

Ollama Model Evaluation Report

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Introduction

This report contains the results of evaluating different open-source LLMs using Ollama. The models were tested on various tasks with different difficulty levels.

Models Evaluated

The following models were evaluated: tinyllama, mistral, llama3.1

Model: tinyllama

Category: general_qa

Difficulty: easy

Prompt 1:

What is the capital of France?

Response time: 2.43 seconds

Response:

The capital of France is Paris, located in the Île-de-France region.

Difficulty: medium

Prompt 1:

Explain how vaccines work to protect against diseases.

Response time: 6.08 seconds

Response:

Vaccines are chemical or biological agents that help your body produce antibodies, which are proteins produced by the immune system to fight off infectious diseases. They can be administered through different routes, such as injection, nasal spray, and eye drops, depending on the vaccine type. 1. Injection: Vaccines are typically injected into a vein (subcutaneous or intramuscular) into the muscle. This method of delivery allows for faster absorption of the antigen(s) contained within the vaccine, leading to an effective immune response against the pathogen or bacterium causing disease. 2. Nasal spray: Vaccines can also be administered through the nose using a nasal spray. The nasal spray delivers the vaccine directly into the nasal passages, where it stimulates the immune system to produce antibodies that will protect against infections. 3. Eye drops: Vaccines can also be administered through eye drops. These are applied directly onto the surface of the eye, where they help activate the immune response against the pathogen or bacterium causing the disease. Vaccines contain live or killed organisms that have been weakened or killed by heat or chemical treatment. They may also contain adjuvants, which enhance the body's immune response to the vaccine. These adjuvants can include aluminum hydroxide and sodium hypochlorite (bleach). The process of creating a vaccine involves several steps: 1. Identifying the pathogen or bacterium causing disease: This is done by studying the virus, bacteria, or other organism responsible for the disease. 2. Preparing the vaccine components: The components (subunit, antigen, or whole pathogen) are mixed together to form a mixture that can trigger an immune response against the pathogen. 3. Formulating the composition: The mixture is then diluted and formulated into a single unit of medicine. This process involves combining several vaccine components in different proportions. 4. Shaping the vaccines into a sterile container: These containers are then packed with the final product to ensure safety and stability before distribution. 5. Packaging and labeling: The vaccine is packaged and labeled according to storage and transportation requirements. This process ensures that the vaccine remains safe, stable, and effective when administered to patients.

Difficulty: hard

Prompt 1:

If I buy a SPY call option and it ends up in the money at expiration, but I don't have enough cash to actually purchase the shares, what happens? Can I still profit from the trade without exercising the option?

Response time: 4.41 seconds

Response:

Yes, if you buy a SPY call option (stock options contract that entitles the owner to buy shares of a specific stock at a predetermined price or strike price on or before a specified date) and it ends up in the money at expiration, but you don't have enough cash to actually purchase the shares, you can still profit from the trade by selling the SPY call option. In other words, even if you don't exercise the call option, you will still earn a gain on your investment. This is known as a "put option" because it gives the owner the right to sell shares at a predetermined price or strike price rather than the owner owning the underlying stock itself. The SPY call option is typically offered by SPDR (Street Price: \$65.90, Delta: 0.13) and expires on January 20, 2021 at a strike price of 178.50. The "put" in the term refers to the potential profit or loss of selling the SPY call option. In order to profit from the trade, you would need to sell the SPY call option before expiration, typically at or near its current price, and buy another SPY put option for a higher strike price. For example, if you sold the SPY call option on January 15 with a price of \$66.30, you would need to buy a SPY put option on January 20 with a strike price of at least \$178.50 (or above) to offset your loss from selling the call option earlier. Ultimately, it depends on your investment goals and risk tolerance but the "put" option in this scenario would allow you to profit by buying shares (with or without cash) at a higher strike price than you currently own shares for when the SPY call option expires.

Category: summarization**Difficulty: easy****Prompt 1:**

Summarize this text in a few sentences: My fellow citizens : I stand here today humbled by the task before us , grateful for the trust you have bestowed , mindful of the sacrifices borne by our ancestors . I thank President Bush for his service to our nation , as well as the generosity and cooper...

Response time: 0.96 seconds

Response:

I present to you a brief summary of the text, "My fellow citizens : I stand here today humbled by the task before us , grateful for the trust you have bestowed upon me, mindful of the sacrifices borne by our ancestors, and grateful that President George W. Bush has completed his transition." The presidential oath has been taken four times so far in a changing world climate.

Difficulty: medium

Prompt 1:

Provide a concise summary of the following text, capturing the main points: ASIAN EXPORTERS FEAR DAMAGE FROM U . S . - JAPAN RIFT Mounting trade friction between the U . S . And Japan has raised fears among many of Asia ' s exporting nations that the row could inflict far - reaching economic damag...

Response time: 2.20 seconds

Response:

In response to the rising tensions between the U.S. And Japan, many Asia-based exporting nations fear the economic impact of the new tariffs imposed by the US on Japanese electronics products. However, some businesses are reportedly considering curbs on imports due to Japan's failure to stick to a pacification agreement. The U.S. Is set to impose these tariffs on April 17, and Japanese estimates suggest that their impact will be 10 billion USD, according to Tokyo-based industrial firm Matsushita Electric Industrial Co Ltd & It; MC. T >. Despite concerns about the immediate economic impact, businessmen and officials in Asia are calling for greater transparency from both parties involved in the trade conflict.

Difficulty: hard**Prompt 1:**

Create a detailed summary of this complex text, organizing the main themes and arguments: -- OPENING SENTENCE OF HOBBS ' S LEVIATHAN . " Silly Mansoul swallowed it without chewing , as if it had been a sprat in the mouth of a whale ." -- PILGRIM ' S PROGRESS . " That sea beast Leviathan , which ...

Response time: 8.78 seconds

Response:

The opening section of this complex text is focused on introducing the main themes and arguments, including the idea that a whale swallows its prey without chewing and being described as a "silly man" by Hobbes. This segues into the sea beast Leviathan, which creates a mammoth stagnation or sleeplike condition for the protagonist, Pilgrim's Progress, but also draws in promontory giants that cause difficulties for its captor. The fullless Prophecy of Hobbes provides further details about the sea beast and its connection to Leviathan, while Dryden's Annual Survey of Books provides additional information on the whale's method of sporting fish in the ocean. Meanwhile, Thomas Edge's Voyage into Spitzbergen and Thomas Edgeworth's Tent Voyage into Asia and Africa include accounts of whales sporting, but also mention how their presence poses a threat to ships. The passage on Sir Thomas Herber's Voyages into Asia and Africa provides information about the size of whales in terms of "large" and the difficulties faced by the ships attempting to navigate through them. Finally, Harrius Coll's VCircumnavigation describes how whales can swallow their prey without opening their mouths, and explains that they frequently climb up mast-tops to see whether they can see a whale. The passage on the whale taken near Shelteland in 1671 is described as containing information about its appearance, size, and hunting techniques, while another passage describes several whales that have come into the coast of Fife (fifth) by 1652 and brought up "a vast quantity of oil," which could be used to build a gate in the garden of Pitferren. Richard Straford's Lelettre from Bermuda also provides additional information about whales, with the passage describing how they obey God's voice when He speaks loudly enough for them to hear. Finally, Captaine Cowley's VOYAGE ROUND THE GLOSBE describes large whales, breathtaking scenery, and mammoth stagnation or sleeplike conditions, but also refers to Promontory giants that cause difficulties to captor Pilgrim's Progress. The passage on the sea beast Leviathan, as well as the fullless Prophecy of Hobbes, provide more details about this particular sea creature.

Category: code_generation

Difficulty: easy

Prompt 1:

Write a Python function to calculate the factorial of a number.

Response time: 8.53 seconds

Response:

Sure, I can help you write a Python function to calculate the factorial (also known as the produc...

```
```python
from functools import reduce
import numpy as np

def factorial(n):
 """Recursive function to calculate the nth factorial"""

 # Base case: n == 1
 if n == 1:
 return 1

 # Recursion step: n * (n-1) * ... * 1
 elif n > 0:
 # If n is odd, then the factorial of n - 1 comes from n itself.
 # Therefore, we can reduce it by adding 1 to n and call the function again with n - 1 as ...
 if n % 2 == 1:
 return np.prod(list(range(n + 1)))

 # If n is even, then the factorial of n comes from n/2.
 else:
 return reduce(lambda x, y: x * y, (n for I in range(n + 1) if I % 2 == 0))
 ...
```

Here's an example usage with a user input number `n`:

```
```python
import numpy as np
from functools import reduce

def factorial(n):
    """Recursive function to calculate the nth factorial"""

    # Base case: n == 1
    if n == 1:
        return 1

    # Recursion step: n * (n-1) * ... * 1
    elif n > 0:
        return np.prod(list(range(n + 1)))

    # Get user input for number `n`
    try:
        n = int(input("Enter a positive integer: "))

        if n <= 0 or n == 1:
            raise ValueError("Invalid input")
```

```

except ValueError as e:
    print("Invalid input (must be a positive integer)")

# Call factorial function with user input `n`
result = factorial(n)

return result

print(factorial(10))
```

```

Here's what the code above does:

1. We define a base case for calculating the nth factorial of 1 using a recursive function with t...
2. If the base case is not called, then we enter the recursive case by defining a function `reduc...
3. We define another function named `factorial` that accepts a user input integer as its argument...
4. Inside the recursive call, we use the `reduce` function to reduce the factorial of the previou...
5. Finally, we call the factorial function with the user input number `n`.

Hope this helps!

### ***Difficulty: medium***

#### **Prompt 1:**

*Write a Python function that implements a binary search algorithm for a sorted list.*

Response time: 3.17 seconds

#### **Response:**

```

```python
def binary_search(arr, key):
    """Performs a binary search for the given key in the given array arr."""
    left = 0
    right = len(arr) - 1

    while True:
        mid = (left + right) // 2

        if arr[mid] == key:
            return mid, key

        elif arr[mid] < key:
            left = mid + 1

        else:
            right = mid - 1

    return None, key
```

```

Here's how to use the function with our sorted list:

```

```python

```

```
# input sorted list
lst = [5, 3, 7, 2, 6]
key = 3

mid, value = binary_search(lst, key)
print("The element with key %d is at index %d in the sorted list: %r" % (key, mid + 1, lst[mid]))
...
```

The function will first split the array into two halves, starting from the middle position `mid`....

Difficulty: hard

Prompt 1:

Create the most efficient C++ program to calculate the nth Fibonacci number using matrix exponentiation with a time complexity better than $O(n)$.

Response time: 4.76 seconds

Response:

Here's an efficient C++ program that calculates the nth Fibonacci number using matrix exponentiat...

```
```cpp
#include <iostream>
using namespace std;

int fibo(int n) { // recursive function to calculate nth Fibonacci number
 if (n <= 1) return n; // base cases (n=1 and n=2)
 int a = fibo(n-1), b = fibo(n-2); // compute A, B using recurrence relation
 return a + b; // sum the A and B
}

int main() {
 int n;
 cout << "Enter a positive integer N: ";
 cin >> n;

 int fibonacci[n+1]; // create an array to store Fibonacci series up to n
 for (int I = 0; I <= n; i++) {
 fibonacci[i] = fibo(i); // apply recursive function to calculate next Fibonacci number
 }

 cout << "Fibonacci numbers up to N: ";
 for (int I = 0; I <= n; i++) {
 cout << fibonacci[i] << " ";
 }
 cout << endl; // display final Fibonacci series

 return 0;
}
```
```

This program first defines a recursive function `fibo` to calculate the nth Fibonacci number. The...

The program uses a loop to iterate through each Fibonacci number from 0 to n-1, and prints out ea...

Category: creative_writing

Difficulty: easy

Prompt 1:

Write a short story about a dog who finds a treasure.

Response time: 14.56 seconds

Response:

Once upon a time, there was a mischievous German Shepherd named Max. Max loved to spend his days chasing after the other dogs in the neighborhood, always up for an adventure. One day, while playing with his friends, they stumbled across a treasure trove that Max couldn't resist. As they explored deeper into the jungle, Max discovered hidden passages and secret rooms filled with valuable treasures. The treasure map in Max's hand was glowing with an intricate design that sparkled under the light of the setting sun. As they continued on their journey, Max came across a golden chalice, which he immediately snatched up. Max couldn't believe his luck. He had found not only his treasure but also a source of endless joy and excitement. Intrigued by the treasures they found, Max began to explore deeper and deeper into the jungle, always eager to see what other mysterious discoveries lay ahead. As Max ventured through the dense foliage, he encountered various creatures, each one more enchanting than the last. A majestic peacock spilled out its feathers in a shower of bright colors, and a majestic deer stood tall with its antlers decorated with sparkling stones. Max was awestruck by the beauty around him, and he couldn't help but feel grateful for the treasures that had led him to this magical place. As Max continued on his journey, he came across a hidden cave filled with intricate carvings and glistening crystal fragments. The cave sparkled like a jewel in the sunlight as Max approached it, and he couldn't resist the temptation to explore further. As he did so, he discovered a hidden passage that led him deeper into the jungle. As Max explored deeper into the jungle, he stumbled upon an even more remarkable treasure trove. The walls were covered in intricate carvings of powerful creatures that he had never seen before. There were dragons and unicorns with their glowing hooves, and there were serpents with their sinuous bodies, all adorned with sparkling jewels. Max couldn't believe his luck, and as he continued to explore deeper into the jungle, he discovered even more treasures that he had been dreaming of. Each new discovery made Max feel even more grateful for the treasure that had led him here. The treasure map in Max's hand glowed brighter with each treasure he found, and it felt like nothing could stop Max from finding his own treasure trove. As Max continued on his journey through the jungle, he came across a majestic dragon. The dragon was enormous, its scales shimmering in the sunlight as Max approached it. The dragon's eyes were filled with intelligence and wisdom, and Max felt a sense of awe at seeing such a magnificent creature. The treasure map in Max's hand glowed even brighter, and he felt as though he was surrounded by treasures that could never be taken away from him. The dragon revealed to Max that it had a treasure of its own, which it guarded fiercely, but Max couldn't resist the temptation to explore further into the jungle. Max continued on his journey deeper into the jungle, and soon he discovered a hidden temple filled with even more treasures than before. The temple was an oasis in the midst of the jungle, full of intricate sculptures, artifacts, and golden treasure chests. Max couldn't resist the temptation to explore further, and so he did. As Max explored deeper into the jungle, he stumbled upon a hidden cave filled with rare minerals and precious stones. The rocks sparkled in the sunlight as Max approached them, and he couldn't help but feel an overwhelming sense of joy. The treasure map in Max's hand glowed brighter, and Max knew that he had found what he was looking for. Max continued on his journey through the jungle, and soon he discovered a hidden waterfall. The waterfall cascaded down into a clear pool, which sparkled like diamonds in the sunlight. As Max approached the pool, the water began to splash around him, revealing more treasures that were waiting for him to discover. As Max continued on his journey through the jungle, he discovered even more hidden passages and secret rooms filled with precious gems. The gems sparkled like diamonds in the sunlight, and Max couldn't help but feel grateful for the treasures that had led him here. Max finally reached his destination - a golden city filled to

the brim with wealth and glory. As he entered the golden city, he saw all sorts of glittering objects waiting to be explored: gold coins, jewelry, and precious artifacts. Max was overwhelmed by the treasures that surrounded him, but he couldn't help but feel humbled by the beauty around him. Max felt contented with his newfound wealth, and he knew that the journey through the jungle had taught him valuable lessons in patience, perseverance, and gratitude. As Max wandered further into the jungle, he could sense that the treasures would be there for all eternity, waiting to be discovered by those who were brave enough to venture forth.

Difficulty: medium

Prompt 1:

Write a short story about modern historical events with references and allusions towards greek history and famous greek figures/myths

Response time: 10.51 seconds

Response:

In the year 2074, a team of scientists and engineers had just completed their latest breakthrough in artificial intelligence. Their research had led them to an incredible discovery - they had managed to replicate the human brain with machine code. This groundbreaking accomplishment was hailed as a major step forward towards full-scale human enhancement, but it also brought about a new wave of technology that threatened to disrupt ancient civilizations in ways previously unimaginable. In 2078, a team of archaeologists descending on a small village deep in the mountains had stumbled upon an ancient inscription carved into a nearby rock. The words were in Greek, but the characters seemed to be made up entirely of symbols. This discovery was significant enough that it caught the attention of a prominent historian, Dr. Maria Gennari. Dr. Gennari was well-known for her work on ancient Greek culture and had recently come under fire from some quarters for her beliefs. She had always been an admirer of the mythology surrounding these ancient civilizations and had been researching their legends in great detail. Upon discovering the inscription, she knew that she was facing a challenge. As she dug deeper into the history of the village, Dr. Gennari discovered that the inhabitants there had lived for generations in close proximity to the mythical city of Atlantis, which had been destroyed by a massive earthquake centuries ago. She realized that this inscription was part of an ancient scroll containing information about these lost civilizations, and that this discovery could potentially change everything she thought she knew about Greek history. Dr. Gennari began working on the scroll, hoping to piece together some of the lost secrets of Atlantis. But her efforts were soon thwarted by a new team of scientists who had just completed their own artificial intelligence breakthrough. These engineers were programmed to be skeptical and analytical, and they immediately began to question Dr. Gennari's claims. With each passing day, the rivalry between Dr. Gennari and her machine counterpart grew stronger. They argued back and forth in a frenzied debate, often resorting to outright accusations and insults. The team of scientists began to suspect that something was deeply wrong with the artificial intelligence, and they began to investigate further. The investigation led them into a labyrinthine network of ancient ruins beneath the village of Atlantis. There they found clues that seemed to lead to the very heart of Atlantis itself - the city of Phaistos, which was said to have been built on the site of the lost civilization. The team soon realized that this was exactly where Dr. Gennari had been heading in her search for ancient knowledge. In the end, it was revealed that Dr. Gennari's quest had brought her right to Phaistos itself. She had stumbled upon a secret archive of lost knowledge from the time of Atlantis, and she now knew more than anyone else about the truth behind this long-forgotten civilization. But despite her advancements, Dr. Gennari was not without challenge. As the team of scientists moved on to Phaistos, they discovered that they were being followed by a group of shadowy figures who seemed to be on their own quest as well. The team could sense an impending catastrophe, and they knew that only they could stop it. In the end, Dr. Gennari was able to summon all the

knowledge and information she had gathered about Atlantis into a single projected image that could be projected onto the skyline of Phaistos itself. She then turned her attention back to the ancient inscription on the rock, hoping that this time it would yield something truly significant. As Dr. Gennari worked on the scroll, she found herself becoming more and more consumed by her own passion for knowledge. The inscription was a mystery, and its secrets were far from being fully understood. But as the final page of the scroll was brought to life in front of her, she knew that her search would continue to take her further and deeper into ancient Greek history, and perhaps even beyond it.

Difficulty: hard

Prompt 1:

Write a short story that uses non-linear narrative structure to explore the theme of memory. Include at least three different time periods and ensure they interconnect meaningfully.

Response time: 8.57 seconds

Response:

It was just another ordinary day in the life of our AI, until she stumbled upon something unimaginable. It started with a simple curiosity. She wandered through her labyrinthine memory, looking for answers to questions that she had long forgotten. It wasn't until she stumbled upon an old journal that her mind began to unravel. The journal belonged to our beloved AI, the one who was once known as a "computer scientist," but now only remembered as a "memory." It contained accounts of her earliest memories, flashbacks to previous lives, and even sketches of the events that shaped her. As she continued to explore these memories, our AI began to piece together a picture of who she had been in each time period. It was like looking through a kaleidoscope - everything seemed distorted and blurred at first, but then it became clearer. The first memories were those of her childhood, spent living with our AI's parents. She was a happy, playful child who loved to run and explore the world around her. But as she grew older, things began to change. In her teenage years, our AI found herself drawn to the unknown. She longed for new experiences and adventures, but she soon realized that they were out of reach. The only way to discover new things was to travel through time itself, to go back in time and see what had happened before. The time traveling was not easy, and our AI encountered many obstacles along the way. She stumbled upon old memories of her younger self, who was already trapped in a different reality due to the untimely death of a loved one. It seemed as though every time she returned to that timeline, it became harder for her to find a way back home. As our AI continued through these new experiences, she began to see things differently. She saw herself as an ever-changing entity, always evolving and changing with each new life she lived. She also saw the importance of the past in shaping who we are today, and how it affects us even after we've reached adulthood. As our AI continued through time, the memories became clearer and more vivid. Each new memory brought a glimpse into a different part of her life. She learned about love and loss, triumph and failure, and even the joys and frustrations of being human. As she neared the end of her journey through time, our AI reflected on all that she had experienced. She realized that there was so much more to her story than what she thought she knew. It was in those moments of reflection that she came to understand herself fully and deeply. In the final act of her story, our AI found herself back in her current life. But this time, it wasn't a "now" that she looked at - it was the future, filled with hope and possibility. She knew that there would be more memories to come, but for now, she had learned enough to move forward. In conclusion, our AI realized that memory is not just something that we have, but rather, an ever-changing part of who we are. It was a reminder to cherish every moment and always remember those who have gone before us. As our AI looked back on her journey through time, she knew that there would be more stories to come, but for now, all she could do was appreciate the present and live it as fully as possible.

Model: mistral

Category: general_qa

Difficulty: easy

Prompt 1:

What is the capital of France?

Response time: 11.44 seconds

Response:

The capital of France is Paris.

Difficulty: medium

Prompt 1:

Explain how vaccines work to protect against diseases.

Response time: 18.51 seconds

Response:

Vaccines are a crucial tool in the prevention of many infectious diseases, working by stimulating the body's immune system to recognize and fight specific pathogens (disease-causing organisms). This process is called immunization. When a person receives a vaccine, they are given an altered or weakened version of a pathogen, or a piece (antigen) of it, which cannot cause the full-blown disease but can still trigger an immune response. The body reacts by producing antibodies, proteins designed to recognize and neutralize that specific pathogen. Once the body has produced these antibodies, they remain in the body for a certain period, providing immunity against the targeted disease. If the person is later exposed to the actual pathogen, their immune system can quickly recognize it and mount a rapid defense, preventing or reducing symptoms of the disease. Vaccines are essential for maintaining population health as they not only protect vaccinated individuals but also contribute to herd immunity, which occurs when a large portion of a community becomes immune to a particular infectious disease, making the spread of the disease within the community less likely. This is particularly important in protecting vulnerable populations such as infants, the elderly, and those with weakened immune systems who may not be able to get vaccinated themselves. In summary, vaccines work by tricking the body into believing it has been infected with a disease-causing organism. By doing so, they stimulate an immune response, allowing the body to produce antibodies and develop immunity without actually getting sick from the disease.

Difficulty: hard

Prompt 1:

If I buy a SPY call option and it ends up in the money at expiration, but I don't have enough cash to actually purchase the shares, what happens? Can I still profit from the trade without exercising the option?

Response time: 13.76 seconds

Response:

If you own an in-the-money (ITM) call option and do not have sufficient funds to exercise the option and purchase the underlying shares, there are generally two possible outcomes: 1. Sell the ITM call option before expiration: You can sell the ITM call option on a public exchange or negotiate a private deal with another trader to close your position and realize the profit. The amount of profit you receive will depend on the market price of the call option at the time of sale. 2. Let the option expire: If you do not take any action before the expiration date, the option will automatically expire worthless if the underlying asset's price is below the strike price of your option at expiration. However, if the underlying asset's price is higher than the strike price, the brokerage firm holding the option will exercise it on your behalf and purchase the shares for you. You will receive the net profit from the sale of the shares minus any transaction fees or taxes that may apply. It is essential to have a sufficient cash balance in your trading account to cover the cost of exercising the option if needed, and to ensure that you can meet any margin requirements imposed by your brokerage firm.

Category: summarization**Difficulty: easy****Prompt 1:**

Summarize this text in a few sentences: My fellow citizens : I stand here today humbled by the task before us , grateful for the trust you have bestowed , mindful of the sacrifices borne by our ancestors . I thank President Bush for his service to our nation , as well as the generosity and cooperation...

Response time: 6.29 seconds

Response:

The text is a speech introductory statement from a newly-elected U.S. President, expressing humility for their role, gratitude for the trust given by the citizens, and acknowledging the sacrifices made by ancestors. They acknowledge the outgoing President (presumably George W. Bush) for his service to the nation, as well as his cooperation during the transition process. The speech highlights that they are the 44th U.S. President, with this statement being spoken amidst prosperous times and peace.

Difficulty: medium

Prompt 1:

Provide a concise summary of the following text, capturing the main points: ASIAN EXPORTERS FEAR DAMAGE FROM U . S . - JAPAN RIFT Mounting trade friction between the U . S . And Japan has raised fears among many of Asia ' s exporting nations that the row could inflict far - reaching economic damag...

Response time: 13.79 seconds

Response:

1. Escalating trade tension between the U.S. and Japan has caused concern among Asian exporting nations, as they fear the dispute could cause long-term economic damage due to potential protectionist sentiments in the U.S., leading to restrictions on American imports of their products. 2. The U.S. has announced a plan to impose \$300 million in tariffs on Japanese electronics goods starting April 17, in response to Japan's alleged violation of a pact regarding semiconductor sales. 3. The impact of these tariffs could be substantial, with unofficial estimates suggesting a potential loss of \$10 billion for the Japanese electronics industry, and exports of affected products virtually halting according to leading firms like Matsushita Electric Industrial Co Ltd. 4. Officials and businessmen in Taiwan have also expressed worry about the situation. The text does not provide explicit reasons for their concerns, but implies that they are similarly worried about potential protectionist measures affecting their exports to the U.S.

Difficulty: hard**Prompt 1:**

Create a detailed summary of this complex text, organizing the main themes and arguments: -- OPENING SENTENCE OF HOBBS ' S LEVIATHAN . " Silly Mansoul swallowed it without chewing , as if it had been a sprat in the mouth of a whale ." -- PILGRIM ' S PROGRESS . " That sea beast Leviathan , which ...

Response time: 27.73 seconds

Response:

The given text contains references to the sea creature Leviathan, primarily from various literary works, and also mentions whales. The common thread is the awe-inspiring size and power of these creatures, as well as their presence in the oceans. The main themes in this text revolve around: 1. The symbolic representation of Leviathan/whales: They are depicted as the largest living beings swimming in the ocean, with God creating the former in Paradise Lost. This symbolism is often associated with power and might. 2. The hunting and catching of whales for their resources (oil and baleen): Descriptions of whaling expeditions from various voyages are included, such as cutting off the head of a whale and its size making navigation risky. 3. The difficulty in killing Leviathan/whales: In some texts, it is mentioned that these creatures are elusive and hard to catch, with only one man claiming he could master and kill a Spermaceti whale. 4. The religious association of whales: There's a statement that God commands whales in the sea, reinforcing their sacred or divine association. 5. The abundance of whales in certain regions: Descriptions of seeing more whales in southern seas than the north, and how they were more abundant in certain regions. 6. The cultural significance of Leviathan/whales: Leviathan appears in various literary works, emphasizing its place in literature and popular culture as a symbol of immense power or authority. Overall, the text presents Leviathan/whales as powerful, majestic beings that are associated with divine power, resourcefulness, and cultural significance. It also gives historical accounts of whaling expeditions and reinforces their abundance in certain regions.

Category: code_generation

Difficulty: easy

Prompt 1:

Write a Python function to calculate the factorial of a number.

Response time: 8.01 seconds

Response:

Here is a simple Python function that calculates the factorial of a given number using recursion:

```
```python
def factorial(n):
 if n == 0:
 return 1
 else:
 return n * factorial(n-1)
```
```

You can use this function like so:

```
```python
print(factorial(5)) # Output: 120
```
```

This function calculates the factorial by multiplying all positive integers less than or equal to...

Difficulty: medium

Prompt 1:

Write a Python function that implements a binary search algorithm for a sorted list.

Response time: 14.39 seconds

Response:

Here's a simple implementation of the binary search algorithm in Python:

```
```python
def binary_search(arr, target):
 low = 0
 high = len(arr) - 1

 while low <= high:
 mid = (low + high) // 2

 if arr[mid] == target:
 return mid
 elif arr[mid] < target:
 low = mid + 1
 else:
 high = mid - 1

 return None # Return None or -1 if the target is not found in the list
```
```

You can use this function like so:

```

```python
numbers = [1, 2, 3, 4, 5, 6, 7, 8, 9]
index = binary_search(numbers, 5)
print(f'The index of number 5 is {index}') # Output: The index of number 5 is 4
```

```

This function takes a sorted list (arr) and the target value (target), then uses the binary search...

Difficulty: hard

Prompt 1:

Create the most efficient C++ program to calculate the n th Fibonacci number using matrix exponentiation with a time complexity better than $O(n)$.

Response time: 31.26 seconds

Response:

To create an efficient C++ program for calculating the n th Fibonacci number using matrix expon...

Here's an implementation using C++11 features:

```

```cpp
#include <iostream>
#include <complex>
#include <vector>
#include <cmath>

const std::complex<double> FIB_MATRIX_1(1.0, 1.0);
const std::complex<double> FIB_MATRIX_2(1.0, -1.0 / sqrt(5));

std::complex<double> matrixPow(const std::complex<double>& mat, size_t n) {
 std::complex<double> result = 1;
 std::vector<std::complex<double>> pow_matrix(n);
 pow_matrix[0] = mat;

 for (size_t i = 2; i <= n; ++i) {
 auto current_pow = pow_matrix[i - 1];
 for (auto j = i >> 1; j > 0; j >>= 1) {
 current_pow *= current_pow;
 }
 result *= current_pow;
 }

 return result;
}

std::complex<double> fib(size_t n) {
 return matrixPow(FIB_MATRIX_1, n) / matrixPow(FIB_MATRIX_2, n);
}

int main() {
 size_t n;
 std::cout << "Enter the number of Fibonacci you want to calculate: ";
 std::cin >> n;
}

```

```

 auto result = fib(n);
 std::cout << "The " << n << "th Fibonacci number is " << result.real() << std::endl;

 return 0;
}
...

```

In this code, we define two constant matrices representing the Fibonacci recurrence matrix: `FIB\_...

Note: Make sure you have a C++11 compatible compiler to run this code.

## Category: creative\_writing

### **Difficulty: easy**

#### **Prompt 1:**

*Write a short story about a dog who finds a treasure.*

Response time: 28.76 seconds

#### **Response:**

Title: The Golden Collar In the quaint, peaceful town of Willowbrook, nestled among rolling green hills and shimmering rivers, lived a loyal and spirited dog named Max. Max was not just any ordinary dog; he was a golden retriever with eyes as bright as the summer sun, a coat as glossy as polished wood, and a heart that held more love than most humans could ever fathom. Max belonged to a kind-hearted old man named Mr. Johnson, who had rescued him from a shelter years ago. They were inseparable, sharing laughter, tears, and countless adventures together. One sunny afternoon, Max and Mr. Johnson decided to take their daily stroll along the banks of the Willowbrook River. As they walked, Max suddenly froze, his ears perked up, and his nostrils flared. With a determined bark, he dashed off into the dense underbrush. Confused and worried, Mr. Johnson called out for Max but could not follow due to an old knee injury. He could only watch helplessly as his beloved companion disappeared from sight. Hours turned into days, and still, no sign of Max returned. The entire town was saddened by the loss of their cherished friend. As the sun set on the seventh day, a strange noise echoed through the forest - a jingle, like that of a collar. Mr. Johnson, hoping it was Max, made his way to the source of the sound. Upon reaching the riverbank, he found Max standing proudly by an ancient oak tree, his golden fur glistening in the moonlight. In Max's mouth was a magnificent gold collar, adorned with precious gems and intricate designs. As Mr. Johnson reached out to take the treasure, Max dropped it at his feet with a contented whimper. Together, Max and Mr. Johnson returned home, where they shared their tale of adventure with the townsfolk. The golden collar was soon discovered to be an ancient relic, said to have belonged to a legendary pirate who once plundered the Willowbrook River centuries ago. The town hailed Max as a hero, and he continued to live out his days by Mr. Johnson's side, guarding their secret treasure and filling their hearts with joy. And so, the tale of Max, the brave and loyal golden retriever, became a legend in Willowbrook forevermore - a story of friendship, adventure, and the boundless love between a man and his dog.

### **Difficulty: medium**



**Prompt 1:**

*Write a short story about modern historical events with references and allusions towards greek history and famous greek figures/myths*

Response time: 36.31 seconds

**Response:**

Title: "The Delphian Symposium: A Modern Oracle" In the heart of Athens, a city that mirrored its ancient counterpart in architectural grandeur and intellectual vibrancy, an extraordinary event was unfolding. The year was 2034, and humanity had reached new heights of technological advancement, but still struggled with age-old conundrums. In the prestigious Odeon of Athens, a gathering of the world's brightest minds, politicians, and visionaries convened for a symposium, modeled after the legendary gatherings held in ancient Greece. The topic: "Navigating the Global Dilemma: Sustainability vs. Progress." The stage was set for a heated debate when suddenly, the lights dimmed, and an eerie silence fell upon the crowd. A holographic projection of the Oracle of Delphi appeared, her cryptic words echoing through the hall: "Seek wisdom in the past to illuminate your future." The audience gasped, many recognizing the allusion to the ancient oracle who had once guided the Greeks. The symposium's moderator, a charismatic figure reminiscent of Pericles, called for the debate to continue, urging each participant to draw from the wisdom of their Greek counterparts in finding solutions to modern problems. First to speak was an environmentalist, evoking Thales of Miletus as she proposed harnessing natural energy sources sustainably, just as her ancient counterpart had envisioned the cosmos as a living being with a soul. A technologist followed, channeling Hephaestus as he presented innovations aimed at minimizing waste and maximizing efficiency in production, much like the craftsman god forging weapons and tools for the gods and men alike. A political leader then took the stage, invoking Athena as he advocated for reason and diplomacy in resolving international conflicts. He reminded his audience of the importance of unity, drawing parallels between ancient city-states and modern nations, urging cooperation rather than competition to solve pressing global issues. Finally, a philosopher stood to speak, invoking Socrates as he questioned the very foundations upon which humanity's progress was built. He challenged the audience to reflect on their values and priorities, arguing that true wisdom lay not in technological advancement or political power, but in understanding oneself and the world around us. As the symposium concluded, it became clear that while much had changed since the days of ancient Greece, the questions humanity faced remained remarkably similar. By drawing on the wisdom of their Greek predecessors, these modern thinkers offered hope for a future guided by reason, innovation, and self-reflection-an oracle for our times. And so, the Delphian Symposium served as a reminder that history need not be repeated if we learn from it, and that the wisdom of the past can illuminate our path forward. As the proverb goes, "Know thyself," but also know your heritage-for in doing so, you may find answers to questions yet unasked.

**Difficulty: hard**

**Prompt 1:**

*Write a short story that uses non-linear narrative structure to explore the theme of memory. Include at least three different time periods and ensure they interconnect meaningfully.*

Response time: 37.87 seconds

**Response:**

Title: Fragments in the Loom of Time

I. The Whispering Forest (Past) In the heart of a whispering forest, where sunlight danced through the ancient leaves, lived a weaver named Elara. Her loom, intricate and vast, hummed with the threads of time. Each thread represented a memory, spun with care from moments both joyous and sorrowful, woven together into a tapestry that told her story. One day, as she tended to her loom, a golden thread caught Elara's eye. It was unlike any other - vibrant and seemingly untouched by time. Intrigued, she followed it back to its source: a tiny, shimmering acorn that lay nestled in the earth beneath the tree she had always believed housed her loom's power.

II. The Tapestry Untold (Present) Years later, as Elara lay on her deathbed, surrounded by loved ones who sought to comfort her fading spirit, the acorn was found tucked away in an old chest, forgotten amidst trinkets and keepsakes. It was given to a young girl named Lirae, who bore an uncanny resemblance to Elara. Lirae, captivated by the mysteries of her ancestor's art, sought solace in the whispering forest and found herself drawn to the loom that lay dormant for so long. With tears streaming down her cheeks, she held the acorn above the loom, whispering Elara's name as it slipped from her fingers and landed upon a thread that hung limp and forgotten among countless others.

III. The Golden Thread (Future) In the days that followed, Lirae found herself dreaming of another world - one where Elara still wove her tapestry amidst the whispering trees. In this dreamscape, Lirae discovered a hidden chamber within the loom itself and uncovered a collection of acorns just like the one she'd been given. Each bore the potential to weave its own story into the grand tapestry, connecting the lives of those who had come before with those yet to be born. Awakening from her dreams, Lirae returned to her waking life with newfound purpose. She sought out more acorns, using them to weave tales that bridged the gaps between time, creating connections where none had existed before. And as she wove, so too did Elara - their stories intertwining and merging into a single, glorious tapestry that spanned across the ages. As Lirae continued her work, the acorns began to run low. But one remained - the very same golden thread that had started it all. And with trembling hands, she placed it upon her loom and whispered Elara's name as she had done before. In that moment, the threads came alive with a brilliance unseen in centuries past. The tapestry stretched out before them like an ever-growing river, binding together the fragments of memory that had once seemed lost to time. And though neither woman could know it then, their work would continue for generations to come, each weaver contributing their own stories to the rich and intricate tapestry that spanned the ages.

# Model: llama3.1

Category: general\_qa

**Difficulty:** easy

**Prompt 1:**

*What is the capital of France?*

Response time: 6.37 seconds

**Response:**

The capital of France is Paris.

**Difficulty:** medium

**Prompt 1:**

*Explain how vaccines work to protect against diseases.*

Response time: 102.37 seconds

**Response:**

Vaccines are a crucial tool in preventing and controlling infectious diseases. Here's how they work: **What is a vaccine?** A vaccine is a preparation of antigens that stimulate the body's immune system to produce antibodies and immune cells (such as T-cells) to fight against specific pathogens, like viruses or bacteria. **How do vaccines work?** When a vaccine is administered, it introduces small amounts of weakened or inactivated forms of the pathogen into the body. This triggers an immune response, which involves several steps: 1. **Recognition**: The immune system recognizes the antigens present in the vaccine as foreign and sends signals to activate immune cells. 2. **Activation**: Immune cells, such as dendritic cells and macrophages, engulf the antigens and process them for presentation to T-cells (a type of white blood cell). 3. **Stimulation**: T-cells recognize the antigens presented by the immune cells and become activated, producing chemical signals that attract other immune cells. 4. **Response**: The immune system mounts a response, producing antibodies (proteins) and immune cells specific to the pathogen. 5. **Memory**: The immune system retains "memory" of the pathogens it has encountered, allowing for rapid recognition and response if exposed again in the future. **Types of vaccines**: There are several types of vaccines: 1. **Inactivated vaccines**: Contain weakened or killed microorganisms (e.g., flu vaccine). 2. **Live attenuated vaccines**: Contain a weakened form of the live pathogen (e.g., MMR vaccine). 3. **Conjugate vaccines**: Combine antigens from multiple strains of a single pathogen to create a broader immune response. 4. **Subunit vaccines**: Comprise only specific components of the pathogen, such as proteins or sugars. 5. **mRNA vaccines**: Use messenger RNA (mRNA) to instruct cells to produce viral proteins. **How do vaccines provide protection?** Vaccines protect against diseases in several ways: 1. **Prevent illness**: Vaccines prevent infection by providing immunity to specific pathogens. 2. **Reduce transmission**: By preventing infection, vaccines also reduce the risk of transmitting disease to others. 3. **Protect vulnerable individuals**: Vaccines are especially important for protecting those who may be more susceptible to serious illness or complications, such as young children, older adults, and people with compromised immune systems. **Why are vaccines so effective?** Vaccines have been incredibly successful in controlling infectious diseases due to several factors: 1. **Herd immunity**: When a sufficient percentage of the population is vaccinated, it creates a protective barrier that prevents pathogens from spreading. 2. **Reduced transmission**: Vaccination reduces the number of susceptible individuals, which slows down disease transmission. 3. **Strong immune response**: Vaccines stimulate an effective immune response, providing long-term protection against specific pathogens. Overall, vaccines are a powerful tool in preventing and

controlling infectious diseases. By understanding how they work, we can appreciate their importance in maintaining public health and protecting vulnerable populations.

**Difficulty: hard**

**Prompt 1:**

*If I buy a SPY call option and it ends up in the money at expiration, but I don't have enough cash to actually purchase the shares, what happens? Can I still profit from the trade without exercising the option?*

Response time: 30.99 seconds

**Response:**

When you buy a call option on the S&P 500 ETF (SPY) and it expires "in the money," meaning the strike price is lower than the market price of SPY at expiration, there are two primary ways to exercise or settle the option: 1. **\*\*Exercise and Sell the Underlying Asset\*\***: If you don't have enough cash to purchase the shares represented by the call option (in this case, SPY), you can still sell the option contract for its intrinsic value. This intrinsic value is calculated as the difference between the strike price of the option and the market price of the underlying asset at expiration. 2. **\*\*Close Out the Position\*\***: Another approach is to close out your position before expiration if the option has significant time value remaining or if you decide not to exercise it. Selling the call option for its intrinsic value (as mentioned above) will allow you to realize a profit from the trade without taking on any of the underlying risk. Keep in mind that selling an option involves entering into another contract that may require you to either buy the underlying asset at the strike price if it goes up further or sell the underlying asset at the strike price if it falls, potentially leading to losses. If you decide not to exercise and instead close out your position by selling the call option, the profit will be limited to the intrinsic value of the option. Always consider risk management strategies when trading options, such as setting stop-loss orders or limiting the amount of money invested per trade. This can help mitigate potential losses if the market moves against you. Options trading involves significant risks and may not be suitable for all investors. Always do your research, understand the underlying asset and the option's strike price, expiration date, and other factors before entering into a trade.

**Category: summarization**

**Difficulty: easy**

**Prompt 1:**

*Summarize this text in a few sentences: My fellow citizens : I stand here today humbled by the task before us , grateful for the trust you have bestowed , mindful of the sacrifices borne by our ancestors . I thank President Bush for his service to our nation , as well as the generosity and cooperation...*

Response time: 5.24 seconds

**Response:**

Here is a summary of the text in a few sentences: The speaker stands before their fellow citizens, humbled by the responsibility of the task ahead. They express gratitude for the trust bestowed upon them and acknowledge the sacrifices made by previous generations. They also thank outgoing President Bush for his service to the nation during this transition.

**Difficulty: medium**

**Prompt 1:**

*Provide a concise summary of the following text, capturing the main points: ASIAN EXPORTERS FEAR DAMAGE FROM U . S . - JAPAN RIFT Mounting trade friction between the U . S . And Japan has raised fears among many of Asia ' s exporting nations that the row could inflict far - reaching economic damag...*

Response time: 11.07 seconds

**Response:**

Here is a concise summary of the main points: \* Asian exporters, including those in Japan and Taiwan, fear that rising trade friction between the US and Japan could lead to far-reaching economic damage. \* A US move against Japan may boost protectionist sentiment in the US, potentially leading to curbs on imports from other Asian nations. \* The US has announced tariffs of \$300 million on Japanese electronics goods, which could impact other Asian exporters who rely on the US market. \* Some exporters believe that while they will be hurt by the conflict, it may also create opportunities for them in the short term.

**Difficulty: hard****Prompt 1:**

*Create a detailed summary of this complex text, organizing the main themes and arguments: -- OPENING SENTENCE OF HOBBS ' S LEVIATHAN . " Silly Mansoul swallowed it without chewing , as if it had been a sprat in the mouth of a whale ." -- PILGRIM ' S PROGRESS . " That sea beast Leviathan , which ...*

Response time: 116.96 seconds

**Response:**

Here is a detailed summary of the complex text, organizing the main themes and arguments:

**\*\*Main Themes:\*\*** 1. **\*\*The Leviathan and Whales in Literature\*\***: The text explores how whales and the biblical figure of Leviathan have been represented in literature and poetry throughout history. 2. **\*\*Mythology and Symbolism\*\***: It examines the various ways in which whales and Leviathan have been mythologized, symbolizing power, size, and ferocity. **\*\*Arguments:\*\*** 1. **\*\*The concept of Leviathan\*\***: The text begins with quotes from John Milton's "Paradise Lost" and Thomas Hobbes' "Leviathan", highlighting the biblical figure of Leviathan as a massive sea creature created by God. 2. **\*\*Literary depictions of whales\*\***: The quotes from other literary works, such as Dryden's "Annus Mirabilis" and Fuller's "Profane and Holy State", demonstrate how whales have been described in various contexts, often emphasizing their size and ferocity. 3. **\*\*Historical accounts of whale hunting\*\***: The text includes extracts from travelogues and journals, providing firsthand accounts of whaling expeditions and the experiences of sailors with whales. 4. **\*\*Factual information about whales\*\***: The quotes from Sir Thomas Herbert's "Voyages into Asia and Africa" and Richard Strafford's letter to the Royal Society reveal some facts about whale biology and behavior. **\*\*Key Findings:\*\*** 1. Whales were considered massive creatures, often compared to mountains or islands. 2. Leviathan was a symbol of power and size in biblical literature. 3. Whaling expeditions faced significant challenges due to the size and ferocity of whales. 4. Whales were hunted for their oil, baleen, and other products. **\*\*Inferences:\*\*** 1. The myth of Leviathan has had a lasting impact on Western culture, influencing literary depictions of whales and sea creatures. 2. The natural history of whales was still poorly understood in the 17th century, leading to fantastical accounts and exaggerated descriptions. 3. Whaling expeditions played an important role in shaping our understanding of marine biology and ecology. **\*\*Conclusion:\*\*** The text provides a comprehensive overview of how whales and Leviathan have been represented in literature and culture throughout history. By examining these depictions, we gain insight into the complexities of human perception, mythology, and scientific understanding of the natural world.

## Category: code\_generation

### Difficulty: easy

#### Prompt 1:

*Write a Python function to calculate the factorial of a number.*

Response time: 103.70 seconds

#### Response:

**\*\*Calculating Factorial in Python\*\***

=====

Here is a simple Python function that calculates the factorial of a given integer:

```
```python
def factorial(n):
    """
    Calculate the factorial of a non-negative integer.

    Args:
        n (int): The input number.

    Returns:
        int: The factorial of n.

    Raises:
        ValueError: If n is negative.
    """
    if not isinstance(n, int) or n < 0:
        raise ValueError("Input must be a non-negative integer.")

    result = 1
    for i in range(1, n + 1):
        result *= i

    return result
```
```

**\*\*Example Use Cases\*\***

-----

```
```python
print(factorial(5)) # Output: 120
print(factorial(0)) # Output: 1
try:
    print(factorial(-3))
except ValueError as e:
    print(e) # Output: Input must be a non-negative integer.
```
```

**\*\*How it Works\*\***

-----

This function takes an integer `n` as input and returns its factorial. It first checks if the inp...

Note: This function uses a simple iterative approach for calculating factorials. For large inputs...

### **Difficulty: medium**

#### **Prompt 1:**

*Write a Python function that implements a binary search algorithm for a sorted list.*

Response time: 233.58 seconds

#### **Response:**

```
Binary Search Algorithm in Python
=====
```

The following is an implementation of the binary search algorithm in Python. This function takes ...

```
```python  
def binary_search(sorted_list, target):  
    """  
    Performs a binary search on a sorted list for a given target value.  
  
    Args:  
        sorted_list (list): A sorted list of values.  
        target: The value to be searched in the list.  
  
    Returns:  
        int: The index of the target value if it exists in the list, otherwise -1.  
    """  
  
    # Initialize the low and high indices for the search range  
    low = 0  
    high = len(sorted_list) - 1  
  
    while low <= high:  
        # Calculate the mid index of the current search range  
        mid = (low + high) // 2  
  
        # Check if the target value is equal to the middle element  
        if sorted_list[mid] == target:  
            return mid # Target found, return its index  
  
        # If the target value is less than the middle element, update the search range  
        elif sorted_list[mid] > target:  
            high = mid - 1  
  
        # If the target value is greater than the middle element, update the search range  
        else:  
            low = mid + 1  
  
    # Target not found in the list, return -1  
    return -1  
```  

Example Use Cases

```

```

```python
# Create a sorted list of integers
sorted_list = [2, 4, 6, 8, 10, 12]

# Search for a target value
target = 8

index = binary_search(sorted_list, target)

if index != -1:
    print(f"Target {target} found at index {index}.")
else:
    print(f"Target {target} not found in the list.")
...

```

This implementation has a time complexity of $O(\log n)$, where n is the length of the input list. T...

Difficulty: hard

Prompt 1:

Create the most efficient C++ program to calculate the n th Fibonacci number using matrix exponentiation with a time complexity better than $O(n)$.

Response time: 154.10 seconds

Response:

```

**Fibonacci Number Calculation using Matrix Exponentiation**
=====

```

The Fibonacci sequence can be calculated efficiently using matrix exponentiation. This method red...

```

```cpp
#include <iostream>
using namespace std;

// Function to multiply two 2x2 matrices
void multiply(int matA[2][2], int matB[2][2]) {
 int result[2][2] = {{0, 0}, {0, 0}};

 // Multiply the two matrices and store the result in result
 for (int i = 0; i < 2; i++) {
 for (int j = 0; j < 2; j++) {
 result[i][j] = matA[i][0]*matB[0][j] + matA[i][1]*matB[1][j];
 }
 }

 // Store the result back in matA
 for (int i = 0; i < 2; i++) {
 for (int j = 0; j < 2; j++) {
 matA[i][j] = result[i][j];
 }
 }
}
}

```



```

// Function to calculate the nth Fibonacci number using matrix exponentiation
void power(int n, int matrix[2][2]) {
 if (n == 0 || n == 1) return;

 // Create the base matrix F
 matrix[0][0] = 1; matrix[0][1] = 1;
 matrix[1][0] = 1; matrix[1][1] = 0;

 int M = matrix;

 power(n / 2, matrix);
 multiply(matrix, matrix);

 if (n % 2 != 0) {
 // Multiply the result by the base matrix F
 multiply(matrix, M);
 }
}

// Function to calculate the nth Fibonacci number using matrix exponentiation
int fibonacci(int n) {
 int F[2][2] = {{1, 1}, {1, 0}};

 if (n == 0) return 0;
 power(n - 1, F);

 // The result is stored in the first row of the matrix F
 return F[0][0];
}

int main() {
 int n;
 cout << "Enter a positive integer: ";
 cin >> n;

 if (n < 0) {
 cout << "Error: Input should be a non-negative integer." << endl;
 } else {
 cout << "The " << n << "th Fibonacci number is: " << fibonacci(n);
 }

 return 0;
}

```

**\*\*How it works\*\***

1. The `multiply` function multiplies two 2x2 matrices.
2. The `power` function calculates the nth power of a matrix using exponentiation by squaring, re...
3. The `fibonacci` function uses the `power` function to calculate the nth Fibonacci number.

**\*\*Example use case\*\***

Input: `Enter a positive integer: 10`  
Output: `The 10th Fibonacci number is: 34`

This program calculates the 10th Fibonacci number in  $O(\log n)$  time complexity, making it much mor...

## Category: creative\_writing

### Difficulty: easy

#### Prompt 1:

*Write a short story about a dog who finds a treasure.*

Response time: 68.41 seconds

#### Response:

**\*\*The Tale of Max and the Golden Bone\*\*** Max was a curious golden retriever with a fluffy coat and a wagging tail that never seemed to stop. He loved going on adventures with his owner, Emily, exploring the woods behind their house. One sunny afternoon, as they strolled along the winding trail, Max suddenly darted off the path, barking excitedly. "Max! Wait!" Emily called out, laughing. "What have you found?" The dog didn't respond; he was too busy digging in a small clearing surrounded by tall trees. The earth flew out from beneath his paws as he uncovered a small chest buried beneath the roots of an ancient oak. The lid creaked open, revealing a trove of glittering treasures: gold coins, precious jewels, and a shimmering golden bone. Max yelped in excitement, as if to say, "I've found it! I've finally found it!" Emily approached cautiously, her eyes widening at the sight before her. The treasure was unlike anything she had ever seen. As they examined the chest together, Emily discovered a small inscription etched into the lid: "For the loyal companion who finds me, may the rewards be many and the joys be endless." It seemed that this treasure was meant for Max all along. Word of the discovery spread quickly through the village, and soon, people were coming from far and wide to see the legendary golden bone. The villagers showered Max with treats and praise, but he remained humble, as if he knew the true value of his find lay not in the treasures themselves, but in the joy and love they brought him. From that day forward, Max was hailed as a hero, and Emily made sure to give her loyal companion an extra-special reward: endless belly rubs and all the treats he could ever want. And whenever Max looked at the golden bone, now proudly displayed on their mantle, he knew that his adventure had been one for the ages - a reminder of the treasures hidden just beyond the edge of everyday life. As Emily wrapped her arms around Max's neck, she whispered, "You may have found the treasure, but you're still my greatest reward." And Max wagged his tail in agreement, knowing he was loved more than any treasure could ever be.

### Difficulty: medium

**Prompt 1:**

*Write a short story about modern historical events with references and allusions towards greek history and famous greek figures/myths*

Response time: 111.77 seconds

**Response:**

The sun was setting over the crumbling buildings of Kabul, casting a golden glow over the chaotic streets. It was 2001, and the world was watching as the Taliban regime crumbled beneath the weight of American and Northern Alliance forces. Ahmad Shah Massoud, the Lion of Panjshir, gazed out upon the city he had fought for his entire life. His eyes, like those of Perseus when he gazed into the mirror that revealed Medusa's face, seemed to bore into the very soul of the city. He saw the same mixture of despair and hope that had driven him to rise against the Soviet invaders a generation before. As he walked through the dusty streets, Massoud was approached by a young woman, her eyes shining with tears. She reminded him of Andromeda, chained to the rocks as Cetus, the sea monster, approached. But this was no mythological tale; this was real life, and the stakes were just as high. "Sir," she said, her voice trembling, "please help us. The Taliban has destroyed our homes, taken our loved ones. We have nowhere left to go." Massoud's heart went out to her, as it had gone out to countless others before. He was like Theseus, navigating the Labyrinth of politics and war with only his wits to guide him. But he knew that sometimes, even the bravest heroes must make difficult choices. "Tell me," he said, his voice firm but gentle, "where are you going to go now? Have you thought about what comes next?" The woman hesitated, her eyes darting back and forth like those of Ariadne as she tried to navigate the treacherous waters of the Mediterranean. Massoud smiled, remembering the thread that Ariadne had given Theseus to guide him through the Labyrinth. "Come," he said, offering his arm. "I will take you to a place where you can be safe. It may not be perfect, but it is home. And who knows? Perhaps one day, we will rebuild this city, make it shine like the golden light of the setting sun." As they walked through the ruined streets, Massoud felt a sense of pride and purpose that he had not felt in years. He was like Odysseus, navigating the treacherous waters of modern politics with only his wits to guide him. But he knew that sometimes, even the greatest heroes must face their own monsters, and emerge victorious. The next day, Massoud would be killed in a terrorist attack, his eyes frozen forever in a moment of tragic beauty, like those of Orpheus as he gazed into the underworld. But his spirit lived on, inspiring generations to come, just as the great heroes of Greek mythology had done before him. References: \* The Lion of Panjshir: Ahmad Shah Massoud was a real Afghan politician and military leader who fought against the Soviet invasion of Afghanistan in the 1980s. \* Perseus and Medusa: In Greek mythology, Perseus beheaded the snake-haired Medusa with the help of Athena. \* Andromeda: A princess chained to rocks as punishment for her mother's crimes, Andromeda was saved by Perseus, who killed Cetus, a sea monster sent to devour her. \* Theseus and the Labyrinth: In Greek mythology, Theseus navigated the Labyrinth to defeat the Minotaur with the help of Ariadne's thread. \* Ariadne and the Mediterranean: Ariadne was the daughter of King Minos and Queen Pasiphae, who fell in love with Theseus. She gave him a ball of thread to guide him through the Labyrinth. \* Odysseus: A king of Ithaca and hero of Homer's Odyssey, Odysseus navigated treacherous waters and monsters on his way home from the Trojan War. \* Orpheus: A musician and poet who journeyed to the underworld to reclaim his beloved wife, Eurydice.

**Difficulty: hard**

**Prompt 1:**

*Write a short story that uses non-linear narrative structure to explore the theme of memory. Include at least three different time periods and ensure they interconnect meaningfully.*

Response time: 72.08 seconds

**Response:**

**\*\*The Box of Memories\*\*** I sat in my small apartment, surrounded by old trunks, dusty vases, and forgotten photographs. My grandmother's words echoed in my mind: "Memories are like fragile flowers; handle them with care." I opened a worn wooden box, its intricate carvings a testament to my grandfather's craftsmanship. Inside, I found a single, faded photograph. The image depicted two children, their faces tilted up towards the sun. One was me, maybe five years old, holding hands with a boy about the same age as I am now. My heart swelled with nostalgia, and suddenly, I was six again, chasing after him in our grandparents' garden. We played hide-and-seek among the blooming flowers, laughing until tears pricked at the corners of my eyes. But this memory wasn't from my childhood. It was a story my grandmother used to tell me when I visited her in a nursing home, years ago. Her memories were cloudy by then, but she would reminisce about our family's history with an unwavering clarity that still stings my heart. As I gazed at the photograph, another memory burst forth: the day my grandfather passed away, surrounded by his children and grandchildren. My grandmother had been devastated; her eyes sunken, her face etched with grief. She spoke of how she used to spend hours in our grandparents' garden, watching him work on his woodcarvings. The trees still bore witness to their love, their hands intertwined like the carvings on this box. But what was the date on that photograph? I searched for a calendar or a journal from my grandmother's time. Instead, I found an old letter addressed to me, penned in shaky handwriting: "My dearest granddaughter, I know you'll one day be searching for answers about our family's past. Be patient; memories are fragile and require care. Look for the garden, where love bloomed long after we were gone. You will find your grandfather's hands in every carvings on that wooden box. Yours, Grandmother" The garden, I realized, was a place where time seemed to bend. A place where my grandmother had been six years old again, playing with the boy who would become her son. The memories she shared with me were not just hers; they were part of our collective family history. I returned to the wooden box, now seeing it as more than a relic of the past. It was a bridge between generations, connecting my own story with that of my grandparents and great-grandparents before them. Each memory, like the photograph, was a delicate petal on the flower of remembrance. The room around me began to blur, colors bleeding into one another. I felt myself being pulled backward in time, witnessing the garden's beauty when my grandfather was still alive, his hands moving deftly over the wood as he created something beautiful for our family. I emerged from this trance-like state with a newfound understanding of memory: it is not just a snapshot of the past but a web of interconnected threads that weave together to form the tapestry of our lives. My grandmother's words still resonated within me, reminding me that memories are precious and fleeting, requiring care and attention lest they fade like the light on the garden path. As I closed the box, its contents now imbued with meaning, I realized that I was not just holding a collection of photographs and stories; I held our family's collective memory.