

Finite key

Monday, March 16, 2015 10:12 AM

Algebra 2 Trig H
11.3 Arithmetic and Geometric FINITE Series

Name:

CHALLENGE! Find the sum of the first 100 terms of the sequence $a_n = 3 + 4(n-1)$.

$$3 + 7 + 11 + \dots + \dots + 391 + 395 + 399$$

FINITE

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$$S_{100} = \frac{100}{2} (3 + 399) = 50 \cdot 402 = 20,100$$

1. Find the sum of the first 26 terms of arithmetic series if $a_1 = 25$ and $d = -2$.

$$a_n = 25 + -2(n-1)$$

$$a_{26} = 25 + -2(26-1) = 25 + -2 \cdot 25 = -25$$

$$S_{26} = \frac{26}{2} (25 + -25) = 13 \cdot 0 = 0$$

2. The sum of the first 87 terms of an arithmetic sequence is 101,703. If $a_{87} = 2,324$, what is a_1 ?

$$101,703 = \frac{87}{2} (a_1 + 2,324)$$

$$a_1 = 14$$

3. Calculate: $\sum_4^{81} 5 + 3k$.

new

$$1, 2, 3, \dots, 78$$

$$17, 20, 23, \dots, 248$$

$$248 = 17 + 3(n-1)$$

$$S_{78} = \frac{78}{2} (17 + 248) = 10,335$$

$$\sum_4^{81} = \sum_1^{81} - \sum_1^3$$

$$= \frac{81}{2} (8 + 248) - \frac{3}{2} (8 + 14)$$

$$= 10,335$$

4. Find the sum of all the odd numbers between 81 and 231.

$$81 \quad 83 \quad 85 \quad 87 \quad \dots \quad 231$$

$$a_n = 81 + 2(n-1)$$

$$231 = 81 + 2(n-1)$$

$$n = 76$$

$$S_{\text{odd}} = \frac{76}{2} (81 + 231)$$

$$= 11,856$$

Geometric Series - FINITE! $a_n = a_1 \cdot r^{n-1}$

$$S_n = a_1 + a_2 + a_3 + \dots + a_n$$

$$= a_1 + a_1 \cdot r + a_1 \cdot r^2 + \dots + a_1 \cdot r^{n-1}$$

$$- r \cdot S_n = -r \cdot a_1 + a_1 \cdot r^2 + a_1 \cdot r^3 + \dots + a_1 \cdot r^n$$

$$S_n - rS_n = a_1 - a_1 \cdot r^n$$

$$S_n(1-r) = a_1(1-r^n)$$

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

5. Find the sum of the first 20 terms of a geometric sequence with $a_1 = 4$ and $a_2 = 12$. $r = 3$

$$S_{20} = \frac{4(1-3^{20})}{1-3} = 6973568800$$

6. Calculate: $\sum_1^7 8 \cdot 3^k$

$$a_1 = 24$$

$$S_7 = \frac{24(1-3^7)}{1-3} = 26,232$$

7. Calculate: $\sum_1^5 6 \left(\frac{1}{3}\right)^{k-1}$

$$S_5 = \frac{6(1-(\frac{1}{3})^5)}{(1-\frac{1}{3})} = \frac{242}{27}$$

8. Calculate: $\sum_1^3 (-1)^{k+1} (2k-7)$ (Be careful!)

$$a_1 = (-1)^2 (2-7) = -5$$

$$a_2 = (-1)^3 (4-7) = 3$$

$$a_3 = (-1)^4 (6-7) = -1$$

$$S_3 = -5 + 3 + -1 \\ = -3$$