As I was going to St. Ives, I met a man with seven wives. Every wife had seven sacks, and every sack had seven cats, every cat had seven kittens.
© http://www.daviddarling.info/encyclopedia/S/St_Ives_problem.html

a. How many wives did I meet? 7 wives

b. How many sacks did I meet? 49

c. How many cats did I meet? 343

d. How many kittens did I meet? 2,401

e. Do these numbers constitute a geometric sequence? Explain why.

Oil Spills

How might we write a formula for the next amount
of barrels of oil (biological agents) based on the
previous amount?

Method 1: Chemical Dispersants				
x	0	1	2	3	4
y	20	17.5	15	12.5	10

Method 2: Biological Agents				
x	0	1	2	3	4
y	20	16	12.8	10.24	8.192

Recursive Formula for a Geometric Sequence

$$a_n = r \cdot a_{n-1}$$

$2, 4, 8, \textcircled{16}, 32, 64.$ ▱

Write a recursive formula for each sequence.

$\frac{20}{8} = 2.5$ $\frac{50}{20} = 2.5$

1. 8, 20, 50, 125, 312.5,... $A_n = 2.5(A_{n-1})$

$\frac{56}{16} = 3.5$ $\frac{196}{56} = 3.5$

2. 16, 56, 196, 686, 2401,... $A_n = 3.5 A_{n-1}$

3. $a_4 = 108$ $r = 3$ $A_n = 3 A_{n-1}$

4. $a_3 = 16$ $r = 4$ $A_n = 4 A_{n-1}$

How might we write a formula for the nth term of the geometric sequence?

$$A_n = 0.8 \, A_{n-1}$$

Method 2: Biological Agents				
x	0	1	2	3	4
y	20	16	12.8	10.24	8.192

Explicit Formula for Geometric
Sequences

$$a_n = a_1 \cdot r^{n-1}$$

Write an equation for the n_{th} term of each geometric sequence.

1. 0.5, 2, 8, 32,... $A_n = 0.5(4)^{n-1}$
2. -0.25, 2, -16, 128,... $A_n = -0.25(-8)^{n-1}$
3. $a_4 = 5 \quad r = 6$ $A_n = \frac{5}{6^3}(6)^{n-1} \qquad \frac{5}{6^3}$
4. $a_3 = 16 \quad r = 4$ $A_n = 1(4)^{n-1}$

Numb3rs Episode: Identity Crisis

- What is a pyramid scheme?
- How tall will the stack of paper be?
- How much money did he have after 19 rounds?

Julian sees a new band at a concert. He emails a link for the band's website to 5 of his friends. They each forward the link to five of their friends. The link is forwarded again follow the same pattern. If the pattern continues, how many emails will be sent in the 8th round?

$$A_n = 1(5)^{n-1}$$

$$A_n = (5)^{8-1}$$
$$= 5^7$$
$$= 78,125 \text{ emails}$$

Shira receives a joke in an email that asks her to forward it to 4 of her friends. She forwards it, then each of her friends forwards it to 4 of their friends, and so on. If the pattern continues, how many people will receive the email on the 9th round of forwarding?

$$A_n = (1)(4)^{n-1}$$

$$A_n = 4^{a-1}$$
$$= 4^8$$
$$= 65,536 \text{ emails}$$