PREVIEW OF YOUR TEST INSTRUCTIONS:

1. WRITE ON ONE SIDE OF THE PAPER.
2. BOX YOUR ANSWERS.
3. WRITE SENTENCE ANSWERS TO WORD PROBLEMS.
4. LEAVE 1-INCH MARGIN ON TOP AND LEFT.
5. WRITE ONLY THE PAGE NUMBER IN THE TOP MARGIN.
6. WRITE NOTHING IN THE LEFT MARGIN.
7. SHOW YOUR WORK IN EACH PROBLEM.

1. Find the first five terms of the recursively defined sequence \( a_n = 2(a_{n-1} - 1) \), and \( a_1 = 3 \).
2. Find the sum \( \sum_{k=1}^{3} \frac{4}{3k} \).
3. Determine the [ i ] common difference, [ ii ] 23-rd term, and [ iii ] n-th term of the arithmetic sequence: 2, 5, 8, 11, ...
4. The **twelfth term** of an arithmetic sequence is \( \frac{200}{3} \), and the **second term** is \( \frac{20}{3} \). Find the **first term**.
5. Find the partial sum of the arithmetic (finite) series \( \frac{1}{2} + 1 + \frac{3}{2} + 2 + \frac{5}{2} + 3 + \ldots + 9 \).
6. A theater has 30 seats in the first row, 34 seats in the second, 38 in the third, and so forth. If there are 39 rows in the theater, how many seats are there altogether in the theater?
7. The **common ratio** in a geometric sequence is \( \frac{3}{4} \), and the **fifth term** is \( \frac{81}{512} \). Find the **fourth term**.
8. Find the partial sum, \( S_4 \), of the geometric sequence with \( a = 8 \) and \( r = \frac{2}{5} \).
9. Find the sum of the infinite geometric series \( 1 + \frac{2}{3} + \frac{4}{9} + \frac{8}{27} + \frac{16}{81} + \ldots \).
10. Use Pascal’s Triangle to expand the expression \( (2x-1)^4 \).
11. Find the first three terms in the expansion of \( (x+3y)^{12} \).
12. Find the 10-th term in the expansion of \( (x + 3)^{15} \).
13. Find the sum of the infinite geometric series when \( a = 100 \) and \( r = \frac{1}{3} \).
14. Find the sum \( \sum_{i=1}^{8} \left[ 1 + \left( -1 \right)^i \right] \).
15. Find the first six terms of the given recursively defined function. \( a_n = 3a_{n-1} + 1 \), \( a_1 = 2 \).
16. An architect designs a theatre with 21 seats in the first row, 25 in the second, 29 in the third, and so on. If the theatre is to have a seating capacity of 2100, how many rows must the architect use in her design? [If you just add up a bunch of numbers to get your answer, then you get no credit whatsoever.]

17. The common ratio in a geometric sequence is \( \frac{3}{2} \) and the fifth term is 1. Find the first three terms.

18. Find the partial sum \( S_n \) of the geometric sequence given that \( a = 5, \ r = 2, \ n = 6 \).

19. Identify each of the following as
   (a) True Statement;  (b) False Statement;  (c) Statement (Truth Value Unknown);  
   (d) Open Sentence;  (e) None of These.
   
   ___ 1 // 3 + 5 \( \leq \) − 6
   ___ 2 // Hurry up, or you’ll be late!
   ___ 3 // 3x + 17 = 0
   ___ 4 // \( \frac{a^2 b^3}{a^3 b^2} \)
   ___ 5 // Mr. Jones is my Precalculus teacher.

20. Translate into symbols using the given letters to stand for affirmative concepts.

   1. If you don’t eat your carrots, then you can’t have your pudding. (c, p)

   2. Either Bob and Alice are going to Las Vegas, or Charlie is going to Paris. (B, A, C).

21. Translate into sentences, using the “dictionary” given here.
   
   a: Apples are red.  p: Peaches are fuzzy.  m: Mangoes are stringy.

   1. \( \sim p \land (a \lor m) \)

   2. \( (a \land p) \Rightarrow \sim m \)

22. Find the first five terms of the recursively defined sequence \( a_n = 3(a_{n-1} + 1) \), and \( a_1 = 2 \).

23. A theater has 30 seats in the first row, 33 seats in the second, 36 in the third, and so forth. If there are 39 rows in the theater, how many seats are there altogether in the theater?
24. Find the partial sum, $S_4$, of the geometric sequence with $a = 12$ and $r = \frac{1}{5}$.

25. Find the first three terms in the expansion of $(x + 2y)^{20}$.

26. Write the sum without using sigma notation. 
\[ \sum_{n=1}^{5} \sqrt{n + 3} \]

27. Write this sum using the sigma notation. 
\[ 2 + 4 + 6 + 8 + \ldots + 22 \]

28. Given: 1, 5, 9, 13, ... is an arithmetic sequence.
   Required: Find the [a] common difference, $d$; [b] sixth term, $a_6$; and [c] 60-th term, $a_{60}$

29. Find the first 5 terms of the recursively defined sequence. 
   \[ a_n = \frac{1}{1 + a_{n-1}} \text{ and } a_1 = 1. \]

30. Find and list the first five terms of the recursively defined sequence 
   \[ a_n = 2 \left( 2 - a_{n-1} \right), \text{ and } a_1 = 0 \]

31. An auditorium has 5 seats in the first row, 9 seats in the second, 13 in the third, 17 in the fourth, and so forth. If there are 45 rows in the auditorium, 
   - How many seats are there in the 45th row? 
   - What is the total number of seats in the auditorium? 
   (Remember – Show work & write sentence answers!)

32. Find the partial sum, $S_8$, of the geometric sequence with $a = 2$ and $r = \frac{1}{4}$.

33. Find the first four terms in the expansion of 
   \[ (2x + 1)^{18} \]. (Don’t be surprised to find that the coefficients are rather large!)

34. Solve for $a$. 
   \[ \frac{1}{a} = \frac{1}{b} + \frac{1}{c} \]

35. Solve for $r$. 
   \[ A = P \left( 1 + rt \right) \]

36. Solve 
   \[ |x + 3| - 9 = 2 \]

37. Factor completely 
   \[ p^4 - 16 \]