Name:_____

NetID:_____ Lecture: A B

Discussion: Thursday Friday 9 10 11 12 1 2 3 4 5 6

1. (4 points) $A = \{\text{fox}, \text{cat}\}$ $B = \{\text{rat}, \text{mouse}\}$ $A \cap B =$

Solution: \emptyset

 $\{p^2+q\mid p\in\mathbb{Z},\ q\in\mathbb{Z},\ 1\leq p\leq 2\ \text{and}\ 1\leq q\leq 3\}=$

Solution: $\{2, 3, 4, 5, 6, 7\}$

2. (4 points) Check the (single) box that best characterizes each item.

For all integers n, if $n^2 = 101$, then n > 11.

true $\sqrt{}$ false $\overline{}$ undefined $\overline{}$

If $x \in A \cup B$, then $x \in A$. true for all sets A and B false for all sets A and B

true for some sets A and B

3. (7 points) In \mathbb{Z}_{11} , find the value of $[6]^6 + [5]^3$. You must show your work, keeping all numbers in your calculations small. You may not use a calculator. You must express your final answer as [n], where $0 \le n \le 10$.

$$[6]^2 = [36] = [3]$$

$$[6]^6 = [3]^3 = [27] = [5]$$

$$[5]^3 = [125] = [4]$$

$$[6]^6 + [5]^3 = [5] + [4] = [9]$$

Name:												
NetID:				Le	ecture	e:	\mathbf{A}	В				
Discussion:	Thursday	Friday	9	10	11	12	1	2	3	4	5	6

1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

For any sets A, B, and C, if $A \subseteq B$ then $A \times C \subseteq B \times C$.

Solution: This is true. Suppose we pick (x, y) from $A \times C$. Then x is in A and y is in C. Since x is in A and $A \subseteq B$, x is in B. So (x, y) is in $B \times C$.

2. (4 points) Check the (single) box that best characterizes each item.

Ø is	an element of	\mathbb{Z}	both	a subset	of \mathbb{Z} $\sqrt{}$	neither
Sets A and B are disjoint	$A \cap B = \{\emptyset\}$	}	$A\cap B=\emptyset$	$\sqrt{}$		
	$ A \cap B = 1$		$A = \overline{B}$			

3. (7 points) In \mathbb{Z}_{11} , find the value of $[8]^{22}$. You must show your work, keeping all numbers in your calculations small. You may not use a calculator. You must express your final answer as [n], where $0 \le n \le 10$.

$$[8]^{2} = [64] = 9$$

$$[8]^{4} = [9]^{2} = [81] = [4]$$

$$[8]^{8} = [4]^{2} = [16] = [5]$$

$$[8]^{16} = [5]^{2} = [3]$$

$$[8]^{22} = [8]^{16} \cdot [8]^{4} \cdot [8]^{2} = [3][4][9]$$

$$[3][4][9] = [3][36] = [3][3] = [9]$$
So $[8]^{22} = [9]$

 $[6]^8 + [5]^{20} = [3] + [1] = [4]$

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Discussion:	Thursday	Friday	9	10	11	12	1	2	3	4	5	6
1. (4 points)	Is this claim true	? Give a cor	ncrete	e count	er-exar	nple o	r brie	fly ex	plain	why	it's t	rue.
For an	y sets $A, B,$ and	$C, A \cup (B -$	- C) <u>c</u>	$\subseteq (A \cup$	B)-C	\mathcal{C}						
Then $A \cup (A \cup B)$	This is false. Su $B - C$ = $\{1, 2\}$ $\{0, C\}$ = $\{1, 2, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,$		2, 4.		$\beta = \{3$, 4}, aı	nd C	$= \{2,$	3}.			
2. (4 points) (Check the (single)	box that be	est ch	aracte	rizes ea	ch ite	m.					
$A \times B = A$		e for all sets e for some se					false	for a	ll sets	s A a	nd B	
$\emptyset \times \emptyset =$	Ø	√ ·	$\{\emptyset\}$		{(($\emptyset,\emptyset\}$			$\{(\emptyset,\emptyset$	Ø)}		
	In \mathbb{Z}_{13} , find the varions small. You $0 \le n \le 12$.											
Solution:												
$[6]^2 = [36] =$												
	= [100] = [9]											
$[6]^8 = [9]^2 =$ $[5]^2 = [25] =$												
	So $[5]^{16} = [1]$. So	$[5]^{20} = [5]^{16}$	$\times [5]^4$	= [1][1	L] = [1]							

Name:												
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1. (4 points) Is this claim true? Give a concrete counter-example or briefly explain why it's true.

For any sets A, B, and C, if $A \subseteq B$ then $A \cap C \subseteq B \cap C$.

Solution: This is true. An element of $A \cap C$ must be in both A and C. I $A \subseteq B$, then it's also in B. But then it's in $B \cap C$.

2. (4 points) Check the (single) box that best characterizes each item.

$A = \overline{A}$ (Assume the universe is not empty.)	true for all		true f	or some sets A	
$\forall x \in \mathbb{Q}$, if $x^2 = 3$, then $x > 3$	> 1000.	true $\sqrt{}$	false	undefined	

3. (7 points) In \mathbb{Z}_{11} , find the value of $[7]^{40}$. You must show your work, keeping all numbers in your calculations small. You may not use a calculator. You must express your final answer as [n], where $0 \le n \le 10$.

$$[7]^{2} = [49] = [5]$$

$$[7]^{4} = ([7]^{2})^{2} = [5]^{2} = [25] = [3]$$

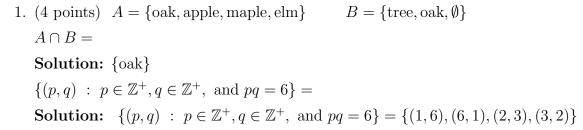
$$[7]^{8} = ([7]^{4})^{2} = [3]^{2} = [9] = [-2]$$

$$[7]^{1}6 = ([7]^{8})^{2} = [-2]^{2} = [4]$$

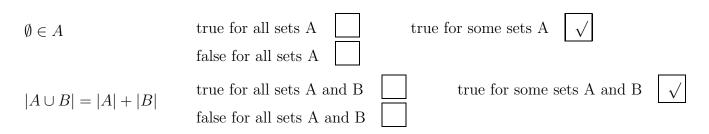
$$[7]^{3}2 = ([7]^{16})^{2} = [4]^{2} = [16] = [5]$$

$$[7]^{40} = [7]^{32} \cdot [7]^{8} = [5] \cdot [-2] = [-10] = [1]$$

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2. (4 points) Check the (single) box that best characterizes each item.



3. (7 points) In \mathbb{Z}_{11} , find the value of $[8]^{37}$. You must show your work, keeping all numbers in your calculations small. You may not use a calculator. You must express your final answer as [n], where $0 \le n \le 10$.

$$[8]^{2} = [64] = 9$$

$$[8]^{4} = [9]^{2} = [81] = [4]$$

$$[8]^{8} = [4]^{2} = [16] = [5]$$

$$[8]^{16} = [5]^{2} = [3]$$

$$[8]^{32} = [3]^{2} = [9]$$

$$[8]^{37} = [8]^{32} \cdot [8]^{4} \cdot [8] = [9] \cdot [4] \cdot [8] = [36] \cdot [8] = [3] \cdot [8] = [24] = [2]$$

Name:_

NetID: Lecture:

A \mathbf{B}

Discussion: Thursday Friday 9 **10** 11 **12** 1 2 3 4 5 6

1. (4 points) $A = \{\text{fox, tiger, wolf}\}$

$$B = \{3, 4\}$$

$$B = \{3, 4\}$$
 $C = \{6, 7, 8\}$

$$|A \times (B \cup C)| =$$

Solution: $|\text{fox, tiger, wolf} \times \{3, 4, 6, 7, 9\}| = 3 \times 5 = 15$

 $\{p+q \mid p \in \mathbb{Z}, q \in \mathbb{Z}, 1 \le p \le 3 \text{ and } 1 \le q \le 3\} =$

Solution: $\{2, 3, 4, 5, 6\}$

2. (4 points) Check the (single) box that best characterizes each item.

 $\{1,2\} \cup \emptyset =$

 $\{(1,\emptyset),(2,\emptyset)\}$

 $\{\emptyset\}$

 $\{1, 2\}$

 $A \cup B = A$

true for all sets A and B true for some sets A and B

 $\{1, 2, \emptyset\}$

false for all sets A and B

undefined

3. (7 points) In \mathbb{Z}_{11} , find the value of $[10]^{43} + [7]^{10}$. You must show your work, keeping all numbers in your calculations small. You may not use a calculator. You must express your final answer as [n], where $0 \le n \le 10$.

$$[10] = [-1]$$
. So $[10]^{43} = [-1]^{43} = -1$.

$$[7]^2 = [49] = [5]$$

$$[7]^4 = [5]^2 = [25] = [3]$$

$$[7]^8 = [3]^2 = [9]$$

So
$$[7]^{10} = [7]^2 \times [7]^8 = [5][9] = [45] = [1]$$

So
$$[10]^{43} + [7]^{10} = [1] + [-1] = [0].$$