# **Student Information**

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## Answer 1

**a**)

For blue:

$$P(1) = 1/6$$
,  $P(2) = 1/6$ ,  $P(3) = 1/6$ ,  $P(4) = 1/6$ ,  $P(5) = 1/6$ ,  $P(6) = 1/6$ .

$$E(X) = \sum xP(x) = 1 \cdot 1/6 + 2 \cdot 1/6 + 3 \cdot 1/6 + 4 \cdot 1/6 + 5 \cdot 1/6 + 6 \cdot 1/6 = 3.5.$$

For yellow:

$$P(1) = 3/8, P(3) = 3/8, P(4) = 1/8, P(8) = 1/8.$$

$$E(X) = 1 \cdot 3/8 + 3 \cdot 3/8 + 4 \cdot 1/8 + 8 \cdot 1/8 = 3.$$

For red:

$$P(2) = 1/2, P(3) = 1/5, P(4) = 1/5, P(6) = 1/10.$$

$$E(X) = 2 \cdot 1/2 + 3 \cdot 1/5 + 4 \cdot 1/5 + 6 \cdot 1/10 = 3.$$

b)

I would prefer rolling three blue dices because:

Expected total value of rolling a single dice of each colors:  $E_{blue}(X) + E_{yellow}(X) + E_{red}(X) = 9.5$ . Expected total value of rolling 3 blue dices:  $E_{blue}(X) \cdot 3 = 10.5$ .

10.5 > 9.5.

 $\mathbf{c})$ 

Expected total value of rolling a single dice of each colors would change to 14.5. That's why, I would choose rolling a single dice of each colors.

$$E_{blue}(X) + 8 + E_{red}(X) = 14.5 > E_{blue}(X) \cdot 3 = 10.5.$$

 $\mathbf{d}$ )

V: value of the dice is 3

R: the rolled dice is red

The question is asking us to find P(R|V), which is equal to  $\frac{P(V|R)\cdot P(R)}{P(V)}$ .

P(V|R) = 2/10 = 1/5.

P(R) = 1/3.

P(V) = 6/24 = 1/4. (total number of 3's divided by total number of values)

Hence,  $P(R|V) = \frac{\frac{1}{5} \cdot \frac{1}{3}}{\frac{1}{4}} \approx 0.2667.$ 

**e**)

1 from blue, 4 from yellow:  $P_{blue}(1) \cdot P_{vellow}(4) = 1/6 \cdot 1/8 = 1/48$ .

2 from blue, 3 from yellow:  $P_{blue}(2) \cdot P_{yellow}(3) = 1/6 \cdot 3/8 = 3/48$ .

4 from blue, 1 from yellow:  $P_{blue}(4) \cdot P_{yellow}(1) = 1/6 \cdot 3/8 = 3/48$ .

Result:  $1/48 + 3/48 + 3/48 = 7/48 \approx 0.1458$ .

# Answer 2

**a**)

I will use Poisson approximation of Binomial Distribution in this part.

 $n = 80, \ p = 0.025 \ \rightarrow \lambda = n \cdot p = 2.$ 

 $P{X >= 4} = 1 - F(3) = 1 - 0.857 = 0.143.$ 

**b**)

I will use Poisson approximation of Binomial Distribution for Company A, Binomial Distribution for Company B.

A: company A offers a discount

B: company B offers a discount

C: a discount is offered

We will try to find  $P_C\{X >= 1\}$  which means at least 1 discount is offered (assuming that we can buy a phone when at least 1 discount is offered).

 $P_A\{X>=1\}$  means that at least 1 discount is offered by company A. Since  $\lambda=2$  for one day for A (found in the previous part), for two days,  $\lambda=4$ .  $P_A\{X>=1\}=1-F_A(0)=0.982$ .

 $P_B\{X>=1\}$  means that at least 1 discount is offered by company B. Since we are doing the experiment for 2 days, n=2. Also, p=0.1 which is given.  $P_B\{X>=1\}=1-F_B(0)=0.190$ .

With  $\lambda = 4$ ,  $P_A\{X = 0\} = 0.018$ .

With n = 2 and p = 0.1,  $P_B\{X = 0\} = 0.81$ .

Hence, the result is:

 $P_C{X >= 1} = P_A{X >= 1} \cdot P_B{X = 0} + P_A{X = 0} \cdot P_B{X >= 1}$ = 0.982 \cdot 0.81 + 0.190 \cdot 0.018 = 0.79884.

# Answer 3

Average total value for the first option: 9.586

Average total value for the second option: 10.612

Percentage of the cases where the total value of the second option is greater than the first option: 56.4

### My code:

```
blue = [1,2,3,4,5,6];
yellow = [1,1,1,3,3,3,4,8];
red = [2,2,2,2,3,3,4,4,6];
idx_b = randi (numel (blue), 1000, 1);
idx_y = randi (numel (yellow), 1000, 1);
idx_r = randi (numel (red), 1000, 1);
values_b = blue (idx_b);
values_y = yellow (idx_y);
values_r = red (idx_r);
values1 = [];
i = 1;
while (i <= 1000)
    values1(i) = values_b(i) + values_y(i) + values_r(i);
    i += 1;
endwhile
mean1 = mean (values1);  # answer of the 1st question
idx_b_1 = randi (numel (blue), 1000, 1);
idx_b_2 = randi (numel (blue), 1000, 1);
idx_b_3 = randi (numel (blue), 1000, 1);
values_b_1 = blue (idx_b_1);
values_b_2 = blue (idx_b_2);
values_b_3 = blue (idx_b_3);
values2 = [];
i = 1;
while (i <= 1000)
    values2(i) = values_b_1(i) + values_b_2(i) + values_b_3(i);
    i += 1;
endwhile
mean2 = mean (values2); # answer of the 2nd question
```

```
i = 1;
total = 0;
while (i <= 1000)
    if (values2(i) > values1(i))
        total += 1;
    endif
    i += 1;
endwhile

percentage = total / 10;  # answer of the 3rd question
```

#### The screenshot:

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\mathbf{\delta} Octave Online
                                                                                                                                                              MENU =
                        idx_b_2 = randi (numel (blue), 1000, 1);
idx_b_3 = randi (numel (blue), 1000, 1);
                                                                                                                                                                     ~
[1x6] blue
                        values_b_1 = blue (idx_b_1);
values_b_2 = blue (idx_b_2);
values_b_3 = blue (idx_b_3);
[1000x1] idx_b
[1000x1] idx_b_1
                        values2 = [];
[1000x1] idx_b_2
[1000x1] idx_b_3
                        [1000x1] idx_r
[1000x1] idx_y
# mean1
                        endwhile
                                                                                                                                                                             Do your part:
# mean2
                        mean2 = mean (values2);  # answer of the 2nd question
                                                                                                                                                                             support Free
# percentage
                       Software by
[1x10] red
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# total
[1x1000] values1
                                                                                                                                                                              US$3/mo.
[1x1000] values2
[1x1000] values_b
[1x1000] values_b_1
[1x1000] values_b_2
[1x1000] values_b_3
                        percentage = total / 10;  # answer of the 3rd question
[1x1000] values_r
                        octave:28> mean1
mean1 = 9.5860
[1x1000] values_y
[1x8] yellow
                        octave:29> mean2
mean2 = 10.612
                        octave:30> percentage
percentage = 56.400
                         へ 会 も ② 回 恒 烷 切) TUR 13:27 □
```

# **Comments:**

The results 9.586 and 10.612 are approximately equal to the results I have found in Q1b, that are 9.50 and 10.50.

The percentage is greater than 50%, which is what I expected because 10.612 > 9.586. If the percentage had been 50%, then the resultant mean values would have been nearly equal to each other.