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:

   $A = \{$the even numbers$\}$

   $B = \{$prime numbers$\}$

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

   (a) List the members of A

   (b) List the members of B

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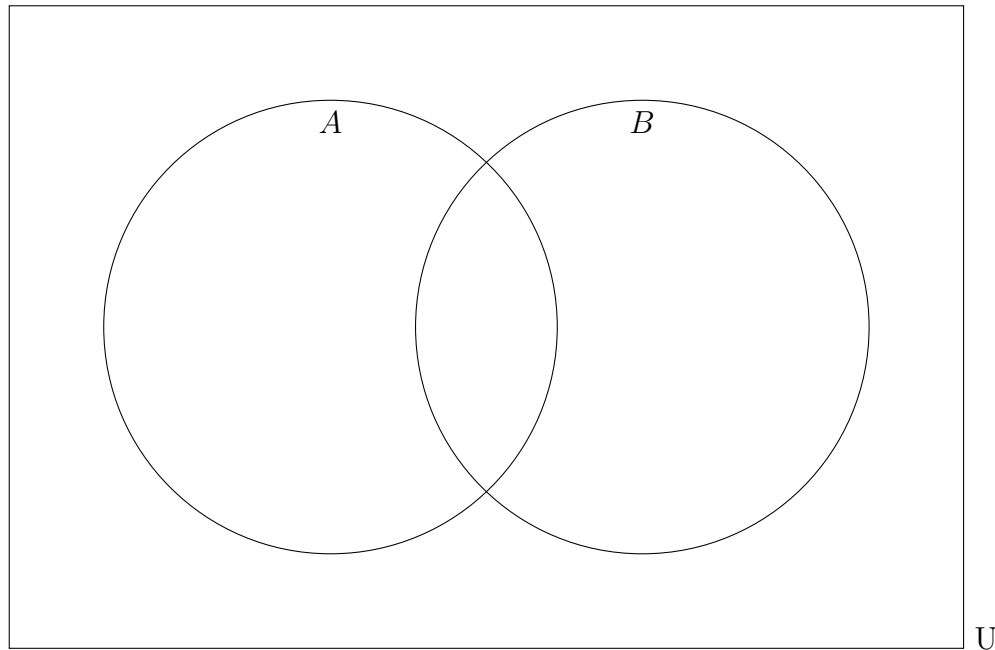

   (d) List the items in neither set A nor set B, $(A \cup B)'$

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

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
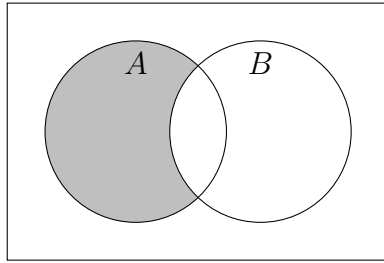- 4 are taking all three subjects

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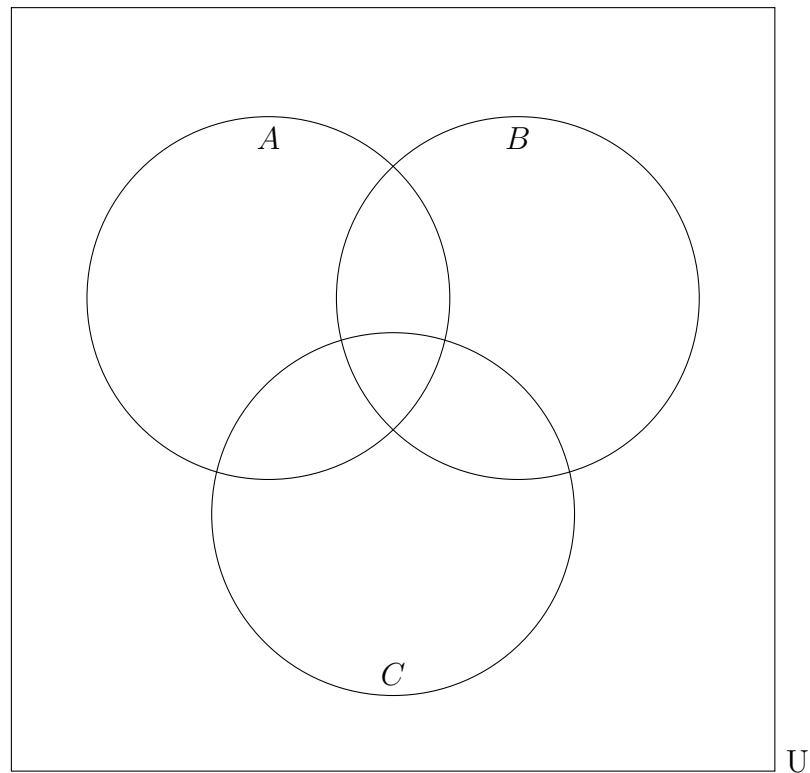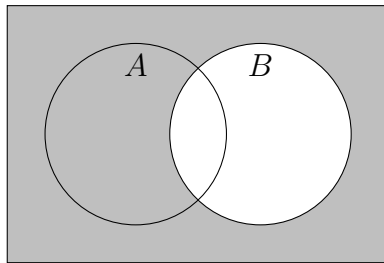

How many juniors are taking none of the three courses?

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

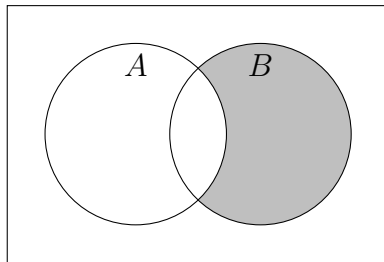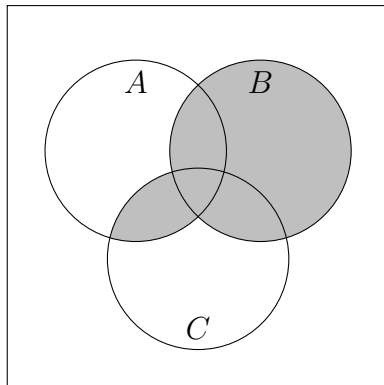(a) For example, for this diagram

Expression: $A \cap B'$

(b)   Expression:

(c)   Expression:

(d)   Expression:

4

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 $A \cap B$?

   (b) What is $(A \cup B)'$?

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?

   (b) What is the probability a survey selected at random was an answer other than B or C?

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

   (a) What is $P(A \cap B)$?

   (b) What is $P(A \cup B)$?

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

   (a) What is $P(A \cap B)$?

   (b) What is $P(A' \cup B)$?

8. Let $y = x^2 - 5x + 4$ and $2x + y = 4$

   (a) Rewrite quadratic in vertex form and state the vertex as an ordered pair.

   (b) Factor the quadratic function and write down its roots.

   (c) Graph the parabola, labeling it. Mark the intercepts and graph the axis of symmetry as a dotted line, labeling it with its equation.

   (d) Graph linear equation and label it with its name or equation.

   (e) Mark the intersections of the two equations as ordered pairs.
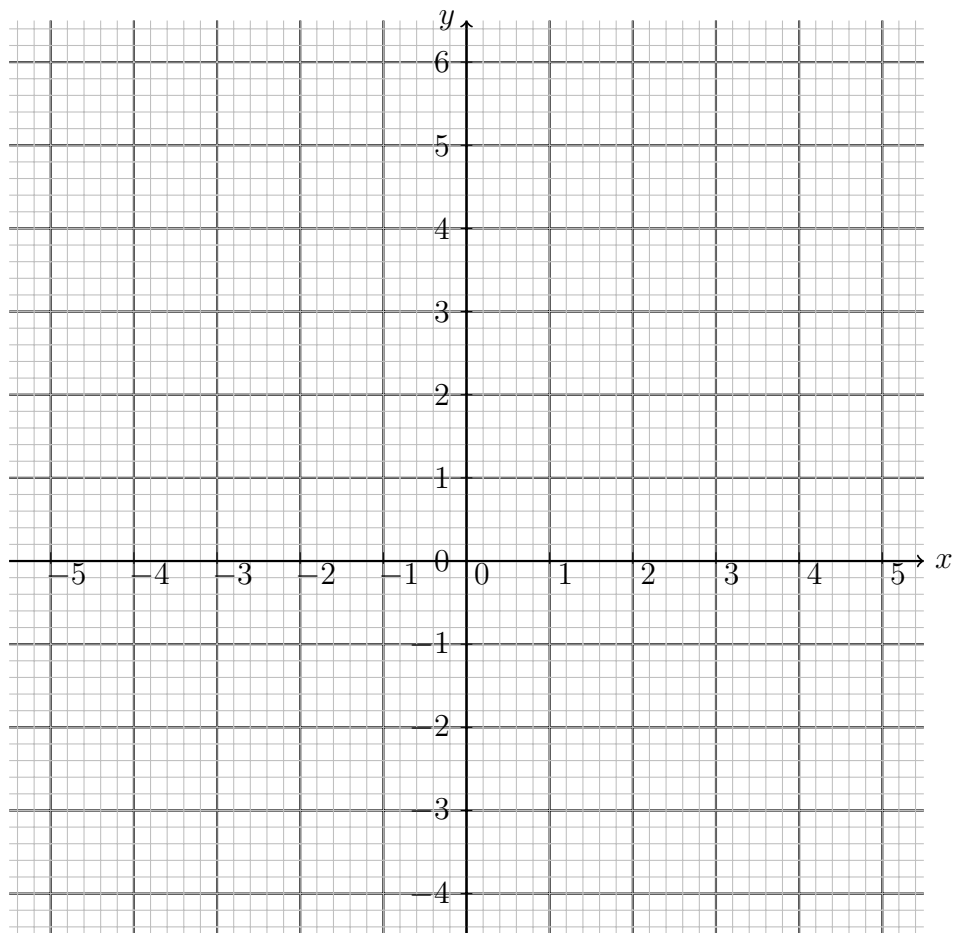
Simplify, leaving no negative or fractional exponents.

9. $2x^{-3}y \times \frac{1}{4}x^2y^{-1}$

10. $a^{\frac{3}{4}} \times (\frac{\sqrt{a}}{b^4})^{\frac{1}{2}}$

11. $\ln e^4$

12. $\log 5^2 + \log 4$

13. $(2x^2 - x - 5)(x - 3) - (x^2 + 3x - 5)(2x - 3)$

14. Factor the expression and then solve for x: $2x^3 - 2x^2 - 24x = 0$

15. Let $f(x) = 2x - 5$ and $g(x) = (x-1)^2$

    (a) Find $(f \circ g)(x)$

    (b) Find $f^{-1}(x)$

16. The function $f(x) = e^x$ is shown on the graph. Sketch $g(x) = f(x-2) + 3$. Plot and label the asymptote(s).