In [1]:
```python
import numpy as np
```

Read the density operator:

In [2]:
```python
rho = np.loadtxt("pset1.txt")
rho.shape
```

Out[2]: (17, 17)

Aha, so we have a 17-dimensional system.

In [3]:
```python
np.max(np.linalg.eigvalsh(rho))
```

Out[3]: 1.0

That sure looks like a pure state!

Let's compute the maximal eigenvalue after applying a depolarizing channel:

In [4]:
```python
def depolarize(p, rho):
    return (1 - p) * rho + p * np.eye(17) / 17


sigma = depolarize(0.7, rho)
np.max(np.linalg.eigvalsh(sigma))
```

Out[4]: 0.3411764705882354

Compute the trace distance ($\|\sigma - \frac{I}{17}\|_1$ in our conventions):

In [5]:
```python
def trace_dist(rho, sigma):
    return np.sum(np.abs(np.linalg.eigvalsh(rho - sigma)))


trace_dist(sigma, np.eye(17) / 17)
```

Out[5]: 0.5647058823529413

If we measure in the standard basis, the probabilities are given by the diagonal entries of the density operator. Hence the outcome with the smallest probability is the following (where 0 corresponds the first basis vector etc.):

In [6]:
```python
np.argmin(sigma.diagonal())
```

Out[6]: 4