

Demo:

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



AI Smart Math Teacher

AI & GPT Hackathon Pitching Day

Reporter: Hongshen Zhang

Zhejiang University

hongshen.zhang@zju.edu.cn

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

Let's denote the number of chickens as x and the number of rabbits as y . According to the problem, we have two equations based on the number of heads and feet:

1. The total number of heads gives us the first equation: $x + y = 88$.
2. The total number of feet gives us the second equation: $2x + 4y = 244$. We can simplify this equation to $x + 2y = 122$.
Subtract the first equation from the simplified second one, we get $y = 34$.
Substitute $y = 34$ into the first equation, we get $x = 88 - 34 = 54$.
So there are 54 chickens and 34 rabbits.

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

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

中文

▾

使用年龄段选项

小学生

▾

问题:

✎

一键解题

知识与答案:

📌 存知识库

📄 查看pdf

知识库:

📄 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 $f(x)$, 我们可以从一个初始近似值 x_0 开始, 通过下列迭代公式寻找 $f(x)=0$ 的根: $x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}$, 其中 $f'(x_n)$ 是函数在 x_n 处的导数。"}] Theorem: [{"name": "牛顿法的收敛定理", "content": "如果 $f(x)$ 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 $\{x_n\}$ 会以至少二阶的速度收敛到 $f(x)$ 的根。"}] Answer: 要使用牛顿迭代法求解方程 $x^3+x=1$, 首先我们需要确定函数 $f(x)$ 及其导数 $f'(x)$。这里, 我们让 $f(x)=x^3+x-1$, 所以 $f'(x)=3x^2+1$。接下来, 我们需要选择一个初始值 x_0, 通常这个值是一个对解的粗略猜测。这里我们假设 $x_0=1$。然后, 我们可以开始迭代过程, 使用下面的迭代公式: $x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}$ 进行迭代。直到满足某个精度要求为止。这个过程需要用程序计算。因此, 最终的答</p>

Project Goal

❑ Personal Math Teacher——Lecture Note

Problem

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

Lecture Note : Definition, Theorem, Answer

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

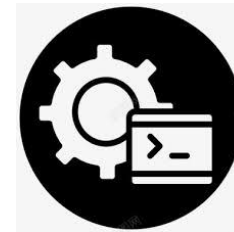
Simultaneous equations are a set of equations containing multiple variables. They are 'simultaneous' in that the equations are all satisfied together. In this context, the number of heads and the number of feet provide two equations that can be solved simultaneously to find the number of chickens and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

Answer

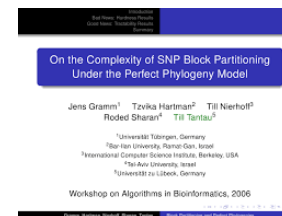
Let's denote the number of chickens as x and the number of rabbits as y . According to the problem, we have two equations based on the number of heads and feet:

1. The total number of heads gives us the first equation: $x + y = 88$.
2. The total number of feet gives us the second equation: $2x + 4y = 244$. We can simplify this equation to $x + 2y = 122$.

Subtract the first equation from the simplified second one, we get $y = 34$.
Substitute $y = 34$ into the first equation, we get $x = 88 - 34 = 54$.
So there are 54 chickens and 34 rabbits.



1. Automatic Generation



2. Academic Template

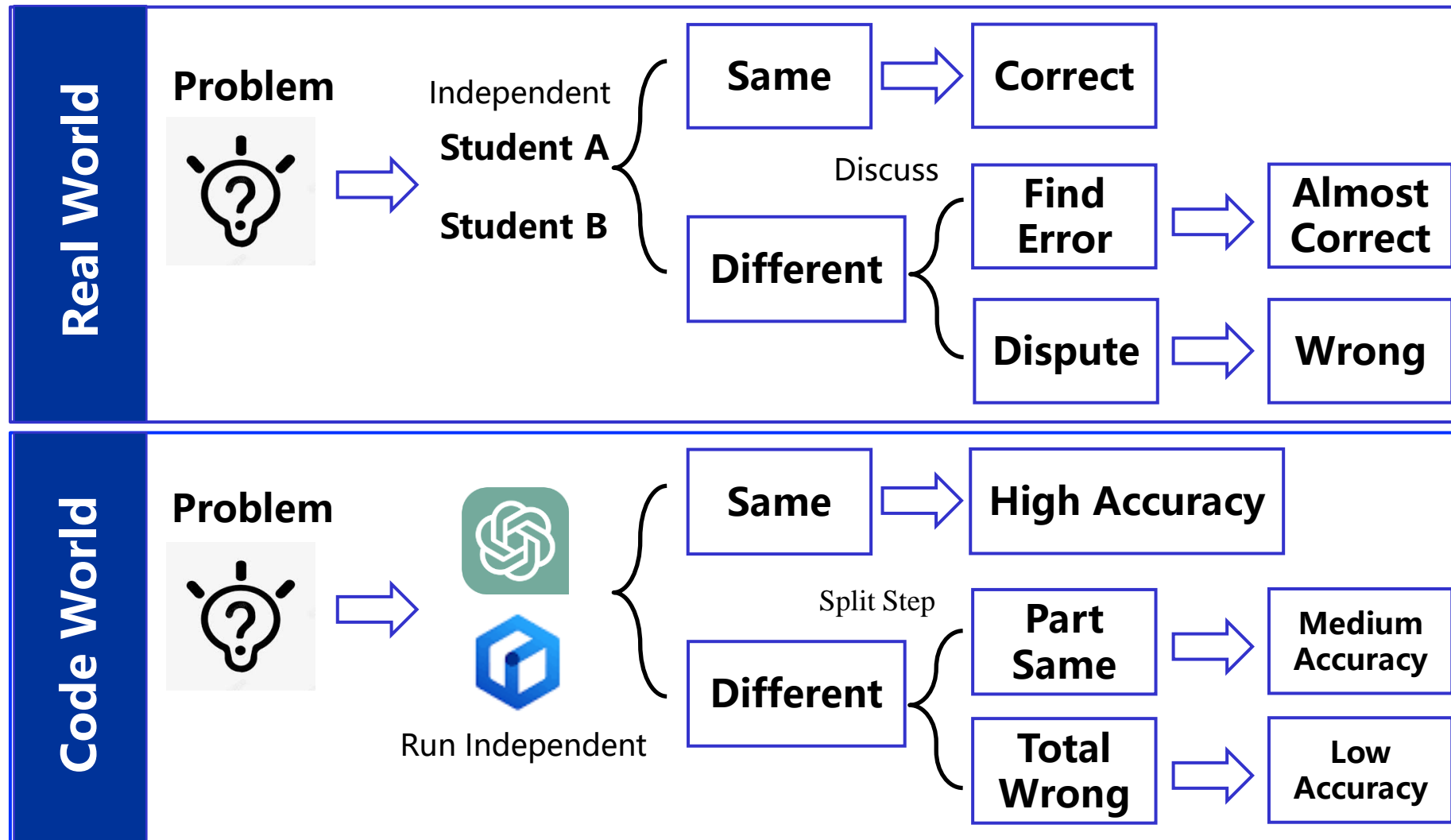


3. Based on knowledge level

Students Need Teacher! Not Solver.

Project Goal

Accuracy — Comparison



❑ 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

Personalize Input

Input Mode	
Text	Text Reading
	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

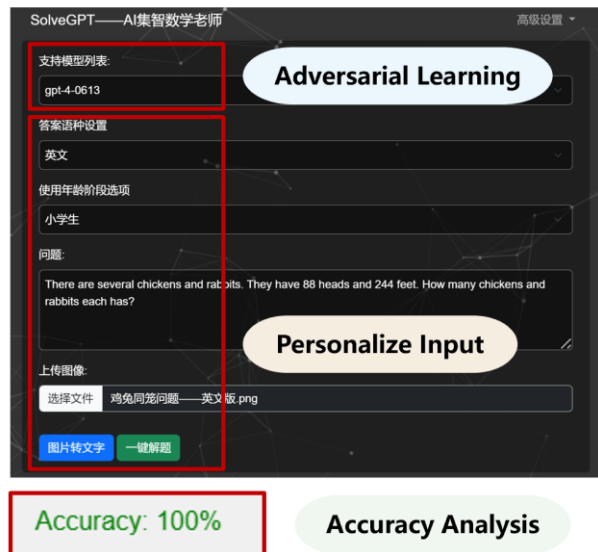
高中生

大学生

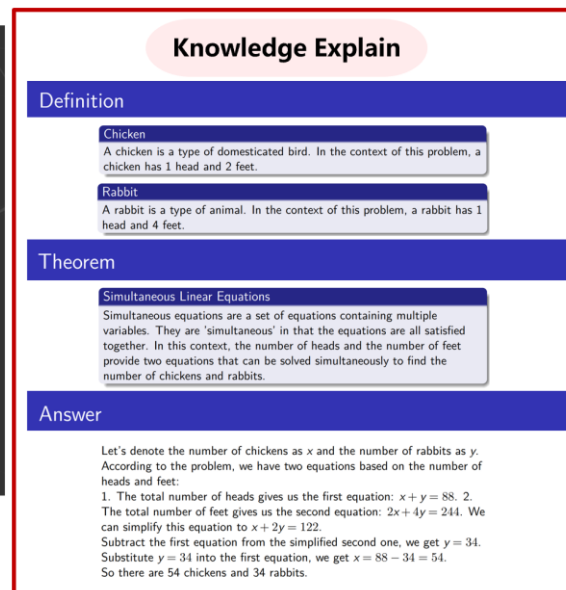
Math Teacher——Efficient



Multimodal Input



Windows, Mac - website (nginx)



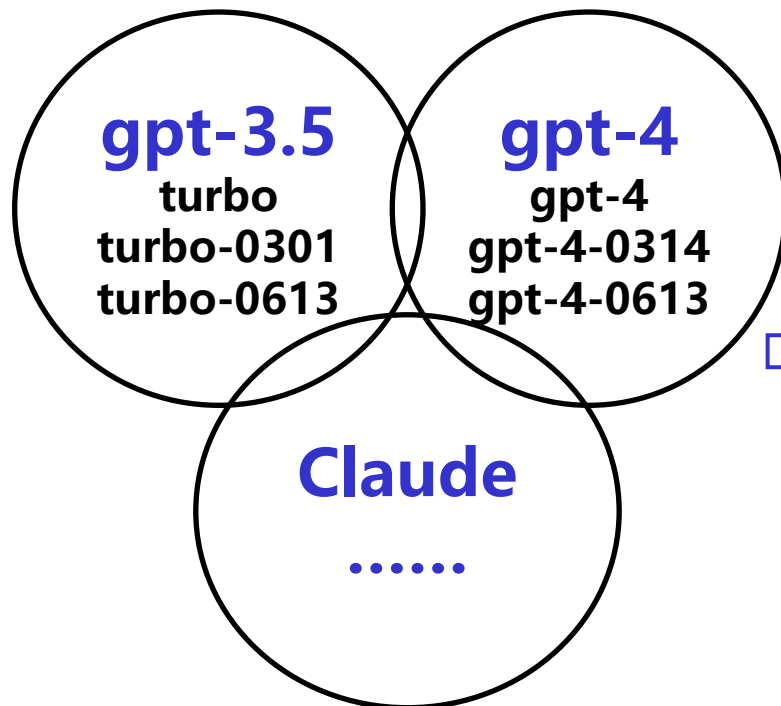
Android-APP

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

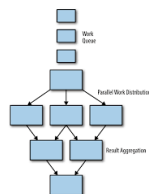
gpt-4

gpt-4-0314

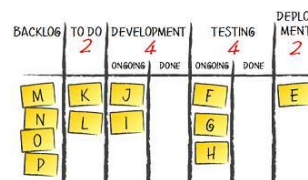
gpt-4-0613

Claude

2 Split Step

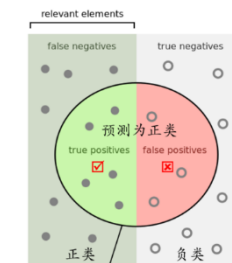


Process Split



+

Step Accuracy



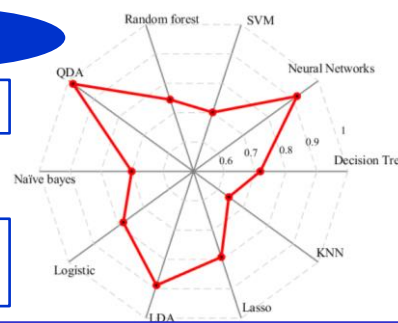
Overall Accuracy

3 Result

Different result



Choose more result

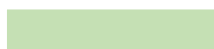


Hold out Method		Model Performance
Iteration	Test	
Iteration 1	Training	95%
Iteration 2	Test	89%
Iteration 3	Test	84%
⋮		
Iteration n-1	Test	91%
Iteration n	Test	92%

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 $f(x)$，我们可以从一个初始近似值 x_0 开始，通过下列迭代公式寻找 $f(x)=0$ 的根: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$，其中 $f'(x_n)$ 是函数在 x_n 处的导数。"}] Theorem: [{"name": "牛顿法的收敛定理", "content": "如果 $f(x)$ 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 $\{x_n\}$ 会以至少二阶的速度收敛到 $f(x)$ 的根。"}] Answer: 要用牛顿迭代法求解方程 $x^3 + x = 1$，首先我们需要确定函数 $f(x)$ 及其导数 $f'(x)$。这里，我们让 $f(x) = x^3 + x - 1$，所以 $f'(x) = 3x^2 + 1$。接下来，我们需要选择一个初始值 x_0，通常这个值是一个对解的粗略猜测。这里我们假设 $x_0 = 1$。然后，我们就可以开始迭代过程，使用下面的迭代公式: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ 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

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.

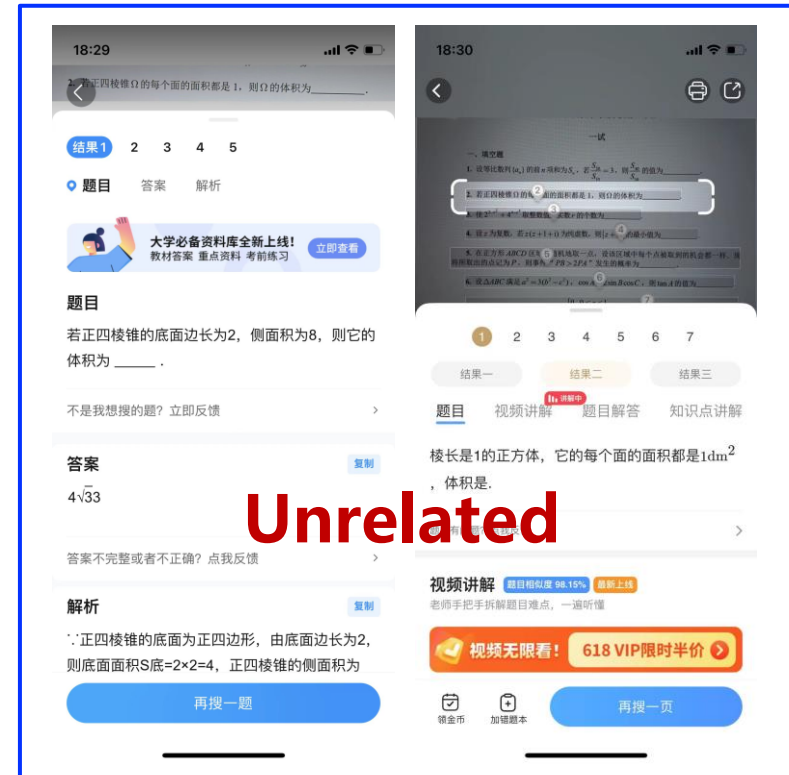
Answer

Let's denote the number of chickens as x and the number of rabbits as y . According to the problem, we have two equations based on the number of heads and feet:

- The total number of heads gives us the first equation: $x + y = 88$.
- The total number of feet gives us the second equation: $2x + 4y = 244$. We can simplify this equation to $x + 2y = 122$. Subtract the first equation from the simplified second one, we get $y = 34$. Substitute $y = 34$ into the first equation, we get $x = 88 - 34 = 54$. So there are 54 chickens and 34 rabbits.

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 Ω 的每个面的面积都是 1, 则 Ω 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 Ω 的每个面的面积都是 1, 则 Ω 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：

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

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

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

Let's denote the number of chickens as x and the number of rabbits as y . According to the problem, we have two equations based on the number of heads and feet:

1. The total number of heads gives us the first equation: $x + y = 88$.
2. The total number of feet gives us the second equation: $2x + 4y = 244$. We can simplify this equation to $x + 2y = 122$.
Subtract the first equation from the simplified second one, we get $y = 34$.
Substitute $y = 34$ into the first equation, we get $x = 88 - 34 = 54$.
So there are 54 chickens and 34 rabbits.



**Math Professor
lecture notes
template**

L^AT_EX

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

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?

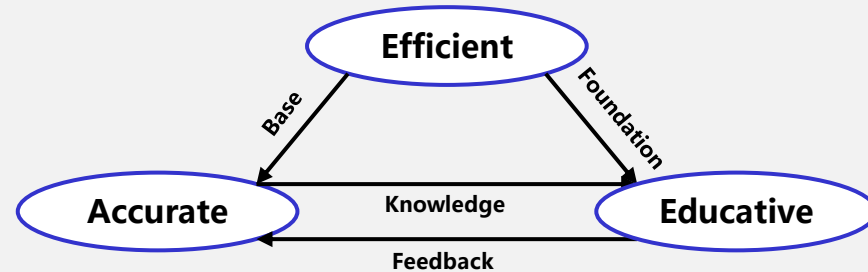
- Easy Usage
- Personalize and Educative
- Cope with any Problem
- Clear Formula
-

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