Q1.

Distribution of the continuous data.

Q2.

- Uniform Distribution
- Normal/Gaussian Distribution
- Bernoulli Distribution
- Log normal Distribution
- Power law distribution
- Binomial Distribution

Q3.

In [2]:
```
import math

def normal_pdf(x, mean, std_dev):
    coefficient = 1 / (math.sqrt(2 * math.pi) * std_dev)
    exponent = -((x - mean) ** 2) / (2 * std_dev ** 2)
    pdf_value = coefficient * math.exp(exponent)
    return pdf_value

mean_value = 0
std_dev_value = 1
point = 1.5

pdf_at_point = normal_pdf(point, mean_value, std_dev_value)
print(f'The PDF at x={point} is: {pdf_at_point}')
```

```
The PDF at x=1.5 is: 0.12951759566589174
```

Q4.

- Fixed Number of Trials
- Independent Trials
- Two Possible Outcomes
- Constant Probability of Success
- Discrete Nature
- Binomial Coefficient

Examples :

- Coin flips
- Quality control

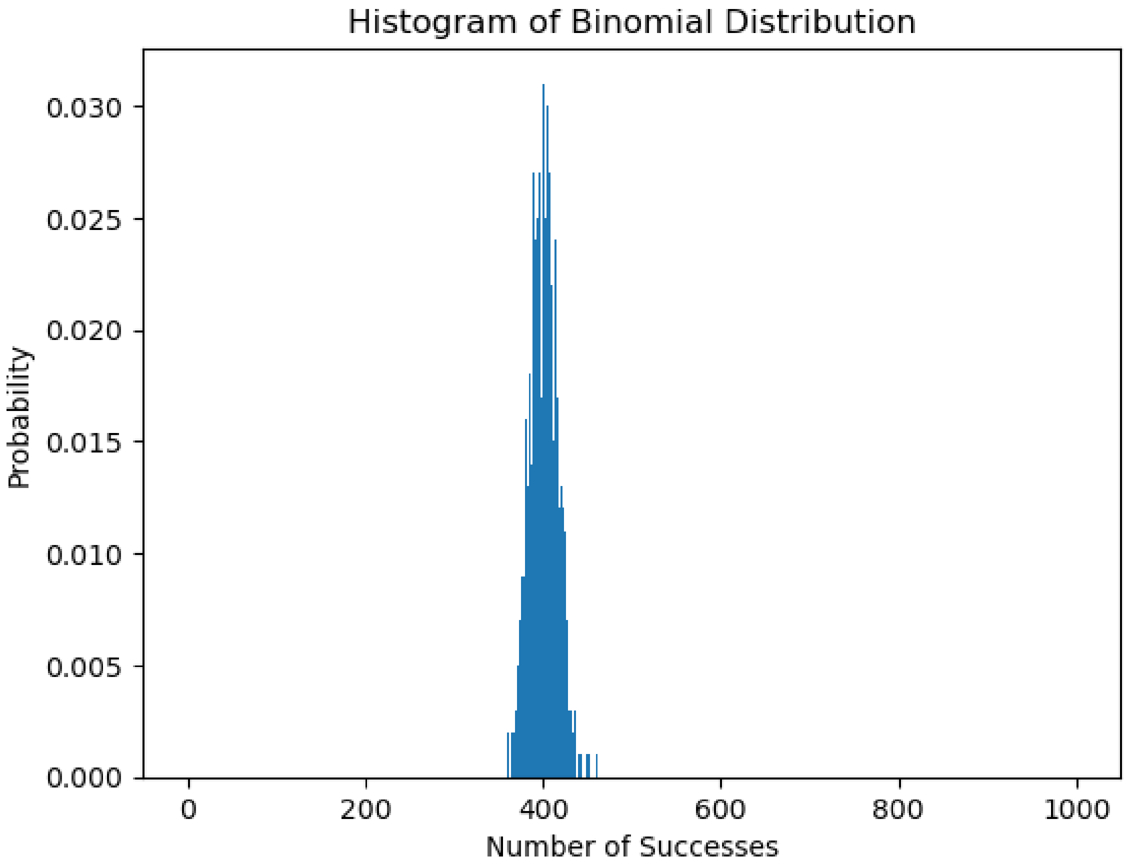
Q5.

In [6]:
```
import numpy as np
import matplotlib.pyplot as plt

n_trials = 1000
p_success = 0.4

random_sample = np.random.binomial(n_trials, p_success, size=1000)

plt.hist(random_sample, bins=np.arange(0, n_trials + 1) - 0.5, density=True)
plt.title('Histogram of Binomial Distribution')
plt.xlabel('Number of Successes')
plt.ylabel('Probability')
plt.show()
```



Q6.

In [9]:
```
import math

def poisson_cdf(x, mean):
    cdf_value = 0
    for k in range(x + 1):
        cdf_value += (math.exp(-mean) * mean**k) / math.factorial(k)
    return cdf_value

mean_value = 3
point = 2
```

```
cdf_at_point = poisson_cdf(point, mean_value)
print(f'The CDF at x={point} for mean={mean_value} is: {cdf_at_point}')
```

```
The CDF at x=2 for mean=3 is: 0.42319008112684353
```

Q7.

Binomial Distribution :

```
- Number of Trials:
     Binomial distribution is used when the number of trials is
fixed in advance.

- Nature of Trials:
    Each trial is independent of the others, and there are only
two possible outcomes.

- Probability of Success:
    The probability of success is constant for each trial.
```

Poisson Distribution :

```
- Number of Trials:
    Poisson distribution is used when the number of trials is
not fixed and the events occur randomly over time or space.

- Nature of Events:
    The events are independent, and there is no limit on the
number of events that can occur in a given interval.

- Discreteness:
    The random variable representing the number of events is
also discrete.
```

Q8.

In [11]:

```
import numpy as np

mean_val = 5
s_size = 1000

p_sample = np.random.poisson(mean_val, size = s_size)

s_mean = np.mean(p_sample)
s_variance = np.var(p_sample)

print(f"Sample mean is {s_mean}")
print(f"Sample variance is {s_variance}")
```

```
Sample mean is 5.071
Sample variance is 5.257959
```

Q9.

In the binomial distribution, the variance depends on both the number of trials and the probability of success, while in the Poisson distribution, the variance is solely determined by the rate parameter (lambda).

Q10.

In a normal distribution,the least frequent data appears in the tails of the distribution, farthest away from the mean. The tails of the normal distribution contain values that are more extreme, and the probability density decreases rapidly as you move away from the mean in either direction