Nathan Stouffer November 27, 2018

CSCI 246 Problem 9-1

Collaborators: *none*

1.1 Find the probability such that the diagram is a four coloring.

Let A = diagram is a four coloring. $P(A) = \binom{6}{4} * (\frac{1}{5})^4 * (\frac{4}{5})^2 = 0.0153$

2.2 What is the expected number of colors that will be used?

$$\begin{aligned} E(\text{number of colors}) &= P(1 \text{ color}) * 1 + P(2 \text{ colors}) * 2 + P(3 \text{ colors}) * 3 + P(4 \text{ colors}) * 4 + P(5 \text{ colors}) * 5 \\ &= \binom{6}{1} * (\frac{1}{5})^6 * (\frac{4}{5})^0 * 1 + \binom{6}{2} * (\frac{1}{5})^5 * (\frac{4}{5})^1 * 2 + \binom{6}{3} * (\frac{1}{5})^4 * (\frac{4}{5})^2 * 3 \\ &+ \binom{6}{4} * (\frac{1}{5})^3 * (\frac{4}{5})^3 * 4 + \binom{6}{5} * (\frac{1}{5})^2 * (\frac{4}{5})^4 * 5 \\ &= 0.000384 + 0.00768 + 0.06144 + 0.24576 + 0.49152 \\ &= 0.806784 \end{aligned}$$

Therefore, $E(\text{number of colors}) = 1$ by rounding up.

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CSCI 246 Problem 9-2

Collaborators: *none*

Section 9.1, Problem 20

1. Let $A =$ original choice wins the prize. $P(A) = \dfrac{\text{winning options}}{\text{total options}} = \dfrac{1}{5}$
2. Let $B =$ switching doors wins the prize. $P(B) = \dfrac{\text{winning options}}{\text{total options}} = \dfrac{1}{4}$

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CSCI 246 Problem 9-3

Collaborators: *none*

Section 9.2, Problem 7

a. Possibility tree

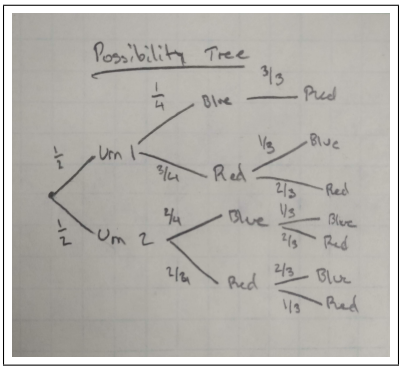

Figure 1: Possibility tree

b. n = number of possibliities = number of possibilites in each urn $= 4 * 3 + 4 * 3 = 12$

c. $P(\text{2 red balls}) = \frac{1}{2} * \frac{3}{4} * \frac{2}{3} + \frac{1}{2} * \frac{2}{4} * \frac{1}{3} = \frac{1}{4} + \frac{1}{12} = \frac{1}{3}$

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CSCI 246 Problem 9-4

Collaborators: *none*

Section 9.3, Problem 16

a. Let p be the number of combinations of four hexadecimal digits without repeats. Then, $p = 16*15*14*13 = 43680$

b. Let q be the number of combinations of four hexadecimal digits with repeats. Then, $q = (total number of combinations) - p = 16^4 - p = 21856$

c. $P(p) = \dfrac{p}{\text{total number of combinations}} = \dfrac{21856}{16^4} = 0.3335$

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CSCI 246 Problem 9-5

Collaborators: *none*

Barbara Liskov

References to online resources are provided as footnotes.

Barbara Liskov is an American Computer Scientist born in the late 1930s who made major contributions to the design of modern programming languages and is one of the most famous women in computer science. According to the Encyclopedia Britannica, Liskov also worked on "artificial intelligence projects at Stanford University." [1] Liskov's contributions to programming languages make our job a lot easier in terms of design and implementation of code.

[1] `https://www.britannica.com/biography/Barbara-Jane-Liskov`