AP STATISTICS
PROBLEM SET #7

OCTOBER 25, 2023

Question 1. Make sure to finish the MCQ Problem Set #7 on AP Classroom.

Question 2. A giant spinner has 36 sectors labelled 1 to 36. Determine the probability that when it is spun, the arrow will land on a sector labelled with:

(a) a multiple of 4
(b) a number $6 \leq x \leq 9$
(c) a number $x > 20$
(d) a multiple of 13
(e) a number containing the digit "1"
(f) an odd number that is also a multiple of 3
(g) a multiple of 4 and 6
(h) a multiple of 4 or 6
(i) a multiple of 4 or 6, but not both

Question 3. A school has three printers. On any given day, the Office Printer has an 8% chance of malfunctioning, the Lounge Printer has a 12% chance of malfunctioning, and the Classroom Printer has a 5% chance of malfunctioning. Determine the probability that on any given day that

(a) All three printers malfunction
(b) All three printers are working
(c) Only the Classroom and Office printer are working

Question 4. If $P(A) = 0.2, P(B) = 0.4$, and $P(A \cap B) = 0.05$, find $P(A \cup B)$.

Question 5. If $P(A) = 0.4$ and $P(A \cup B) = 0.9$, and $P(A \cap B) = 0.1$, find $P(B)$ and $P(B^c)$.

Question 6. Suppose A and B are mutually exclusive events with $P(B) = 0.45$ and $P(A \cup B) = 0.8$. Find $P(A)$.

Question 7. Exactly one ball is drawn from each of the bags X, Y and Z as shown below.

bag X   bag Y   bag Z
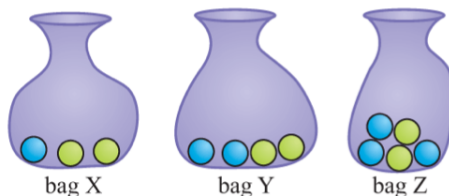
Using a tree diagram, find the probability that

(a) you get 3 blue balls
(b) you get a green ball from bags Y and Z
(c) at least one blue ball is drawn

Question 8. Suppose $P(R) = 0.4$ and $P(S) = 0.5$ and $P(R \cup S) = 0.7$. Are R and S independent events?

Question 9. Suppose $P(X) = 0.4$, $P(Y) = \frac{1}{3}$, and $P(X \cup Y) = 0.5$. Find the following:

(a) $P(X \cap Y)$
(b) $P(X|Y)$
(c) $P(Y|X)$
(d) Are X and Y independent events?

Question 10. Suppose $P(A) = \frac{9}{20}, P(B|A) = \frac{1}{4}$ and $P(B|A^c) = \frac{1}{5}$.

(a) Find $P(B)$.
(b) Are A and B independent events?

Question 11 (Monty Hall). Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the other two doors are goats. If you open the door hiding the car, you win the game and are the new owner of the car. If you open a door hiding a goat, you lose the game and are thrown out of the game show.

You pick a door, say No. 1, and the host, who knows what's behind the doors, opens a *different door*, say No. 3, to reveal a goat. The host then turns to you and asks, "Do you want to switch your choice to door No. 2?"

(a) Draw a tree diagram to represent the problem.
(b) Find the probability that your first choice has the car
(c) Find the probability that the second choice has the car, assuming that you've decided to change your original guess.

Question 12. The English Premier League consists of 20 teams. Newcastle United are a team in the English Premier League and are currently in 8th place on the table. Suppose that Newcastle United have a 20% chance of winning and a 50% chance of losing when playing against any team higher than them on the table. When playing a team below them on the table, Newcastle has a 60% chance of winning and a 30% chance of losing. Find the probability that Newcastle will **draw** (neither win nor lose) their next match.

Hint: consider who their next opponents are, and the probability that their opponent is sitting above/below Newcastle.