Find the Maximum a posteriori estimate (MAP) of observing a Head while tossing a coin. The dataset given is the list of outcome of tossing a coin 100 times. Assume prior distribution to be uniform distribution.

In [14]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [10]:

```
df = pd.read_csv('Coin_toss_outcome.csv')
df.head()
```

Out[10]:

Outcome 0 H 1 T 2 H 3 T

T

In [11]:

```
# defining prior
prior = 1
```

In [23]:

```
# defining likelihood
def likelihood(n_samples,n_heads,q):
    n_samples: number of samples in the data
    n_heads: number of heads in the given data
    likelihood = (q**n_heads)*((1-q)**(n_samples-n_heads))
    return likelihood
```

In [13]:

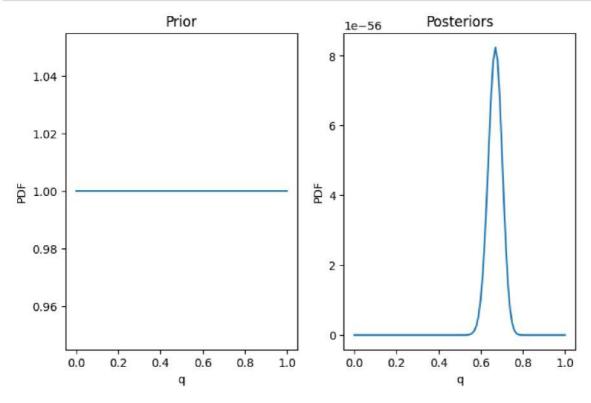
```
# posterior
def posterior(data,prior,q):
    n_samples = len(data)
    n_heads = np.sum(data=='H')
    posterior = likelihood(n_samples,n_heads,q)*prior
    return posterior
```

In [24]:

```
# plotting the priors and posteriors
fig, ax = plt.subplots(1,2,figsize=(8,5))
q = np.arange(0,1.01,0.01)

# plotting priors
ax[0].plot(q,[prior]*101)
ax[0].set(xlabel='q',ylabel='PDF',title='Priors')

# plotting posteriors
posteriors = posterior(np.array(df),prior,q)
ax[1].plot(q,posteriors)
ax[1].set(xlabel='q',ylabel='PDF',title='Posteriors');
```



In [25]:

```
# MAP estimate
MAP_q = q[np.argmax(posteriors)]
```