

Shi.Chunlin.hw1

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Q5

(a)

```
num_simulation = 100000
sample_size = 100
dup.true = rep(0,num_simulation)

for (i in 1:num_simulation) {
  sample = sample(0:9999, sample_size, replace = TRUE)
  dup.true[i] = (length(unique(sample))!=sample_size)
}
estimated_prob = sum(dup.true)/num_simulation
estimated_prob
```

```
## [1] 0.39011
```

(b)

In this case, we have:

```
prob = 1-exp(lfactorial(10000)-lfactorial(10000-100)-100*log(10000))
prob
```

```
## [1] 0.391434
```

(c)

In this case, we can use a while loop to find the smallest enrollment number

```
desired_prob = 0.50
enrollment = 2

while (TRUE) {
  current_prob = 1-exp(lfactorial(10000)-lfactorial(10000-enrollment)-enrollment*log(10000))
  if (current_prob >= desired_prob) {
    break
  }
  enrollment = enrollment + 1
}

enrollment
```

```
## [1] 119
```