

TMUA Practice - Sequences and Binomial

- 1) The first three terms of an arithmetic series are $(m + 1)$, $(m^2 + m)$ and $(3m^2 - m - 4)$, where m is a positive constant. Find the 21st term of the series.
- (a) 0 (b) 172 (c) 164 (d) 84 (e) 64
- 2) The sum to infinity of a geometric series is 3 times as large as its first term, and the third term of the same series is 40. Find the first term of the series.
- (a) 90 (b) $\frac{2}{3}$ (c) $\frac{40}{3}$ (d) 360 (e) $\frac{125}{2}$
- 3) A geometric series G , whose first term is a and common ratio is r , has a sum to infinity of 128. A geometric series G' , with first term a and common ratio $3r$ has a sum to infinity of 384. Find the first term of these series.
- (a) 90 (b) 48 (c) 60 (d) 96 (e) 32
- 4) The 2nd, 3rd and 9th terms of an arithmetic progression are three consecutive terms of a geometric progression. Find the common ratio of the geometric progression.
- (a) $\frac{5}{4}$ (b) $-\frac{5}{4}$ (c) 4 (d) -2 (e) 6

MC Practice

- 5) Three numbers A, B, C are the first three terms of a geometric progression. Given that A, 2B, C are in arithmetic progression determine the common ratio of the geometric progression.

(a) ± 2 (b) $2 \pm \sqrt{3}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$ (e) $1 \pm \sqrt{3}$

- 6) A sequence (p_n) has first term $p_1 = k^2$ and subsequent terms defined by $p_{n+1} = kp_n$ for $n \geq 1$. What is the product of the first 12 terms of the sequence?

(a) k^{13} (b) $12 + k^{13}$ (c) k^{90} (d) k^{91} (e) $12k^{13}$

- 7) The sequence (a_n) where $n \geq 0$, is defined by $a_0 = \frac{1}{2}$ and $a_n = \sum_{r=0}^{n-1} a_r$ for $n \geq 1$

Find the sum $\sum_{r=0}^{\infty} \frac{1}{a_r}$

(a) 3 (b) 5 (c) $\frac{8}{3}$ (d) 6 (e) $\frac{32}{5}$

- 8) The sequence (x_n) is defined by $x_{n+1} = \frac{x_n}{x_{n-1}}$ for $n \geq 2$ with $x_1 = 6$ and $x_2 = 3$

What is the value of x_{2023} ?

(a) 2 (b) 6 (c) $\frac{1}{3}$ (d) 3 (e) $\frac{3}{2}$

MC Practice

- 9) What is the sum of the first $2n$ terms of the following series:

$$1 + \frac{1}{2} + \frac{1}{6} + \frac{1}{12} + \frac{1}{36} + \frac{1}{72} + \dots$$

- (a) $\frac{1}{6^n}$ (b) $\frac{9}{5}(1 - \frac{1}{6^n})$ (c) $\frac{7}{2^n}$ (d) $\frac{1}{5}(1 + \frac{1}{6^n})$ (e) $\frac{1}{2^n} + \frac{1}{3^n}$

- 10) A sequence (u_n) is defined by $u_n = (-1)^{n+1}n$ for $n \geq 1$. Let $w_n = \sum_{r=1}^n u_r$

For which value of n is $w_n = 500$

- (a) 999 (b) 500 (c) 499 (d) 1000 (e) 501

- 11) The sequence (a_n) is defined by $a_{n+2} = \frac{a_{n+1}}{a_n}$ for $n \geq 1$ with $a_1 = x$ and $a_2 = y$

What is the period of this sequence?

- (a) 4 (b) 5 (c) 6 (d) 8 (e) the sequence is not periodic

- 12) For what value(s) of k does the sequence $a_{n+1} = \frac{k(a_n + 2)}{a_n}$ with $a_1 = 2$, have period 3?

- (a) -2 (b) 1 (c) -2, or 1 (d) 2 (e) all even values of k

13) What is the coefficient of x^2 in the expansion of $(2 - x^2)[(1 + 2x + 3x^2)^6 - (1 + 2x^3)^4]$

- (a) 18 (b) 36 (c) 120 (d) 156 (e) 3^6

14) Find the coefficient of x^2 in the expansion of $(3x^2 - x + 1)^7$

- (a) 21 (b) 42 (c) -21 (d) 10 (e) -3

15) Find the coefficient of x in the series expansion of $(1 + \frac{2}{x})^2(1 + \frac{x}{2})^7$

- (a) 42 (b) 21 (c) $\frac{35}{2}$ (d) $\frac{7}{2}$ (e) 1

16) Find the coefficient of x^5 in the series expansion of $(1 - x)^5(1 + x)^6$

- (a) 1 (b) 5 (c) 10 (d) 15 (e) 30