Example 6

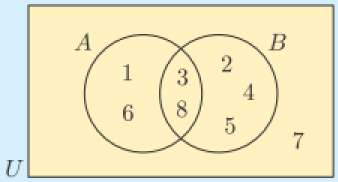
Self Tutor

Suppose $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$. Illustrate on a Venn diagram the sets:

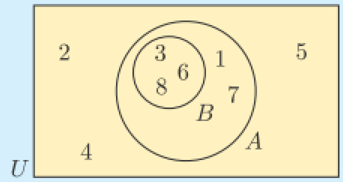
a $A = \{1, 3, 6, 8\}$ and $B = \{2, 3, 4, 5, 8\}$

b $A = \{1, 3, 6, 7, 8\}$ and $B = \{3, 6, 8\}$.

a $A \cap B = \{3, 8\}$



b $A \cap B = \{3, 6, 8\}$, $B \subseteq A$

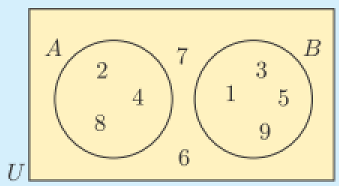


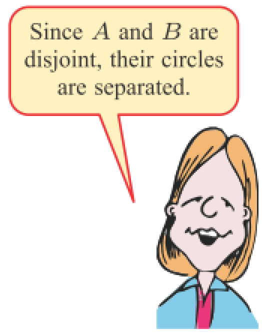
Example 7

Self Tutor

Suppose $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Illustrate on a Venn diagram the sets $A = \{2, 4, 8\}$ and $B = \{1, 3, 5, 9\}$.

$A \cap B = \varnothing$





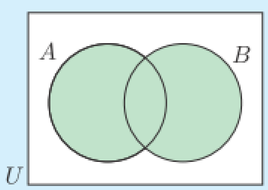
Example 8

Self Tutor

Shade the following regions for two intersecting sets A and B:

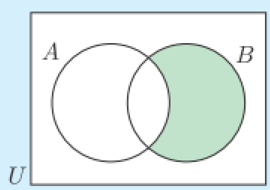
a $A \cup B$ **b** $A' \cap B$ **c** $(A \cap B)'$

a



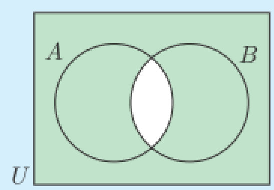
(in A, B, or both)

b



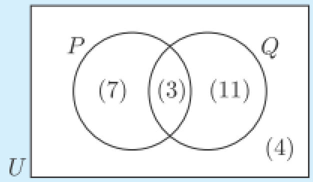
(outside A, intersected with B)

c



(outside $A \cap B$)

Example 9 Self Tutor



In the Venn diagram given, (3) means that there are 3 elements in the set $P \cap Q$. How many elements are there in:

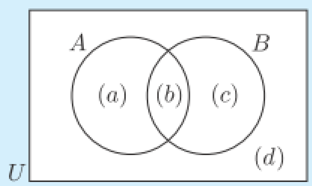
a P
b Q'
c $P \cup Q$
d P, but not Q
e Q, but not P
f neither P nor Q?

a $n(P) = 7 + 3 = 10$
b $n(Q') = 7 + 4 = 11$
c $n(P \cup Q) = 7 + 3 + 11 = 21$
d $n(P, \text{ but not } Q) = 7$
e $n(Q, \text{ but not } P) = 11$
f $n(\text{neither } P \text{ nor } Q) = 4$

Example 10 Self Tutor

Given $n(U) = 30$, $n(A) = 14$, $n(B) = 17$, and $n(A \cap B) = 6$, find:

a $n(A \cup B)$
b $n(A, \text{ but not } B)$



We see that $b = 6$ $\{$as $n(A \cap B) = 6\}$
$a + b = 14$ $\{$as $n(A) = 14\}$
$b + c = 17$ $\{$as $n(B) = 17\}$
$a + b + c + d = 30$ $\{$as $n(U) = 30\}$

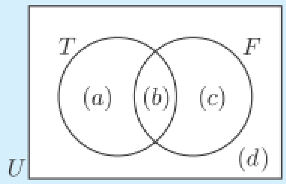
$\therefore$ $b = 6$, $a = 8$, and $c = 11$
$\therefore$ $8 + 6 + 11 + d = 30$
$\therefore$ $d = 5$

a $n(A \cup B) = a + b + c = 25$
b $n(A, \text{ but not } B) = a = 8$

Example 12 | **Self Tutor**

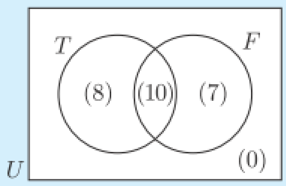
A platform diving squad of 25 has 18 members who dive from 10 m and 17 who divide from 5 m. How many dive from both platforms?

Let T represent those who dive from 10 m and
F represent those who dive from 5 m.



$$d = 0 \quad \{\text{as all divers in the squad must dive from at least one of the platforms}\}$$

$$a + b = 18$$
$$b + c = 17 \qquad \therefore \; a = 8, \; b = 10, \; c = 7$$
$$a + b + c = 25$$



$$n(\text{both } T \text{ and } F) = n(T \cap F) = 10$$

10 members dive from both platforms.