Venn diagram exercises

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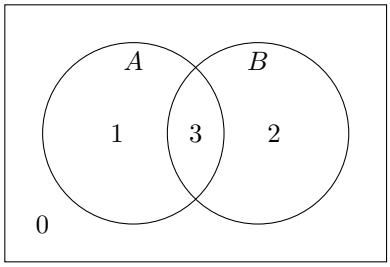
1. In the diagram below, the rectangle represents the universe of discourse. Within this, there are four regions numbered 0–4. The table records whether each number appears in the circles A and B. Note that the table records the binary representations of the numbers 0–4. Can you add a third circle and number the regions in the same way?

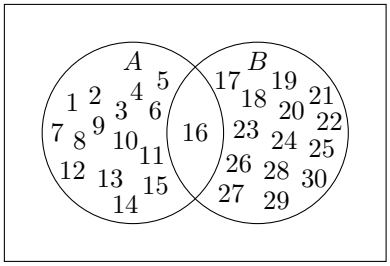


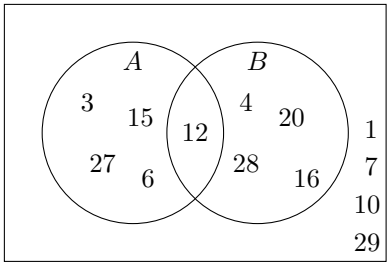
	B	A
0	0	0
1	0	1
2	1	0
3	1	1

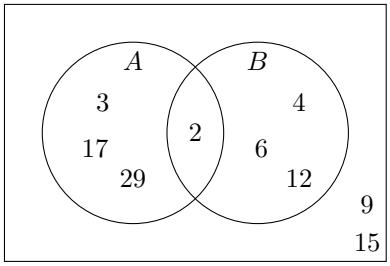
2. Draw Venn diagrams to represent the following relationships between two sets A and B.
   (a) B'; (b) $B - A$; (c) $(A - B) \cup (A \cap B)$; (d) $(A \cap B) \cup (A \cup B)'$.

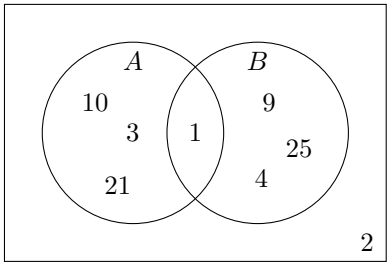
3. Draw Venn diagrams to represent the following relationships between three sets A, B and C.
   (a) A'; (b) $A \cup B \cup C$; (c) $C - (A \cup B)$; (d) $(A - B) \cap (A - C)$.

4. These Venn diagrams are representations of the universal set $U = \{1, 2, 3, \ldots, 30\}$ but they are not all complete. For each diagram, write possible definitions for the sets A and B.

(a)


(b)


(c)


(d)


5. Three friends, Anne, Bill, and Chloe, have lunch together once a week. Their choices follow these rules:

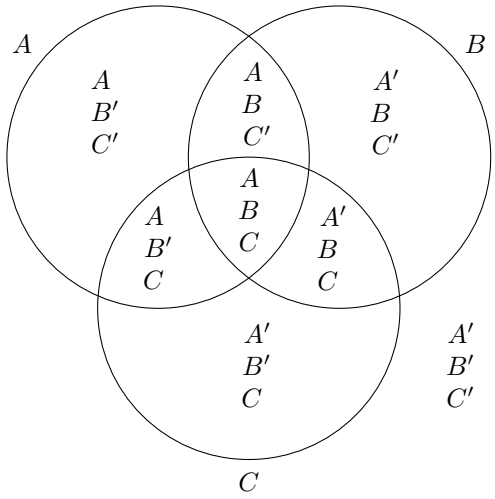
   (a) If Anne orders cake, so does Bill.

   (b) Either Bill or Chloe always orders cake, but never both at the same lunch.

   (c) Either Anne or Chloe or both always orders cake.

   (d) If Chloe orders cake, so does Anne.

   Let a set A represent all the lunches where Anne orders a cake, and similarly with B for Bill and C for Chloe. The Venn diagram below represents the relationships between these sets.



   Rewrite the rules for Anne, Bill and Chloe's choices in terms of these sets. For example, the rule "If Anne orders cake, so does Bill" can be written $A \subseteq B$.

   Which regions of the Venn diagram satisfy the rules given?

   What can you conclude?