

Name: _____ Score: _____ / 45

PLEASE DO NOT FILL IN ABOVE! (the "SCORE" blank)

Grade: _____ Team: _____

This is a round consisting of 9 problems that is to be done in 35 minutes. The problems are split into 3 themes, which are in ascending difficulty. For example, problem 3 in category 3 is significantly harder than problem 3 in category 1. The problems within each theme are also in ascending difficulty. The problems are each worth 5 points.

No aids are permitted aside from pencils, pens, and scratch paper. In particular, no calculators or other computers are permitted. Communication with other people is not permitted.

Record your answers in the box corresponding to the correct problem. Only answers printed in the boxes below will be scored.

Your Answers

Jars and Boxes	Ornithology	Willa's Economic Escapades
1.	1.	1.
2.	2.	2.
3.	3.	3.

Jars and Boxes

1. You have 5 red apples and 7 blue apples in a box. What is the least number of blue apples you need to replace with red apples to make the probability of randomly choosing a red apple greater than $\frac{1}{2}$?

2. A box contains a number of potato chip bags of the following flavors: Sour Cream Onion, Barbeque, Salt Vinegar, and Classic. The probability that a randomly selected bag is Sour Cream Onion is $\frac{1}{5}$, the probability for Barbeque is $\frac{1}{4}$, for Salt Vinegar: $\frac{1}{12}$, and for Classic: $\frac{7}{15}$. What is the minimum number of total bags in the box?

3. A jar contains only red and green beans, with 21 beans in total. You don't know exactly how many are of each color, but you know it is equally likely that there are 0, 1, 2, 3, [...], or 21 red beans. What is the probability that the first bean chosen at random is green?

Ornithology*

1. There are 14 members in the coolest club at school, the Bird Watchers' Club. The club wants to send a team of 4 members to compete at a national elimination tournament for bird-watching (where you win by identifying the most number of bird species). How many distinct bird-watching teams can be selected?
2. Katherine takes care of eleven birds in her aviary. Among them are only two kinds: the Glossy Ibis, which has a wingspan of 3 feet, and the Great Blue Heron, which has a wingspan of 6 feet. If there is a total length of 45 feet of wingspan among the birds in Katherine's aviary, how many of the birds are Great Blue Herons?
3. Which of the following choices (A, B, C, D, or E) disproves this statement? "If the bird gives a warning call, then it sees a predator and other birds will give warning calls in the future."
 - A. The bird sees no predator, but the bird gives a warning call.
 - B. There is a predator, the bird does not see it, but other birds give the warning call.
 - C. There is a predator and other birds give warning calls in the future, and the bird gives a warning call.
 - D. There is no predator and no other bird will give warning calls in the future, but the bird gives a warning call.
 - E. None of these

* Ornithology is the scientific study of birds.

Willa's Economic Escapades*

Note: While the same individual, Willa, is featured throughout this theme, all problems represent separate situations that aren't related to each other in any way.

1. Willa plans to fish for 3 hours daily, hoping to catch the legendary "Titanic Bottlefish," which requires 1500 total hours of fishing to find. Each day, after fishing, Willa earns a revenue of \$200 from selling her catch, but will spend 80% of the revenue on bait, and then another \$50 on necessities. What is the minimum whole number of dollars that Willa must start with (she'll steal from her friend) in order to guarantee that she'll find the Bottlefish before going bankrupt?

2. A piggy bank with \$14 is shared between Willa and three other people. At roughly 3:00 PM each day, Willa spends 50% of the money in the piggy bank, and then is equally likely to either lose \$1, waste \$3, or make back \$1. At this rate, what is the probability that the group is bankrupt after 2 days? It is possible for the piggy bank to have negative money.

3. Each day, Willa buys wood for \$50, then puts it up for auction at a nearby market for 3 hours, where there is a limit of 1 bid per hour. For the first hour, there is a 100% chance that someone bids, and for each subsequent hour, the probability that someone bids is halved. For each bid, the auction price of the item increases by 25%. If Willa puts the wood up for auction each day at a starting price of \$36, what is the probability that she makes a profit?

* Some synonyms for the word "escapade": *antic, adventure, stunt, shenanigan*