

Challenge #16

Euclid has fifty tons of sand. He gives away $\frac{1}{4}$ of what is left each week, free if you will haul it away. On the first week, Archimedes comes to get some to put a sandy beach on his river. The second week, Babbage gets some for his elephants to play in. On the third week, Cauchy picks up some to put in barrels to hold down his tent....

Who gets about a ton?

How much is left for Zeno?

Challenge #16 Solution

Back to Euclid ...

50 tons of sand

Gives away 1/4 of what is left each week

What about Zeno?

z: $t = 26$
 he gets
 $\frac{1}{4} \left(\frac{3}{4}\right)^{25} (50)$
 $\approx 0.009407 \text{ tons}$
 $(\approx 18.8 \text{ lbs})$

(wks)	(tons)	(tons)
t	amt of sand left	sand each person gets
0	50	0
A 1	$\frac{3}{4}(50) = 37.5$	$\frac{1}{4}(50) = 12.5$
B 2	$\left(\frac{3}{4}\right)^2(50) = 28.125$	$\frac{1}{4}\left(\frac{3}{4}(50)\right) = 9.375$
C 3	$\left(\frac{3}{4}\right)^3(50) \approx 21.09$	$\frac{1}{4}\left(\frac{3}{4}\right)^2(50) \approx 7.03$
D 4	$\left(\frac{3}{4}\right)^4(50) \approx 15.82$	$\frac{1}{4}\left(\frac{3}{4}\right)^3(50) \approx 5.27$
...
t	$\left(\frac{3}{4}\right)^t(50)$	$\frac{1}{4}\left(\frac{3}{4}\right)^{t-1}(50)$

Who gets a ton? i.e. $t = ?$ when $\frac{1}{4}\left(\frac{3}{4}\right)^{t-1}(50) = 1$
 when $t = 9, (I)$ $\frac{1}{4}\left(\frac{3}{4}\right)^8(50) \approx 1.25 \text{ tons}$ Ito
 $t = 10, (J)$ $\frac{1}{4}\left(\frac{3}{4}\right)^9(50) \approx 0.939 \text{ tons}$ Jacobi

Equation:

Graph:

reminder:
 2000 lbs
 = 1 ton

