Investigating Finite and Infinite Series Using a ClassPad 300

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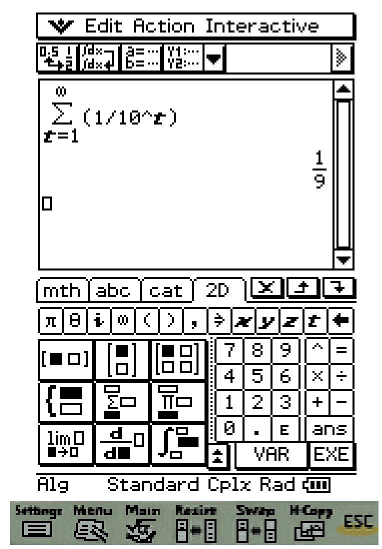
All fractions can be represented as either a finite decimal or an infinite, repeating decimal. For example, the finite decimal 0.5 is the fraction $\frac{1}{2}$, and the infinite, repeating decimal $0.\bar{3} = 0.333333\cdots$ is the fraction $\frac{1}{3}$.

OK, so you know these values because you have come across them so many times. But do you know the fractional equivalent of $0.\bar{1}$? Those of you who remember the formula for converting infinite, repeating decimals to fractions know that the answer is $\frac{1}{9}$. But independent of whether or not you remembered this formula, let's look at how using a TI-89 to evaluate a series will help us find the answer.

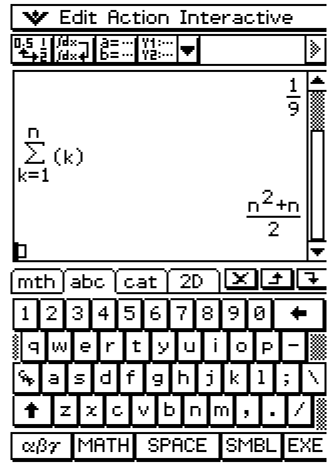
Expressed as an infinite sum, $0.\bar{1} = 0.1 + 0.01 + 0.001 + 0.0001 + \cdots$. In base 10 notation this is equivalent to $0.\bar{1} = \frac{1}{10} + \frac{1}{10^2} + \frac{1}{10^3} + \frac{1}{10^4} + \cdots$. And in "summation notation" we get $0.\bar{1} = \sum_{t=1}^{\infty} \frac{1}{10^t}$.

This is easy to evaluate using a ClassPad. Here's how:



- Tap M on the Icon panel.
- Press k on the Keypad.
- Tap the) tab at the top of the Soft keyboard.
- If K appears in the middle of the bottom of the screen, tap it. If instead you see J, do nothing for now.
- Tap O in the center of the list of 2D symbols.
- Tap each box in the summation symbol and enter the appropriate value. (The ∞ symbol is on the second line of the Soft keyboard.)
- Tap E to evaluate the sum.

Another fact which you may, or may not, know is that the sum of the first n counting numbers is $\frac{n(n+1)}{2}$. That is, $1+2+\cdots+n=\frac{n(n+1)}{2}=\frac{n^2+n}{2}$. But if you don't remember this, it's not problem. The ClassPad can find the answer for you. Simply tap the O in the) menu of the Soft keyboard and enter the appropriate values. (Tap 0 at the top of the Soft keypad to enter letters such as *k* and *n*.) Then tap E to evaluate the sum.



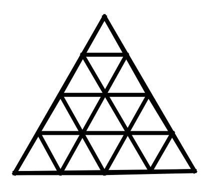
EXERCISES:

The following problems are taken from the Calendar Section of various issues of the **Mathematics Teacher**. The first two can be found in the April, 1992 issue, and the third appeared in the December, 1991 issue.

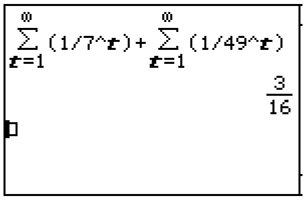
1. Find $\frac{1}{7}+\frac{2}{7^2}+\frac{1}{7^3}+\frac{2}{7^4}+\cdots$

2. A postal employee delivered mail daily for 42 days, each day delivering 4 more letters than the day before. The total delivery for the first 24 days of the period was the same as that for the last 18 days. How many letters did the employee deliver during the whole 42 day period?

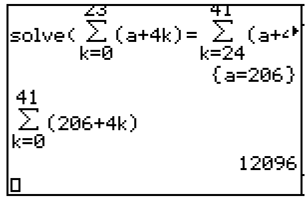
3. If you added twenty rows to the bottom of this picture, how many small triangles would you have altogether?



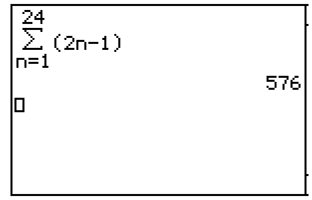
SOLUTIONS:



1.



2.



3.