

Worksheet 1 Solution

March 9, 2020

Question 1

a) $A = \{2, 5\}$

$$A^c = \{1, 3, 4, 6\}$$

b) $A^c = U \setminus A$

c) $A^c \cap B^c = \{x \mid x \in U, x \leq 0 \text{ and } x \geq 4\}$

$$A^c \cap B^c = \{x \mid x \in U, x < 1 \text{ and } x > 2\}$$

$$(A \cap B)^c = \{x \mid x \in U, x < 1 \text{ and } x > 2\}$$

$$(A \cup B)^c = \{x \mid x \in U, x \leq 0 \text{ and } x \geq 4\}$$

Question 2

a) $T_0 \rightarrow 0, 3, 6$

$$T_1 \rightarrow 1, 4, 7$$

$$T_2 \rightarrow 2, 5, 8$$

$$T_3 \rightarrow 12, 18, 24$$

b) $\mathbb{Z}^+ = \{T_0, T_1, T_2\}$

T_3 not included. A partition of a set must not have any common elements.

Question 3

a) 000, 110,
001, 010,
011, 100,
101, 111

b) $S_1 = \{aa, bb, cc, ab, ca, ba, ac, bc, cb\}$
 $S_2 = \{a, b, c, aa, bb, cc, ab, ca, aaa, aba, aca, bab, bbb, bcb, cac, cbc, ccc \dots\}$

$$S_1 \cap S_2 = \{aa, bb, cc\}$$

$$S_1 \setminus S_2 = \{ab, ca, ba, ac, bc, cb\}$$

c) $S_1 = (S_1 \cap S_2) \cup (S_1 \setminus S_2)$

Question 4

a)

x	$\lfloor x \rfloor$	$\lceil x \rceil$
$\frac{25}{4}$	6	7
0.999	0	1
-2.01	-3	-2

b) Domain: \mathbb{R}
Codomain: \mathbb{Z}

c) False. Consider the following example.

$$1 = \lfloor 0.75 + 0.25 \rfloor$$

$$0 = \lfloor 0.75 \rfloor + \lfloor 0.25 \rfloor$$