

# Student Information

Full Name : Unal Hasanli

Id Number : 2589877

## Answer 1

a)

To find the **expected value** for every dice we need to find their respective average values.

Blue:  $(1 + 2 + 3 + 4 + 5 + 6)/6 = 3.5$

Yellow:  $(1 + 1 + 1 + 3 + 3 + 3 + 4 + 8)/8 = 3$

Red:  $(2 + 2 + 2 + 2 + 2 + 3 + 3 + 4 + 4 + 6)/10 = 3$

b)

**1st case:** overall expected value of this case is the mean of all dices' individual expected value:

$$(3.5 + 3 + 3)/3 = 3.1\bar{6}$$

**2nd case:** overall expected value of this case is the same as blue dice itself:

$$(3.5 + 3.5 + 3.5)/3 = 3.5$$

Therefore, since  $3.1\bar{6} < 3.5$ , the second option is preferable.

c)

In the given case, the overall expected value would increase:

$$(3.5 + 8 + 3)/3 = 4.8\bar{3}$$

Therefore, since  $4.8\bar{3} > 3.5$ , the first option becomes preferable.

d)

Let the probabilities of randomly choosing and rolling red, yellow and blue dices respectively be:  $C(B(x)), C(Y(x)), C(R(x))$  Then, the probability of rolling a 3 from each dice becomes:

$$B(3) = 1/6$$

$$Y(3) = 3/8$$

$$R(3) = 2/10 = 1/5$$

Since we know that 3 is already rolled, we can use the **Bayes Rule** to find the probability of the rolled dice being red:

$$\begin{aligned} & \frac{C(R(3))}{C(B(3)) + C(Y(3)) + C(R(3))} \\ &= \frac{1/3 * 1/5}{1/3 * 1/6 + 1/3 * 3/8 + 1/3 * 1/5} \\ &= \frac{24}{89} \end{aligned}$$

e)

There are 3 cases possible:

$$B(1) * Y(4), B(2) * Y(3), B(4) * Y(1)$$

plugging in the values and summing up, we get:

$$\begin{aligned} & 1/6 * 1/8 + 1/6 * 3/8 + 1/6 * 3/8 \\ &= \frac{7}{48} \end{aligned}$$

## Answer 2

a)

To find the probabaility of at least 4 distributors of company A offering a discount, we can find and deduct complementary probability (no, 1, 2, 3 distributor cases):

$$P(\geq 4 \text{ distributors offering a discount}) = 1 - P(< 4 \text{ distributors offering a discount})$$

$$P(\geq 4 \text{ distributors offering a discount}) = 1 - (P(0 \text{ dist.}) + P(1 \text{ dist.}) + P(2 \text{ dist.}) + P(3 \text{ dist.}))$$

Using the **Binomial distribution** and choosing  $n = 80$ :

$$\begin{aligned} P(\geq 4 \text{ distributors offering a discount}) &= 1 - ((1 - 0.025)^{80} + \binom{80}{1} * 0.025 * (1 - 0.025)^{79} \\ &\quad + \binom{80}{2} * 0.025^2 * (1 - 0.025)^{78} + \binom{80}{3} * 0.025^3 * (1 - 0.025)^{77}) \approx 0.1407 \end{aligned}$$

b)

Again, to find the probability of being able to buy a phone in 2 days, we look at the complementary probabilities (not being able to buy a phone) of store 1 and store 2 respectively.

In the case of store 1, we can find the no discount case using **Binomial distribution**:

$$P(\text{no discount}) = (1 - 0.025)^{80} \approx 0.1319$$

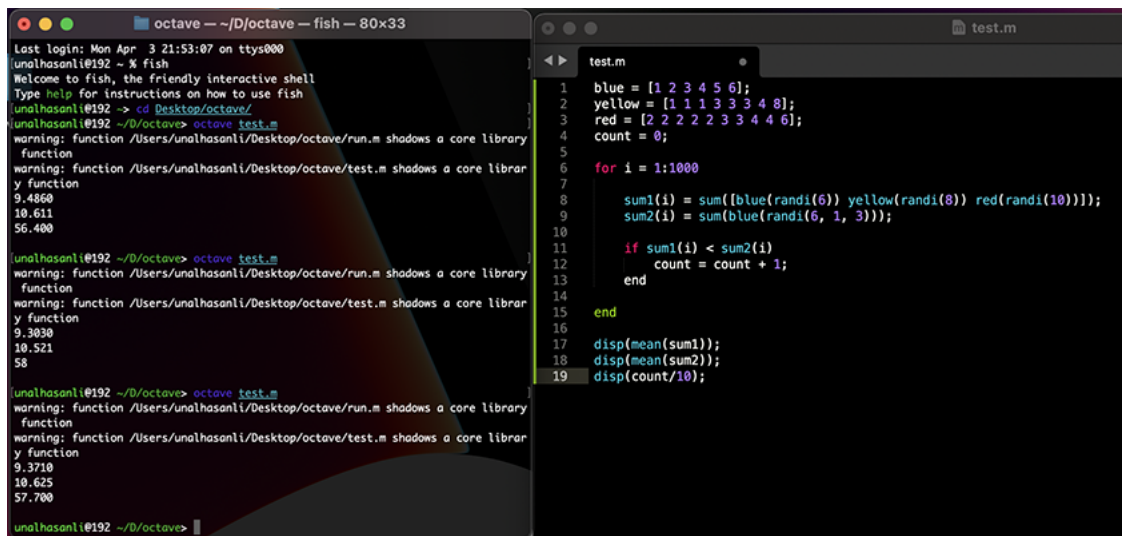
In the case of store 2, we can find the no discount case with a simple deduction operation since the store has exactly 1 distributor:

$$1 - 0.1 = 0.9$$

Finally, we find the square of the multiplication of above given probabilities since we are tasked to work with 2 days and find the complement to reach required number:

$$1 - (0.9 * 0.1319)^2 \approx 0.9859$$

## Answer 3



```
octave -- ~/D/octave -- fish -- 80x33
Last login: Mon Apr 3 21:53:07 on ttys000
unalhasanli@192 ~ % fish
Welcome to fish, the friendly interactive shell
Type help for instructions on how to use fish
unalhasanli@192 -> cd Desktop/octave/
unalhasanli@192 ~/D/octave> octave test.m
warning: function /Users/unalhasanli/Desktop/octave/run.m shadows a core library
function
warning: function /Users/unalhasanli/Desktop/octave/test.m shadows a core library
function
y function
9.4860
10.611
56.400
unalhasanli@192 ~/D/octave> octave test.m
warning: function /Users/unalhasanli/Desktop/octave/run.m shadows a core library
function
warning: function /Users/unalhasanli/Desktop/octave/test.m shadows a core library
function
y function
9.3030
10.521
58
unalhasanli@192 ~/D/octave> octave test.m
warning: function /Users/unalhasanli/Desktop/octave/run.m shadows a core library
function
warning: function /Users/unalhasanli/Desktop/octave/test.m shadows a core library
y function
9.3710
10.625
57.700
unalhasanli@192 ~/D/octave>

test.m
1 blue = [1 2 3 4 5 6];
2 yellow = [1 1 1 3 3 3 4 8];
3 red = [2 2 2 2 2 3 3 4 4 6];
4 count = 0;
5
6 for i = 1:1000
7
8     sum1(i) = sum([blue(randi(6)) yellow(randi(8)) red(randi(10))]);
9     sum2(i) = sum(blue(randi(6, 1, 3)));
10
11     if sum1(i) < sum2(i)
12         count = count + 1;
13     end
14 end
15
16 disp(mean(sum1));
17 disp(mean(sum2));
18 disp(count/10);
```

The results vary as expected, since the sample size is fairly limited.

And here is the code that is displayed on the screenshot before:

```
blue = [1 2 3 4 5 6];
yellow = [1 1 1 3 3 3 4 8];
red = [2 2 2 2 2 3 3 4 4 6];
count = 0;

for i = 1:1000
    sum1(i) = sum([blue(randi(6)) yellow(randi(8)) red(randi(10))]);
```

```
    sum2(i) = sum(blue(randi(6, 1, 3)));

    if sum1(i) < sum2(i)
        count = count + 1;
    end
end

disp(mean(sum1));
disp(mean(sum2));
disp(count/10);
```