

## *Stat 134: Section 22*

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### ***Conceptual Review***

- a. Suppose I know  $\mathbb{E}(X) = \mu$  and  $\text{Var}(X) = \sigma^2$ . With minimal computation, find  $\mathbb{E}(X^2)$ .
- b. What is the computational formula for  $\text{Cov}(X, Y)$ ?
- c. If two variables  $X, Y$  are independent, what is  $\text{Cov}(X, Y)$ ?

### *Problem 1: Success Runs*

I toss a coin which lands heads with probability  $p$ . Let  $W_H$  be the number of tosses until I get one head in a row (i.e., one head), and  $W_{HH}$  be the number of tosses until I get two heads in a row. Find:

- a.  $\mathbb{E}(W_H)$ ;
- b.  $\mathbb{E}(W_{HH})$ .

*Ex 6.rev.21 in Pitman's Probability*

*Problem 2*

Let  $X$  have uniform distribution on  $\{-1, 0, 1\}$  and  $Y = X^2$ .

- a. Are  $X, Y$  uncorrelated?
- b. Are  $X, Y$  independent? Explain carefully.

*Ex 6.4.5 in Pitman's Probability*

*Problem 3*

Let  $A$  and  $B$  be possible results of a trial, not necessarily mutually exclusive. Let  $N_A, N_B$  be the number of times  $A, B$  each occur in  $n$  independent trials, respectively. Show that  $N_A$  and  $N_B$  are uncorrelated if and only if the events  $A$  and  $B$  are independent.

*Ex 6.4.13 in Pitman's Probability*