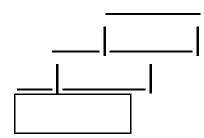
BEREKELEY MATH CIRCLE---ADVANCED GROUP OCT 6, 2015
Peter Bates

1. How far, horizontally, can you make a stack of bricks lean?



DISCUSSION: Sequences and series, limit and convergence.

2. Eric took his pet bee for a bike ride along a straight road. On the way home being impatient (as bees are) when Eric is 15miles from home the bee takes off and flies at 20mph to Eric's home at the end of the road. As soon as he arrives he realizes he would rather be with Eric and so flies back, still at 20mph. Meanwhile Eric, who is traveling at a constant 10mph has advanced some distance towards home and so his bee flies less than 15miles to meet him. Now the bee is immediately impatient again and flies home, always at 20mph, then immediately turns round upon arriving and flies back to Eric.
a) At the point of meeting Eric the second time, how far has the bee flown?
b) If the bee continues this behavior, making infinitely many trips between Eric and home, how far in total will he have flown?

TELESCOPING SERIES: e.g. $\Sigma\ 1/[n(n+1)]$, $\Sigma\ 2/[n(n+2)]$,
$\Sigma\ [5n^2+24n+24]/[n^4+9n^3+26n^2+24n]$

GEOMETRIC SERIES: $½+1/4+ 1/8 +\ldots.+?$ $\Sigma\ ar^n =?$

DIFFERENTIAL CALCULUS: $f'(x) = \lim_{h\to 0} [f(x+h)-f(x)]/h$
e.g. If $f(x)=x^2$, then $f'(x)=2x$. If $f(x)=x^n$, then $f'(x)=n\ x^{n-1}$.

NEW SERIES FROM OLD: Find $\Sigma\ n^2/2^n$

And now for something completely different: Infinite-dimensional space and Fourier series.
Find $\Sigma\ 1/n^2$