

(Q8)

(a)

Let $S = (-\infty, 0) \cup \{x \in \mathbb{Z} : 1 \leq x \leq 8\}$.

Let $T = (9, \infty) \cup \{x \in \mathbb{Z} : 1 \leq x \leq 8\}$.

In $S \cap T$, the open intervals get removed, leaving $\{x \in \mathbb{Z} : 1 \leq x \leq 8\}$, which is equivalent to $\{1, 2, 3, 4, 5, 6, 7, 8\}$ which has exactly 8 elements.

(b)

Let $S = \{0\}$.

$$S \cap \mathbb{Z} = \{0\}$$

$$S \cap \mathbb{N} = \emptyset$$

$$S \cap \mathbb{Z} \neq S \cap \mathbb{N}$$

(c)

Let $S = (a, |b - a|)$. Let $T = (b, |b - a|)$.

$S \cup T = (a, b)$ where $a < b$.