

**2002 National Mu Alpha Theta  
Theta Level-- Sequences and Series Topic Test**

1. Find the 40th term of the arithmetic sequence 10, 13, 16, 19  
a. 117      b. 130      c. 133      d. 127      e. NOTA
2. Find the 16th square number.  
a. 16      b. 225      c. 136      d. 289      e. NOTA
3. Find the common difference for the arithmetic sequence 12, 9, 6, 3 ...  
a. 3      b. -3      c. 3/4      d. 2/3      e. NOTA
4. Find the sum of the first fifty whole numbers.  
a. 49      b. 1200      c. 1225      d. 2450      e. NOTA
5. Find the common ratio of the geometric sequence 6, 9, 27/2, 81/4, ...  
a. 3      b. 2      c. 3/2      d. 2/3      e. NOTA
6. Find the sum of the first eleven positive square integers.  
a. 66      b. 4356      c. 406      d. 385      e. NOTA
7.  $\sum_{n=1}^6 (2n+1)$   
a. 42      b. 35      c. 3+5+7+9+11+13      d. 48      e. NOTA
8. Find  $S_{20}$  if  $S_n = 1+2+4+\dots+2^n$   
a. 524,288      b. 1,048,575      c. 2,097,155      d. 1,048,576      e. NOTA
9.  $\sum_{n=3}^7 (2^n - 1)$   
a. 45      b. 247      c. 50      d. 243      e. NOTA
10. Find the sum of the first nine prime numbers.  
a. 78      b. 107      c. 108      d. 100      e. NOTA
11. Insert four arithmetic means between -2 and 6.  
a. -1.2, -0.4, 0.4, 1.2      b. -1.375, -0.75, -0.125, 0.5  
c. -0.4, 1.2, 2.8, 4.4      d. -2, 0, 2, 4  
e. NOTA

12. Insert three real geometric means between 2 and 32. (Give all possible answers)  
 a. 4, 8, 16                      b. -4, -8, -16                      c. -4, 8, 16  
 d. 4, 8, 16 or -4, 8, -16                      e. NOTA
13. 48 is which term in the following arithmetic sequence -3, 0, 3, 6, ...  
 a. 18<sup>th</sup>                      b. 17<sup>th</sup>                      c. 16<sup>th</sup>                      d. 19<sup>th</sup>                      e. NOTA
14. 524,288 is which term in the following geometric sequence 2, 8, 32, 128, ...  
 a. 8<sup>th</sup>                      b. 9<sup>th</sup>                      c. 10<sup>th</sup>                      d. 11<sup>th</sup>                      e. NOTA
15. Let  $S_n$  be the sum of the first  $n$  terms of the arithmetic sequence  $-4, -2, 0, 2, \dots$ . Find  $n$  if  $S_n = 644$ .  
 a. 27                      b. 28                      c. 29                      d. 30                      e. NOTA
16. Let  $S_n$  be the sum of the first  $n$  terms of the geometric sequence 6, 18, 54, .... Find  $n$  if  $S_n = 177,144$ .  
 a. 7                      b. 8                      c. 9                      d. 10                      e. NOTA
17.  $\sum_{n=0}^{\infty} \left(\frac{1}{3}\right)^n$   
 a. 1                      b. 4/3                      c. 3/2                      d. 5/3                      e. NOTA
18. If  $a_1 = 13$  and  $a_n = 2a_{n-1} + 3$ , find  $a_8 - a_4$ .  
 a. 240                      b. 960                      c. 13                      d. 12  
 e. NOTA
19. If  $a_1 = 13$  and  $a_n = a_{n-1} + 3$ , find  $f(n)$  if  $f(n) = a_n$  for all integers  $n$ .  
 a.  $f(n) = 10n + 3$                       b.  $f(n) = 3n + 13$                       c.  $f(n) = 3n + 10$                       d.  $f(n) = 3n - 10$   
 e. NOTA
20. Find the sixth through tenth triangular numbers.  
 a. 21, 28, 36, 45, 55                      b. 6, 10, 15, 21, 28  
 c. 10, 15, 21, 28, 36                      d. 1, 3, 6, 10, 15  
 e. NOTA
21. Solve  $\sum_{n=1}^6 (3ny + 2) = 327$  for  $y$ .  
 a. 105                      b. 5                      c. 17.5                      d. 6                      e. NOTA

22. Given  $a_n = (-2)^{(n-1)}$ , write the first four terms of the sequence, starting with  $a_1$ .
- a. 0, -2, 4, 8      b. 1, -2, 4, -8      c. 1, -2, -4, -8      d. 0, -2, -4, -8  
e. NOTA
23.  $\sum_{n=1}^{10} (i)^n$
- a.  $i$       b.  $-i$       c. 1      d. -1      e. NOTA
24. Insert one geometric mean between 2 and 16. Give all possible answers.
- a.  $2\sqrt{2}$    b.  $4\sqrt{2}$    c.  $-4\sqrt{2}$       d.  $\pm 4\sqrt{2}$       e. NOTA
25. Find the 30th term of the arithmetic sequence:  $-2x + 1, -x + 2, 3, x + 4, \dots$
- a.  $28x + 30$    b.  $27x + 30$       c.  $31x + 30$       d.  $27x + 28$       e. NOTA
26. Three numbers are in an arithmetic sequence; their average is 16. Find all possible pairs for first and last numbers
- a. 15 & 17      b. 14 & 18      c. 13 & 19      d. any pair of numbers whose sum is 32  
e. NOTA
27. Tina has two salary offers: #1: Starting salary of \$30,000 with semi-annual increases of 5%. #2: Starting salary of \$30,000 with semi-annual increases of \$3000. When will the salary for offer # 1 first be greater than the salary for offer #2?
- a. 27 years      b. 26 years      c. 13 years      d. 13.5 years      e. NOTA
28. Write in summation notation,  $3 + 7 + 11 + \dots + 247$
- a.  $\sum_{n=1}^{247} (4n - 1)$       b.  $\sum_{n=1}^{247} (4n)$       c.  $\sum_{n=1}^{62} (4n - 1)$       d.  $\sum_{n=1}^{62} (4n)$       e. NOTA
29. Tim dropped a ball 20 feet from a balcony onto the courtyard below. It bounces up 75% of its previous height. How far has the ball traveled at the top of its 5th bounce?
- a. 57.77 feet      b. 115.54 feet      c. 131.54 feet      d. 92.6 feet  
e. NOTA
30.  $\sum_{n=1}^5 (\log n + \log 2)$
- a.  $\log 3840$       b.  $\log 30$       c.  $\log 25$       d.  $\log 15$   
e. NOTA