Analysis H 2019-20 – Deggeller / Gleason / Tantod  Odds-on-Favorite: Alan Lee

Probability Quiz 2  Period: D

+30/30 11

Awesome!

No Calculators! Because you don't have a calculator you don't need to simplify any answers.

1. You are dealt 5 cards from a deck of 52. The first two cards are an Ace and a King. What is the probability that you will complete the A-K-Q-J-10 straight (suits do not matter)?

$$\frac{1\binom{4}{1}^3}{\binom{50}{3}} \qquad \boxed{\frac{\binom{4}{1}^3}{\binom{50}{3}}}$$

2. In Europe, 90% of all households have a television. 50% of all households have a television and DVD player. 1% of all households own a DVD player, but not a television.

   a) What is the probability that a household has a DVD player, given that it has a television?

| | TELLY | NOT TELLY |
|---|---|---|
| DVD | 50% | 1% |
| NO DVD | 40% | 9% |

$\boxed{5/9}$

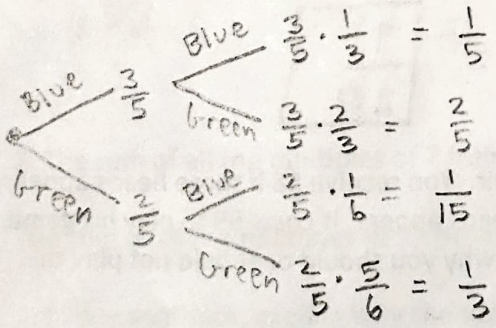
   b) Are the events owning a television and owning a DVD player independent events or not? Show your work to support your answer.

$P(DVD) = 51\%$  Since $P(DVD) \neq P(DVD|TV)$

$P(DVD|TV) = 5/9 \approx 55\%$  the answer is $\boxed{\text{no}}$

3. Jar A has 3 blue and 2 green marbles, and Jar B has 1 blue and 4 green marbles. A random marble is drawn from Jar A and placed in Jar B. Then a random marble is drawn from Jar B. [6]

   a) Draw a tree diagram of the given information.




   b) P (the second marble is green) =

$$\frac{2}{5} + \frac{1}{3} = \boxed{\frac{11}{15}}$$

   c) P (2nd marble is green | 1st marble was blue) =

$$\frac{2}{5} \Big/ \frac{3}{5} = \boxed{\frac{2}{3}}$$

   d) P (1st marble is blue | 2nd marble was green) =

$$\frac{2}{5} \Big/ \frac{2}{5} + \frac{1}{3} = \frac{6}{15} \Big/ \frac{11}{15} = \boxed{\frac{6}{11}}$$

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4. A factory produces components of which 1% are defective. The components are packed in boxes of . A box is selected at random.

a) Find the probability that the box contains exactly one defective component.

$$\binom{10}{1}(0.01)^1(0.99)^9$$

b) Find the probability that there are at least 2 defective components in the box.

$$1 - \binom{10}{1}(0.01)^1(0.99)^9 - \binom{10}{0}(0.99)^{10}$$

5. Three horses, A, B, and C, compete in four races. Assuming that each horse has equal chance of winning in each race,

a) what is the probability that A wins two races and B and C win one race each?

36/81 —— 2, 1, 1

24/81 —— 3, 1, 0

3/81 —— 4, 0, 0

2,2,0 — 18/81

$$\frac{12}{81} = \boxed{\frac{4}{27}}$$

b) what is the probability that the same horse wins all four races?

$$3 \cdot \frac{1}{3}\cdot\frac{1}{3}\cdot\frac{1}{3}\cdot\frac{1}{3} = \boxed{\frac{1}{27}}$$

6. Big Al has a game where he tosses three fair coins in the air. You receive $8 if three heads appear, $4 if two heads appear, $2 if one head appears, and $1 if no heads appear. It costs $5 to play his game. What is the expected value of playing this game? Explain why you should or should not play this game?

$$8\cdot\frac{1}{8} + 4\cdot\frac{3}{8} + 2\cdot\frac{3}{8} + 1\cdot\frac{1}{8} = 1 + \frac{3}{2} + \frac{3}{4} + \frac{1}{8}$$

$$= \frac{8+12+6+1}{8} = \frac{27}{8}$$

$$\frac{27}{8} - 5 = -\frac{13}{8}$$

$$\boxed{-\$\frac{13}{8}}$$

We should not play [illegible] Since, the expected value is negative, we cannot expect to [illegible] instead, we would [illegible] losing money