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Discussion:

Thursday

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Friday 4 5

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11 12

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1. (4 points)

$$A = \{fox, cat\}$$

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

$$C = \{3, 7\}$$

$$A \times (B \cap C) = A \times \{3\} = \{(fox, 3), (cat, 3)\}$$

$$A \cap B = \emptyset$$

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

 $\emptyset \in A$

true for all sets A

false for all sets A

true for some sets A



If $x \in A \cap B$, 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 $0 \le n \le 10$.

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

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

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

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

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

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

$$C = \{6, 7\}$$

$$A \times (B \cap C) = A \times \emptyset = \emptyset$$

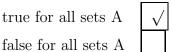
$$|A \times (B \cup C)| = 20$$

Because $B \cup C$ contains 4 elements and A contains 5 elements.

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

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

true for all sets A



true for some sets A



Ø is

an element of \mathbb{Z}

a subset of \mathbb{Z}



both neither

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
$$[8]^{22} = [9]$$

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1. (4 points)

$$A = \{fox, cat\}$$

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

 $A \cap B = \emptyset$

$${p + q^2 \mid 0 \le p \le 2 \text{ and } 1 \le q \le 2} =$$

[Correction announced at exam: p and q are integers.]

 $\{1, 2, 3, 4, 5, 6\}$

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

 $\{13, 14, 15\} \times \emptyset =$

 \emptyset $\sqrt{}$

 $\{\emptyset\}$

{13, 14, 15}

 $|A \cup B| = |A| + |B|$

true for all sets A

true for some sets A

 $\sqrt{}$

false for all sets A

3. (7 points) In \mathbb{Z}_9 , find the value of $[5]^{21}$. 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 $0 \le n \le 8$.

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

$$[5]^4 = [7]^2 = [49] = [4]$$

$$[5]^8 = [4]^2 = [16] = [7]$$

$$[5]^{16} = [7]^2 = [49] = [4]$$

$$[5]^{21} = [5]^{16} \cdot [5]^4 \cdot [5] = [4][4][5] = [80] = [8]$$

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1. (4 points) $A = \{4, 5, 9\}$ $B = \{\text{arya, bran}\}$ $C = \{(4, 5), (4, 9)\}$ $B \times A = \{(\text{arya}, 4), (\text{arya}, 5), (\text{arya}, 9), (\text{bran}, 4), (\text{bran}, 5), (\text{bran}, 9)\}$ $A \cap C = \emptyset$

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

3. (7 points) In \mathbb{Z}_{13} , find the value of $[7]^{19}$. 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 $0 \le n \le 12$.

$$[7]^{2} = [49] = [10]$$

$$[7]^{4} = [100] = [9]$$

$$[7]^{8} = [9]^{2} = [81] = [3]$$

$$[7]^{16} = [3]^{2} = [9]$$

$$[7]^{19} = [7]^{16} \cdot [7]^{[2]} \cdot [7] = [9][10][7]$$

$$[9][10][7] = [90][7] = [-1][7] = [-7] = [6]$$
So $[7]^{19} = [6]$