1. You find out a secret on Monday. On Tuesday, you tell two of your friends. On Wednesday, everyone who knows the secret tells two more people. How many people know the secret on Thursday? Friday? Saturday?

   Fill out the following table:

Day of the week	Day number	Number of people that know the secret
Monday	1	1
Tuesday	2	3
Wednesday		

   If x_n is the number of people who know the secret on day number n, how many people know the secret on the next day, day number $n + 1$?

   $$x_{n+1} =$$

2. Juliet and Romeo have can have positive or negative feelings for each other. At the beginning, Juliet dislikes Romeo, $J_0 = -1$, and Romeo likes Juliet, $R_0 = 1$.

   Suppose that Juliet and Romeo's feelings are governed by the following relationships:

   $$J_{n+1} = \frac{1}{2}R_n$$
   $$R_{n+1} = 2J_n$$

   Explain what both equations in this *mathematical model* mean.

3. Use a spreadsheet to determine what happens over 30 days to their feelings using the following rules:

$$J_{n+1} = \frac{1}{2}R_n$$
$$R_{n+1} = 2J_n$$

Explain what happens to their feelings for each other. Try to make a line graph of the results.

4. What if Juliet's feelings depend not only on her own feelings but also how Romeo feels for her? For example, suppose that their feelings are described by the following rules:

$$J_{n+1} = \frac{1}{2}R_n - 2J_n$$
$$R_{n+1} = 2J_n$$

Explain what happens to their feelings over time. Try to make a line graph of the results.

5. Suppose that

$$R_{n+1} = aR_n + bJ_n,$$
$$J_{n+1} = cR_n + dJ_n,$$

where a, b, c, and d can change. Try

(a) $a = 0.5$, $b = 0.7$, $c = 0.7$, $d = 0.9$

(b) $a = 0.5$, $b = 0.2$, $c = 0.5$, $d = 0.7$

(c) $a = 1$, $b = 0.2$, $c = -0.2$, $d = 1$

(d) $a = 0.8$, $b = -1.1$, $c = 1$, $d = -0.2$

and describe what happens to their feelings for each other in each case.