Vernacular

**Ultimate kcet crash course 2026**

**Maths**

**Relations and Functions**

**DPP: 1**

**Q1** If A = {7, 8, 9} and B = {9, 5}, then (A    B) × (A    B) is

(A) {(7, 9), (7, 5), (8, 9),(8, 5),(9, 9),(9, 5)}
(B) {(5, 9),(7, 9),(8, 9),(9, 9)}
(C) {(9, 5), (9, 7), (9, 8), (9, 9)}
(D) None of these

**Q2** If (x - 2,2y + 1) = (y - 1,x + 2), then find x and y respectively.

(A) 2, 3 (B) 3, 2
(C) 4,1 (D) 1, 4

**Q3** If A = {x : $x^2$ – 5x + 6 = 0}, B = {2, 4}, C = {4, 5}, then A × (B∩C) is

(A) {(2, 4), (3, 4)}
(B) {(4, 2), (4, 3)}
(C) {(2, 4), (3, 4), (4, 4)}
(D) {(2, 2), (3, 3), (4, 4), (5, 5)}

**Q4** If A = {8, 9,10},B = {1, 2, 3, 4, 5}, then find the number of elements in A × A × B.

(A) 15 (B) 45
(C) 48 (D) 75

**Q5** If $A$ = {1, 2, 3, 4, 5}, $B$ = {$p$, $q$, $r$, $s$}, then $n(A \times B)$=

(A) 8 (B) 4
(C) 20 (D) $5^4$

**Q6** Let A and B be two sets such that A × B has 6 elements. If three elements of A × B are {(4,7), (5,8),(6, 8)}, then

(A) A = {5, 6} and B = {4, 6}
(B) A = {4, 6} and B = {7, 8}
(C) A = {4, 5, 6} and B = {7, 8}
(D) A = {4, 5, 6} and B = {6, 8}

**Q7** Let A = {a,b,c,d} and B = {x,y,z}. Which one of the following is not a relation from A to B ?

(A) {(a, x),(c, x)}
(B) {(c, y),(d, y)}
(C) {(a, z),(d, z)}
(D) {(b, z),(b, y),(d, a)}

**Q8** If number of elements in Set A and B are $m$ and $n$ respectively, then the number of relations from A to B is

(A) $2^{m+n}$ (B) $2^{mn}$
(C) m + n (D) mn

**Q9** Let A and B be finite sets such that n(A) = 3. If the total number of relations that can be defined from A to B is 4096, then n(B) =

(A) 5 (B) 4
(C) 6 (D) 8

**Q10** The number of relations from $A$ = {2, 6} to $B$ = {1, 3, 5, 7} that are not functions from $A$ to $B$ is

(A) 240 (B) 16
(C) 128 (D) 200

**Q11** Let $n(A)$ = 4 and $n(B)$ = 6, then the total number of non-empty relations that can be defined from $A$ to $B$ is

(A) $6^4$ (B) $4^6 - 1$
(C) $2^3$ (D) $2^{24} - 1$

**Q12** If n(A) = 5 and n(B) = 7, then the number of relations from A to B is

(A) $2^{35}$ (B) $2^{49}$
(C) $2^{25}$ (D) $2^{70}$

**Q13** Let $R$ be a relation in $N$ defined by $R = \{(x, y) : x + 2y = 8, x, y \quad N\}$. The range of $R$ is

(A) {2, 4, 6}

(B) {1, 2, 3}

(C) {1, 2, 3, 4, 6}

(D) {4, 5, 6, 7}

**Q14** Let $R$ be the relation in set $N$ given by $R = \{(a, b) : a = b - 2, b > 6\}$ Choose the correct answer

(A) $(2, 4) \in R$

(B) $(3, 8) \in R$

(C) $(6, 8) \in R$

(D) $(8, 7) \in R$

**Q15** The relation R defined on the set A = {1, 2, 3, 4, 5} by $R = \{(x, y) : |x^2 + y^2| < 16\}$ is given by

(A) {(1,1),(2,1),(3,1),(4,1),(2, 3)}

(B) {(2, 2),(3, 2),(4, 2),(2, 4)}

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

(D) None of these

**Q16** If $n(A) = 5$ and $n(B) = 4$, then number of functions from $B$ to $B$ is:

(A) $4^5$ (B) $4^4$

(C) $5^5$ (D) $5^4$

**Q17** If A = {1, 3, 5, 7} and B = {1, 2, 3, 4, 5, 6, 7, 8} then the number of one-one function from A to B is

(A) 1340 (B) 1860

(C) 1430 (D) 1680

**Q18** If f(x) = ax + b, where a and b are integers, f(–1) = –5 & f(3) = 3 then a & b are equal to

(A) a = –3, b = –1

(B) a = 2, b = –3

(C) a = 0, b = 2

(D) a = 2, b = 3

**Q19** If f and g are real functions defined by $f(x)=x^2 + 7$ and g(x) = 3x+5, then find f(3)+g(-5).

(A) 6 (B) 8

(C) 10 (D) 12

**Q20** Let $R = \{x : x$ is a set of all children of a same father$\}$. Then $R$ is

(A) Only reflexive

(B) Only symmetric

(C) Reflexive and symmetric only

(D) Equivalence relation

**Q21** If the relation R on the set N of all natural numbers defined as R = {(x, y) : y = x + 5 and x < 4}, then R is

(A) reflexive (B) symmetric

(C) transitive (D) equivalence

**Q22** Let R be a relation on N defined by $R = \{(1 + x, 1 + x^2) : x \le 5, x \quad N\}$. Which of the following is True ?

(A) R is reflexive

(B) R is symmetric

(C) R is transitive

(D) None of these

**Q23** Let $R = \{(x, y): x^2 + y^2 = 1, x, y \in R\}$ be a relation in R. The relation R is:

(A) Reflexive

(B) Symmetric

(C) Transitive

(D) Anti-symmetric

**Q24** For the set A = {1,2,3}, define a relation R on the set A as follows : R = {(1, 1), (2, 2), (3, 3), (1, 3)} How many ordered pairs to be added to R to make it the smallest equivalence relation?

(A) 1 (B) 2

(C) 3 (D) 4

**Q25** Let R = {(3, 3), (5, 5), (9, 9), (12,12), (5, 12),(3, 9), (3, 12), (3,5)} be a relation on the set A = {3, 5, 9, 12}. Then R is

(A) an equivalence relation.
(B) reflexive, symmetric but not transitive.
(C) symmetric, transitive but not reflexive.
(D) reflexive, transitive but not symmetric

**Q26** If $f(x) = e^x$ and $g(x) = \log x$, find *fog* and *gof*.

(A) x, x
(B) x, $x^2$
(C) $x^2$, x
(D) $x^2$, $x^4$

**Q27** Find gof, if f :R  R and g : R  R are given by f(x) = cosx and g(x) = $3x^2$.

(A) $3\cos^2 x$
(B) $\cos\left(3x^2\right)$
(C) $3\cos\left(x^2\right)$
(D) $\cos^2(3x)$

**Q28** If f : R  R,g : R  R are defined by f(x) = 2x+3 and g(x) = $x^2$+7, then find the values of x such that g(f(x)) = 16.

(A) 0,-3
(B) 1,3
(C) 0,3
(D) -1,3

**Q29** If $f(x)= \frac{2x-3}{3x+4}$, then $f^{-1}\left(\frac{-4}{3}\right)$ =

(A) 0
(B) $\frac{3}{4}$
(C) $-\frac{2}{3}$
(D) None of these

**Q30** If $f(x)= \frac{6x-7}{3}$, then $f^{-1}(x)$

(A) $\frac{6x+7}{3}$
(B) $\frac{6x-7}{3}$
(C) $\frac{3x+7}{6}$
(D) $\frac{3x-7}{6}$

# Answer Key

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

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# Hints & Solutions

Note: scan the QR code to watch video solution

**Q1 Text Solution:**

A  B = {5, 7, 8, 9} and A  B = {9}

(A  B) × (A  B) = {(5, 9), (7, 9), (8, 9), (9, 9)}

**Video Solution:**

**Q2 Text Solution:**

(x - 2, 2y + 1) = (y - 1, x + 2)

x - 2 = y - 1 and 2y + 1 = x + 2

x = y + 1 and x = 2y - 1

y + 1 = 2y -1  y = 2

x = 2 + 1 = 3

**Video Solution:**

**Q3 Text Solution:**

From given:

$$A \times (B \cap C) = \{2,3\} \times \{4\}$$
$$= \{(2,4),\ (3,4)\}.$$

**Video Solution:**

**Q4 Text Solution:**

We have, n(A) = 3 and n(B) = 5

n(A × A × B) = n(A) × n(A) ×n(B)

= 3 × 3 × 5 = 45

**Video Solution:**

**Q5 Text Solution:**

By using the formula $n(A \times B) = n(A).\,n(B)$

$n(A) = 5$ and $n(B) = 4$

$n(A \times B) = 20$

**Video Solution:**

**Q6 Text Solution:**

Since A × B has 6 elements. Therefore, A has 3 elements and B has 2 elements.

Also (4, 7), (5, 8), (6, 8)  A × B

So, A = {4, 5, 6} and B = {7, 8}

**Video Solution:**

**Q7 Text Solution:**

: R A×B

For given A = {a,b,c,d} & B = {x,y,z}

A × B = {(a,x),(b,x),(c,x),(d,x),(a,y), (b,y),(c,y),(d,y), (a,z),(b,z),(c,z),(d,z)})

Clearly, {(b,z),(b,y),(d,a)} is not a subset of A × B.

It is not a relation.

**Video Solution:**

**Q8 Text Solution:**

If n(A) = m n(B) = n then total number of relations from A to B is $2^{mn}$

**Video Solution:**

**Q9 Text Solution:**

Let the number of elements in set *B* be *x*

Number of elements in set *A* = 3

Number of relaions from *A* to *B* = 4096

$\Rightarrow 2^{3x} = 4096 \Rightarrow 2^{3x} = 2^{12}$

**Video Solution:**

**Q10 Text Solution:**

Given $n(A) = 2 = p$

$n(B) = 4 = q$

Number of relations from *A* to *B* = $2^{pq} = 2^8$

= 256

Number of functions from *A* to *B*

$= [n(B)]^{n(A)} = q^p$

$= 4^2$ 16

Total = 256 – 16

= 240

**Video Solution:**

**Q11 Text Solution:**

Total number relations from *A* to *B*

$= 2^{n(A)n(B)}$

Total number of non-empty relations from *A* to *B*

$= 2^{n(A)n(B)} - 1$

$= 2^{4(6)} - 1 = 2^{24} - 1$

**Video Solution:**

**Q12 Text Solution:**

If n(A) = m and n(B) = n, then total number of relations from A to B is $2^{mn}$.

Here, m = 5 and n = 7, therefore number of relations = $2^{(5\times7)} = 2^{35}$

**Video Solution:**

**Q13 Text Solution:**

The roster form of given relation is

R = {(2, 3), (4, 2), (6, 1)}

∴ Range of R = {1, 2, 3}

**Video Solution:**

**Q14 Text Solution:**

Since $b > 6$

$(6, 8) \in R$

**Video Solution:**

**Q15 Text Solution:**

We have R={(x,y):$|x^2 + y^2| < 16$}

Let x = 1 $|1 + y^2| < 16$ y = 1, 2, 3

Let x = 2 $|4 + y^2| < 16$ y = 1, 2, 3

Let x = 3 $|9 + y^2| < 16$ y = 1, 2

R = {(1, 1),(1, 2), (1, 3),(2,1),(2, 2),(2, 3),(3,1),(3, 2)}

**Video Solution:**

**Q16 Text Solution:**

Number of functions from $B$ to $B$

$= [n(B)]^{n(B)} = 4^4$

**Video Solution:**

**Q17 Text Solution:**

$A = \{1, 3, 5, 7\}$ and $B = \{1, 2, 3, 4, 5, 6, 7, 8\}$

number of one-one functions $np_p$ if $n \geq m$

Here $n(A) = 4 = m$ $n(B) = 8 = n$.

$^8P_4 = \frac{8!}{(8-4)!} = 8 \times 7 \times 6 \times 5 = 1680$

**Video Solution:**

**Q18 Text Solution:**

Given

f(x) = ax + b

f(–1) = –5 ⇒ –a + b = – 5

f(3) = 3 ⇒ 3a + b + 3

On solving we get a = 2, b = –3.

**Video Solution:**

**Q19 Text Solution:**

Given, f and g are real functions defined by f(x) = $x^2$ + 7 ...(i)

and g(x) = 3x + 5

Put x = 3 in (i) and x = -5 in (ii), we get

f(3) = $(3)^2$ + 7 = 9 + 7 = 16,

g(-5) = 3(-5) + 5 = -15 + 5 = -10

\ f(3) + g(-5) = 16 - 10 = 6

**Video Solution:**

**Q20 Text Solution:**

Given relation 'R' is the set of all children in family having same father.

Let 'A' be the set of children in a family

(i) Reflexive : For $a \in A$, $(a, \text{a}) \in R$. 'a' has the same father as 'a'

(ii) Symmetric : For any $a, b \in A$ if $(a, b) \in R \Rightarrow (b, \text{a}) \in R$

(iii) Transitive : For any $a$, b, c ∈ A if $(a, b) \in R$, $(b, \text{c}) \in R$ its obvious that $(a, c) \in R$

Hence given relation is equivalence.

**Video Solution:**

**Q21 Text Solution:**

(c) : We have, R = {(x, y) : y = x + 5 and x < 4}, where x, y N. R = {(1, 6), (2, 7), (3, 8)}

Clearly, (1,1), (2,2), etc. are not in R. So, R is not reflexive.

Since, (1, 6) R but (6, 1) R. So, R is not symmetric.

Since, (1, 6) R and there is no order pair in R which has 6 as the first element. Same is the case for (2, 7) and (3, 8).

So, R is transitive

**Video Solution:**

**Q22 Text Solution:**

$R = \{(2,2),(3,5),(4,10),(5,17)\}$

*it is clear that $R$ is not reflexive*

*not symmetric*

*not transitive*

**Video Solution:**

**Q23 Text Solution:**

We have R = {($x$, $y$) : $x^2 + y^2 = 1$, $x$, $y$ R}.

Let $x = 4$, $y = 4$,

$(4)^2 + (4)^2 = 32 \neq 1$. .. $(4, 4) \notin R$.

$R$ is not reflexive.

Let $(x, y)$ $R$.

$x^2 + y^2 = 1$ $y^2 + x^2 = 1$ $(y, x)$ $R$

$R$ is symmetric.

(0, 1), (1, 0) $R$ because $(0)^2 + (1)^2 = 1$ and $(1)^2 + (0)^2 = 1$.

Also $(0)^2 + (0)^2 = 0 \neq 1$, .. $(0, 0) \notin R$

$\therefore R$ is not transitive.

**Video Solution:**

**Q24 Text Solution:**

Here, A = {1,2,3} and the relation R = {(1, 1), (2, 2) (3, 3) (1, 3)}.

Clearly, R is reflexive but not symmetric as (1, 3) R but (3, 1) R.

We shall include (3, 1) to the above relation to make it smallest equivalence relation

R' = {(1, 1), (2, 2), (3, 3) (1, 3), (3, 1)}.

R' is certainly transitive as transitivity is not contradicted.

**Video Solution:**

**Q25 Text Solution:**

Given, R = {(3, 3), (5, 5), (9, 9), (12, 12), (5, 12), (3, 9), (3, 12),(3, 5)} and set A = {3, 5, 9, 12}

Reflexive : Clearly R is reflexive.

As, (a, a) R a A

Symmetric : Since, (5, 12) R, but (12, 5) R

R is not symmetric.

Transitive : (a, b) R and (b, c) R, then (a, c) R

R is transitive

**Video Solution:**

**Q26 Text Solution:**

Given, $f(x) = e^x$, $D_f = R$ and $R_f$ = (0, ¥) and $g(x)$ = log $x$, $D_g$ = (0, ¥) and $R_g = R$.

For *fog* : Since $R_g = R$ Ì $R = D_f$

Þ $D_{fog} = D_g$ = (0, ¥)

Now, $(fog)(x) = f(g(x)) = f(\log x) = e^{\log x} = x$

For *gof* : Since $R_f$ = (0, ¥) Ì (0, ¥) = $D_g$

Þ $D_{gof} = D_f = R$

\ *gof* is defined with domain *R*.

Now, $(gof)(x) = g(f(x)) = g(e^x) = x \log e = x.\ 1 = x$

**Video Solution:**

**Q27 Text Solution:**

$gof = g(f(x)) = g(\cos x) = 3\cos^2 x$

**Video Solution:**

**Q28 Text Solution:**

As g(x) = $x^2+7$

$g(f(x)) = (f(x))^2+7 = 16$

$(f(x))^2 = 9$ $f(x) = \pm 3$

$2x+3 = \pm 3$ $2x = -3 \pm 3$

$2x = -3+3$ & $2x = -3 -3$

$x = 0$ & $x = -3$ $x = 0, -3$

**Video Solution:**

**Q29 Text Solution:**

$Let\ f(x) = \frac{2x-3}{3x+4}$

$Let\ f(x) = y = \frac{2x-3}{3x+4}$

On cross multiplication, we get

$3xy + 4y = 2x - 3$

$\Rightarrow x(3y-2) = -3 - 4y \Rightarrow x = \frac{-3-4y}{3y-2}$

$\Rightarrow x = f^{-1}(y) = \frac{-3-4y}{3y-2}$

4

Put y = $-\frac{4}{3}$, we get

$f^{-1}\left(-\frac{4}{3}\right) = \frac{-3-4\times\left(-\frac{4}{3}\right)}{3\left(-\frac{4}{3}\right)-2} = \frac{-3+\frac{16}{3}}{-4-2} = \frac{7}{3\times(-6)}$

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

**Video Solution:**

**Q30 Text Solution:**

Here $f(x) = \frac{6x+7}{3}$

*Let* $x_1, x_2 \in D_f$, *such that* $f(x_1) = f(x_2)$

$\therefore \frac{6x_1-7}{3} = \frac{6x_2-7}{3} \Rightarrow 6x_1 - 7 = 6x_2 - 7$

$\Rightarrow 6x_1 = 6x_2$

$\therefore x_1 = x_2$

$\therefore$ $f$ is one-one function.

*Let* $y = f(x) = \frac{6x-7}{3} \Rightarrow 3y = 6x - 7 \Rightarrow 6x$
$= 3y + 7$

*Let* $y = f(x) = \frac{6x-7}{3} \Rightarrow 3y = 6x - 7 \Rightarrow 6x$
$= 3y + 7$

$\Rightarrow x = \frac{3y+7}{6} \Rightarrow f$ *is onto.*

$\therefore f^{-1}(x)$ *exists*

$\Rightarrow f^{-1}(x) = \frac{3x+7}{6}$

**Video Solution:**