

Unit 11 Test — Answer Key

Arithmetic/Geometric Sequences, Series, Binomial Theorem & Probability

FOR TEACHER / SELF-CHECK USE

This test was written to cover Unit 11's topics (arithmetic and geometric sequences and series, the Binomial Theorem, permutations, combinations, and probability). Every solution below has been independently verified.

1	$a_n = a_1 + (n-1)d$. Here $a_1=5$, $d=4$. $a_{10} = 5 + (9)(4) = 5 + 36$. Answer: A — 41
2	Divide any term by the previous term: $6/3 = 2$ (check: $12/6=2$, $24/12=2$). Answer: A — 2
3	$a_1=2$, $d=3$, last term $a_n=29$. Find n : $29 = 2 + (n-1)(3) \rightarrow 27 = 3(n-1) \rightarrow n-1=9 \rightarrow n=10$. $\text{Sum} = n/2 \cdot (a_1 + a_n) = 10/2 \cdot (2+29) = 5 \cdot 31$. Answer: 155
4	For $ r <1$, $\text{sum} = a_1/(1-r)$. Here $a_1=8$, $r=1/2$. $\text{Sum} = 8/(1-1/2) = 8/(1/2)$. Answer: A — 16
5	By the Binomial Theorem, $(x+3)^4 = \sum C(4,k)x^{4-k}3^k$. The x^2 term occurs at $k=2$: $C(4,2)x^2(3^2) = 6 \cdot 9 \cdot x^2 = 54x^2$. Answer: A — 54
6	${}_5C_2 = 5!/(2! \cdot 3!) = (5 \cdot 4)/(2 \cdot 1) = 20/2$. Answer: 10
7	${}_5P_3 = 5!/(5-3)! = 5!/2! = (5 \cdot 4 \cdot 3 \cdot 2 \cdot 1)/(2 \cdot 1) = 120/2$. Answer: A — 60
8	Probability = favorable/total = $13/52$, which simplifies to $1/4$. Answer: A — 1/4
9	$S_n = a_1(r^n - 1)/(r - 1)$. Here $a_1=3$, $r=2$, $n=6$. $S_6 = 3(2^6 - 1)/(2 - 1) = 3(64 - 1)/1 = 3(63)$. Answer: $S_6 = 189$
10	$P(\text{first red}) = 5/10$. Without replacement, 4 red remain out of 9 total: $P(\text{second red}) = 4/9$. $P(\text{both red}) = (5/10) \cdot (4/9) = 20/90$, which simplifies to $2/9$. Answer: 2/9