COLLECTING STATE QUARTERS EXERCISE WITH SOLUTION

In 1999, the United States launched the 50 State Quarters program where each of the 50 states was honored with a special quarter. Suppose you purchase 100 "state" quarters where each quarter is equally likely to feature one of the 50 states.

1) Write a function using the `sample()` function to simulate the purchase of 100 quarters and record the number of unique quarters that are purchased.

```
collect.quarters=function(n){
  sample.q=sample(1:50, n, replace=TRUE)
  length(unique(sample.q))
}

collect.quarters(100)
```

2) Using the `replicate()` function, repeat this process for 1000 purchases. Construct a table of the number of unique quarters you obtain in these 1000 simulations. Use this table to estimate the probability that you obtain at least 45 unique quarters.

```
N = replicate(1000, collect.quarters(100))
table(N)
mean(N >= 45)
```

3) Use the output from 2) to find the expected number of unique quarters.

```
mean(N)
```

4) Suppose you are able to complete your quarter set by purchasing state quarters from a coin shop for $2 for each quarter. Revise your function to compute the total (random) cost of completing the quarter set. Using the `replicate()` function, repeat the quarter-purchasing process 1000 times and compute the expected cost of completing your set.

```
collect.quarters2=function(n){
  sample.q=sample(1:50, n, replace=TRUE)
  U = length(unique(sample.q))
  ifelse(U < 50, 2 * (50 - U), 0)
}

C = replicate(1000, collect.quarters2(100))
mean(C)
```