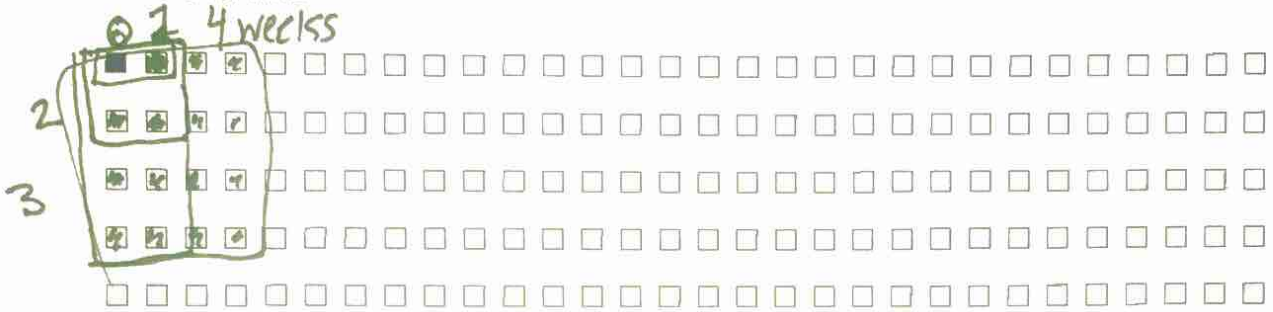
# How long until the zombies take over?

THE WALKING DEAD

On the TV show The Walking Dead, a disease was contracted that turns people into zombies or Walkers. If the Walkers bite a human, the human is turned in to a Walker. Assume that the each Walker turns one person a week into a zombie and that none of the Walkers are killed.

1. The diagram below represents a town with 150 people. Each box represents a human; each filled in box represents a Walker. Keep track of the Walker and human populations over time.



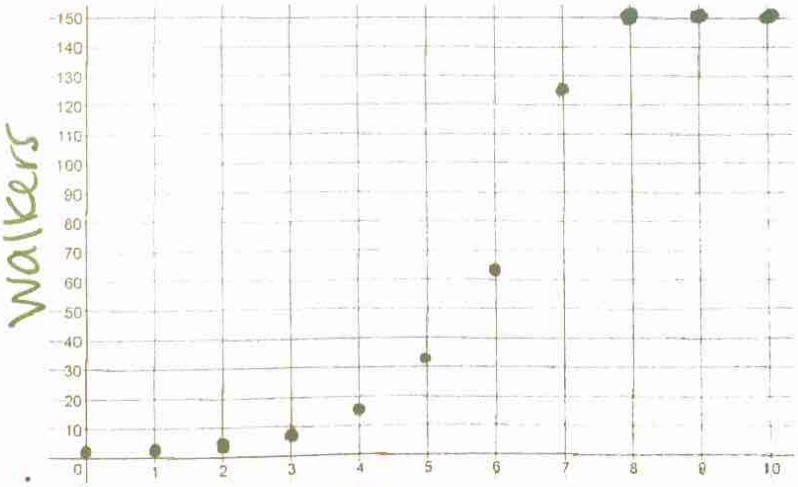

| Weeks | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ Walkers | 1 | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 150 | 150 | 150 |
| □ Humans | 149 | 148 | 146 | 142 | 134 | 118 | 86 | 22 | 0 | 0 | 0 |

a. How does the Walker population change each week, and how long will it take before everyone in town is a Walker?
It doubles every week. It will take between 7 & 8 weeks.

b. List the number of Walkers as a sequence for the first 5 weeks.
1, 2, 4, 8, 16, 32

c. Write a **recursive** formula for the sequence.
Geometric: ×2 Repeatedly
$u_0 = 1$
$u_n = u_{n-1} \times 2$

d. Graph the sequence.




e. What $x$ values are used?
Whole numbers between 0 & 8
Domain: $0 \le x \le 8$

f. What $y$ values are used?
Numbers from 1 to 150
Range: $1 \le y \le 150$

y-int (0,1)

2. A different town of 150 people started with 3 Walkers. Complete the table below.

| Weeks | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ■ Walkers | 3 | 6 | 12 | 24 | 48 | 96 | 150 | 150 | 150 | 150 | 150 |
| □ Humans | 147 | 144 | 138 | 126 | 102 | 54 | 0 | 0 | 0 | 0 | 0 |

a. How long will it take for everyone in that town to become a Walker?

Between 5 & 6 weeks

b. List the number of Walkers as a sequence for the first 5 weeks.

3, 6, 12, 24, 48, 96

c. Write a recursive formula for the sequence. How is it different from your answer to 1c?

$u_0 = 3$

$u_n = u_{n-1} \times 2$

The starting point is at 3 instead of 1. It grows faster.

y-int (0, 3)

3. Imagine there is an infinite number of people who can be infected by the Walkers.

a. Create a sequence showing how many people are infected if there are 4 Walkers to start at week 0. Show weeks 0 to 5.

4, 8, 16, 32, 64, 128

b. Write a recursive formula for the sequence.

$u_0 = 4$

$u_n = u_{n-1} \times 2$

c. How many Walkers will there be in...

Week 8? 1024

Week 13? 32,768

Week 24? 67,108,864

d. How can you figure out how many total Walkers there will be for ANY week?

$\text{Walkers} = 4 \times 2^{(\text{weeks})}$

Explicit formula:

$y = a \cdot b^x$

↑ y-int, ↖ growth rate