1. Let A be the event that Legolas studied for this exam in the library. Let B be the event that Legolas did not study in the library. A and B are:

    A. independent events

    B. disjoint events

    C. sample spaces

    D. sample statistics

2. If you flip a fair coin 5 times, what is the probability of getting at least one heads?

3. Below are four versions of the same game. In each version, you are flipping a fair coin. After each flip, you calculate the proportion of heads in all flips and you win or lose based on that number. It costs \$1 each time you play the game. Assume you will play 100 times and you want to maximize the amount of money you win. Which game should you choose? Why?

    A. If the proportion of heads is larger than 0.60, you win \$1.

    B. If the proportion of heads is larger than 0.40, you win \$1.

    C. If the proportion of heads is between 0.20 and 0.40, you win \$1.

    D. If the proportion of heads is smaller than 0.30, you win \$1.

4. Suppose you have 4 Sac State shirts and 7 shirts from your high school. Whilst packing for a weekend of camping with friends, you you reach into your drawer full of university shirts and pull three out at random. What is the probability that all three are Sac State shirts?

Consider the following joint probability distribution about household pet ownership:

Joint outcome	Probability
`Cats` and `Dogs`	0.11
`Cats` and `No Dogs`	0.28
`No Cats` and `Dogs`	0.27
`No Cats` and `No Dogs`	0.34

Use the joint distribution table to answer the following **4 questions**.

5. Is this a valid probability distribution? Explain why or why not.

6. What is the probability that a household includes cats?

7. If we know that a household has cats, what is the probability that it also has dogs?

8. What is the probability that a household has cats or dogs (or both)?

Suppose Sac State is considering adding a new student fee. This fee goes toward beneficial programs but some students may not want to pay. A simple random sample of students, both undergraduate and graduate, was taken to gauge student opinions. The possible responses were: approve, disapprove, or not sure (no opinion).

	Approve	Disapprove	Not Sure	Total
Graduate	56	30	101	187
Undergraduate	298	63	214	575
Total	354	93	315	762

Use the table to answer the following **4 questions**. Round answers to 2 decimal places as needed.

9. What proportion of students (both graduate and undergraduate) approve of the fee?

10. What proportion of those surveyed are graduate students or are not sure (or both)?

11. What is the probability a student disapproves given that the student is an undergrad?

12. Is being an undergraduate student independent of disapproving? Are they disjoint? Explain.

Spell-checking software catches "non-word errors", which are a string of letters that is not a word, as when "the" is typed as "teh". When undergraduates are asked to write a 250-word essay (without spell-checking), the number X of non-word errors has the following distribution:

Value of X	0	1	2	3	4
Probability	0.1	0.3	0.3	0.2	0.1

Use this distribution to answer the following **5 questions**.

13. How would you write the probability of at least one non-word error in probability notation?

14. Find the probability of at least one non-word error.

15. What is the mean of this distribution?

16. What is the standard deviation?

17. Describe the event $\{X \leq 2\}$ in words.

Consider the midterm and final for a math class. Suppose 19% of students earned an A on the midterm. Of those students who earned an A on the midterm, 51% received an A on the final, and 9% of the students who earned lower than an A on the midterm received an A on the final.

Use this information to answer the following **two questions** (*hint*: draw a tree diagram).

18. What is the probability that a randomly selected student got an A on the final?

19. You pick up a final exam at random and notice the student received a C. What is the probability that this student earned an A on the midterm?

Table 1: Dog Ownership Data

Number of Dogs, x	0	1	2	≥ 3
Proportion of People, $p(x)$	0.635	0.212	0.131	0.022

20. Table 1 shows the distribution of the number of dogs owned by people in the US.

(a) Find the mean number of dogs owned by people in the US.

(b) What proportion of people have at least one dog?

(c) Consider two categories: (1) people with no dogs and (2) people with dog(s). A random sample of 10 people were asked about their dog ownership. Let Y be the random variable which counts number of people with (some number of) dogs. What is the distribution of Y?

(d) What is the probability that fewer than 3 people out of 10 will have dog(s)?

(e) Now suppose we take a random sample of 100 people and ask whether they have dog(s). Find the probability that between 45 and 80 of them have dog(s).