Student Information

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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:

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

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 $3.1\overline{6} < 3.5$, the second option is preferable.

c)

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

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

Therefore, since $4.8\overline{3} > 3.5$, 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:

$$\frac{C(R(3))}{C(B(3)) + C(Y(3)) + C(R(3))}$$

$$= \frac{1/3 * 1/5}{1/3 * 1/6 + 1/3 * 3/8 + 1/3 * 1/5}$$

$$= \frac{24}{89}$$

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:

$$1/6 * 1/8 + 1/6 * 3/8 + 1/6 * 3/8$$

$$= \frac{7}{48}$$

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):

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

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

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

$$P(\geq 4 \text{ distrbutors offering a discount}) = 1 - ((1 - 0.025)^{80} + \binom{80}{1} * 0.025 * (1 - 0.025)^{79}$$

$$+ \binom{80}{2} * 0.025^2 * (1 - 0.025)^{78} + \binom{80}{3} * 0.025^3 * (1 - 0.025)^{77}) \approx 0.1407$$

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**:

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

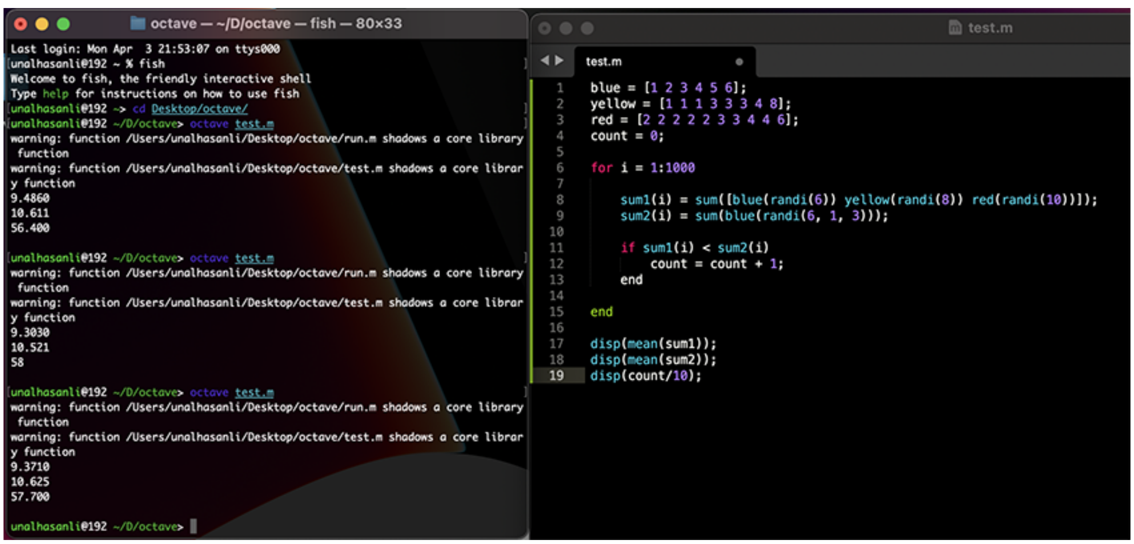
In the case of store 2, we can find the no discount case with a simple deduction operation since the store has exactly 1 distributor:

$$1 - 0.1 = 0.9$$

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



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);
```