KVS BHOPAL REGION CBT TEST OCT 2023
SUBJECT-MATHEMATICS
CLASS-11

TOPICS:
BINOMIAL THEOREM, SEQUENCES AND SERIES

Case Study-1

Two students Akhil and Nikhil of class XI trying to solve the questions based on Binomial Theorem. Akhil expanded $(1+x)^6$ whereas Nikhil expanded $(x+1)^6$ by using Binomial Theorem.

Based on this above information answer the following questions. (Q1 to Q3)

Q1. According to Akhil the 4th term in the expansion is

(A) $20x^3$ (B) $15\ x^3$ (C) $20\ x^4$ (D) $15\ x^4$

Feedback

$(x+1)^6 = x^6+6x^5+15x^4+20x^3+15x^2+6x+1$

$(1+x)^6 =1+6x+15x^2+20x^3+15x^4+6x^5+x^6$

Q2. The value of $6c_0 + 6c_1 + 6c_2 + 6c_3 + \ldots\ldots + 6c_6$

(A) 36 (B) 64 (C) 60 (D) 6

Feedback

The value of $nc_0 + nc_1 + nc_2 + nc_3 + \ldots\ldots + n\ c_n$ is 2^n.

Hence the value of $6c_0 + 6c_1 + 6c_2 + 6c_3 + \ldots\ldots + 6c_6$ is $2^6 = 64$

Q3. The value of x if 3rd terms of Akhil and Nikhil's expansions are equal

(A) ± 2 (B) 3 (C) 0 (D) ± 1

Feedback

If their third terms are equal then, $15x^4 = 15x^2$

or $x^2=1$

or $x = \pm 1$

Q4. The total number of terms in expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification is -

(a) 202 (b) 51

(c) 50 (d) None of these.

Feedback

Number of terms in a binomial expansion is=(n+1)

When n is even, in the expansion $(x+a)^n+(x-a)^n=2\{{}^nC_0x^n+{}^nC_2x^{n-2}\ a^2+\ldots+a^n\}$

Thus, the odd number of terms get cancelled and even number of terms get added except the first term.

Therefore, total number of terms is=(n/2+1)terms

Hence, $(x+a)^{100}+(x-a)^{100}$ has

(100/2+1)terms=51 terms

Case study-2

Ravi being a plant lover decides to open a nursery and he bought few plants with pots. He wants to place pots in such a way that number of pots in first row is 2, in second row is 4 and in third row is 8 and so on. Answer the following questions based on the above information.(Q5. To Q7)

Q5. The number of pots in the 8th row is

(A) 64 (B) 128 (C) 256 (D) 512

Feedback

The Sequence 2,4,8… is a GP with a=2 and r=2

$a_8 = ar^7 = 2x2^7 = 256$

Q6. The total number of pots in 10 rows is

(A) 512 (B)1024 (C) 2046 (D) 2124

Feedback

$S_{10} = a(r^{10}-1)/(r-1) = 2(2^{10}-1)/(2-1) = 2(1024-1) = 2046$

Q7. If Ravi wants to place 510 pots in all,how many rows will be formed?

(A) 6 (B) 8 (C) 10 (D) 12

Feedback

Let $S_n=510$

therefore $a(r^n-1)/(r-1) = 510$

$2(2^n-1)/(2-1)=510$

$2^n-1=255$

$n=8$

Q8. Statement I : In the G.P. $2 , 2\sqrt{2} , 4 , \ldots.. 13^{th}$ term of the series is 128.

Statement II: A series in which the ratio of any term with the previous term (if any) remain constant is called G.P.

a) Both the statement I and Statement II are true and statement II is the correct explanation of Statement.
b) Both the statement I and II are true and statement II is not the correct explanation ofStatement I
c) Statement I is true but Statement II is false
d) Statement I is false but Statement II is true

Feedback

In the G.P. $2 , 2\sqrt{2} , 4 , \ldots.. 13^{th}$ term $= 2 \times \sqrt{2}^{(13-1)} = 2 \times 2^6 = 128$

So, both the statement I and II are true and statement II is not the correct explanation ofStatement I

Q9. Statement I : Four terms of the G.P. $3 , 3^2 , 3^3 , \ldots$ Are needed to give the sum 120

Statement II: $T_n = ar^n$ is n^{th} terms of G.P. whose first term is a and common ratio r.

a) Both the statement I and II are true and statement II is the correct explanation ofStatement I
b) Both the statement I and II are true and statement II is not the correct explanation

ofStatement I

c) Statement I is true but Statement II is false
d) Statement I is false but Statement II is true

Feedback

n^{th} terms of G.P. whose first term is a and common ratio r is $T_n = ar^{n-1}$

So, statement I is true but Statement II is false

Q10. A carpenter was hired to build 192 window frames. The first day he made five frames and each day, thereafter he made two more frames than he made the day before. How many days did it take him to finish the job?

a) 10 b) 8 c) 25 d)12

Feedback

Here we have, total no. of frames to be made =192

The first day he made five frames so, a1=5

Second day =a2=7

This will form an AP with a=2

Let the carpenter finish the job in n days

Then Sn=192

and Sn=n/2[2a+(n−1)d]=192

n/2[2×5+(n−1)2]=192

n/2[2×5+(n−1)2]=192

n=12

Answer Key

Q.1 A	Q2. B	Q3. D	Q4. B	Q5. C
Q6. C	Q7. B	Q8. B	Q9. C	Q10. D