# How to Survive a Zombie Attack

On June 30, 2035, a sleeper cell of zombies executed an evil plan 10 years in the making. Their objective: to "turn" the entire human race into evil zombies! Each zombie can turn 3 humans per day, but they are not sure how long it will take them to completely turn every human on the planet. Complete the table below to show how many total zombies there will be every day for the first 10 days of the attack. The original sleeper cell had only 5 members, but keep in mind that newly turned zombies also have the power (and the will!) to turn other humans.

Day	Number of Zombies turned each day	Day	Number of Zombies turned each day
0	5	6	
1		7	
2		8	
3		9	
4		10	
5		x	

1. What patterns of growth do you notice in the number of zombies turned each day as the days go by?

2. What would this data look like on a graph? Sketch a graph of the data for days 1-10.
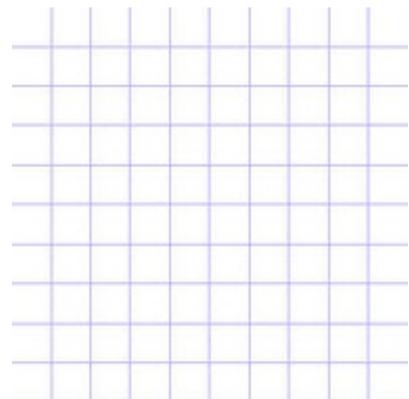
3. From the table or graph:
   a. How many zombies are turned on day 10?

   b. What would you have to multiply this number by to get the number of zombies created on day 11?

   c. How would the entire table table change if instead of starting with 5 zombies we only started with one zombie?

   d. How long would it take now for the zombies to take over the world? Assume the population of the world is 6,975,000,000 and we started with 5 zombies.

4. Which one of the equations below would correctly model the number of zombies turned each day if you start with 5 zombies? Explain.

$$y = 5(3)^x \qquad y = 5x^3 \qquad y = 3x + 5 \qquad y = 3^x + 5 \qquad y = 3(5)^2$$

5. What does the unknown variable, x, represent in the equation you chose from #4?

6. Write an equation to model the pattern if instead 12 zombies were in the sleeper cell initially and had the ability to run... so they can infect 6 people per day. How long would it take the zombies to take over the world now?

7. If you were given the choice of between more initial zombies, but a slower growth rate or fewer initial zombies, but a greater growth rate, which would you pick and why?

Within 3 days of the initial attacks being reported, a group of scientists quickly began working to find an antidote for "zombieism". Within a few short weeks, they were successful, but unfortunately their antidote was found to only be successful 15% of the time. Make a table showing how many zombies were cured after 10 rounds of administering the antidote (assume every remaining zombie is given the antidote in every round and no new zombies are created).

Rounds of Antidote	Zombies Remaining
0	6,975,000,000
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
x	

8. What patterns of "decay" do you notice in the cumulative number of zombies remaining after each round of the antidote's administration? (hint: If 15% of the zombies are cured, then how many remain?)

9. What would this data look like on a graph?
Sketch a graph of the first 10 rounds of administration.
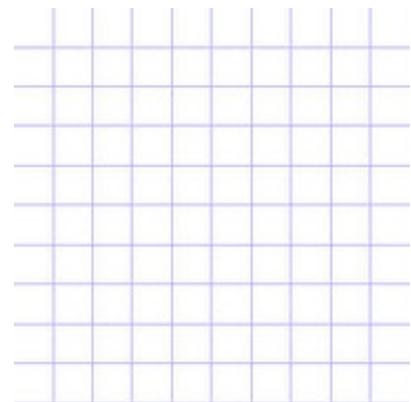
10. Write an equation to model the pattern in the data.

11. At this rate, how long will it take the scientists to completely turn all zombies back into humans? Can this ever really happen? Why or why not?

12. What similarities and differences do you notice in the equations developed for both the initial attack and the antidote phases?

13. What number in the equation impacts whether or not the initial value will increase or decrease over time? Which number in the equation tells us what the initial value is?

14.   Canadian mathematicians and authors of "[When Zombies Attack!: Mathematical Modeling of an Outbreak of Zombie Infections](#)" published the in journal of "[Infectious Disease Modelling Research](#)" concluded that the secret to our survival is to hit zombies with everything we have... hard, fast and <u>early</u>. Using what you have learned about exponential growth in this worksheet, why do you think these scientists came to that conclusion?