



An Unsolved Mystery: The Collatz Conjecture

A. Choose the correct option.

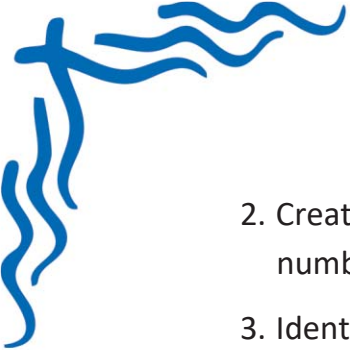
1. What is the first step in the Collatz Conjecture for an odd number?
 - a) Divide by 2
 - b) Multiply by 3 and add 1
 - c) Subtract 1
 - d) Multiply by 2
2. What will be the next number in the Collatz sequence starting from 6?
 - a) 3
 - b) 9
 - c) 5
 - d) 18
3. Which of the following numbers enters the loop $4 \rightarrow 2 \rightarrow 1$ under Collatz Conjecture?
 - a) 5
 - b) 7
 - c) 11
 - d) All of the above
4. Which pattern is always followed in the Collatz Conjecture?
 - a) Number always increases
 - b) Number always decreases
 - c) Sequence ends in $4 \rightarrow 2 \rightarrow 1$ loop
 - d) Sequence becomes zero eventually
5. The Collatz Conjecture is named after:
 - a) A Greek Mathematician
 - b) A scientist from NASA
 - c) Lothar Collatz
 - d) Isaac Newton

B. Write the Missing Terms to Complete the Sentences:

1. If the number is even, in Collatz Conjecture, we _____ it by 2.
2. If the number is odd, we multiply by _____ and add _____.
3. The Collatz Conjecture is sometimes called the _____ problem.
4. The sequence always ends in the loop _____ \rightarrow _____ \rightarrow _____.
5. The Collatz Conjecture helps develop skills in _____ and _____ thinking.

C. Figure out the answers to these questions:

1. Find the Collatz sequence starting from 7 and write all the steps till it reaches 1.



2. Create a flowchart that explains how the Collatz steps work for any given number.
3. Identify and explain the pattern in the sequence starting from 9.
4. Challenge your friend: Can you find a starting number between 10 and 20 that takes the longest to reach 1 using the Collatz steps? Write the steps.
5. Match the number with the number of steps it takes to reach 1 using Collatz:
 - **Numbers:** 5, 6, 11, 3
 - **Steps:** 5, 8, 14, 16
6. Write a short story or riddle describing the journey of a number in the Collatz world.
7. **Think and Predict:** If you start with 15, what kind of numbers do you mostly get in the sequence—odd or even?
8. **Do it Yourself:** Try to find a 2-digit number whose sequence takes more than 15 steps to reach 1.

D. Mark each sentence with a True (✓) or False (X):

1. The Collatz Conjecture always leads to a result of 0.
2. The number 1 is the end of every Collatz sequence.
3. Every even number in the sequence is divided by 2.
4. Collatz Conjecture has been fully proven for all natural numbers.
5. The Collatz Conjecture helps us practice logical thinking.

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E. Challenge yourself with these questions:

1. **Code Puzzle:** Write a pseudo-code or steps in your own words to perform the Collatz operation on any number.
2. **Graph It Out:** Plot the sequence for number 13 on graph paper or digitally—use Y-axis for values and X-axis for steps.
3. **Team Game Idea:** Design a board game where players must follow Collatz steps to reach 1 the fastest!
4. **Art Integration:** Create a Collatz Sequence Art using colors for odd and even numbers in a spiral or grid.
5. **Math Debate:** “Is the Collatz Conjecture the most exciting mystery in math?” Prepare your views for or against.