CHAMP 3/3/2014 – Worksheet

Problem 1

Suppose a person stands 1 yard away from a wall, and begins walking to the wall according to these rules:

- The person may only use the given move, and only once per second:
- The move is: “Walk half-way to the wall.”
- The person has an unlimited number of moves.

Can the person reach the wall using only this move? You may want to use this chart:

Number of moves	Distance travelled	Distance remaining
0		
1		
2		
3		
4		

Will the person reach the wall? Be ready to explain your answer.

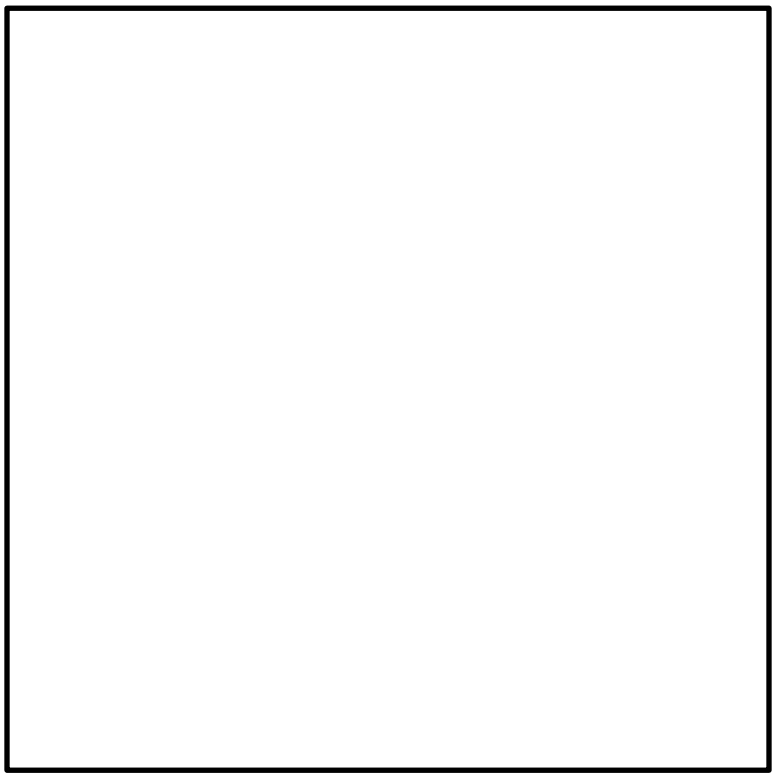
Challenge: Can you find a pattern in the distance travelled or the distance remaining?

Problem 2

Figure out the value of this "infinite sum":

$$\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\frac{1}{64}+\cdots$$

Start with a 1 by 1 square:



Write down the area of the whole square:

1) Lightly shade half of the square. Label the area of shaded portion:

2) Shade half of what's not shaded. Label the area of what you just shaded:

3) Shade half of what's not shaded. Label the area of what you just shaded:

4) Repeat this process until you see what the value of $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\cdots$ is, and try to explain why.

Problem 3

Try to figure out what the list of numbers "approaches." Use a calculator if you need to. Challenge: Can you find the pattern in each of the first three lists of numbers? Can you write down a formula for each number in the list?

$2 \quad \frac{3}{2} \quad \frac{4}{3} \quad \frac{5}{4} \quad \frac{6}{5} \quad \frac{7}{6} \quad \ldots$

$\frac{1}{3} \quad \frac{1}{9} \quad \frac{1}{27} \quad \frac{1}{81} \quad \ldots$

$3 \quad \frac{5}{2} \quad \frac{7}{3} \quad \frac{9}{4} \quad \frac{11}{5} \quad \ldots$

$0.3 \quad 0.33 \quad 0.333 \quad 0.3333 \quad 0.33333 \quad \ldots$

$3 \quad 3.1 \quad 3.14 \quad 3.141 \quad 3.1415 \quad 3.14159 \quad \ldots$