Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on a separate sheet of paper.

You may find the following definitions helpful:

$A \cap B = \{ x : x \in A \wedge x \in B \}$
$A \cup B = \{ x : x \in A \vee x \in B \}$
$A - B = \{ x : x \in A \wedge x \notin B \}$
$A \oplus B = \{ x : x \in A \oplus x \in B \}$
$A \times B = \{ (a, b) : a \in A \wedge b \in B \}$
$\overline{A} = \{ x : x \notin A \}$

Consider the following sets:

$A = \{ 1, 2, 3, 4, 5 \}$
$B = \{ a, b, c, d, 4, 5 \}$
$C = \{ a, b \}$

1. Using roster notation, give formal descriptions of the following sets:
   (a) $A \cap B$

   (b) $A \cup B$

   (c) $B - C$

   (d) $C - B$

   (e) $(A \cap B) \times C$

   *(f) $\overline{A}$

2. For each of the following sets, draw the corresponding Venn diagram:
   (a) $A \cap B$

   (b) $A \cup B$

   (c) $B - C$

   (d) $C - B$

   (e) $\overline{A}$

3. For each of the following statements, let $|A| = n$ and $|B| = m$. If $A \subseteq B$, then what is the cardinality of each of the following sets:

   (a) $|A \cap B|$

   (b) $|A - B|$

   (c) $|B \oplus A|$

   (d) $|B \times A|$

   Hint: for the following parts, you might find it useful to restate each set as an equivalent set, using applications of the *set identities* before trying to determine cardinality

   *(e) $|A \cup (A \cap B)|$

   *(f) $|(\overline{A} \cap B) \cup (A \cap B)|$

   *(g) $|A \cap (B \cap \overline{B})|$