```
import numpy as np
```

```
def init(prob, pi):
    pi = np.random.random(4)
    pi /= np.sum(pi)
    for i in range(0, 100):
        prob[i][0] = 1.0
    for i in range(100, 150):
        prob[i][1] = 1.0
    for i in range(150, 225):
        prob[i][2] = 1.0
    for i in range(225, 300):
        prob[i][3] = 1.0
    return prob, pi
```

```
def e_step(prob, pi):
    for i in range(300, 300 + 28):
        prob[i][0] = pi[0] / (pi[0] + pi[1])
        prob[i][1] = pi[1] / (pi[0] + pi[1])
    for i in range(300 + 28, 300 + 28 + 60):
        prob[i][2] = pi[2] / (pi[2] + pi[3])
        prob[i][3] = pi[3] / (pi[2] + pi[3])
    for i in range(300 + 28 + 60, 300 + 28 + 60 + 30):
        prob[i][0] = pi[0] / (pi[0] + pi[2])
        prob[i][2] = pi[2] / (pi[0] + pi[2])
    for i in range(300 + 28 + 60 + 30, 300 + 28 + 60 + 30 + 60):
        prob[i][1] = pi[1] / (pi[1] + pi[3])
        prob[i][3] = pi[3] / (pi[1] + pi[3])
    return prob
```

```
def m_step(prob):
    pi_new = np.sum(prob, axis=0)
    return pi_new / np.sum(pi_new)
```

```
def em_step(prob, pi):
    prob = e_step(prob, pi)
    pi = m_step(prob)
    return prob, pi
```

```
prob = np.zeros(shape=[478, 4])
pi = np.zeros(shape=4)
prob, pi = init(prob, pi)
prob, pi = em_step(prob, pi)
```