

Homework 10, Morally due Tue Apr 30, 3:30PM  
**THIS HW IS THREE PAGES!!!!!!!!!!**

1. (0 points but if you don't show up to the final I will assume you got this problem wrong and you will get 0 points for this entire HW) WHEN IS THE FINAL? WHERE IS THE FINAL?
2. (30 points)
  - (a) (15 points) Josh rearranges the letters in the sequence *machinery* randomly. What is the probability that the new sequence is *machinery*?
  - (b) (15 points) Bill makes lunch for her darling. There is a sandwich- either PBJ, Turkey, Tomato, Egg salad, or Tuna fish, a fruit- either apple or blueberries or blackberries or a banana, and a snack- either pretzels, potato chips or applesauce. Suppose Bill selects a lunch to prepare uniformly at random out of all the possibilities. What is the probability that Bill's darling gets a lunch that DOES NOT have both an apple and applesauce.

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3. (40 points) I have two coins.

One of them is FAIR

One of them is BIASED:  $\text{Prob}(H)=\frac{7}{12}$ ,  $\text{Prob}(T)=\frac{5}{12}$ .

One is chosen at random (prob  $1/2$  for each). That coin is tossed 20 times.

Do the following TWENTY ONE problems and put them in a table. For the first one show us your work (you can use a calculator or your program for the arithmetic), but the rest just have the answers in the table.

You will want to write a computer program for them. Note when the prob of biased goes from  $> \frac{1}{2}$  to  $< \frac{1}{2}$ .

- The result is *HHHHHHHHHH* (so 20 H's and 0 T). What is the prob that the coin is biased?
- The result is *HHHHHHHHHT* (so 19 H's and 1 T). What is the prob that the coin is biased?
- The result is *HHHHHHHHTT* (so 18 H's and 2 T). What is the prob that the coin is biased?
- $\vdots$
- The result is *TTTTTTTTTT* (so 0 H's and 20 T). What is the prob that the coin is biased?

All numbers should be to six places, so for example

$$(7/12)^{20} \sim 0.000021$$

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4. (30 points) I have two 10-sided die.

One of them is FAIR

One of them is BIASED:  $\text{Prob}(1)=\text{Prob}(10)=\frac{1}{2}$  and  $\text{Prob}(2)=\dots=\text{Prob}(9)=0$ .

- (a) I roll the fair die. What is the expected value? What is the variance?
- (b) I roll the biased die. What is the expected value? What is the variance?
- (c) I roll both and add the values. What is the expected value? What is the variance?