Name: ____________________________

Directions: **Work only on this sheet** (on both sides, if needed); do not turn in any supplementary sheets of paper. There is actually plenty of room for your answers, as long as you organize yourself BEFORE starting writing.

Unless otherwise stated, give numerical answers as expressions, e.g. $\frac{2}{3} \times 6 - 1.8$. Do NOT use calculators.

1. (15) What is the relation of the value of s^2 printed out by R's **var()** function to the value I use? (Assume neither is 0.) (i) My value is larger. (ii) R's value is larger. (iii) They are equal. (iv) The **var()** function has no relation to my s^2; they just have similar names.

2. Consider the R code on p.125.

(a) (15) Of all the variables in that code, which one—if any—corresponds to the "number of lines in the notebook"?

(b) (15) Which R expression in that code is a standard error? And for which variable in the code is that expression a standard error?

3. (5) Fill in the blank. The variable Y on p.131 is an example of what is generally called a/an __________________________ variable.

4. (10) Consider Equation (4.16), p.122. In each of the entries in the table below, fill in either R for random, or NR for nonrandom:

quantity	R or NR?
$\overline{W}$	
s	
μ	
n	

(That quantity on the left, second line, is $\overline{W}$, "W-bar," not so clear in the table.)

5. (10) Consider $\hat{p}$, the estimator of a population proportion p, based on a sample of size n. Give the expression for the standard error of $\hat{p}$.

6. (15) The term **random sample** means *with* replacement. If it is *without* replacement, it is called a **simple random sample**. Suppose we take a simple random sample of size 2 from a population consisting of just three values, 66, 67 and 69. Let $\overline{X}$ denote the resulting sample mean. Find $p_{\overline{X}}(67.5)$.

7. (15) Suppose we have a random sample $W_1, ..., W_n$, and we wish to estimate the population mean μ, as usual. But we decide to place double weight on W_1, so our estimator for μ is

$$U = \frac{2W_1 + W_2 + ... + W_n}{n+1} \tag{1}$$

Find E(U) and Var(U) in terms of μ and the population variance σ^2. Do reasonable algebraic simplification.

Solutions:

1. (ii)

2a. numruns

2b. s/sqrt(nreps)

3. *indicator*

4. R, R, NR, NR

5. $\sqrt{\frac{1}{n}\hat{p}(1-\hat{p})}$

6.

$$p_{\overline{X}}(67.5) = P(\overline{X}) = 67.5) = P(\text{get 66 then 69 or 69 then 66}) = 2 \cdot \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{3}$$

7. $E(U) = \mu$, $Var(U) = \frac{n+3}{(n+1)^2} \cdot \sigma^2$