

**Directions [80 Points Total]**

- Solve for all probabilities **exactly**, and then **approximate** each to three decimal-place accuracy using a calculator (if needed).
  - Write neatly, use correct mathematical symbols, correctly identify and label each calculation and equation.
  - It is your job to make your responses clear, easy to read and easily understood. I will take off points for lack of clarity, even if the correct answer appears on your test, when I get confused about what you did.
1. [10 Points] Two urns are filled with marbles. One marble is selected at random from the first and placed in the second. Then (after stirring), a ball is chosen at random from the second. Find the following probabilities based on the chart below that summarizes the distributions in each urn:

	<b>Color</b>	<b>Number</b>
<b>Urn 1</b>	Red	6
	Blue	4
<b>Urn 2</b>	Green	6
	Blue	3

- a. Find the probability a green ball is selected (in the end).
- b. Find the probability a red ball is selected (in the end).
- c. Find the probability a blue ball is selected (in the end).

2. [10 Points] Having just completed a Master's Degree in Art History, Joe has just landed a new job and is repeating the following probability experiment. He asks each patron, "Would you like fries with that?" He calculates the probability of success (i.e. that the patron does purchase fries) to be  $P(S) = 0.7$ . He repeats this experiment 25 times during one shift, find:

a.  $P(\text{exactly 10 successes})$

b.  $P(15 \text{ or more successes})$

c.  $P(3 \text{ or fewer successes})$

3. [10 Points] Flush-draw flops can help a starting hand that, otherwise, is a real dog. They can also kill a great hand, if an opponent hits the flush draw (or seems to). A flush-draw flop is 3-cards with at least 2 cards of the same suit. Find the probabilities below:
- Knowing none of the other cards in play, what is the probability the 3-card flop has at least 2 cards of the same suit?
  - Knowing none of the other cards in play, what is the probability the 3-card flop has all 3 cards the same suit?
  - What is the probability that, with hero holding an otherwise worthless suited J4, two or more cards of hero's suit hit the flop?



5. [10 Points] Two urns (same as problem #1) are filled with marbles. One marble is selected at random from urn. Find the following probabilities:

	<b>Color</b>	<b>Number</b>
<b>Urn 1</b>	Red	6
	Blue	4
<b>Urn 2</b>	Green	6
	Blue	3

a.  $P(\text{both marbles are green})$

b.  $P(\text{at least one red})$

c.  $P(\text{no blue})$

6. [10 Points] Dr. Sinn is considering dividing a class of 20 students into 4 groups of 5 or 5 groups of 4. Which way has more possible combinations? Justify with precise mathematical calculations.

7. [10 Points] You are holding  $A\heartsuit 2\heartsuit$  late in a tournament. You need to go “all in,” and you wonder what the probability is of hitting your diamond flush by the river with all five board cards to come might be. Calculate and justify.

8. [10 Points] To the nearest penny, find the expected value, variance and standard deviation for the following game. Pay \$5. Draw two cards from standard deck of 52. If both cards are of the same suit, you win \$20. Otherwise, you lose.