

WEEK-2: Assignment - Probability Distribution

1. Calculate Probabilities Using a Binomial Distribution

Q1.1. Pavan kumar makes 65% of his free-throw attempts. If he shoots 15 free throws, what is the probability that he makes exactly 10

```
In [1]: from scipy.stats import binom
```

```
In [3]: binom.pmf(k=10, n=15, p=0.65)
```

```
Out[3]: 0.2123386834880357
```

Q1.2. Shivam flips a fair coin 6 times. What is the probability that the coin lands on heads 3 times or fewer?

```
In [4]: from scipy.stats import binom
```

```
In [9]: binom.cdf(k=3, n=6, p=0.5)
```

```
Out[9]: 0.65625
```

Q1.3. It is known that 65% of individuals support a certain law. If 10 individuals are randomly selected, what is the probability that between 3 and 6 of them support the law?

```
In [15]: from scipy.stats import binom
```

```
In [16]: binom.cdf(k=6, n=10, p=0.65) - binom.cdf(k=3, n=10, p=0.65)
```

```
Out[16]: 0.4601487031476562
```

2. Calculate Probabilities Using a Poisson Distribution

Q2.1. A store sells 4 apples per day on average. What is the probability that they will sell 6 apples on a given day?

```
In [17]: from scipy.stats import poisson
```

```
In [31]: poisson.cdf(6, 4)
```

```
Out[31]: 0.8893260215974264
```

Q2.2. A certain store sells seven footballs per day on average. What is the probability that this store sells four or less footballs in a given day?

```
In [32]: from scipy.stats import poisson
```

```
In [33]: poisson.cdf(4,7)-poisson.cdf(0,7)
```

```
Out[33]: 0.17207972591651693
```

Q2.3. A certain store sells 15 cans of tuna per day on average. What is the probability that this store sells more than 20 cans of tuna in a given day?

```
In [39]: 1-poisson.cdf(20,15)
```

```
Out[39]: 0.08297091003146029
```

3. Calculate Probabilities Using a Uniform Distribution

Q3.1. Suppose a bus shows up at a bus stop every 20 minutes. If you arrive at the bus stop, what is the probability that the bus will show up in 8 minutes or less?

```
In [40]: from scipy.stats import uniform
```

```
In [41]: uniform.cdf(20,8)-uniform.cdf(0,8)
```

```
Out[41]: 1.0
```

Q3.2. The weight of a certain species of frog is uniformly distributed between 15 and 25 grams. If you randomly select a frog, what is the probability that the frog weighs between 17 and 19 grams?

```
In [42]: from scipy.stats import uniform
```

```
In [44]: uniform.cdf(19,loc=15,scale=4)-uniform.cdf(17,loc=15,scale=4)
```

```
Out[44]: 0.5
```

Q3.3. The length of an NBA game is uniformly distributed between 120 and 170 minutes. What is the probability that a randomly selected NBA game lasts more than 150 minutes?

```
In [45]: from scipy.stats import uniform
```

```
In [62]: uniform.cdf(170,loc=120,scale=150)-uniform.cdf(120,loc=120,scale=150)
```

```
Out[62]: 0.3333333333333333
```

4. Calculate Probabilities Using a Normal Distribution

Q4.1. A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr?

```
In [49]: from scipy.stats import norm
```

```
In [50]: 1-norm.cdf(100,90,10)
```

```
Out[50]: 0.15865525393145707
```

Q4.2. For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours.

```
In [51]: from scipy.stats import norm
```

```
In [54]: norm.cdf(70,50,15)-norm.cdf(50,50,15)
```

```
Out[54]: 0.4087887802741321
```

Q4.3. Entry to a certain University is determined by a national test. The scores on this test are normally distributed with a mean of 500 and a standard deviation of 100. Tom wants to be admitted to this university and he knows that he must score better than at least 70% of the students who took the test. Tom takes the test and scores 585. Will he be admitted to this university?

```
In [61]: if 1-norm.cdf(585,500,100)<1*0.3:  
        print("He be admitted to this university")
```

He be admitted to this university

```
In [ ]:
```