In [ ]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy import stats
```

Problem 2

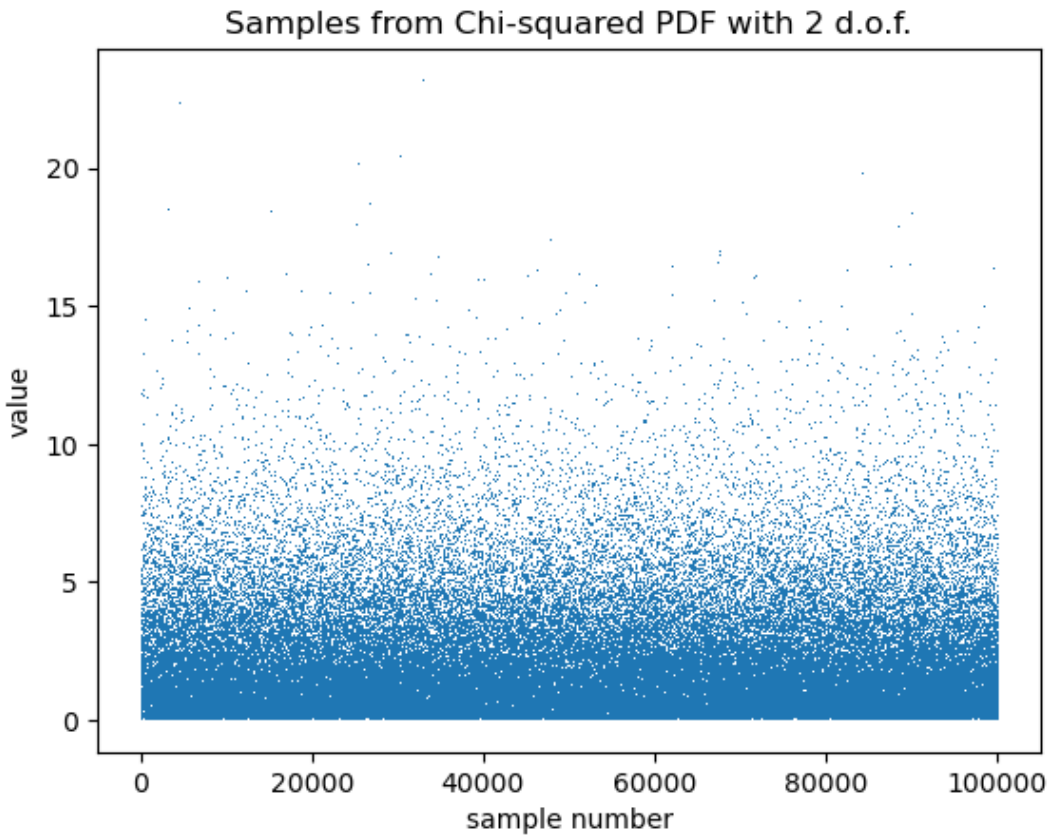
Generate a realization of the chi-squared distribution for 2 degrees of freedom.

1. Present a plot of a realization of samples drawn from this distribution
2. Plot a histogram of this realization, choose the number of samples to be sufficiently high that the shape of the distribution can be seen with limited noise.
3. Compute the mean, standard deviation, skewness, and kurtosis

1. Present a plot of a realization of samples drawn from this distribution

In [ ]:
```
N = 100_000
data = stats.chi2.rvs(2, size=N)
plt.plot(data, ',')
plt.title("Samples from Chi-squared PDF with 2 d.o.f.")
plt.xlabel("sample number")
plt.ylabel("value")
```

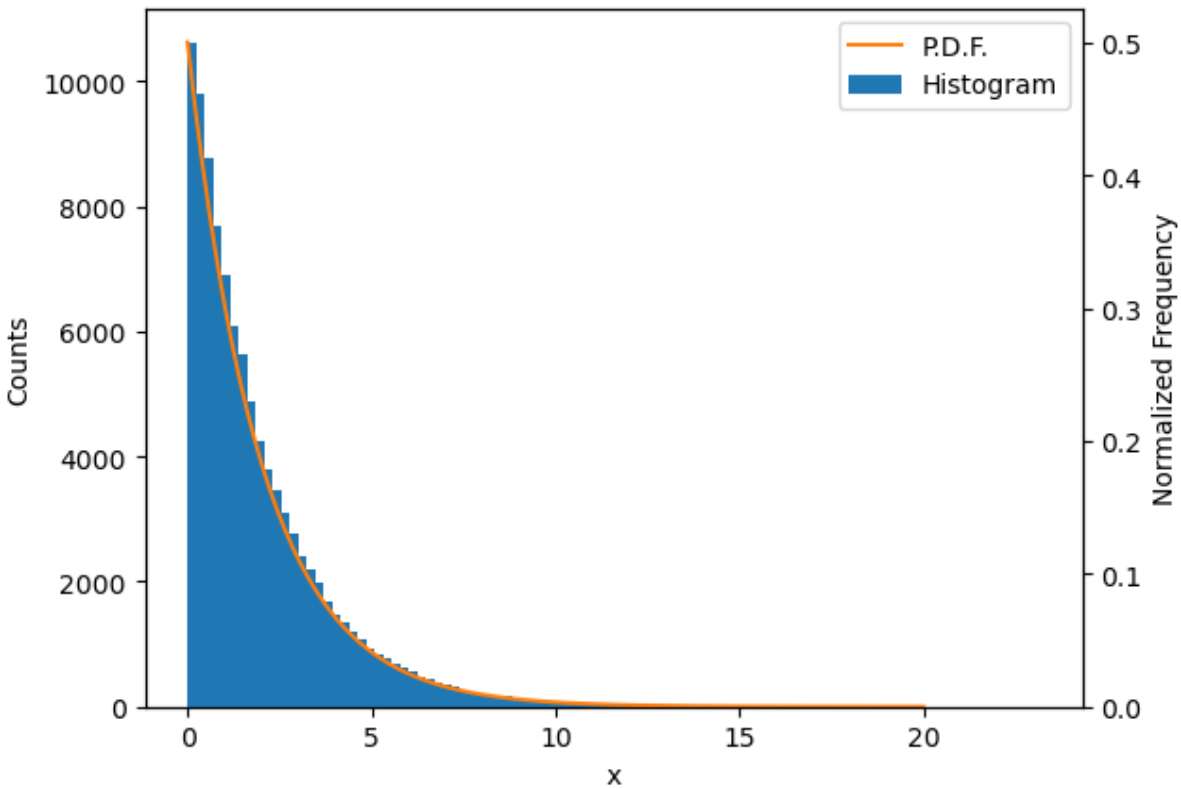
Out[ ]:
```
Text(0, 0.5, 'value')
```



2. Plot a histogram of this realization, choose the number of samples to be sufficiently high that the shape of the distribution can be seen with limited noise.

In [ ]:
```
fig, ax = plt.subplots()
ax2 = ax.twinx()

# Normalized Histogram:
ax2.hist(data, bins=100, density=True, label='Histogram')

# Counts Histogram:
ax.hist(data, bins=100, density=False)

# P.D.F. to see if fit is o.k.:
x = np.linspace(0, 20, 100)
p_x = stats.chi2.pdf(x, 2)
ax2.plot(x, p_x, label="P.D.F.")

# Plot stuff:
ax.set_xlabel("x")
ax2.set_ylabel("Normalized Frequency")
ax.set_ylabel("Counts")
ax2.legend()
```

Out[ ]:
```
<matplotlib.legend.Legend at 0x7f8edcfbce80>
```



3. Compute the mean, standard deviation, skewness, and kurtosis

In [ ]:
```
mean = stats.tmean(data)
std = stats.tstd(data)
skewness = stats.skew(data)
kurtosis_fisher = stats.kurtosis(data, fisher=True)

print(f" Mean: \t {mean} \n",
      f"Standard Deviation: \t {std} \n",
      f"Skewness (Fisher-Pearson coefficient): {skewness} \n",
      f"Kurtosis (Fisher's definition): {kurtosis_fisher} \n"
      )
```

```
 Mean:   2.004627329788164
 Standard Deviation:     1.997369093428983
 Skewness (Fisher-Pearson coefficient): 1.9732009618915567
 Kurtosis (Fisher's definition): 5.683907012480711
```