



BK BIRLA CENTRE FOR EDUCATION
SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL



PERIODIC TEST-2 (2024-25)

MATHEMATICS (041)

Class: XI Science

Date: 02/12/24

Duration: 1 Hour

Max. Marks: 25

Marking Key

General Instructions:

Question 1 to 5 carries ONE mark each. Questions 6 to 9 carries TWO marks each. Questions 10 to 13 carries THREE marks each.

- 1 The value of ${}^{14}C_1 + {}^{14}C_3 + {}^{14}C_5 + \dots + {}^{14}C_{11}$ is
(A) $2^{14}-1$ (B) $2^{14}-14$ (C) 2^{12} (D) $2^{13}-14$
- 2 The number of terms in the expansion of $[(2x + y^3)^4]^7$ is
(A) 28 (B) **29** (C) 30 (D) 27
- 3 Write the first three terms of the sequence whose general term is given by $a_n = 2n+5$.
(A) 1, 3, 5 (B) 2, 4, 6 (C) **7,9,11** (D) 6,8,10
- 4 What is the 2nd term of the sequence defined by $a_n = \frac{n(n+1)^2}{3}$
(A) 2 (B) 3 (C) **4** (D) 5

Assertion and Reasoning questions: In the following two questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true and R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.
- 5 Assertion (A): The number of terms in $(1+x^2+2x)^{20}$ is 41.
Reason (R): The number of terms in the expansion of $(a+b)^x$ is $x+1$.
- 6 Find the largest coefficient in the expansion of $(1+x)^{30}$.
Ans: In the expansion of $(1+x)^n$ the largest coefficient is ${}^nC_{n/2}$
 ${}^{30}C_{15}$ is the largest coefficient of $(1+x)^{30}$.
- 7 Which term is greater $(1.2)^{400}$ or 800.
Ans: **$(1.2)^{400} = (1+0.2)^{400} = 1+400(0.2) + 3129 + \text{other positive terms which is greater than 800}$**
Therefore, $(1.2)^{400}$ is greater than 800

8 Let the sequence a_n be defined as follows: $a_1 = 1$, $a_n = a_{n-1} + 2$ for $n \geq 2$. Find first term and write corresponding series.

Ans: $a_1 = 1$, $a_2 = 3$, $a_3 = 5$, $a_4 = 7$, $a_5 = 9$.

9 Find the sum of first 8 terms of the G.P. $10, 5, \frac{5}{2}, \dots$.

Ans: $a=10$, $r=\frac{1}{2}$. $s_n = a \left(\frac{1-r^n}{1-r} \right)$, therefore, $S_8 = 10 \left[\frac{1 - (\frac{1}{2})^8}{1 - \frac{1}{2}} \right] = 10(1 - \frac{1}{2^8})$.

10 Simplify $(x+2y)^8 + (x-2y)^8$.

Ans: $(x+2y)^8 + (x-2y)^8 = 2[x^8 + 28x^6x4y^2 + 70x^416y^4 + 28x^2x64y^2 + 256y^8]$
 $= 2[x^8 + 112x^6y^2 + 1120x^4y^4 + 1792x^2y^6 + 256y^8]$

11 Prove that $(\sqrt{3}+\sqrt{2})^6+(\sqrt{3}-\sqrt{2})^6=970$.

Ans: $\sqrt{3}+\sqrt{2})^6+(\sqrt{3}-\sqrt{2})^6 = 2 \left[1 \cdot 3^3 + \frac{6x^5}{2x1} \cdot 3^2 \cdot 2 + \frac{6x^5}{2x1} \cdot 3 \cdot 2^2 + 1 \cdot 2^3 \right]$
 $= 2[27 + 270 + 180 + 8]$
 $= 2(485)$
 $= 970$

12 In a G.P. of positive terms, if any term is equal to the sum of the next two terms, then find the common ratio of the G.P.

Ans: $a_n = a_{n+1} + a_{n+2}$

$$1 = r + r^2, r^2 + r - 1 = 0, r = \frac{\sqrt{5}-1}{2}$$

13 The product of the first three terms of a G.P. is 1000. If we add 6 to its second term and 7 to its third term, the resulting three terms form an A.P. Find the terms of the G.P.

Ans: Three terms in G. P are $\frac{a}{r}$, a , ar

$$\text{Here, } a/r \cdot a \cdot ar = 1000, a^3 = 1000, a = \sqrt[3]{1000}, a = 10$$

According to question; $\frac{a}{r}$, $a+6$, $ar+7$, $\frac{10}{r}$, 16 , $10r+7$ are in A.P

$$2(16) = \frac{10}{r} + 10r + 7, 2r^2 - 5r + 2 = 0, r = 2 \text{ or } \frac{1}{2}$$
