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CSSC263 Exercise #1

A) In the best case SILLY will only execute one print statement (line 1) and print A.

This will only happen when A == B, B == C, A == C which is the negation of the

if statements in lines 2 and 4 so that lines 3 and 5 will not execute.

B)

Let m be the number of items in the set {1, 2 ... m} which A, B and C belong to

such that m >= 1.

$P(A == B) = 1/m$ //chance B will not be printed

$P(B == C$ or $C == A) = 1/m + 1/m$ //chance C will not be printed

$P(A == B$ & $B == C) = P(A == B) * P(B == C) = 1/m * 2/m = 2/m^2$.

The probability of the best case occuring is $2/m^2$.

C) In the worst case A != B and B != C and A != C then all (3) the print statements will execute

since it passes all the if statements (lines 2 and 4) and it will execute lintes 3 and 5

(the print statements) right after executing line 1. It would print A then B then C.

D) $P(A != B) = (m - 1) / m = (1 - 1/m)$ //m - 1 since B relies on a set of size m but in m

                                                                                    //there exists

one number that equals A

  $P(B != C$ AND $A != C) = (m - 2) / m = (1 - 2/m)$ //m - 1 since C relies on a set of size m

there exists TWO number that equals A and B

$P(A \neq B \ \& \ B \neq C \ \text{AND} \ A \neq C) = P(A \neq B) * P(B \neq C \ \text{AND} \ A \neq C) = (1 - 1/m) * (1 - 2/m)$

$$= 1 - 2/m - 1/m + 2/m^2$$

$$= 1 - 3/m + 2/m^2$$

The probability of the worst case occuring is $1 - 3/m + 2/m^2$ where

m is the number of items in the set {1, 2 ... m} which A, B and C belong to

such that m >= 1.

E) We are assuming our sample space has a discrete uniform distribution.

The expected value formula for discrete uniform distribution is:

$E(X) = (a+b)/2$ where a is the best runtime and b is the worst runtime.

$E(X) = (1+3)/2 = 2$

The expected number of print statements executed by SILLY is 2.