1. The universal set U is defined as the set of positive integers less than 15. The subsets A and B are defined as follows:
$A = \{\text{the even numbers}\}$ ← describe
$B = \{\text{prime numbers}\}$

(note: Prime numbers have only themselves and one as factors. One is not considered a prime.)

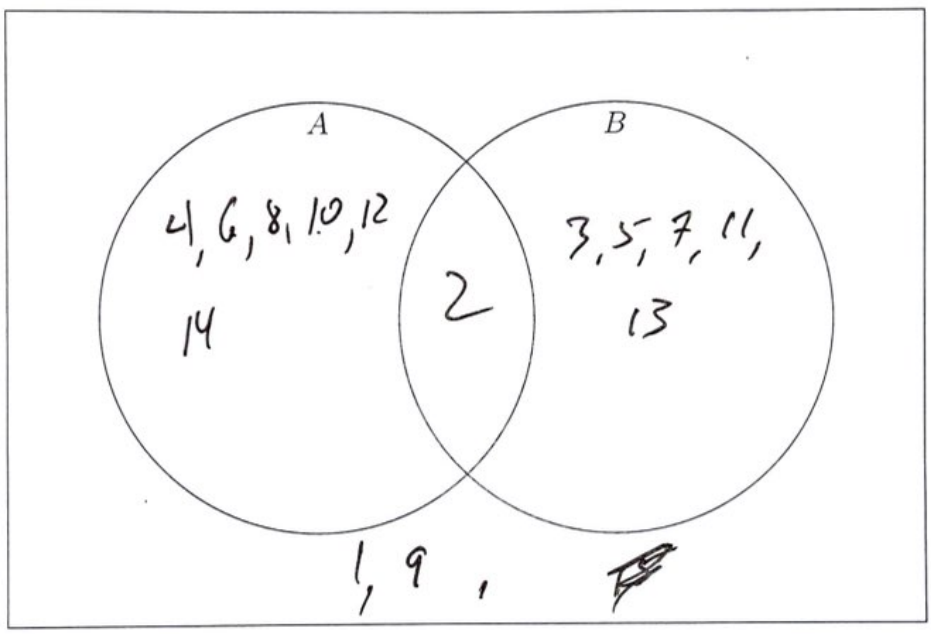
(a) List the members of A

$\{2, 4, 6, 8, 10, 12, 14\}$ LIST ROSTER

(b) List the members of B

$\{2, 3, 5, 7, 11, 13\}$

(c) Place the elements of A and B in the appropriate regions in the Venn diagram below.



(d) List the items in neither set A nor set B, $(A \cup B)'$

$\{1, 9\}$

(e) If an element is selected at random, what is the probability that it is a member of both sets, $(A \cap B)$?

$P(x \in (A \cap B)) = \frac{1}{14}$

2. There are 90 juniors at a school taking courses as follows:

- 27 are taking Algebra
- 35 are taking Botany
- 51 are taking Chemistry
- 11 are taking Algebra and Chemistry
- 6 are taking Algebra and Botany
- 13 are taking Botany and Chemistry
- 4 are taking all three subjects

$27-(2+4+7)=14$

$35-(2+4+9)=20$

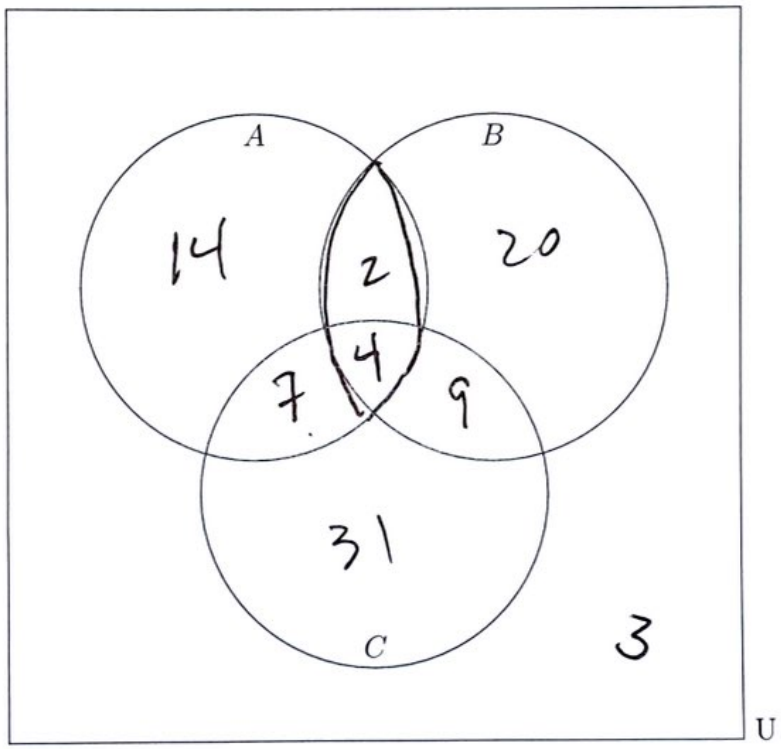
$51-(7+4+9)=31$

$11-4=7$

$6-4=2$

$13-4=9$

Complete the Venn diagram below with the number of students in each region to represent the situation.

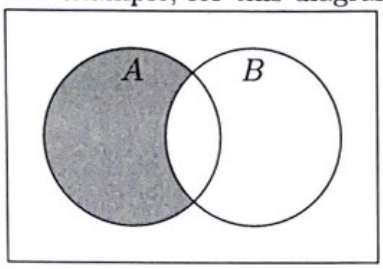


How many juniors are taking none of the three courses?

3

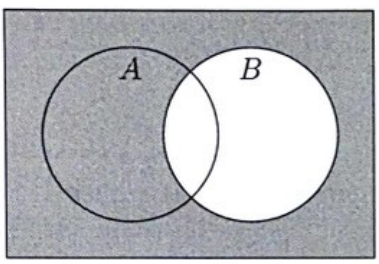
3. For each Venn diagram, write an expression representing the shaded area.

(a) For example, for this diagram



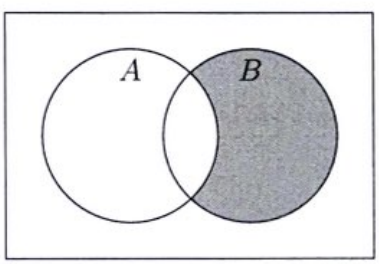
Expression: $A \cap B'$

(b)



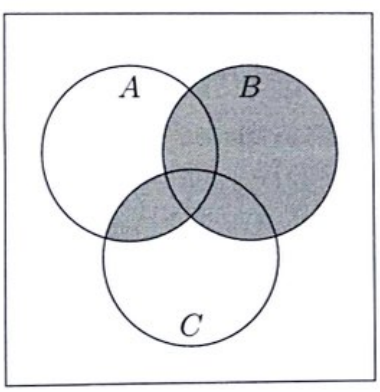
Expression: B'

(c)



Expression: $B \cap A'$

(d)



Expression: $(A \cap C) \cup B$

4. Given:
   $U = \{\text{the letters in the alphabet}\}$
   $A = \{a, b, c, d, e, f, g, h, i, j\}$ $B = \{h, i, j, k, l, m, n, o, p, q\}$

   (a) What is $A \cap B$? $\{h, i, j\}$

   (b) What is $(A \cup B)'$? $\{r, s, t, u, v, w, x, y, z\}$

5. A survey question has three possible responses, A, B, and C. Among 100 surveys, the frequency of the answers collected were as follows: $n(A) = 10, n(B) = 35,$ and $n(C) = 55$.

   (a) If a survey is selected at random, what this the probability the response was B or C? $\frac{35+55}{100} = 0.9$

   (b) What is the probability a survey selected at random was an answer other than B or C? $\frac{10}{100} = 0.1$

6. The events A and B are independent with $\mathrm{P}(A) = 0.3$ and $\mathrm{P}(B) = 0.2$.

   (a) What is $\mathrm{P}(A \cap B)$? $0.3 \times 0.2 = 0.06$

   (b) What is $\mathrm{P}(A \cup B)$? $0.3 + 0.2 - 0.06 = 0.44$

7. The events A and B are mutually exclusive with $\mathrm{P}(A) = 0.4$ and $\mathrm{P}(B) = 0.3$.

   (a) What is $\mathrm{P}(A \cap B)$? $\emptyset$, $P(A \cap B) = 0$

   (b) What is $\mathrm{P}(A' \cup B)$? 0.3