Student Information

Full Name : Furkan KARACA
Id Number: 2521698

Answer 1

a)
Blue: $\frac{1}{6} * (1+2+3+4+5+6) = \frac{21}{6}$
Yellow: $\frac{1}{8} * (1+1+1+3+3+3+4+8) = 3$
Red: $\frac{1}{10} * (2+2+2+2+2+3+3+4+4+6) = 3$

b) I would prefer to roll the blue die 3 times since its expected value is bigger, therefore I have more chance to get a bigger sum. 3 Blue = 21/2, 3 different 19/2
c) Making a quick calculation, 3 times blue expected value is 10.5, and new expected value sum of three different dice is $(8 * 1 + \frac{21}{6} + 3) = 14.5$ so I prefer rolling 3 different dice.
d) We use the Bayes Rule and Law of Total Probability rules for solving the problem.
Let's say P{R} is the probability of picking the red die, P{U} is the probability of having value 3. P{Y} is probability of picking yellow die and P{B} is probability of picking blue die
$P\{U|R\} = 0.2$
P{R}=$\frac{1}{3}$
$P\{R|U\}=\frac{P\{U|R\} * P\{R\}}{P\{U|R\} * P\{R\} + P\{U|Y\} * P\{Y\} + P\{U|B\} * P\{B\}}$
Calculated as $\frac{\frac{1}{5} * \frac{1}{3}}{\frac{1}{5} * \frac{1}{3} + \frac{3}{8} * \frac{1}{3} + \frac{1}{6} * \frac{1}{3}} = \frac{24}{89}$
e) B=1 Y=4, B=2 Y=3, B=4 Y=1 are the situations.
$\frac{3}{8} * \frac{1}{6} + \frac{3}{8} * \frac{1}{6} + \frac{1}{8} * \frac{1}{6} = 0.146$ is the answer

Answer 2

a) For this part, we should use binomial distribution. We must sum the events between 4 discounts to 80 discounts but it is easier to calculate 1-(sum 0 discounts to 3 discounts) and they are mathematically the same.
$1 - \sum(x = 0 \text{ to } 3)\binom{n}{x} 0.025^x * 0.975^{(80-x)}$ is the formula where n=80, p=0.025 and q=0.975
Calculating the summation, 0.14106 is the answer
b) It seems easy to calculate the probability of offering 0 times discounts for 2 days and subtract

it from 1. We can find P(0) by using Poisson distribution.
General formula of $\lambda = n * p$ and general formula of P=$e^{\lambda} * \frac{\lambda^x}{x!}$
For distributor A:
$\lambda = 2 * 80 * 0.025 = 4$, $P(0)_A = e^{-4} = 0.0183$
For distributor B:
$\lambda = 2 * 1 * 0.1 = 0.2$ and
$P(0)_B = e^{-0.2} = 0.8187$, $0.819 * 0.0183 = 0.01498$
$1 - 0.01498 = 0.9850$

Answer 3

My code for the calculations is at the end:

I wrote this code and ran it. I observed that the expected value of 3 blue dice is more than 3 different dice in 1000 tries. Also, the percentage of the total of 3 blue is more than the percentage of 3 different dice. I choose to throw 3 blue dice in Q1 and now I proved it with this octave code.

```
octave:5> source("my_script.m")
Avg total value of 1000  dice rolls of 3 different dice: 9.554
Average total value of 1000  dice rolls of 3 blue dice : 10.499
Percentage of 3 blue bigger than 3 differents: 64.90
```

```
yuzlermavi = [1,2, 3, 4,5, 6];
yuzlersari = [1,1,1,3,3, 3, 4,8];
yuzlerkirmizi = [2,2,2,2,2, 3,3,4, 4, 6];
topred = 0;
topmavi = 0;
topsari = 0;
topdif =0;
top3blue=0;
for i = 1:1000
roll1 = randi(10);
roll2 = randi(6);
roll3 = randi(8);
roll4 = randi(6);
roll5 = randi(6);
roll6 = randi(6);
topred = topred + yuzlerkirmizi(roll1);
topsari=topsari+yuzlersari(roll3);
topmavi=topmavi+yuzlermavi(roll2);
topmavi2=topmavi+yuzlermavi(roll4);
topmavi3=topmavi+yuzlermavi(roll5);
topmavi4=topmavi+yuzlermavi(roll6);

if (yuzlerkirmizi(roll1)+yuzlersari(roll3) +yuzlermavi(roll2))>=
    (yuzlermavi(roll4)+yuzlermavi(roll5)+yuzlermavi(roll6))
    topdif=topdif+1;
endif
endfor
topred=topred/1000;
topsari=topsari/1000;
topmavi=topmavi/1000;
topmavi2=topmavi2/1000;
topmavi3=topmavi3/1000;
topmavi4=topmavi4/1000;
avgTotalDiff = topred + topmavi + topsari;
avgTotalMavi = topmavi2+topmavi3+topmavi4;

fprintf('Avg total value of 1000  dice rolls of 3 different dice: %d \n'
    avgTotalDiff);
fprintf('Average total value of 1000  dice rolls of 3 blue dice : %d \n'
    avgTotalMavi);
fprintf('Percentage of 3 blue bigger than 3 differents: %.2f\n', (1000
    -topdif)/10);


```