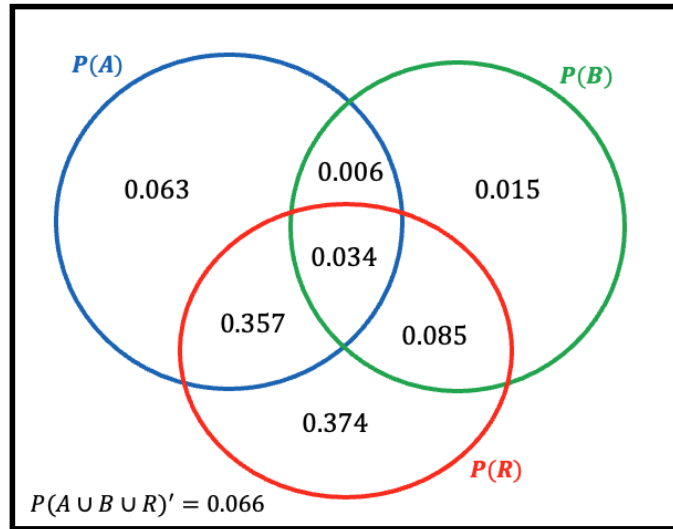**Note:** Your solution should be in the form the questions appear. Do **NOT** change the questions' template or the pages' order. All final values should be approximated to **THREE** decimal places. **No work, no credit!**

1. A person's blood can have the A antigen(A), the B antigen(B), and the Rh factor +(R), in any or no combination. Use the Venn diagram below to answer the questions.

$P(A)$ $P(B)$

0.006

0.063   0.015

0.034

0.357   0.085

0.374

$P(R)$

$P(A \cup B \cup R)' = 0.066$

(a) $P(A) =$

(b) $P(A \cup B) =$

(c) $P(A \cap B) =$

(d) $P(A \cap \overline{B} \cap \overline{R}) =$

(e) $P((A \cap B) \cup R) =$

(f) $P(A \cap (B \cup R)) =$

(g) $P(B|A) =$

(h) $P(R|(A \cap B)) =$

2. A special committee for community development consists of four members from the town council. The council has 15 members: six Democrats, eight Republicans, and one Green. Suppose the committee members are selected at random; (**Use the first letter to define each event.**)

   (a) What is the probability of a committee consisting of all Republicans?

   (b) What is the probability of a committee consisting of two Democrats and two Republicans?

3. The Statistics Canada Annual Greenhouse, Sod Farm, and Nursery Survey includes information about the type of labor in each agricultural sector. The two-way table shows the number of employees in each sector in 2017. Assume a Canadian agricultural worker is selected at random. **For each statement, if it is in words, convert it to symbolic and find the probability. Use the first letter of the word to represent the event.**

	Greenhouse	Farm	Nursery
Seasonal	18741	1140	7268
Permanent	14348	428	3332

   (a) What is the probability that a worker is seasonal?

   (b) Find $P(P|G)$.

(c) Suppose the person does not work in a nursery. What is the probability the worker is seasonal?

(d) Find $P(N|P)$.

(e) What is the probability that the workers is employed at a sod farm given that they are seasonal?
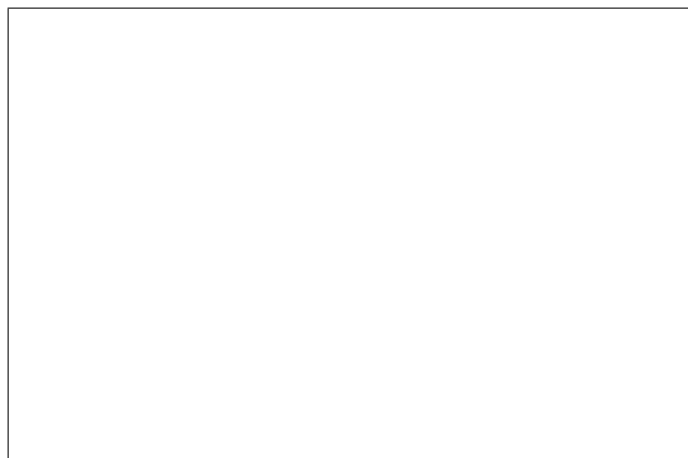
(f) Find $P(S|\overline{G})$.

4. Penicillin was one of the world's first antibiotics, commonly used to treat many bacterial infections. However, many people have allergic reactions to penicillin, including nausea, hives, and rash. Consider the following statements concerning patients' medical records and reactions to penicillin.

- The probability that a patient has a penicillin allergy listed in their medical records is 0.45.

- If the patient has a penicillin allergy listed in their medical records, the probability that they will have a reaction to penicillin is $1/3$.

- The probability of a patient not having a penicillin allergy listed **and** having a reaction is 0.4.

(a) What is the probability of having an allergy **and** a reaction to penicillin?

(b) What is the probability of having a reaction to penicillin?
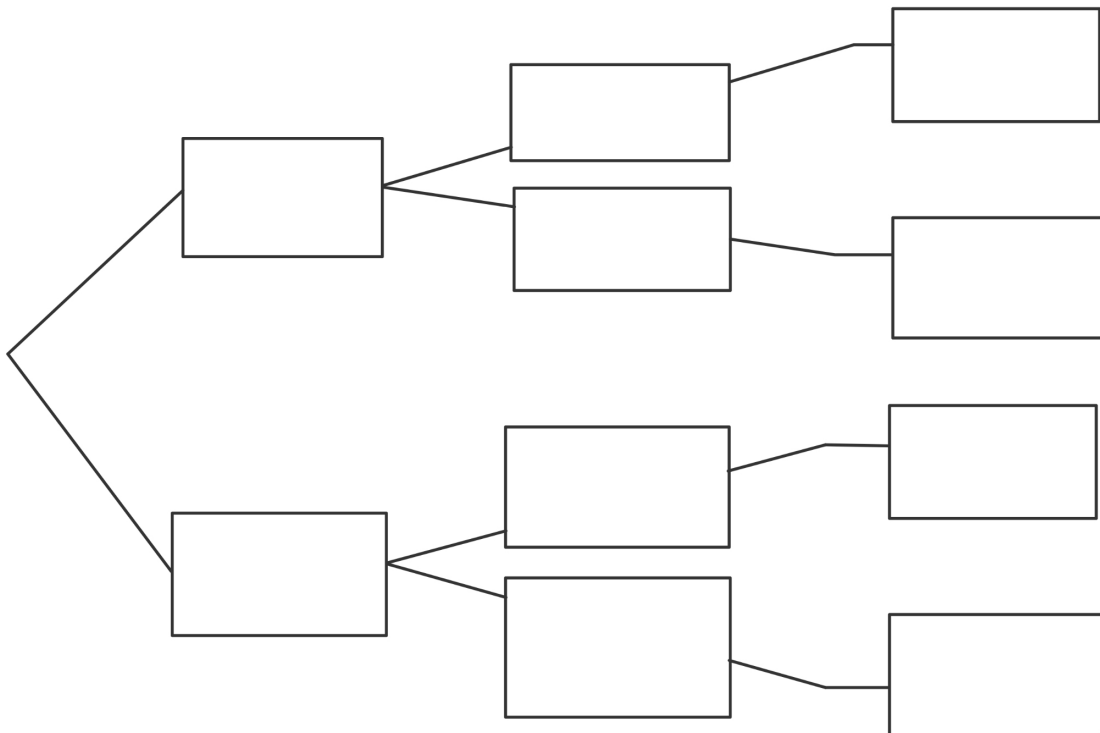
(c) Carefully sketch a Venn diagram with probabilities to illustrate the relationship between the two events $A :=$ penicillin allergy, and $R :=$ reaction to penicillin. **(Label it appropriately)**

(d) Are reaction to penicillin and allergy listing independent events? Justify your answer **mathematically.**

5. You're planning a weekend getaway, and your choice of activity is influenced by the weather forecast and your friend's preferences. The probability of you opting for a hiking trip is 0.4 and 0.3 for a sunny and rainy day, respectively. The weather forecast indicates sunshine in 6 out of every 10 weekends.

(a) Represent this on a tree diagram. Define events as $H :=$ choosing a hiking trip, $S :=$ for a sunny day, and $R :=$ rainy day.

(b) What is the probability that you will choose a hiking trip?