

## Math 330 Section 1 - Fall 2024 - Homework 02

Published: Tuesday, August 27, 2024

Running total: 14 points

Last submission: Wednesday, September 4, 2024 That is **before HW 1!**

### Status - Reading Assignments:

The reading assignments you were asked to complete before the first one of this HW are:

MF lecture notes:

ch.1; ch.2.1 - 2.6, 3.1 - 3.4 until Def.3.13

B/G (Beck/Geoghegan) Textbook:

ch.2.1 - 2.2

B/K lecture notes:

ch.1.1 (Introduction to sets) (optional)

ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions (optional)

### Written assignments only for this homework set:

- The material for all assignments, including the size of a set, is covered in MF ch.2.1 (Sets and Basic Set Operations) and MF ch.2.5 (Cartesian Products).
- This set is worth **ten points!** (probably translates to more than 70 grade points)!
- Graded **ONLY ONCE**, but partial credit will be given.

### Clarification:

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| <p><b>a. Correct:</b> No matter what <math>A</math> stands for, it is never true that <math>A = \{A\}</math>. Not even if <math>A = \emptyset</math> (the empty set): <math>\{\emptyset\}</math> is a set: it is of the form <math>\{\dots\}</math>. But <math>\{\emptyset\}</math> contains an element (exactly one): The empty set! So <math>\{\emptyset\} \neq \emptyset</math>. By the way: It is true that <math>\emptyset \subseteq \{\emptyset\}</math>!</p> <p><b>b. Correct:</b> No matter what <math>A</math> stands for, it is never true that <math>A \in A</math>. Again, not even if <math>A = \emptyset</math> (the empty set): The empty set contains nothing at all; in particular, it does not contain any set; in particular, it does not contain the set that has no elements, i.e., the empty set.</p> |
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**Written assignment 1:**

Let  $S = \{3, 5, \{3, 5\}, \{5\}\}$ . True or false?

- a.  $\{5\} \subseteq S$    c.  $\{\{5\}\} \subseteq S$    e.  $\{3\} \subseteq S$    g.  $3 \subseteq S$   
b.  $\{5\} \in S$    d.  $\{\{5\}\} \in S$    f.  $\{3\} \in S$    h.  $3 \in S$

**Written assignment 2:**

Find the size of each of the following sets:

- a.  $A = \{x, \{x\}, y, \{x\}, \{x, y\}\}$    c.  $C = \{j, k, j, k, j\}$    e.  $E = \{e^x : x \in \mathbb{R}\}$   
b.  $B = \{a, \{a\}, \{b\}\}$    d.  $D = \{4q^2 : q \in \mathbb{Z}\}$    f.  $F = \{(-1)^m : m \in \mathbb{Z}\}$

**Written assignment 3:**

Let  $X = \{x, y, \{x\}, \{x, y\}\}$  and  $Y = \{x, \{y\}\}$ . True or false?

- a.  $x \in X \cap Y$    c.  $x \in X \cup Y$    e.  $x \in X \setminus Y$    g.  $x \in X \Delta Y$   
b.  $\{y\} \in X \cap Y$    d.  $\{y\} \in X \cup Y$    f.  $\{y\} \in X \setminus Y$    h.  $\{y\} \in X \Delta Y$

**Written assignment 4:**

Let  $X = \{x, y\}$  and let  $Y = \{1, 2, 3\}$ .

- a. What is  $X \times Y$ ?   c. What is  $\text{card}(X \times Y)$ ?   e. Is  $(x, 3) \in X \times Y$ ?   g. Is  $3 \cdot x \in X \times Y$ ?  
b. What is  $Y \times X$ ?   d. What is  $\text{card}(Y \times X)$ ?   f. Is  $(x, 3) \in Y \times X$ ?   h. Is  $2 \cdot y \in Y \times X$ ?

**Written assignment 5:**

Let  $Y = \{3\}$ .

- a. What is  $2^Y$ ?  
b. What is  $2^{(2^Y)}$ ?

Remember that you are dealing with power sets, so the answers must be sets and NOT numbers!