# MATH 350 Assignment 2 Solutions

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## 1.5.4

### d.

$\{(b,b)(b,c)(b,d)\}$

### e.

$\emptyset$

### f.

$$\Big\{\emptyset, \{b\}\Big\}$$

### g.

$$\Big\{\{c\}, \{d\}, \{b,c\}, \{c,d\}, \{b,d\}, \{b,c,d\}\Big\}$$

## 1.5.9

$(\mathbb{R} \times \mathbb{Z}) \cap (\mathbb{Z} \times \mathbb{R}) = \mathbb{Z} \times \mathbb{Z}$ is true.
Note that $\mathbb{Z} \cap \mathbb{R} = \mathbb{Z}$.
$(\mathbb{R} \times \mathbb{Z}) \cup (\mathbb{Z} \times \mathbb{R}) = \mathbb{R} \times \mathbb{R}$ is false.
Observe $(\pi, \pi) \in \mathbb{R} \times \mathbb{R}$, but cannot be made from $(\mathbb{R} \times \mathbb{Z}) \cup (\mathbb{Z} \times \mathbb{R})$.
Here we are unioning all of these ordered sets, but notice that there are no ordered pairs such that both coordinates are elements of the reals.

## 1.6.1

### a.

$\{0, 2, 5, 8, 10\}$

**b.**

$\{0, 1, 2, 3, 7, 9, 10\}$

**c.**

$\emptyset$

**d.**

$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

**e.**

$A = \{1, 3, 4, 6, 7, 9\}$

**f.**

$\{4, 6\}$

**g.**

$\{5, 8\}$

**h.**

$\{5, 8\}$

**i.**

$\{0, 1, 2, 3, 4, 6, 7, 9, 10\}$

## 1.8.4

$\bigcup_{i \in \mathbb{N}} A_i = \{\cdots, -4, -2, 0, 2, 4, \cdots\} = 2\mathbb{Z}$

Notice $A_1 = \{-2, 0, 2\}$, $A_2 = \{-4, 0, 4\}$. This will generate all even integers, thus when we union all of these sets, we get a set containing all even integers.

$\bigcap_{i \in \mathbb{N}} A_i = \{0\}$

The only element that every set has in common is 0.

## 1.8.9

$$\bigcup_{X \in \mathcal{P}(\mathbb{N})} X = \mathbb{N}$$

$\emptyset, \{1\}, \{2\}, \cdots \subset \mathcal{P}(\mathbb{N})$. Thus the union of all these sets would just be $\mathbb{N}$.

$$\bigcap_{X \in \mathcal{P}(\mathbb{N})} X = \emptyset$$

There is no set that is a subset of all the subsets of $\mathbb{N}$.