

Name: \_\_\_\_\_

Directions: **Work only on this sheet** (on both sides, if needed). MAKE SURE TO COPY YOUR ANSWERS TO A SEPARATE SHEET FOR SENDING ME AN ELECTRONIC COPY LATER.

**Important note:** Remember that in problems calling for R code, you are allowed to use any built-in R function, e.g. `choose()`, `sum()`, etc.

1. This problem deals with the ALOHA simulation example on p.23.

- (a) (20) What variable in the program is analogous with the number of lines in our “notebook” view?
- (b) (20) Suppose we want to add code to find  $P(\text{collision during epoch } 2)$ . We’ll set a variable `ce2` to 0 early in the code, and near the end, we’ll divide it by `nreps`. We’ll need to add one more line of code. State the line number after which the new line is to be inserted, and state what code goes there. Sample answer:

```
after line 10 insert "if (x == 0) y <- 3"
```

2. This problem involves the bus ridership example in Section 2.11.

- (a) (20) Find the probability that no passengers board the bus at the first three stops.
- (b) (20) Suppose it is observed that the bus arrives empty at the third stop. What is the probability that exactly two people boarded the bus at the first stop?
- (c) (20) Suppose we wish to find  $E(L_2)$  via simulation, by modifying the program on p.24. Say we initialize to 0 a variable named `t12` near the beginning of the program, and will divide it by `nreps` near the end of the code. State the line number after which the new line is to be inserted, and state what code goes there.

**Solutions:**

**1.a nreps**

**1.b** After line 29, insert

```
if (numsend == 2) ce2 <- ce2 + 1
```

**2.a**

```
0.5^3
```

**2.b** The event of the bus arriving empty at stop 3 is the same as  $L_2 = 0$ . Then we have:

$$P(B_1 = 2 | L_2 = 0) = \frac{P(B_1 = 2 \text{ and } L_2 = 0)}{P(L_2 = 0)} \quad (1)$$

$$= 0.1 * 0.2^2 * 0.5 / 0.292 \quad (2)$$

where the numbers in the last step come from p.19.

**2.c** After line 12, insert:

```
if (j == 2) t12 <- t12 + passengers
```