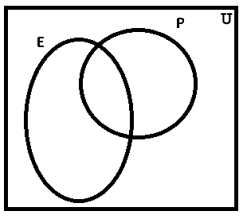
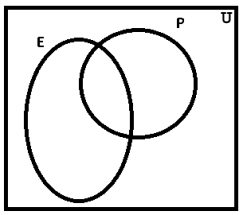
1. Suppose U is the set of all students currently enrolled at the University of Toronto (UofT), P is the set of all students enrolled in a programming course at UofT, and E is the set of all students enrolled in an engineering course at UofT.

   Your friend claims "all students enrolled in an engineering course at UofT are also enrolled in a programming course at UofT."

   (a) What evidence would you need to prove your friend correct? Draw a Venn diagram with a rectangle labeled U, and two interlocking circles labeled P and E, with an X on any region that must be empty and an O on any region that must be occupied. Do no use any assumptions or knowledge you have about UofT students other than what's given in this question.



   (b) What evidence would you need to prove your friend wrong? Draw a Venn diagram with a rectangle labeled U, and two interlocking circles labeled P and E, with an X on any region that must be empty and an O on any region that must be occupied. Do no use any assumptions or knowledge you have about UofT students other than what's given in this question.



2. Indicate if the following statements are True or False. If False, provide a counter example:

   (a) $\forall a, b \in \mathbb{R}^+$: if $a = b$ then $\sqrt{a} = \sqrt{b}$

   (b) $\forall a, b \in \mathbb{R}$: if $a > b$ then $a \geqslant b$

   (c) $\forall a \in \mathbb{R} : |-a| = a$

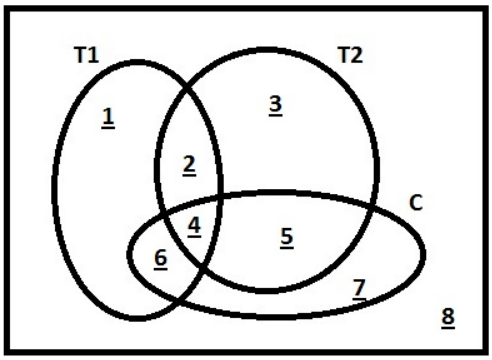
   (d) $\forall a, b \in \mathbb{R}$: if $a < b$ then $|a| < |b|$

   (e) $\forall a, b, c \in \mathbb{R}$: if $a = b$ then $c.a = c.b$

   (f) $\forall a, b \in \mathbb{R}$: if $a^2 = b^2$ then $a = b$

3. The below Venn diagram represents three sets of "programs written in C", "programs that passed test 1", and "programs that passed test 2". The three sets overlap and the diagram is divided into eight regions).

   In the below diagram, let P denote the set of all programs, C denote the set of programs written in C, T1 denote the set of programs that passed test 1, and T2 denote the set of programs that passed test 2.



(a) Shade (or list) the region(s) that corresponds to "programs that have passed every test".

(b) Shade (or list) the region(s) that corresponds to "programs that have passed some text".

(c) Shade (or list) the region(s) that corresponds to "programs that have passed only one text".

(d) Shade (or list) the region(s) that corresponds to "programs that have passed no test".

(e) Shade (or list) the region(s) that corresponds to "programs that are not written in C".

(f) Shade (or list) the region(s) that corresponds to "C programs that passed only one test".

(g) What does region 7 correspond to?

(h) What does region 3 correspond to?