
STORE
24
HOUR
CAB
13

19

CHANCES OF SURVIVAL: YOU'RE DEAD

SURVIVAL STRATEGIES: EXPRESSIONS AND EQUATIONS

DEATH BY: BLOOD LOSS

DEFEAT THE VAMPIRES

THE CHALLENGE

You never believed in vampires—until you saw one for yourself. He's new in town, a strange-looking dude, who up until now seems to have been living off of the stray cats in the neighborhood. Problem is, no one else has ever seen him but you. And no one believes you—no one except your best friend, Jamie, who happens to be an

expert on vampires. According to Jamie, vampires only come out at night, and they only feed two times a month. Feeding means sucking the blood of a human, and after they're through, that person becomes a vampire, too. One month later, these new vampires will each be capable of turning 2 more people into vampires.

"But how come he only feeds on cats?" you ask Jamie.

"They're just an appetizer," Jamie explains. "At the next full moon, he'll be looking for human blood. The good news is that there's only one vampire in town. How much harm could a single vampire do?"

"A lot!" you answer. "There are 500,000 people living in this town, right? That means, unless we find the vampire before the next full moon, our town will soon be completely taken over by vampires!" Jamie doesn't believe you, so you have to prove it to him.

If the vampires feed only on people in your town, approximately how many months will it take for your 500,000-person town to become populated entirely by vampires?

EUCLID'S ADVICE

Remember the power of 3! Things can get out of control pretty quickly when numbers continue to triple. Once you figure out the pattern in which the vampires are increasing, creating an algebraic linear equation may be helpful. You'll need to assign two variables, one to represent the current number of vampires (a value you know), and another to represent the new number of vampires (the value you're solving for). Then, set up a table, or chart, to organize your data.

But first, write down everything you know:

- **There is currently only 1 vampire in town.**
- **There are 500,000 people who live in town.**
- **Every month, 1 vampire feeds on 2 humans, turning both of them into vampires.**

WORKSHEET

THE SOLUTION

IN 12 MONTHS, THE ENTIRE TOWN WILL BE MADE UP OF VAMPIRES.

Solve it, step-by-step:

1. First, let's find the pattern. Consider that the vampire population trples each month because each vampire feeds on 2 humans, turning each of them into a vampire.

2. At the end of 1 month, 2 humans will have become vampires.

$1 \times 2 = 2$ vampires

Add these 2 to the original vampire and it puts the total vampire population at 3.

$2 + 1 = 3$ vampires

3. In the following month, each of these 3 vampires will then transform 2 more humans into vampires, making 6 new vampires.

$3 \times 2 = 6$ vampires

Add these 6 to the original 3, and the total vampire population would be 9.

$6 + 3 = 9$ vampires

4. These 9 each turn 2 more humans into vampires by the end of the third month, making the vampire population 27.

$(9 \times 2) + 9 = 27$ vampires

5. Do you see a pattern emerging? To find the total number of vampires each month, multiply the current number of vampires by 2 and then add the current number of vampires to that number. This will give you the new total number of vampires in that month. Written as an equation, it would look like this:

v = the current number of vampires
x = the total number of vampires
$(v \times 2) + v = x$

6. To solve for the total number of vampires (x), you multiply the current number of vampires (v) by 2, and then add v to get x.

Continue the pattern until you figure out how many months it will take to create at least as many vampires as there are townspeople (500,000).

Month	"Current" Vampires	"New" Vampires	Total Vampires
0	1	0	1
1	1	2	3
2	3	6	9
3	9	18	27
4	27	54	81
5	81	162	243
6	243	486	729
7	729	1,458	2,187
8	2,187	4,374	6,561
9	6,561	13,122	19,683
10	19,683	39,366	59,049
11	59,049	118,098	177,147
12	177,147	354,294	531,441

If you continue in this fashion, the numbers really start to climb. Now you can show Jamie why it's important you get this vampire *before* the next full moon!

MATH LAB

A story from India relates how chess was invented by the Sissa ibn Dahir, a wise man who taught King Shihram how to play the game. The ruler was delighted and asked the sissa to decide on what he wanted as a prize.

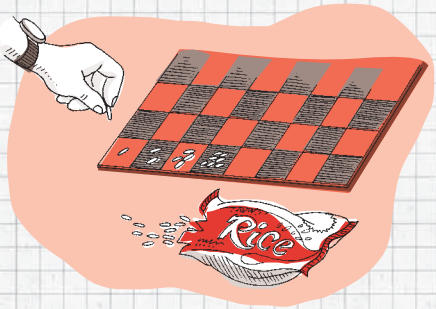
"I am a simple man, and ask only for a simple reward of rice," the sissa said. "Lay your chessboard there and place a single grain of rice on the first square. Place 2 grains (double the amount) on the second square and 4 grains (double the previous amount) on the next square, and so on through all the squares. Remember—this is a simple request."

That's all he asked. King Shihram agreed, and asked for a servant to lay out the chessboard and to fetch some rice. And since the reward is so simple, it's the next lab in this book. Is it also the simplest activity in these pages, or the hardest? You decide.

YOU WILL NEED

- CHESSBOARD (OR CHECKERBOARD)
- SMALL BAG OF UNCOOKED RICE

THE METHOD



1. Follow the sissa's instructions and place 1 grain of rice on the first square, 2 on the second, 4 on the third, and 8 on the fourth.

2. Now stop for a minute and do some calculations: You need to put 128 grains on the eighth square, which is at the end of the first row. But there are 7 more rows, and the number keeps doubling! By the end of the second row, you'd have reached about 32,000 grains, and just at the start of the third row, it would be double *that*. Yikes!

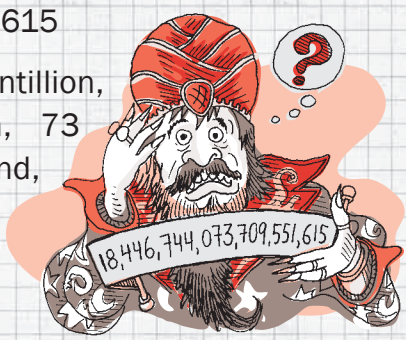
The sissa's request creates a sequence that mathematicians and scientists call *exponential,* which rises much, much faster than a sequence in which you add the same amount each time to move from one step to the next. That sort of a sequence is called *linear*.

You probably gave up by about the end of the first row, but if you did go all the way to the end, you'd finish up with this many rice grains on the last (sixty-fourth) square:

18,446,744,073,709,551,615

which in other words is: 18 pentillion, 446 quadrillion, 744 trillion, 73 billion, 709 million, 551 thousand, 615.

That's a lot of rice!



BRAIN BENDER

TWO MINUTES

The following statistics have been gathered from a wide range of sources. They all represent what happens in 2 minutes. But we've jumbled up the numbers in the right column and you've got to rearrange them to correctly match the events in the left column. Are you up for it? You have . . . 2 minutes!

1. Water urinated by all humans (gallons)	a. 27
2. Tons of garbage produced	b. 15,122
3. World deaths	c. 308
4. Lightning strikes	d. 3,577,938
5. Meteorites entering atmosphere	e. 158,728
6. World tobacco deaths	f. 19
7. Wall posts on Facebook	g. 11,911
8. World births	h. 160,404,800,000
9. Trees cut down	i. 209
10. Pints of blood pumped	j. 17

Answers:
1=d, 2=j, 3=i, 4=g, 5=a, 6=f, 7=e, 8=c, 9=b, 10=h