CA266 - Probability & Statistics Assignment
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Information about the system:

reliability_probabilities <- c(.97, .68, .89, .93)
num_of_components_in_parallel <- c(1, 5, 3, 2)

Part A

```
> calc_system_reliability <- function(num_of_components_in_parallel, reliability_probabilities)
+ {
+     system_reliability_probability <- 1
+     for (i in 1:length(num_of_components_in_parallel))
+     {
+         system_reliability_probability <- system_reliability_probability * (1 - ((1 - reliability_probabilities[i]) ^ num_of_components_in_parallel[i]))
+         # print(1 - ((1 - reliability_probabilities[i]) ^ num_of_components_in_parallel[i]))
+     }
+     return(system_reliability_probability)
+ }
```

Result

```
> sprintf("Probability of system working = %f", calc_system_reliability
(num_of_components_in_parallel, reliability_probabilities))
[1] "Probability of system working = 0.960728"
```

Part B

```
> num_iterations <- 100
```

```
> simulate_system_reliability <- function(num_iterations, num_of_components_in_parallel, reliability_probabilities)
+ {
+     total_system_reliability_probability = 0
+     for (iterations in 1:num_iterations)
+     {
+         system_reliability_probability <- 1
+         for (i in 1:length(num_of_components_in_parallel))
+         {
+             system_reliability_probability <- system_reliability_probability * (1 - ((1 - reliability_probabilities[i]) ^ num_of_components_in_parallel
[i]))
+
+         }
+
+         if (runif(1) < system_reliability_probability) {
+             total_system_reliability_probability <- total_system_reliability_probability + 1
+         }
+     }
+     return(total_system_reliability_probability / num_iterations)
+ }
```

```
> sprintf("Probability of system working for %i iterations is %f", num_iterations, simulate_system_reliability(num_iterations, num_of_components_in_parallel,
 reliability_probabilities))
[1] "Probability of system working for 100 iterations is 0.970000"
```

Part C

```
iteration_intervals <- seq(1,10000,50)
```

```
> simulate_system_reliability <- function(num_iterations, num_of_components_in_parallel, reliability_probabilities)
+ {
+     total_system_reliability_probability = 0
+     for (iterations in 1:num_iterations)
+     {
+         system_reliability_probability <- 1
+         for (i in 1:length(num_of_components_in_parallel))
+         {
+             system_reliability_probability <- system_reliability_probability * (1 - ((1 - reliability_probabilities[i]) ^ num_
of_components_in_parallel[i]))
+
+         }
+
+         if (runif(1) < system_reliability_probability) {
+             total_system_reliability_probability <- total_system_reliability_probability + 1
+         }
+     }
+     return(total_system_reliability_probability / num_iterations)
+ }
>
> count = 0
> for (iteration_n in iteration_intervals )
+ {
+     count = count + 1
+     reliabilities[count] <- simulate_system_reliability(iteration_n, num_of_components_in_parallel, reliability_probabilities)
+ }
```

```
plot(iteration_intervals, reliabilities, xlab = 'Number of iterations in simulation', ylab = 'System Reliability')
abline(h=system_reliability_probability, col='red')
```