**Instruction Manual**

Firstly, you will need download and install python 3.7.3 or higher on your system. Next, open “Start Menu” and type “cmd” and hit “Enter”. Lastly, type “py avg-probabilty-solution.py” in the cmd and hit “Enter”. After hitting “Enter”, a small window will pop up in the corner of your screen. This means that the program is running successfully on your system. Python 3 (3.7.3) is used during the development of this program

**Solution**

Assuming that one of the two buckets is chosen at random and then one of the balls from that bucket is chosen at random. I will put to put 1 red ball in 1 of the buckets and all the other 99

balls in the other bucket. This gives a less than 75% chance of having a red ball being chosen. Therefore, there will be a 50% chance of selecting the bucket containing 1 ball with a 100% chance of selecting a red ball from that bucket. And a 50% chance of selecting the bucket containing 99 balls with a 49.5% (45/99) chance of selecting a red ball from the bucket

Total probability of selecting a red ball is

(50% % 100%) + (50% \* 49.5%) = 74.7%.

**Program Capabilities**

The program can simulate the solution by clicking on the “Simulate” button on the Show Solution window. The program generates a random number from 0 to 1. When the program generates number 0, it can be assumed that the ball is chosen.

**Code**

#ryan

# Import tkinter library

from tkinter import \*

from tkinter.ttk import \*

# Import random library

import random

# creates a Tk() object

master = Tk()

# root window

master.resizable(width=True, height=True)

master.title('Probability GUI')

# function to open a new window

# on a button click

def openSolution():

# Toplevel object which will

# be treated as a new window

solutionWindow = Toplevel(master)

# new window

solutionWindow.geometry("400x350")

solutionWindow.title("Show Solution")

# display solution

Label(solutionWindow,

text ="Bucket A \t Bucket B \n1 \t\t 49 \n0 \t\t 50 \n").pack()

solution = 'Solution: \n' \

+ 'Assuming that one of the two buckets is chosen at random \n' \

+ 'and then one of the balls from that bucket is chosen at random. \n' \

+ 'You want to put 1 red ball in 1 of the buckets and all of the other 99 \n' \

+ 'balls in the other bucket. This gives you just slightly less than a 75% \n' \

+ 'change of having a red ball chosen. There’s a 50% chance of \n' \

+ 'selecting the bucket containing 1 ball with a 100% chance of \n' \

+ 'selecting a red ball from that bucket. And a 50% chance of \n' \

+ 'selecting the bucket containing 99 balls with a 49.5% (49/99) \n' \

+ 'chance of selecting a red ball from that bucket. \n' \

+ 'Total probability of selecting a red ball is \n\n' \

+ '(50% % 100%) + (50% \* 49.5%) = 74.7%.'

Label(solutionWindow,

text =solution).pack()

btnSim = Button(solutionWindow,

text ="Simulate",

command = runSims)

btnSim.pack(pady = 5)

btnRun = Button(solutionWindow,

text ="Run Solution",

command = runSolution)

btnRun.pack()

def runSims(a\_simulations = 1, b\_simulations = 99):

# Toplevel object which will

# be treated as a new window

runWindow = Toplevel(master)

# new window

runWindow.geometry("400x400")

runWindow.title("Simulate")

# create a horizontal scrollbar by

# setting orient to horizontal

h = Scrollbar(runWindow, orient = 'horizontal')

# attach Scrollbar to root window at

# the bootom

h.pack(side = BOTTOM, fill = X)

# create a vertical scrollbar-no need

# to write orient as it is by

# default vertical

v = Scrollbar(runWindow)

# attach Scrollbar to root window on

# the side

v.pack(side = RIGHT, fill = Y)

# create a Text widget with 15 chars

# width and 15 lines height

# here xscrollcomannd is used to attach Text

# widget to the horizontal scrollbar

# here yscrollcomannd is used to attach Text

# widget to the vertical scrollbar

t = Text(runWindow, width = 40, height = 40, wrap = NONE,

xscrollcommand = h.set,

yscrollcommand = v.set)

countRA = 0 # Bucket A Red Balls

countBA = 0 # Bucket A Blue Balls

t.insert(END,"Simulating picking a ball in A Bucket\n")

# insert some text into the text widget

for i in range(a\_simulations):

getRand = random.randint(0,1)

if getRand == 0:

t.insert(END,"\nCollected a Red ball\n")

countRA = countRA + 1

else:

t.insert(END,"\nCollected a Blue ball\n")

countBA = countBA + 1

totalA = '\nRED BALL:', countRA, '\nBLUE BALL:', countBA ,"\n"

t.insert(END,totalA)

countRB = 0 # Bucket B Red Balls

countBB = 0 # Bucket B Blue Balls

t.insert(END,"\nSimulating picking a ball in B Bucket\n")

# insert some text into the text widget

for i in range(b\_simulations):

getRand = random.randint(0,1)

if getRand == 0:

t.insert(END,"\nCollected a Red ball\n")

countRB = countRB + 1

else:

t.insert(END,"\nCollected a Blue ball\n")

countBB = countBB + 1

totalB = '\nRED BALL:', countRB, '\nBLUE BALL:', countBB

t.insert(END,totalB)

avgP = ((50/100)/(100/100))\*100 + ((countRB/99)\*(50/100))\*100

formatting = '{:.2f}'.format(avgP)

avgPans = "\nAverage Probabilty of getting a \n"

avgPansCont = "RED Ball is", formatting, "%"

join = avgPans, avgPansCont

t.insert(END, join)

btnRunS = Button(runWindow,

text ="Simulate",

command = runSims)

btnRunS.pack(pady = 10)

# attach Text widget to root window at top

t.pack(side=TOP, fill=X)

# here command represents the method to

# be executed xview is executed on

# object 't' Here t may represent any

# widget

h.config(command=t.xview)

# here command represents the method to

# be executed yview is executed on

# object 't' Here t may represent any

# widget

v.config(command=t.yview)

def runSolution():

# Toplevel object which will

# be treated as a new window

runSWindow = Toplevel(master)

# new window

runSWindow.geometry("400x400")

runSWindow.title("Run Solution")

countRA = 1 # Bucket A Red Balls

countBA = 0 # Bucket A Blue Balls

countRB = 49 # Bucket B Red Balls

countBB = 50 # Bucket B Blue Balls

avgP = ((50/100\*100/100) + ((countRB/99)\*50/100))\*100

formatting = '{:.2f}'.format(avgP)

avgPans = "\nAverage Probabilty of getting a RED Ball is", formatting, "%"

label = Label(runSWindow,

text =avgPans)

label.pack(pady = 10)

# display question

intro = 'There are 2 buckets named A and B and it is filled \n' \

+ 'with a total of 100 balls. There are 50 blue balls \n' \

+ 'and 50 red balls. Give a solution so that the average \n' \

+ 'probabilty of a red ball gets chosen is 74%. \n'

label = Label(master,

text =intro)

label.pack(pady = 10)

# a button that opens the solution window

btn = Button(master,

text ="Show solution",

command = openSolution)

btn.pack(pady = 10)

# mainloop, runs infinitely

mainloop()