Directions: You may work to solve these problems in groups, but all written work must be your own. **Show your work**; See "Guidelines and advice" on the course webpage for more information.

1. Compute the following sums.
   (a) $3 + 6 + 9 + 12 + \cdots + 3n$
   (b) $\sum_{k=1}^{n}(3k - 1)$.
   (c) Let a and b be real numbers. Evaluate $\sum_{k=1}^{n}(ak + b)$. Show how your answer to part (c) generalizes your answers to parts (a) and (b).

2. [S 3.11.1] Decide whether each of the following statements is True or False. Briefly justify your answer. We define the following sets.

$$A = \{x \in \mathbb{Z} \mid -3 \leq x \leq 3\}$$
$$B = \{y \in \mathbb{Z} \mid -5 < y < 6\}$$
$$C = \{x \in \mathbb{R} \mid x^2 \geq 9\}$$
$$D = \{x \in \mathbb{R} \mid x < -3\}$$
$$E = \{n \in \mathbb{N} \mid n \text{ is even}\}$$

   (a) $A \subseteq B$
   (b) $C \cap D = \emptyset$
   (c) $4 \in E \cap B$
   (d) $\{4\} \subseteq A \cap E$
   (e) $10 \in C - D$
   (f) $A \cup B \supseteq C$
   (g) $3 \in A \cap C$
   (h) $0 \in (A - B) \cup D$
   (i) $E \cap C \subseteq \mathbb{Z}$
   (j) $0 \notin B - C$

3. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and let $B = \{\{1\}, \{2, 3, 4\}, \{5, 5, 6\}, 7\}$.
   (a) Determine $|A|$ and $|B|$.
   (b) Determine $A \cap B$.
   (c) True or False: $\{4, 3, 2\} \in A$
   (d) True or False: $\{4, 3, 2\} \in B$
   (e) True or False: $\{5, 6\} \in A$
   (f) True or False: $\{5, 6\} \in B$
   (g) True or False: $\{5, 6\} \subseteq A$
   (h) True or False: $\{5, 6\} \subseteq B$