Section 1 Assignment (108 points)- Sets

To receive credit, you must either show your work on the worksheet or explain how you got the answer.

1. (6 points) Cardinality of a set defined by a Cartesian product.

    (a) (3 pts) What is $\left| \{1, 2, 4, 5, 7, 8\}^3 \right|$

    $$216$$

    (b) (3 pts) What is $\left| \{a, b, c, d, e\}^2 \right|$

    $$= 25$$

2. (10 points) Express each set in roster notation. Express the elements as strings, not n-tuples.

    (a) (5 pts) A^3, where $A = \{a, b\}$

    $$\{aaa, aab, aba, baa, abb, bab, bba, bbb\}$$

    (b) (5 pts) B^2, where $B = \{1, 2, 3\}$

    $$\{11, 12, 13, 21, 22, 23, 31, 32, 33\}$$

3. (18 points) Set Properties. Use the following sets to answer the questions.
   U = {a, b, c, d, e, f, g, h, i}   A = {c, d, e, i, h}   B = {a, b, c, d, e, f, i, h}   C = {d, {e, f}, g, h}

   a. (3 pts) **T** / F   {a, b, c, h, i} ⊆ U

   b. (3 pts) T / **F**   {} ∈ C

   c. (3 pts) **T** / F   {e, f} ∈ C

   d. (3 pts) T / **F**   {e, f, g, h} ⊆ C

   e. (3 pts) **T** / F   A ⊆ U

   f. (3 pts) **T** / F   A ⊂ B

4. (36 points) Set Operations. Use the following sets to answer the questions.
   U = {a, b, c, d, x, y, z}   A = {b, c, x, y}   B = {a, b, c, z}   C = {a, b, d, y}

   a. (6 pts) What is A ∪ C?

   $$\{b, c, x, y, a, d\}$$

   b. (6 pts) What is A ∩ B ∩ C?

   $$\{b\}$$

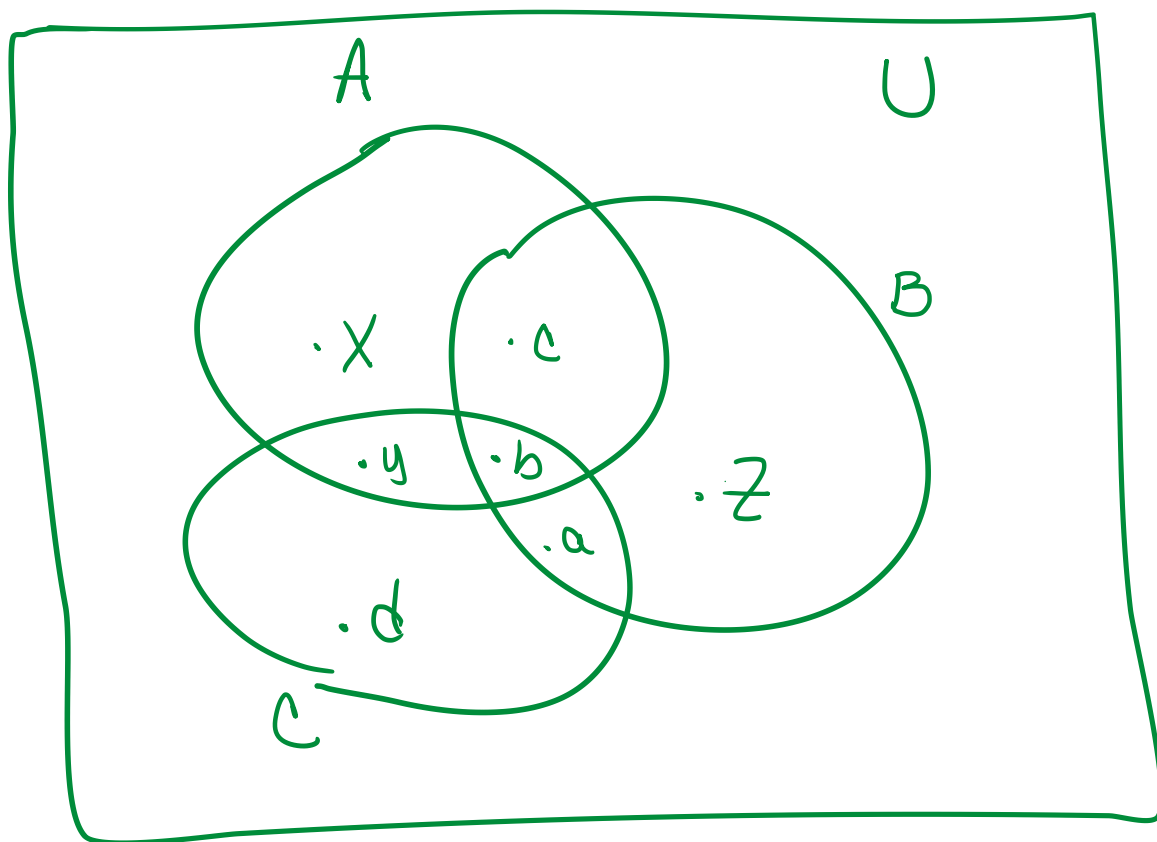   c. (6 pts) What is $\overline{A \cap C}$?

   $$= \{a, c, d, x, z\}$$

   d. (8 pts) List all subsets of C ∩ (A ∪ B).

   $$\{a\}, \{b\}, \{y\}$$
   $$\{a, b\}, \{a, y\}, \{b, y\}$$
   $$\{a, b, y\}$$
   $$\{\}$$

e. (10 pts) Draw the Venn diagram for these sets (U, A, B, C).
$U = \{a, b, c, d, x, y, z\}$ $A = \{b, c, x, y\}$ $B = \{a, b, c, z\}$ $C = \{a, b, d, y\}$

5. (20 points) Set Properties and Operations. Use the following sets to answer the questions.
$U = \{a, b, c, d, x, y, z\}$ $A = \{b, c, x, y\}$ $B = \{a, b, c, z\}$ $C = \{a, b, d, y\}$

a. (3 pt) Find $C - B$

$\{d, y\}$

b. (3 pt) Find $B - C$

$\{c, z\}$

c. (6 pt) Find $A \oplus B$

$\{x, y, a, z\}$

d.   (8 pts) Find $| \ \overline{B \oplus C} \ |$

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6.   (18 points) Cartesian Product of sets. Use the following sets to answer the questions.
A = {1, 2, 3, 4, 5}
B = {x, y, z, w}
C = {q, r, s, t}

  a.   (3 pt) T / F   (5, s) ∈ A x C

  b.   (3 pt) T / F   (q, 5) ∈ B x A

  c.   (3 pt) T / F   (r, r) ∈ B x B

  d.   (3 pt) T / F   (t, s, 4) ∈ C x B x A

  e.   (6 pt) Find $| A \ x \ B |$
      A = {1, 2, 3, 4, 5}
      B = {x, y, z, w}

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