B.Tech - II (CSE) Semester - III Discrete Mathematics MA 221 (Mathematics III)

*Required

Attempt All Questions

Check correct options

An binary operation * defined on the set integers Z as (a, b)*(c, d)=(ac, bc+d). Is algebraic structure (Z, *) a group? Which of the following are correct? * 2 points

- [ ] Group with identity (0, 1)
- [ ] * is not Associative.
- [ ] Abelian group
- [ ] Inverse of (a, b) is (-a, -b)
- [x] Group with identity (1, 0)
- [ ] Yes it is group.
- [ ] Group with identity (0,0)
- [ ] Inverse of (a, b) is (1/a, 1/b)
- [ ] Group with identity (1, 1)

Given a group of 100 people, at minimum, how many people were born in the same month? * 1 point

- ○ 11
- ◉ 9
- ○ 10
- ○ 8

The set M of 2X2 matrices given below forms which algebraic structure with respect to matrix multiplication? Which of the following are true? * 2 points

$$M = \left\{ \begin{bmatrix} a & a \\ a & a \end{bmatrix} : a \in \mathbb{R} \right\}$$

- ☐ Group
- ☐ Can't Say
- ☑ Semigroup
- ☑ Monoid
- ☑ Groupoid

Let,S be the set of odd positive integers less than 20. Then * 1 point

$|S|$ = _____

- 15
- 5
- 20
- 10

* 1 point

Let $f : \mathbb{R} \to \mathbb{R}$, $f(x) = -x^2$ **and** $g : \mathbb{R}^+ \to \mathbb{R}^+$, $g(x) = \sqrt{x}$. **Then** $f \circ g(x)$=_____.

- [ ] Option 1: x
- [ ] Option 4: $-x^2$
- [x] -x
- [ ] x^2

- [x] Option 2
- [ ] Option 3

* 1 point

In usual notation, $(g \circ f)^{-1}(x) =$ _____.

- [ ] Option 3: $(g \circ f^{-1})(x)$
- [ ] Option 2: $(g^{-1} \circ f)(x)$
- [ ] Option 1: $(g^{-1} \circ f^{-1})(x)$
- [x] Option 4: $(f^{-1} \circ g^{-1})(x)$

If (G, #) is a group then how many elements in G satisfy a#a=a? * 1 point

- [x] Only identity
- [ ] Can't say
- [ ] self inverse

- [ ] All elements
- [ ] All elements except identity

The intersection of two normal subgroups is _____ * 1 point

- [x] Subgroup
- [x] Normal subgroup
- [ ] Quotient group
- [ ] May or may not be a subgroup

The product of two permutations fog, f=(1 2) (3 4) and g=(1 3)(2 4) is * 1 point

- ( ) (1 2)(3 4)
- ( ) Option 5
- ( ) (1 2 3 4)
- (•) (1 4)(2 3)
- ( ) (1 3)(2 4)

If A has m elments and B has n elements then A×B has _____elements 1 point

*

☐ Option 4

☑ Option 3

☐ Option 1

☐ Option 2

If O(A)=n then how many elements in the power set of A? * 1 point

- [ ] n^2
- [x] 2^n
- [ ] Option 2
- [x] Option 1
- [ ] 3^n
- [ ] n^n
- [ ] Option 4
- [ ] Option 3

If T is a permutation group under product of permutations then identity in T is * 1 point

- [ ] (1 2)
- [x] (1 2)(1 2)
- [x] (1 2 3 ... n)
- [ ] None of thses

The identity * 1 point

$A \cup (A \cap B) = A$

is known as

- (●) Absorption law
- ( ) De Morgan's law
- ( ) Complement law
- ( ) Distributive law

Let O(G)=20 O(G')=25. Let f is homomorphism from G to G' then Ker(f)_ may has _____ elements. * 1 point

- (●) 2
- ( ) 10
- ( ) 4
- ( ) 5

In the group {0, 1, 2, 3, 4} under modulo addition 5, the order of element 3 is _____ * 1 point

- ( ) 2
- ( ) 3
- ( ) 0
- ( ) 4

- ○ 1
- ◉ 5

*

1 point

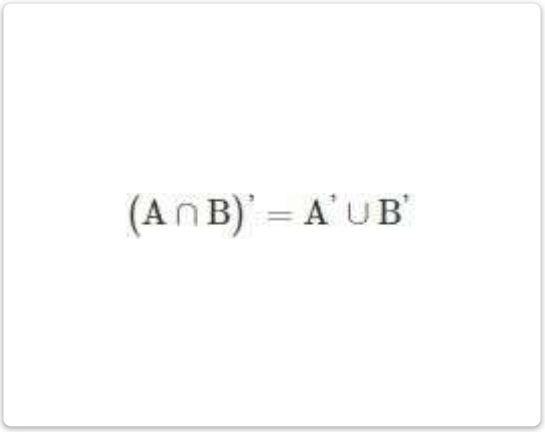
Let $G=\left\{\begin{bmatrix} a & b \\ c & d \end{bmatrix}: a,b,c,d \in \mathbb{Z}\right\}$, then (G +) is a group. Let $H=\left\{\begin{bmatrix} a & b \\ c & d \end{bmatrix}: a,b,c,d \text{ are even}\right\}$ is subgroup of G. Distinct number of cosets of H in g are____

- ☐ Can't say
- ☐ 4
- ☐ infite
- ☑ 16
- ☐ 8

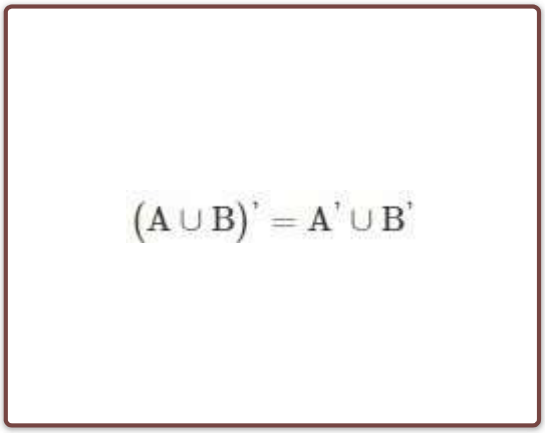
*

1 point

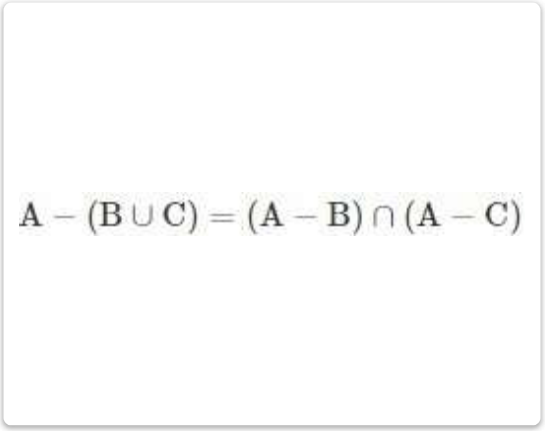
Which of the following is incorrect?



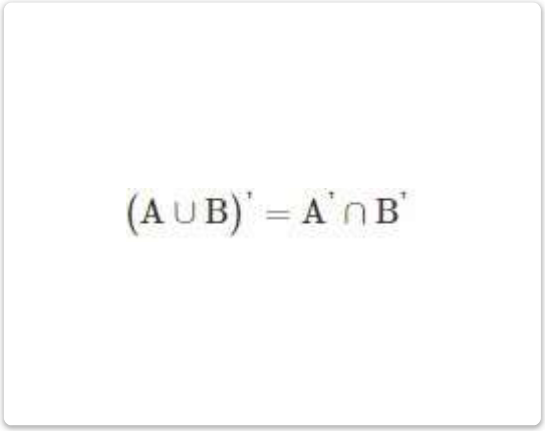
Option 2



Option 1



Option 4



Option 3

Consider the following encoding scheme e(00)=00000, e(01)=01110, e(10)=10101, e(11)=11011 What is the minimum distance of the code? How many errors can be detected? *

1 point

4, 2

3, 2

- ○ 4, 1
- ◉ 3, 1

*

2 points

Let $f:(\mathbb{R},+)\to(\mathbb{R}-\{0\},\times)$ is homomorphism and f(2)=5, then f(-8)=_____

- ☐ 625
- ☐ 1/25
- ☐ 5
- ☐ 1/5
- ☐ 25
- ☑ 1/625

*

1 point

$$f:\mathbb{N}\to\mathbb{N} \text{ define as } f(n)=n+2 \text{ is } \_\_\_\_\_ \text{ function.}$$

- ☐ Surjective
- ☑ one to one
- ☐ None
- ☑ Injective
- ☐ bijective
- ☐ onto
- ☐ Other:

*

1 point

If $f : \mathbb{R} \to \mathbb{R}, f(x) = ax + b$ **then** $f^{-1}(x)$=____.

$x - b$

- [ ] Option 3

$\frac{x-b}{a}, a \neq 0$

- [x] Option 1

(x-b)/a

- [ ] (x-b)/a

$(x - b)a$

- [ ] Option 2

$\frac{x-a}{b}, b \neq 0$

- [ ] Option 4

Is the group "{1, 2, 3, 4, 5, 6} under modulo 7 multiplication" cyclic? * 2 points

- [ ] Yes and only 1 is generator.
- [ ] No
- [ ] Yes and 2 and 4 are generators.
- [ ] Yes and 2, 4, 6 are only generators.
- [ ] Yes and all elements are generator.
- [ ] Yes and 1, 3, 5 are only generators.
- [x] Yes
- [x] Yes and 3 and 5 are generators.

* 1 point

Let A and B are the subsets of the universal set U. Let n(A)=20, n(B)=30, n(U)=80 and n(A ∩ B)=10. Then $n(A' \cap B') =$ _____?

- [ ] 42
- [ ] 41
- [x] 40
- [ ] 43

*

1 point

Let X={1, 2, 3} and f, g & h are functions from X to X given by f={(1, 2), (2, 3), (3, 1)}, g={(1, 2), (2, 1), (3, 3)} & h={(1, 1), (2, 2), (3, 1)}. The function $f \circ h \circ g$=____.

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

☐ Option 3

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

☐ Option 1

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

☐ Option 4

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

☑ Option 2

A (4, 7) Hamming code can detect and correct only ____ error. *

1 point

☑ 1

☐ 2

☐ 0

3

*

1 point

If $f(x) = \begin{cases} x & ; x \geq 0 \\ -x & ; x < 0 \end{cases}$ for $f : \mathbb{R} \to \mathbb{R}$

then f is known as _____function.

- [ ] constant
- [ ] ceiling
- [ ] identity
- [x] modulus

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