Ultimate KCET Crash Course 2026

Maths

sets, binomial theorem

DPP: 1

Q1 The set of all natural numbers '*x*' such that 4*x* + 9 < 50 is equal to

(A) {x N : x [1, 10]}
(B) {x N : x (1, 10)}
(C) {x N : 1 ≤ x ≤ 11}
(D) {x N : 1 < x < 11}

Q2 Which of the following statements is/are correct? Statement 1:A={1,3,5},B={2,4,8} are equivalent sets.
Statement 2 : P={a,b,c,d},Q={b,c,d,e,f} are equivalent sets.

(A) Statement 1 only
(B) Statement 2 only
(C) Both statement 1 and 2
(D) Neither Statement 1 nor 2

Q3 A well defined collections of distinct objects is called

(A) set
(B) element
(C) super set
(D) None of these

Q4 Which of the following is a null set?

(A) {x : x Z, x^2 = 4}
(B) {x : x Z, x + 5 = 0}
(C) {x : x Z, x^2 = -1}
(D) {x : x Z, x^2 = 36}

Q5 Which of the following sets is an empty set?

(A) A = {x : x N, 2x + 5 = 6}
(B) B = {x : x N, 1 < x ≤ 2}
(C) C = {x : x is an even prime}
(D) D = {x : x Q, 1 < x < 2}

Q6 If *X* = {1, 2, 3, 4} *Y* = {2, 3, 5, 7}, *Z* = {3, 6, 8, 9}, *W* = {2, 4, 8, 10}, then (*X* Δ *Y*) Δ (*Z* Δ *W*) is

(A) {4, 8}
(B) {1, 5, 6, 10}
(C) {1, 2, 3, 5, 6, 7, 9, 10}
(D) None of hte foregoing sets

Q7 If *A* = {1, 3, {3, 4}, 5} then ∅_____A

(A)
(B)
(C)
(D) None of these

Q8 Which one of the following is finite set?

(A) The set of animals on the Earth.
(B) The set of all letters in the English alphabets.
(C) The set of all prime numbers
(D) None of these

Q9 Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9} , A = {1, 2, 3, 4} B = {2, 4, 6, 8} then (A ∪ B)' =

(A) {5, 6, 7, 8, 9}
(B) {1, 3, 5, 7, 9}
(C) {5, 7, 9}
(D) {5, 7, 8, 9}

Q10 Let A = {a, b, c},B = {b, c, d},C = {a, b, d, e}, then A (B C) is

(A) {a, b, c}
(B) {b, c, d}
(C) {a, b, d, e}
(D) {e}

Q11 If A = {x : x is multiple of 5} and B = {x : x is multiple of 7}, then A $\overline{B}$ is equal to

(A) A - B
(B) A
(C) B - A
(D) Both (a) and (b)

Q12 Write the set builder form of $A = \{-2, 2\}$

(A) A = {x : x is a natural number}

(B) A = {x : x is a root of the equation $x^2 + 2 = 0$}

(C) A = {x : x is a real number}

(D) A = {x : x is a root of the equation $x^2 = 4$}

Q13 If $U = \{1, 2, 3, 4, 5\}$, $A = \{2, 4\}$ and $B = \{3, 5, 7\}$, then (A B)′,(A′ B′) and are equal to

(A) {1}, {2, 8}

(B) {1}, {1}

(C) {1, 2, 4}, {1, 3, 5}

(D) {1, 3}, {2, 3}

Q14 If $U = \{2, 4, 6, 8, 10, 12, 14\}$, $A = \{2, 6, 8\}$, $B = \{10, 12\}$, then (A B′)′=

(A) {2, 6, 8}

(B) {4, 10, 12, 14}

(C) {2, 4, 6, 8}

(D) {4, 10, 12}

Q15 If $n(A) = 5$, then number of non-empty subsets of A is

(A) 32 (B) 16

(C) 31 (D) 15

Q16 The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification is

(A) 50 (B) 202

(C) 51 (D) none of these

Q17 The number of terms in $((4x + y)^9 + (4x - y)^9)$ is

(A) 6 (B) 10

(C) 5 (D) 13

Q18 $\left(x + \frac{1}{x}\right)^6 =$

(A) $x^6 + 6x^4 + 15x^2 - 20 - \frac{15}{x^2} + \frac{6}{x^4} - \frac{1}{x^6}$

(B) $x^6 + 6x^4 + 15x^2 + 20 + \frac{15}{x^2} + \frac{6}{x^4} + \frac{1}{x^6}$

(C) $x^6 + 2x^4 + 5x^2 + 20 - \frac{5}{x^2} - \frac{6}{x^4} + \frac{1}{x^6}$

(D) $2x^6 + 6x^4 + 15x^2 - 20x + \frac{15}{x^2} - \frac{6}{x^4} + \frac{1}{x^6}$

Q19 If 21^{st} and 22^{nd} terms in the expansion of $(1 + x)^{44}$ are equal, then x is equal to

(A) $\frac{8}{7}$ (B) $\frac{21}{22}$

(C) $\frac{7}{8}$ (D) $\frac{23}{24}$

Q20 The coefficient of x^{32} in the expansion of $\left(x^4 - \frac{1}{x^3}\right)^{15}$ is

(A) $^{15}C_5$ (B) $^{15}C_6$

(C) $^{15}C_4$ (D) $^{15}C_7$

Q21 If $\frac{T_2}{T_3}$ is the expansion of $(a + b)^n$ and $\frac{T_3}{T_4}$ in the expansion of $(a + b)^{n+3}$ equal, then n =

(A) 3 (B) 4

(C) 5 (D) 6

Q22 The value of $\left(1 + \sqrt{2}\right)^7 + \left(1 - \sqrt{2}\right)^7$ is

(A) 478 (B) 476

(C) 477 (D) 475

Q23 $\sum_{k=0}^{20} \left({}^{20}C_k\right)^2$ is equal to

(A) $^{40}C_{21}$ (B) $^{41}C_{21}$

(C) $^{40}C_{20}$ (D) $^{40}C_{19}$

Q24 The number of terms in the expansion of $(1 + 3x + 3x^2 + x^3)^7$ is

(A) 21 (B) 22

(C) 20 (D) 19

Q25 The number of terms in the expansion $(1 - x)^{101}(1 + x + x^2)^{100}$ is

(A) 302 (B) 202

(C) 301 (D) 101

Q26 If $\left(1 + x - 2x^2\right)^{20} = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + ... + a_{40} x^{40}$, then $a_1 + a_3 + a_5 + ... + a_{39}$ is equal to

(A) -2^{19} (B) -2^{20}

(C) -2^{21} (D) -2^{18}

Q27 The term independent of x in $(2x^{1/2} - 3x^{-1/3})^{20}$ is

(A) $20\,C_{12} \cdot 2^9 \cdot 3^{12}$

(B) $20\,C_{12} \cdot 2^8 \cdot 3^{11}$

(C) $20\,C_{12} \cdot 2^8 \cdot 3^{12}$

(D) $20\,C_{12} \cdot 2^9 \cdot 3^{11}$

Q28 The number of rational term in the Expansion of $\left(\sqrt{3} + \sqrt[8]{5}\right)^{256}$ is________

(A) 35 (B) 32

(C) 33 (D) 34

Q29 If $\left(1 + x - 2x^2\right)^8 = a_0 + a_1 x + a_2 x^2 + \ldots\ldots \ldots + a_{16} x^{16}$ then the sum of $a_0 + a_2 + a_4 + \ldots\ldots\ldots\ldots\ldots a_{16}$ is equal to

(A) -2^7 (B) 2^7

(C) 2^8 (D) None of these

Q30 The co-efficient of x^5 in the expansion of $(1 + x^2)^5 \times (1 + x)^4$ is

(A) 30 (B) 60

(C) 40 (D) 20

Vernacular

Answer Key

Q1	A	Q16	C
Q2	A	Q17	C
Q3	A	Q18	B
Q4	C	Q19	C
Q5	A	Q20	C
Q6	C	Q21	C
Q7	A	Q22	A
Q8	B	Q23	C
Q9	C	Q24	B
Q10	A	Q25	B
Q11	A	Q26	A
Q12	D	Q27	C
Q13	B	Q28	C
Q14	B	Q29	B
Q15	C	Q30	B

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

$4x + 9 < 50 \Rightarrow 4x < 41$

$\Rightarrow$ x < 10.25

$\because$ x is a natural number.

$\therefore$ x = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Required set is {x ∈ N : x ∈ [1, 10]}

Video Solution:

Q2 Text Solution:

If is clear that n(A) = n(B) A and B are equivalent sets.

And $n(p) \neq n(Q)$ $\because n(p) = 4$ and $n(Q) = 5$

So P and Q are not equivalent sets.

Hence only statement - 1 is correct.

Video Solution:

Q3 Text Solution:

According to definition of set, a well defined collection of distinct objects

Video Solution:

Q4 Text Solution:

$(a)\ x^2 = 4 \Rightarrow x = \pm 2$

$(b)\ x + 5 = 0 \Rightarrow x = -5$

$(c)\ x^2 = -1 \Rightarrow$ No value of x exists

$(d)\ x^2 = 36 \Rightarrow x = \pm 6$

Thus, set given in option (c) is a null set.

Video Solution:

Q5 Text Solution:

From the given options, we have

A = {*x* : *x* *N*, 2*x* + 5 = 6}, i.e., A = {x : 2x = 1}

i.e., $\left\{x : x = \frac{1}{2},\ x \in N\right\}$, which cannot be possible.

$\therefore A = \phi$

Also, B = {2}, C = {2}

Also, $D = \{x : x \in Q,\ 1 < x < 2\} \neq \phi$

Video Solution:

Q6 Text Solution:

$$X\Delta Y = (X - Y) \cup (Y - X) = \{1,\ 4\} \cup \{5,\ 7\}$$
$$= \{1, 4, 5, 7\}$$
$$Z\Delta W = (Z - W) \cup (W - Z) = \{3,\ 6, 9\}$$
$$\cup \{2, 4, 10\} = \{2, 3, 4, 6, 9, 10\}$$
$$(X\Delta Y)\Delta(Z\Delta W) = A\Delta B$$
$$= (A - B) \cup (B - A)$$
$$= \{1, 5, 7\} \cup \{2, 3, 6, 9, 10\}$$
$$= \{1, 2, 3, 5, 6, 7, 9, 10\}$$

Video Solution:

Q7 Text Solution:

$\varnothing \subset A$, Since empty set is a subset of every set.

Video Solution:

Q8 Text Solution:

In the given sets, the set of all letters in the english alphabets is finite set

Video Solution:

Q9 Text Solution:

$(A \cup B)' = U - (A \cup B)$

= {1, 2, 3, 4,...... 9} – {1, 2, 3, 4, 6, 8}

= {5, 7, 9}

Video Solution:

Q10 Text Solution:

B C = {a, b, c, d,e}

A (B C) = {a, b, c} {a, b, c, d, e} = {a, b, c}.

Video Solution:

Q11 Text Solution:

A = {5,10,15, 20,....}

B = {7,14, 21, 28,....}

$\overline{B}$ = {x : x is not multiple of 7}

= {1, 2, 3, 4, 5, 6, 8, 9,10,11,12,13,15,....}

A $\overline{B}$ = A - B

Video Solution:

Q12 Text Solution:

Since x = -2 and x = 2 are roots

\ (x + 2) and (x - 2) are factors of equation.

\ (x + 2) (x - 2) = x^2 - 4 = 0 is required equation

\ Set builder form of given set A is

A = {x : x is a root of the equation x^2 = 4]

Video Solution:

Q13 Text Solution:

Given sets are $U = \{1, 2, 3, 4, 5\}$

$A = \{2, 4\}$ and $B = \{3, 5\}$

Now, $A' = U - A = \{1, 3, 5\}$ and $B' = U - B = \{1, 2\}$

$(i)\ A \cup B = \{2, 4\} \cup \{2, 3, 5\} = \{2, 3, 4, 5\}$

$\therefore (A \cup B)' = U - (A \cup B) = \{1\}$

$(ii)\ (A' \cap B') = \{1, 3, 5\} \cap \{1, 2, 4\} = \{1\}$

Video Solution:

Q14 Text Solution:

$B' = \{2, 4, 6, 8, 14\}$

$A \cap B' = \{2, 6, 8\}$

$(A \cap B')' = \{4,\ 10, 12, 14\}$

Video Solution:

Q15 Text Solution:

$2^5 - 1 = 32 - 1 = 31$

Video Solution:

Q16 Text Solution:

Number of terms $= \frac{n+2}{2} = \frac{100+2}{2} = 51$

Video Solution:

Q17 Text Solution:

If n is odd, then the expansion of $(x + a)^n + (x - a)^n$ contains $\left(\frac{n+1}{2}\right)$ terms.

So, the expansion of $((4x + y)^9 + (4x - y)^9)$ has $\left(\frac{9+1}{2}\right) = 5$ terms.

Video Solution:

Q18 Text Solution:

We have, $\left(x + \frac{1}{x}\right)^6$

$$= {}^6C_0(x)^6 + {}^6C_1(x)^5\left(\frac{1}{x}\right) + {}^6C_2(x)^4\left(\frac{1}{x}\right)^2 + {}^6C_3\left(x^3\right)\left(\frac{1}{x}\right)^3 + {}^6C_4(x)^2\left(\frac{1}{4}\right)^4 + {}^6C_5(x)\left(\frac{1}{x}\right)^5 + {}^6C_6\left(\frac{1}{x}\right)^6$$

$$= x^6 + 6x^4 + 15x^2 + 20 + 15\left(\frac{1}{x^2}\right) + 6\left(\frac{1}{x^4}\right) + \frac{1}{x^6}$$

$$= x^6 + 6x^4 + 15x^2 + 20 + \frac{15}{x^2} + \frac{6}{x^4} + \frac{1}{x^6}$$

Video Solution:

Q19 Text Solution:

$T_{21} = T_{22}$

$T_{20+1} = T_{21+1}$

r = 20   r = 21

$^{n}C_r a^{n-r} b^r = {}^{n}C_r a^{n-r} b^r$

$^{44}C_{20}\ 1^{41-20} \cdot x^{20} = {}^{44}c_{21}\, 1^{44-21} \cdot x^{24}$

$^{44}C_{20} \cdot x^{20} = {}^{44}C_{21} \cdot x^{21}$

$\frac{^{n}C_{r-1}}{^{n}C_r} \Rightarrow \left\{ \frac{^{44}C_{20}}{^{44}C_{21}} = \frac{x^{21}}{x^{20}} \right.$

$\frac{r}{n-r+1} = x$

$\frac{21}{44-21+1} = x$

$\frac{21}{24} = x$

$x = \frac{7}{8}$

Video Solution:

Q20 Text Solution:

General term:

$T_{r+1} = {}^{n}C_r a^{n-r} b^r$

$T_{r+1} = {}^{15}C_r \left(x^4\right)^{15-r} \left(\frac{-1}{x^3}\right)^r$

$= {}^{15}C_r x^{60-4r} (-1)^r \cdot x^{-3r}$

$= {}^{15}C_r (-1)^r \cdot x^{60-7r}$

For coefficient of x^{32} :

$60 - 7r = 32 \Rightarrow 7r = 28$

$\therefore r = 4$

$\therefore T_5 = {}^{15}C_4 (-1)^4 x^{28}$

$\therefore$ coefficient of x^{28} : is $^{15}C_4$

Video Solution:

Q21 Text Solution:

We have,

$\frac{T_3}{T_2}$ for, $(a+b)^n$; $\frac{T_3}{T_2} = \frac{n-2+1}{2} \cdot \frac{b}{a}$

$\frac{T_4}{T_3}$ for, $(a+b)^{n+3}$; $\frac{T_4}{T_3} = \frac{(n+3)-3+1}{3} \cdot \frac{b}{a}$

$\Rightarrow \frac{T_3}{T_2} = \frac{n-1}{2} \cdot \frac{b}{a}$; $\frac{T_4}{T_3} = \frac{n+1}{3} \cdot \frac{b}{a}$

By data, $\frac{n-1}{2} = \frac{n+1}{3}$

$\Rightarrow 3n - 3 = 2n + 2 \Rightarrow n = 5$

Video Solution:

Q22 Text Solution:

we know $(1+x)^7 + (1-x)^7$

$= 2\left[{}^{7}c_0(1)^7 + {}^{7}c_2(1)^5 x^2 + {}^{7}c_4(1)^3 x^4 + {}^{7}c_6(1\right.$

$= 2\left[1 + 21x^2 + 35x^4 + 7x^6\right]$

put $x = \sqrt{2}$ we get.

$\left(1+\sqrt{2}\right)^7 + \left(1-\sqrt{2}\right)^7$ &

$= 2\left[1 + 21 \times 2 + 35 \times 4 + 7 \times 8\right]$

$= 2 \times 239 = 478.$

Video Solution:

Q23 Text Solution:

We know that

$(1+x)^n = {}^nC_0 + {}^nC_1 x + {}^nC_2 x^2 + \ldots + {}^nC_n x^n \quad ...(i)$

Also $(x+1)^n = {}^nC_0 x^n + {}^nC_1 x^{n-1} + {}^nC_2 x^{n-2} + \ldots . + {}^nC_n \quad ..(ii)$

Multiply (i) and (ii), we get

$(1+x)^{2n}$

$=({}^nC_0 + {}^nC_1 x + \ldots + {}^nC_n x^n)\left({}^nC_0 x^n + {}^nC_1 x^{n-1} + \ldots + {}^nC_n\right)$

Comparing coefficient of x^n both sides, we get

${}^{2n}C = {}^nC_0{}^2 + {}^nC_1{}^2 + {}^nC_2{}^2 + \ldots . + {}^nC_n{}^2$

$\Rightarrow \sum_{r=0}^{n} ({}^nC_r)^2 = {}^{2n}C_n$

$\therefore \sum_{k=0}^{20} \left({}^{20}C_k\right)^2 = {}^{40}C_{20} \left[\because n = 20\right]$

Video Solution:

Q24 Text Solution:

$\left(1 + 3x + 3x^2 + x^3\right)^7 = \left[(1+x)^3\right]^7$

$= (1+x)^{21}$

$n = 21 \quad \Rightarrow$ number of terms $= 22$

Video Solution:

Q25 Text Solution:

$(1-x)^{101}\left(1 + x + x^2\right)^{100}$

$= \left(1 - x\right)\left(1 + x^3\right)^{100}$

There are 101 terms in $(1 + x^3)^{100}$, these are multiplied with (1 – x). Thus

number of terms = 101 + 101 = 202

Video Solution:

Q26 Text Solution:

$\left(1 + x - 2x^2\right)^{20} = a_1 + a_1 x + a_2 x^2 + \ldots . + a_{40} x^{40}$

Putting x = 1 and -1, in the above equation, we get

$a_0 + a_1 + a_2 + a_3 + \ldots + a_{40} = 0 \quad ...(i)$

$a_0 - a_1 + a_2 - a_3 + \ldots . + a_{40} = 2^{20} \quad ...(ii)$

Subtracting (ii) from (i), we get

$a_1 + a_3 + \ldots + a_{39} = -2^{19}$

Video Solution:

Q27 Text Solution:

The term independent of x is $20\ C_{12} \cdot 2^8 \cdot 3^{12}$

Video Solution:

Q28 Text Solution:

The (r + 1)th term of null is given by

$$T_{r+1} = {}^{256}C_r\left(\sqrt{3}\right)^{256-r}\left(\sqrt[8]{5}\right)^r$$

$$= {}^{256}C_r\, 3^{\frac{256-r}{2}}\ 5^{\frac{r}{8}}.$$

Tr+1 will be an integer if r is a multiple of both 2 and 8.

\ r = 0, 8, 16, 32.......256

\ Number of rational terms = 1 + numbe of multiples of 8 up to 256 = 1 + $\frac{256}{8}$ = 1 + 32 = 33

Video Solution:

Q29 Text Solution:

$$\left(1 + x - 2x^2\right)^8 = a_0 + a_1x + a_2x^2 + \cdots + a_{16}x^{16} \quad (1)$$

put $x = 1$ in (1) we get

$$a_0 + a_1 + a_2 + \cdots + a_{16} = 0 \quad (2)$$

put $x = -1$ in (1) We get

$$a_0 - a_1 + a_2 \cdots + a_{16} = 2^8 \quad (3)$$

Add equation (2) and (3).

$$2(a_0 + a_2 + a_4 + \cdots + a_{16}) = 2^8$$

$$a_0 + a_2 + a_4 + \cdots + a_{16} = 2^7$$

Video Solution:

Q30 Text Solution:

$(1 + x^2)^5 (1 + x)^4 = ({}^5C_0 + {}^5C_1 x^2 + ... + {}^5C_5 x^{10}) \times ({}^4C_0 + {}^4C_1x + ... + {}^4C_4.x^4)$

The coefficient of x^5 in $(1 + x^2)^5 \times (1 + x)^4$ is

$$\left({}^5C_1 \cdot {}^4C_3 + {}^5C_2{}^4C_1\right)x^5 + \ldots = 60$$

\ The coefficient of x^5 is 60.

Video Solution: