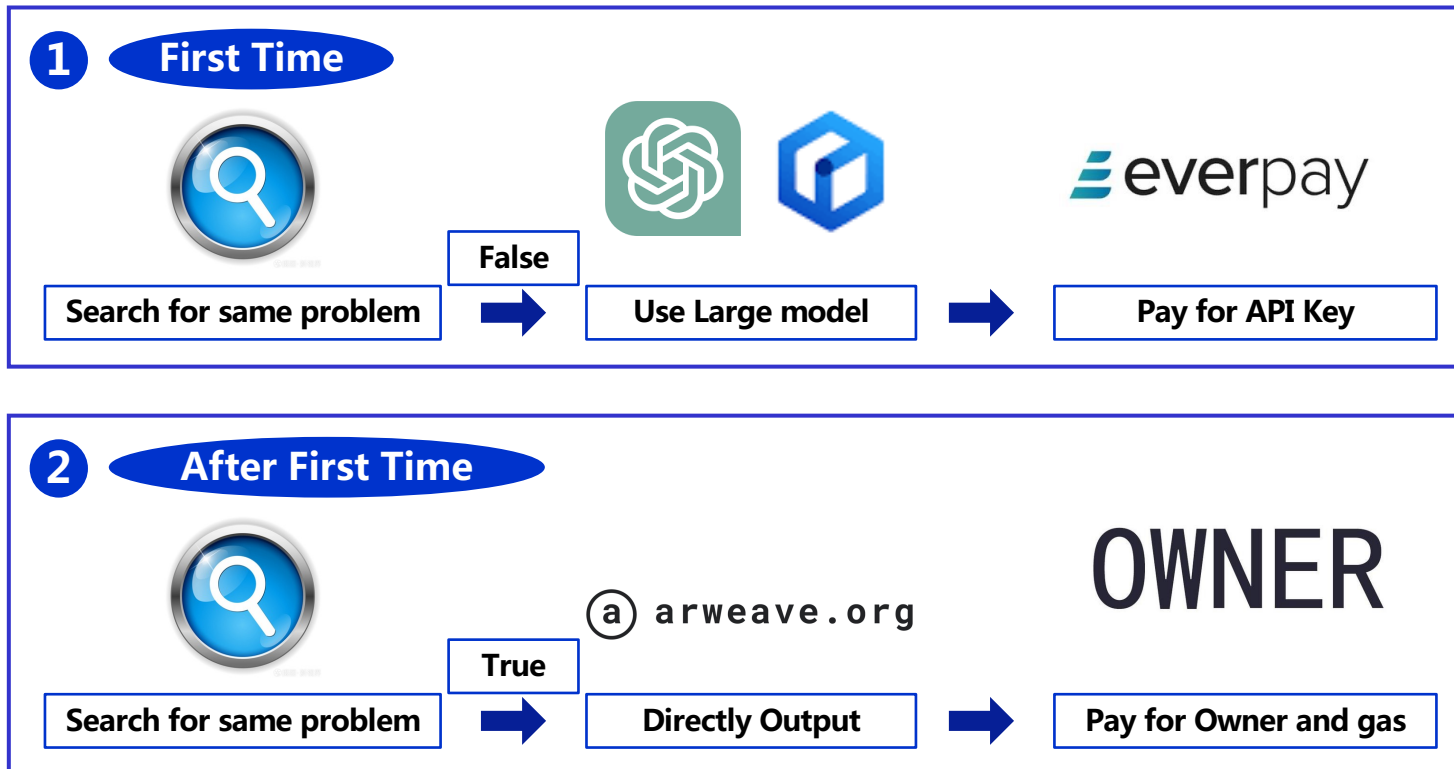
## 3. Based on knowledge level

**Students Need Teacher! Not Solver.**

# Product Feature



## ❑ Own the solution (based on Arweave)



**Student can study as well as earn money**

## ❑ SolveGPT——AI Smart Math Teacher

- **Personalize Input**, different choice and photo input
- **Adversarial Learning**, large model joint adversarial solving
- **Accuracy Analysis** , evaluate accuracy of solution
- **Knowledge Explain** , automated generation of lecture notes

## ❑ Judges Suggestions

- (Finished) Better Website Interface by add cartoon
- (Finished) Design for Different Ages by change prompt
- (Finished) Design for English and other switch button
- (Coming Soon) Combine with wolframalpha or stackoverflow

# Technical Implementation



**Technology**

Personalize  
Input

Adversarial  
Learning

Accuracy  
Analysis

Knowledge  
Explain

**Character**

AI Smart Math Teacher

Efficient、 Accurate、 Educative



# Math Teacher——Efficient



## Personalize Input

Input Mode	
Text	Text Reading
Image	Image Recognition
	OCR Image

Language
English
Chinese

Student level
Elementary
Middle
High
College

上传图像:

选择文件

未选择任何文件

答案语种设置

中文

中文

英文

使用年龄阶段选项

小学生

小学生

中学生

高中生

大学生

# Math Teacher——Efficient



## Multimodal Input

SolveGPT——AI集智数学老师 高级设置

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Adversarial Learning

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Accuracy: 100%

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Windows, Mac - website (nginx)

12:46 SolveGPT

SELECT PICTURE

一加一等于几

gpt-3.5-turbo(fast response low acc..)

SUBMIT QUESTION

Answer:

一加一等于几这个问题是一个简单的算术问题，答案显然是2。在数学中，加法是一种基本

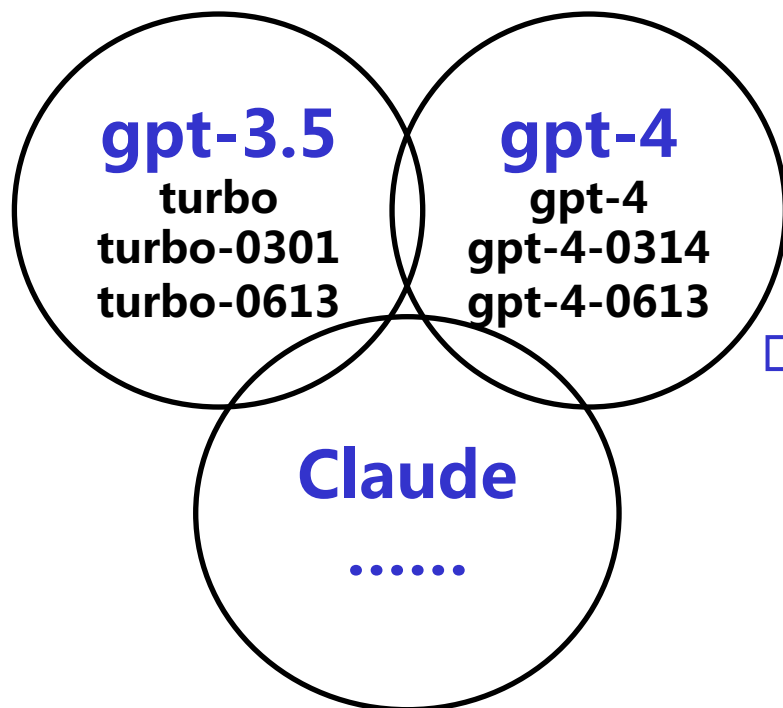
Android-APP

# Math Teacher——Accurate



## Adversarial Learning

### Model Fusion



### Target

High  
Accuracy

Wide Usage

More  
Practical

### Concept

Model Analysis

Data ↓ Support

Result Correction

Perform ↓ Assure

Evaluate Accuracy

# Math Teacher——Accurate



## Accuracy Analysis

### 1 Synchronize

**gpt-3.5-turbo**  
**gpt-3.5-turbo-0301**  
**gpt-3.5turbo-0613**

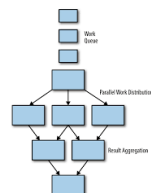
**gpt-4**

**gpt-4-0314**

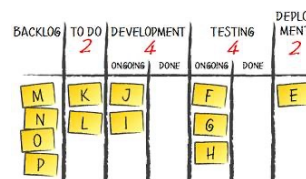
**gpt-4-0613**

**Claude**

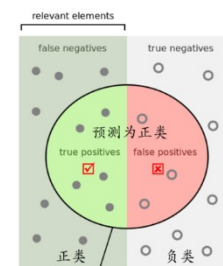
### 2 Split Step



Process Split



Step Accuracy

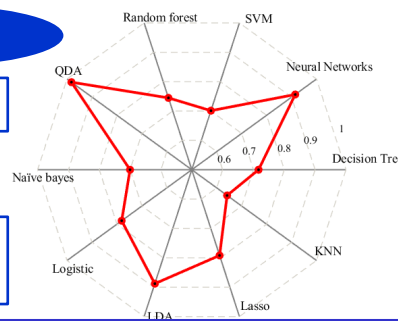


Overall Accuracy

### 3 Result

Different result

Choose more result



Hold out Method		Model Performance
Training	Test	
Iteration 1		95%
Iteration 2	Test	89%
Iteration 3	Test	84%
⋮		
Iteration n-1	Test	91%
Iteration n	Test	92%

# Math Teacher——Accurate



2023 College Chinese Examination						
Mathematics						
Problem	GPT API4	GPT4-Default	GPT4-WebBing	GPT4-Wolframalpha	SolveGPT	Answer
1	C	C	C	C	C	C
2	A	A	A	A	A	A
3	C	D	D	D	D	D
4	D	D	D	D	D	D
5	A	A	A	A	A	A
6	B	C	/	/	B	B
7	C	C	C	C	C	C
8	A	A	/	/	/	B
9	BCD	BCD	BCD	BD	BD	BD
10	AC	AC	AC	ACD	AC	ACD
11	AC	AB	A	AB	/	ABC
12	A	A	A	A	A	ABD
13	64	64	64	74	64	64
14	$7\sqrt{2}/3$	$7\sqrt{2}/3$	$5\sqrt{2}$	$7\sqrt{2}/3$	$7\sqrt{2}/3$	$7\sqrt{6}/6$
15	$(1, +\infty)$	$(1, 2]$	$(3, 6)$	/	/	$[2, 3)$
16	$\sqrt{2}$	3	/	/	/	$3\sqrt{5}/5$
Accuracy	44%	44%	44%	50%	56%	100%



Correct



Unable



Wrong

Test Method : Video BV1Fh411K7vp

## Knowledge Explain

Knowledge Database

Automatic PPT

### 知识宝库:

下载 上传

Question	Definition/Theorem/Answer
用牛顿迭代法求解 $x^3+x=1$	<p>Definition: [{"name": "牛顿迭代法", "content": "牛顿迭代法是一种用于求解方程根的迭代算法，对于一个实值函数 <math>f(x)</math>，我们可以从一个初始近似值 <math>x_0</math> 开始，通过下列迭代公式寻找 <math>f(x)=0</math> 的根: <math>x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}</math>，其中 <math>f'(x_n)</math> 是函数在 <math>x_n</math> 处的导数。"}] Theorem: [{"name": "牛顿法的收敛定理", "content": "如果 <math>f(x)</math> 在包含根的某个区间内具有连续的一阶和二阶导数，并且初值选择得当，那么牛顿法产生的迭代序列 <math>\{x_n\}</math> 会以至少二阶的速度收敛到 <math>f(x)</math> 的根。"}] Answer: 要用牛顿迭代法求解方程 <math>x^3+x=1</math>，首先我们需要确定函数 <math>f(x)</math> 及其导数 <math>f'(x)</math>。这里，我们让 <math>f(x)=x^3+x-1</math>，所以 <math>f'(x)=3x^2+1</math>。接下来，我们需要选择一个初始值 <math>x_0</math>，通常这个值是一个对解的粗略猜测。这里我们假设 <math>x_0=1</math>。然后，我们就可以开始迭代过程，使用下面的迭代公式: <math>x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}</math> 进行迭代，直到满足某个精度要求为止。这个过程需要用到程序计算。因此，最终的答案需要依据迭代的次数和精度要求来确定。</p>
为了测量小木板和斜面间的摩擦因数某同学设	<p>Definition: [{"name": "摩擦因数", "content": "摩擦因数，也称为摩擦系数，是描述物体表面间摩擦力强度的无量纲量。其定义为：摩擦力和压力（正压力）之比，不随接触面积的变化而变化，只与物体表面的性质有关。摩擦系数通常区分为静摩擦系数（在两物体开始滑动之前的摩擦系数）和动摩擦系数（在两物体滑动时的摩擦系数）。"}, {"name": "弹簧测力计", "content": "弹簧测力计是一种物理实验设备，用于测量力的大小。它的工作原理主要是利用虎克定律：弹簧的伸长或者压缩长度与施加在弹簧上的力成正比。因此，通过测量弹簧的伸长或者压缩长度，就可以推断出施加在弹簧上的力的大小。"}, {"name": "斜面", "content": "斜面是一种常见的简单机械，基本原理是将需要垂直上升或下降的物体沿斜面移动，以减小所需的力。在物理学中，斜面问题通</p>

### Definition

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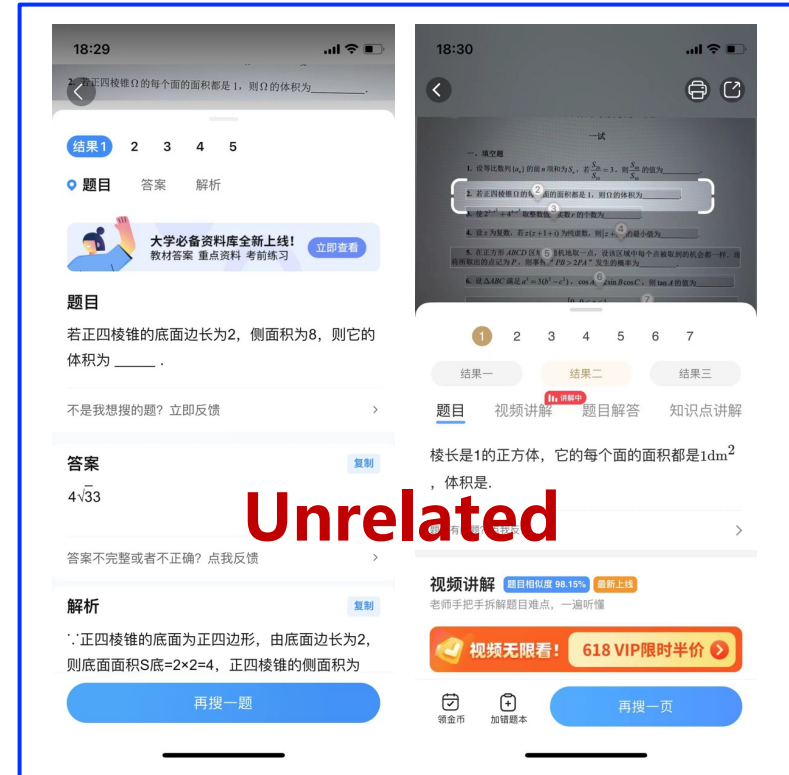
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# Advantage 1

## ❑ Compare Traditional Tools: Chegg、Zuoyebang



Traditional tool **can not** solve Problem not in database

# Advantage 2



## ❑ Compare Large Language Model: chatgpt, claude

Model: Default (GPT-3.5)

10 若正四棱锥  $\Omega$  的每个面的面积都是1, 则  $\Omega$  的体积为

若正四棱锥的每个面的面积都是1, 则它的体积可以通过以下方法计算:

- 首先, 我们需要确定正四棱锥的形状和尺寸。正四棱锥是一个四面体, 其中底面是一个正方形, 四个侧面是等腰直角三角形。设正方形的边长为  $a$ , 等腰直角三角形的等腰边长为  $b$ 。
- 接下来, 我们可以计算正方形的面积。正方形的面积公式是面积 = 边长  $\times$  边长, 因此正方形的面积为  $a \times a = a^2$ 。
- 正方形的面积等于1, 因此有  $a^2 = 1$ 。解这个方程, 可以得到正方形的边长  $a = 1$ 。
- 然后, 我们需要计算等腰直角三角形的面积。等腰直角三角形的面积公式是面积 =  $0.5 \times$  底边长  $\times$  高, 其中底边长是等腰边长, 高是垂直于底边的线段长度。
- 在正四棱锥中, 等腰直角三角形的底边长为  $b$ , 高可以通过勾股定理计算得到。由于等腰直角三角形的等腰边长为  $b$ , 直角边长为  $b/\sqrt{2}$ , 因此三角形的高为  $b/\sqrt{2}$ 。
- 等腰直角三角形的面积等于1, 因此有  $0.5 \times b \times (b/\sqrt{2}) = 1$ 。解这个方程, 可以得到等腰边长  $b = \sqrt{2}$ 。
- 现在, 我们已经确定了正四棱锥的尺寸, 正方形的边长为1, 等腰边长为  $\sqrt{2}$ 。
- 正四棱锥的体积可以通过计算四个等腰直角三角形的体积和正方形的体积之和得到。等腰直角三角形的体积公式是体积 =  $0.5 \times$  底边长  $\times$  高  $\times$  高, 其中底边长和高分别为等腰边长和垂直于底边的线段长度。
- 因此, 正四棱锥的体积为  $V = 4 \times (0.5 \times \sqrt{2} \times (\sqrt{2}/\sqrt{2}) \times (\sqrt{2}/\sqrt{2})) + 1 \times 1 = 4 + 1 = 5$ 。

所以, 正四棱锥的体积为5。

**GPT-3.5**  
**Answer=5**

Model: GPT-4

10 若正四棱锥  $\Omega$  的每个面的面积都是1, 则  $\Omega$  的体积为

正四棱锥（正四面体）的体积公式是：

$$V = \sqrt{2}/12 * a^3$$

这里,  $a$  是正四棱锥的棱长。在这个问题中, 我们知道每个面的面积为1, 我们可以用这个信息来求解  $a$ 。一个正四面体的一个面是一个等边三角形, 其面积  $A$  和边长  $a$  之间的关系是：

$$A = \sqrt{3}/4 * a^2$$

所以我们可以求出  $a$ ：

$$1 = \sqrt{3}/4 * a^2$$

这给出  $a = \sqrt{(4/\sqrt{3})} = 2/\sqrt{\sqrt{3}} = 2\sqrt{3}/3$

然后将这个值代入体积公式得到正四棱锥的体积：

$$V = \sqrt{2}/12 * (2\sqrt{3}/3)^3 = \sqrt{2}/12 * 8\sqrt{3}/27 = \sqrt{2}/12 * 2\sqrt{3}/9 = \sqrt{2}/54 * \sqrt{3} = \sqrt{6}/54$$

**GPT-4**  
**Answer=0.09**

**Correct Answer=0.75**

**Large Language Model , Confident to give wrong answer**



# Advantage 3

## □ Targeted Lecture notes for specific problem

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**Math Professor  
lecture notes  
template**

L<sup>A</sup>T<sub>E</sub>X

$$v_f = C_d n \frac{\pi D^2}{4} \sqrt{\frac{2P}{\rho}}$$

**Explain definition, theorem and solution like professor**

## ❑ Business : To Customer (Each Cost within 0.1\$)

- Pay-per-view
- Monthly plan
- .....

## ❑ Why choose AI Smart Math Teacher?

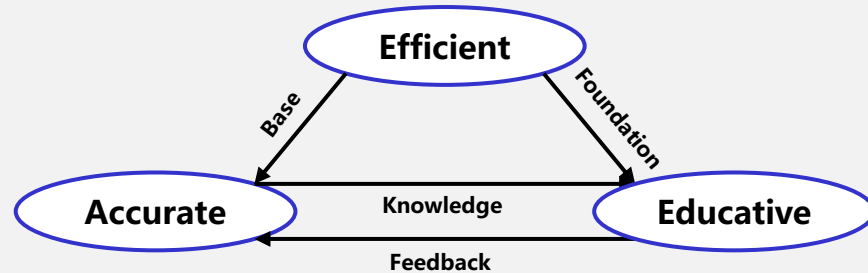
- Easy Usage
- Own pdf solution
- Personalize and Educative
- Cope with any Problem
- .....

# Thanks for listening



## AI Smart Math Teacher

- Personalize Input
- Adversarial Learning
- Accuracy Analysis
- Knowledge Explain



## Existing Tool

Traditional tool can not solve Problem not in database

Large Language Model , confident to give wrong answer, lack of teach

Lecture note or book contains too much knowledge, not practical

## SolveGPT

Click One button to generate note  
**Efficient**

Use Model Fusion to achieve result  
**Accuracy**

Personal Teacher, patient and smart  
**Educative**