

Activity on Sequences Tower of Hanoi

In 1883, French mathematician Edourd Lucas invented the puzzle or mathematical game popularly called as Tower of Hanoi and also known as Towers of Brahma. The Towers of Hanoi is played with three stacks and any number of differently-sized disks. At the start, all the disks are in the leftmost stack, with the largest disk on the bottom and the smallest on the top. The object is to get all the disks over to the rightmost stack.

You can only move one disk per move, and you can only move the top disk on a stack. The top disk of any stack can be moved to the top disk of any other stack, with the restriction that you can't move a larger disk on top of a smaller disk: disks can only be moved to empty stacks or on top of larger disks.



Determine the minimum number of moves needed to move 10 discs to another peg.

Work with the Hanoi Tower at

<http://britton.disted.camosun.bc.ca/hanoi.swf>

or at <http://www.cut-the-knot.org/recurrence/hanoi.shtml>

or at <http://www.sheppardsoftware.com/braingames/tower/tower.htm>

Number of Discs	Minimum Number of Moves	Recursive Formula
1		
2		
3		
4		
5		
6		
n		

Develop the recursive formula for the sequence:

4. Given the sequence $\frac{3}{4}, \frac{5}{9}, \frac{7}{16}, \frac{9}{25}, \frac{11}{36}, \frac{13}{49}, \frac{15}{64}, \dots$, determine the general term.

5. Leonardo Fibonacci of Pisa was a mathematician in 13th century Italy. A man put a pair of newborn rabbits (one male and one female) in an area surrounded on all sides by a wall. When the rabbits are in their second month of life, they produce a new pair of rabbits every month (one male and one female), which eventually mate. If the cycle continues, how many pairs of rabbits are there every month? By charting the population of rabbits, he discovered a number sequence:



1, 1, 2, 3, 5, ...

Explain how these terms are related and generate the next five terms. Determine a recursive formula for generating any term, in the sequence.

French mathematician Edouard Lucas named the sequence in the rabbit problem “the Fibonacci sequence.” He studied the related sequence:

1, 3, 4, ... ,

whose terms are generated in the same way as the Fibonacci sequence. Generate the next five terms of the Lucas sequence.

1. For each arithmetic sequence, determine
- i) the recursive formula
 - ii) the general term
 - iii) t_{10}
- a) 29, 21, 13, ... d) 3.25, 9.5, 15.75, ...
- b) -8, -16, -24, ... e) $\frac{1}{2}, \frac{2}{3}, \frac{5}{6}, \dots$
- c) -17, -9, -1, ... f) $x, 3x + 3y, 5x + 6y, \dots$

2. Determine the recursive formula and the general term for the arithmetic sequence in which
- a) the first term is 17 and the common difference is 11
 - b) $t_1 = 38$ and $d = -7$
 - c) the first term is 55 and the second term is 73
 - d) $t_3 = -34$ and $d = -38$
 - e) the fifth term is 91 and the seventh term is 57

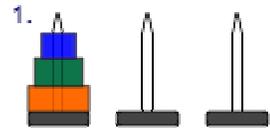
3. The number of seats in the rows of a stadium form an arithmetic sequence. Two employees of the stadium determine that the 13th row has 189 seats and the 25th row has 225 seats. How many seats are in the 55th row?

4.

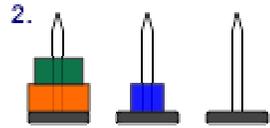
A work of art is priced at \$10 000. After one week, if the art isn't sold, its price is reduced by 10%. Each week after that, if it hasn't sold, its price is reduced by another 10%. Your mother really likes the art and you would like to purchase it for her, but you have only \$100. If the art is not sold, how many weeks will you have to wait before being able to afford it?

5.

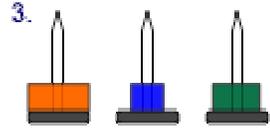
- i) Determine whether each sequence is arithmetic or geometric.
 - ii) Determine the general term, the recursive formula, and t_G .
- | | |
|-----------------------|---|
| a) 15, 30, 45, ... | d) 3000, 900, 270, ... |
| b) 640, 320, 160, ... | e) 3.8, 5, 6.2, ... |
| c) 23, -46, 92, ... | f) $\frac{1}{2}, \frac{1}{3}, \frac{2}{9}, \dots$ |



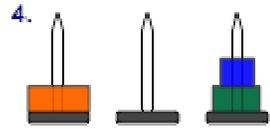
From Tower A to Tower B



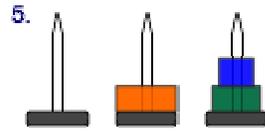
From Tower A to Tower C



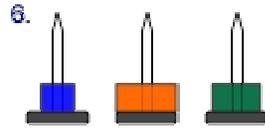
From Tower B to Tower C



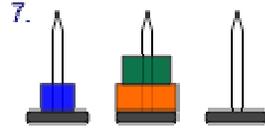
From Tower A to Tower B



From Tower C to Tower A



From Tower C to Tower B



From Tower A to Tower B

