Test- 02

Ultimate kcet crash course 2026

Maths

Q1 Let R = {(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)} be a relation on the set A = {3, 6, 9, 12}. The relation is
(A) Reflexive and transitive only
(B) Reflexive only
(C) An equivalence relation
(D) Reflexive and symmetric only

Q2 Let R = {(1, 3), (4, 2), (2, 4), (2, 3), (3, 1)} be a relation on the set A = {1, 2, 3, 4}. The relation R is
(A) Symmetric (B) Reflexive
(C) Not Symmetric (D) Function

Q3 Let R be a relation on the set R of all real numbers defined by a R b iff $|a-b| \leq 1$. Then R is
(A) Reflexive and Symmetric
(B) Symmetric only
(C) Transitive only
(D) An equivalence relation.

Q4 For $x,\ y \in R$, define a relation R by xRy if and only if $x-y+\sqrt{2}$ is an irrational number. Then R is
(A) An equivalence relation
(B) R is symmetric
(C) R is transitive
(D) None of these

Q5 Let $f: R \to R$ be defined by $f(x)$ Then f(-1)

$$= \begin{cases} 2x & x > 3 \\ x^2 & 1 < x \leq 3 \\ 3x & x \leq 1 \end{cases}.$$

+ f(2) + f(4) =
(A) 9 (B) 14
(C) 5 (D) None of these

Q6 Domain of the function $f(x)=\frac{1}{\sqrt{[x]^2-[x]-6}}$ where [x] is greatest integer $\leq$ x is
(A) $(-\infty,\ -2)\cup[4,\ \infty)$
(B) $(-\infty,\ -2)\cup[3,\ \infty)$
(C) $(-\infty,\ -2]\cup[4,\ \infty)$
(D) $(-\infty,\ -2]\cup(3,\ \infty)$

Q7 Domain of $f(x)=\frac{x}{1-|x|}$ is
(A) [-1, 1]
(B) (-1, 1)
(C) $(-\infty,\ 1)\cup(0,\ 1)$
(D) R - {-1, 1}

Q8 If $x^y = y^x$, then $x(x - y\log\ x)\frac{dy}{dx}$ is equal to
(A) y(y - x log y) (B) y(y + x log y)
(C) x(x + y log x) (D) x(y - x log y)

Q9 If $y=\sqrt{x+\sqrt{x+\sqrt{x....\infty}}}$ then $\frac{dy}{dx}=$
(A) 1/y (B) 1/x
(C) $\frac{1}{2x-1}$ (D) $\frac{1}{2y-1}$

Q10 If $f(x)=\begin{cases} Kx^2, & \text{if } x \leq 2 \\ 3, & \text{if } x > 2 \end{cases}$ is continuous at x = 2, then the value of K is
(A) 3/4 (B) 4
(C) 4/3 (D) 3

Q11 If $f(x)=\begin{cases} \frac{1-\cos kx}{x\sin x}, & \text{if } x \neq 0 \\ \frac{1}{2}, & \text{if } x = 0 \end{cases}$ is continuous at x = 0, then the value of K is
(A) ± 1 (B) $\pm 1/2$
(C) 0 (D) ± 2

Q12 If $f(x)=\begin{cases}\frac{\sin 5x}{x^2+2x}, & x\neq 0\\ k+\frac{1}{2}, & x=0\end{cases}$ is continuous at x = 0, then the value of k is

(A) 1 (B) -2

(C) 2 (D) 1/2

Q13 If $y=2^{\log_e x}$, then $\frac{dy}{dx}$ is

(A) $\frac{2^{\log_e x}}{\log_e 2}$

(B) $2^{\log_e x}\cdot\log_e 2$

(C) $\frac{2^{\log_e x}}{x}$

(D) $\frac{2^{\log_e x}\log_e 2}{x}$

Q14 If $y=\tan^{-1}\left(\frac{\cos x-\sin x}{\cos x+\sin x}\right)$, then $\frac{dy}{dx}=$

(A) -1 (B) sin 2x

(C) cos 2x (D) 0

Q15 If $\lim_{x\to -3}\frac{3x^2+ax+a-7}{x^2+2x-3}$ exists, then a is equal to

(A) 10 (B) 15

(C) -15 (D) -10

Q16 $\lim_{x\to 0} x\sin\frac{1}{x}$ is equal to

(A) 0 (B) 11

(C) 1/2 (D) Does not exist

Q17 The value of $I=\int_0^{\pi/2}\frac{(\sin x+\cos x)^2}{\sqrt{1+\sin 2x}}dx$ is

(A) 0 (B) 3

(C) 2 (D) 1

Q18 $\int e^{\log(1+\cot^2 x)}dx=$

(A) -cot x + c (B) cot x + c

(C) cosec x + c (D) -cosec x + c

Q19 $\int\frac{1+\sin^2 x}{1-\cos 2x}dx=$

(A) $\frac{1}{2}(-\cot x+x)+c$

(B) $\frac{1}{2}(\cot x+x)+c$

(C) $\frac{1}{2}(\tan x+x)+c$

(D) None

Q20 $\int\frac{2\cos^2 x-3\sin^2 x}{\cos^2 x\sin^2 x}dx=$

(A) -2 cot x - 3tan x + c

(B) 2cot x - 3 tan x + c

(C) 2 cot x + 3 tan x + c

(D) None

Q21 $\int(1-\cos x)\operatorname{cosec}^2 x\,dx=f(x)+c\Rightarrow f(x)=$

(A) tan x/2 (B) cot x/2

(C) 2tan x/2 (D) 1/2 tan x/2

Q22 **The number of 3 letters words, with or without meaning, which can be formed out of letters of the word 'NUMBER', is**

Consider the following statements

Statement I: When repetition of letters is not allowed, is 120.

Statement II: When repetition of letters is allowed, is 216.

Choose the correct option.

(A) Only Statement I is correct

(B) Only Statement II is correct

(C) Both Statements are correct

(D) Both Statements are false

Q23 The number of 3-digit numbers that can be formed from the digits 1, 2, 3, 4 and 5

Consider the following statements.

Statement I: When the repetition of number is allowed is 125.

Statement II: When the repetition of numbers is not allowed is 60.

Which of the above statement is/are true?

(A) Only I

(B) Only II

(C) Neither I nor II

(D) Both I and II

Q24 The number of arrangements that can be made by taking all the letters of the word SQUARE that are to begin with **S** and end with **E** is

(A) 24 (B) 120

(C) 720 (D) 30

Q25 The number of ways in which 6 red balls and 5 black balls of different sizes can be arranged in a row so that no two balls of the same color come together is

(A) $6! \, {}^{7}P_5$ (B) $6! \cdot 5!$

(C) $7! \cdot 5!$ (D) $5! \, {}^{6}C_5$

Q26 The number of ways in which 5 boys and 5 girls can sit in a row so that the boys and girls sit alternately is

(A) 14,400 (B) 28,800

(C) 23,500 (D) 18,400

Q27 The number of ways in which we can choose a committee from four men and six women so that the committee includes atleast two men and exactly twice as many women as men is

(A) 94

(B) 126

(C) 128

(D) None of the above

Q28 If A and B are two independent events with $P(A)=\frac{3}{5}$ and $P(B)=\frac{4}{9}$ then $P\left(A' \cap B'\right)=$

(A) 4/15 (B) 8/45

(C) 1/3 (D) 2/9

Q29 A purse contains 4 copper coins, 3 silver coins, the second purse contains 6 copper coins and 2 silver coins. A coin is taken out of any purse. The probability that it is a copper coin, is

(A) 4/7 (B) 3/4

(C) 3/7 (D) 37/56

Q30 A man is known to speak the truth 2 out of 3 times. He throws a die and reports that it is a six. The probability that it is actually six, is

(A) 5/6 (B) 1/6

(C) 2/3 (D) 2/7

Answer Key

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

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

A = {3, 6, 9, 12} and (3, 3), (6, 6), (9, 9), (12, 12) ∈ R ⇒ R is reflexive.

$(6,\ 12) \in R$ but $(12,\ 6) \notin R \Rightarrow R$ is not symmetric.

$(3,\ 6) \in R (6,\ 12) \in R \Rightarrow (3,\ 12) \in R$

\ R is transitive.

Video Solution:

Q2 Text Solution:

(2, 4), (2, 3)$\in R \Rightarrow R$ has two images

⇒ R is not a function.

$(1,\ 1) \notin R \Rightarrow R$ is not reflexive.

$(2,\ 3) \in R,\ (3,\ 2) \notin R \Rightarrow R$ is not symmetric.

Video Solution:

Q3 Text Solution:

|a - a| = 0 < 1

$\therefore aRa \forall a \in R$

$\therefore R$ is reflexive

Again

$aRb \Rightarrow |a-b| \leq 1 \Rightarrow |b-a| \leq 1 \Rightarrow bRa$

\ R is symmetric.

Again $1R\frac{1}{2}$ and $\frac{1}{2} R1$ but $\frac{1}{2} \neq 1$

Further, 1R2 and 2R3 are true but 1R3 is false

$[\because |1-3| = 2 > 1]$

\ R is not transitive.

Video Solution:

Q4 Text Solution:

Since $x - x + \sqrt{2} = \sqrt{2}$ which is an irrational number, so xRx for all $x \in R$.

Hence R is reflexive.

R is not symmetric as $\left(\sqrt{2},\ 1\right) \in R,$ but $\left(1,\ \sqrt{2}\right) \notin R$

Again R is not transitive.

Since $\left(\sqrt{2},\ 1\right) \in R$ and $\left(1,\ 2\sqrt{2}\right)$

$\in R$ but $\left(\sqrt{2},\ 2\sqrt{2}\right) \notin R$

Video Solution:

Q5 Text Solution:

$f(-1)= 3(-1)= -3 \qquad (\because -1 < 1)$

$f(2)= 2^2 = 4 \qquad (\because -1 < 2 < 3)$

$f(4)= 2(4)= 8 \qquad (\because 4 > 3)$

$\therefore f(-1)+f(2)+f(4)= 9$

Video Solution:

Q6 Text Solution:

$f\left(x \right) = \frac{1}{\sqrt{[x]^2-[x]-6}}$ is defined

$\Rightarrow [x]^2 -[x]-6 > 0$

$\Rightarrow ([x] - 3)([x] + 2) > 0$

$\Rightarrow \left[x\right]\langle -2 \text{or} [x]\rangle 3$

$\Rightarrow x < -2 \text{or} x \geq 4$

$\Rightarrow \text{Domain} = (-\infty, -2) \cup [4, \infty)$

Video Solution:

Q7 Text Solution:

$f(x)= \frac{x}{1-|x|}$ is defined

$\Rightarrow\ 1 -|x|\neq 0$

$\Rightarrow\ |x|\neq 1\ \Rightarrow x \neq \pm 1$

$\text{Domain} = R -\{-1,\ 1\}$

Video Solution:

Q8 Text Solution:

Since $x^y = y^x$

$\Rightarrow y \log x = x \log y$

On differentiating with respect to x, we get

$\Rightarrow y\frac{1}{x} + \log x \frac{dy}{dx} = \frac{x}{y}\frac{dy}{dx} + \log y$

$\Rightarrow \frac{dy}{dx}\left(\frac{x}{y} - \log x\right)= \frac{y}{x} - \log y$

$\therefore x\left(x - y \log x\right)\frac{dy}{dx} = y\left(-x \log y + y\right)$

Video Solution:

Q9 Text Solution:

$y = \sqrt{x + \sqrt{x + \sqrt{x \ldots \infty}}}$

$= \sqrt{x + y}$

$\Rightarrow y^2 = x + y$

$\Rightarrow \frac{d}{dx}\left(y^2\right)= \frac{d}{dx}\left(x + y\right)$

$\Rightarrow 2y \cdot \frac{dy}{dx} = 1 + \frac{dy}{dx}$

$\Rightarrow \frac{dy}{dx}\left(2y - 1\right) = 1$

$\therefore \frac{dy}{dx} = \frac{1}{2y-1}$

Video Solution:

Q10 Text Solution:

$$\underset{x\to 2^-}{Lt} f(x) = \underset{x\to 2^-}{Lt} Kx^2 = 4K$$

$$\underset{x\to 2^+}{Lt} f(x) = \underset{x\to 2^+}{Lt}(3) = 3 \text{ and } f(2) = 4K$$

$So,\ 4K = 3$

$\Rightarrow K = \frac{3}{4}$

Video Solution:

Q11 Text Solution:

$\because f(0) = \frac{1}{2}$

$\underset{x\to 0}{Lt} \frac{1-\cos Kx}{x \sin x}$

$\underset{x\to 0}{Lt} \frac{K \sin Kx}{x \cos x + \sin x}$ [L-Hospital Rule]

$= \underset{x\to 0}{Lt} \frac{K^2 \cos Kx}{-x \sin x + \cos x + \cos x}$

$= \frac{K^2 \times 1}{1+1} = \frac{1}{2}$

$\therefore K = \pm 1$

Video Solution:

Q12 Text Solution:

$\lim_{x\to 0} \frac{\sin 5x}{x^2+2x} = \lim_{x\to 0} \frac{\sin 5x}{(x+2)x} = \lim_{x\to 0}\left(\frac{\sin 5x}{5x}\right) \cdot \left(\frac{5}{2+x}\right) = \frac{5}{2}$

For continuity $\frac{5}{2} = k + \frac{1}{2} \Rightarrow k = 2$

Video Solution:

Q13 Text Solution:

Given, $y = 2^{\log x}$

$\frac{dy}{dx} = 2^{\log x} \times \frac{1}{x} \log_e 2$

$\therefore \frac{dy}{dx} = \frac{2^{\log x} \log_e 2}{x}$

Video Solution:

Q14 Text Solution:

$\because y = \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right) = \tan^{-1}\left(\frac{1-\tan x}{1+\tan x}\right)$

$= \tan^{-1}\left(\tan\left(\frac{\pi}{4} - x\right)\right) = \frac{\pi}{4} - x$

$= y = \frac{\pi}{4} - x$

$\Rightarrow \frac{dy}{dx} = -1$

Video Solution:

Q15 **Text Solution:**

Here, $\lim_{x\to -3} x^2+2x-3=0$

So, $\lim_{x\to -3} 3x^2+ax+a-7$ must be zero, in order to limit exist.

$\Rightarrow 3(-3)^2+a(-3)+a-7=0$

$\Rightarrow 27-2a-7=0 \Rightarrow 2a=20$

$\therefore a=10$

Video Solution:

Q16 **Text Solution:**

Since, $\lim_{x\to 0} x=0$ and $-1\le \sin\frac{1}{x}\le 1$

Therefore $\lim_{x\to 0} x\sin\frac{1}{x}=0$

Video Solution:

Q17 **Text Solution:**

$$I=\int_0^{\pi/2}\frac{(\sin x+\cos x)^2}{\sqrt{1+\sin 2x}}dx$$

$$=\int_0^{\pi/2}\frac{(\sin x+\cos x)^2}{\sqrt{1+\sin 2x}}dx$$

$$=\int_0^{\pi/2}\frac{(\sin x+\cos x)^2}{\sqrt{\cos^2 x+\sin^2 x+2\sin x\cos x}}dx$$

$$=\int_0^{\pi/2}\left(\sin x+\cos x\right)dx$$

$$=[-\cos x+\sin x]_0^{\pi/2}=2$$

Video Solution:

Q18 **Text Solution:**

$$\int e^{\log(1+\cot^2 x)}dx$$

$$=\int e^{\log\ \mathrm{cosec}^2 x}dx$$

$$=\int \mathrm{cosec}^2 x\ dx$$

$$=-\cot x\ +c$$

Video Solution:

Q19 **Text Solution:**

$$\int \frac{1+\sin^2 x}{1-\cos 2x}dx$$
$$= \int \frac{1+\sin^2 x}{2\sin^2 x}dx$$
$$= \frac{1}{2}\int \text{cosec}^2 x\, dx + \frac{1}{2}\int 1 dx$$
$$= \frac{-1}{2}\cot x + \frac{x}{2} + c$$

Video Solution:

Q20 **Text Solution:**

$$\int \frac{2\cos^2 x - 3\sin^2 x}{\cos^2 x \sin^2 x}dx$$
$$= \int \frac{2\cot^2 x}{\cos^2 x \sin^2 x}dx - \int \frac{3\sin^2 x}{\cos^2 x \sin^2 x}dx$$
$$= 2\int \text{cosec}^2 x\, dx - 3\int \sec^2 x dx$$
$$= -2\cot x - 3\tan x + c$$

Video Solution:

Q21 **Text Solution:**

$$\int (1-\cos x)\text{cosec}^2 x\, dx$$
$$= \int \frac{1-\cos x}{\sin^2 x}dx$$
$$= \int \frac{1}{1+\cos x}dx$$
$$= \int \frac{1}{2\cos^2 \frac{x}{2}}dx$$
$$= \frac{1}{2}\int \sec^2 \frac{x}{2}dx$$
$$= \tan \frac{x}{2} + c$$
$$\Rightarrow f(x) = \tan \frac{x}{2}$$

Video Solution:

Q22 **Text Solution:**

I. Number of 3 letter words (repetition not allowed) = 6 × 5 × 4 = 120

(As first place can be filled in 6 different ways, second place can be filled in 5 different ways, and third place can be filled in 4 different ways.)

II. Number of 3 letter words (repetition is allowed) = 6 × 6 × 6 = 216

(As each of the 3 places can be filled in 6 different ways.)

Video Solution:

Q23 Text Solution:

I. Number of 3-digit numbers [repetition allowed] = 5 × 5 × 5 = 125

(as unit's, ten's and hundred's places can be filled in 5 ways.)

II. Number of 3-digits numbers [repetition is not allowed] = 5 × 4 × 3 = 60

(as hundred's, ten's and unit's places can be filled in 5, 4 and 3 ways respectively.)

Video Solution:

Q24 Text Solution:

The number of arrangements that begin with **S** and end with **E** is 4! = 24

Video Solution:

Q25 Text Solution:

no two balls of the same color are together with 6 red and 5 black balls, they must alternate (RBRBRBRBRBR): assuming all are distinct, there are 6! x 5! ways

Video Solution:

Q26 Text Solution:

The required number of ways = 2 × 5! × 5!

= 2 × 120 × 120 = 28800

Video Solution:

Q27 Text Solution:

There are two possibilities

	Men	Women
(i)	2	4
(ii)	3	6

(i) Number of ways of choosing a committee of 2 men and 4 women = ${}^4C_2 \times {}^6C_4$

$= \frac{4\times3}{2\times1} \times \frac{6\times5}{2\times1} = 90$

(ii) Number of ways of choosing a committee of 3 men and 6 women = ${}^4C_3 \times {}^6C_6$

= 4 × 1 = 4

Required number of ways = 94

Video Solution:

Q28 Text Solution:

If A and B are independent events then

$P(A \cap B) = P(A) \cdot P(B)$

Also, A', B' are also independent events

$\therefore P(A' \cap B') = P(A') \cdot P(B')$

$= [1 - P(A)][1 - P(B)]$

$= \left(1 - \frac{3}{5}\right)\left(1 - \frac{4}{9}\right)$

$= \frac{2}{5} \times \frac{5}{9} = \frac{2}{9}$

Video Solution:

Q29 Text Solution:

Let A_1 be the event of selecting the first purse, A_2 be the event of selecting the second purse and E be the event of getting a copper coin from the selected purse.

$P(A_1) = 1/2$, $P(A_2) = 1/2$, $P(E|A_1) = 4/7$, $P(E|A_2) = 6/8$

$P(E) = P(A_1)P(E|A_1) + P(A_2)P(E|A_2)$

$= \frac{1}{2} \times \frac{4}{7} + \frac{1}{2} \times \frac{6}{8}$

$= \frac{32+42}{112} = \frac{74}{112} = \frac{37}{56}$

Video Solution:

Q30 Text Solution:

Let A be the event that six occurs when a die is thrown

$P(A) = 1/6$, $P(\bar{A}) = 5/6$

Let E be the event that the man reports that it is six

Since the man speaks the truth 2 out of 3 times,

$P(E|A) = 2/3$, $P(E|\bar{A}) = 1/3$

By Bayes' Theorem,

$$P(A|E) = \frac{P(A) \cdot P(E|A)}{P(A) \cdot P(E|A) + P(\bar{A}) \cdot P(E|A)}$$

$$= \frac{\frac{1}{6} \times \frac{2}{3}}{\frac{1}{6} \times \frac{2}{3} + \frac{5}{6} \times \frac{1}{3}} = \frac{\frac{2}{18}}{\frac{7}{18}} = \frac{2}{7}$$

Video Solution: