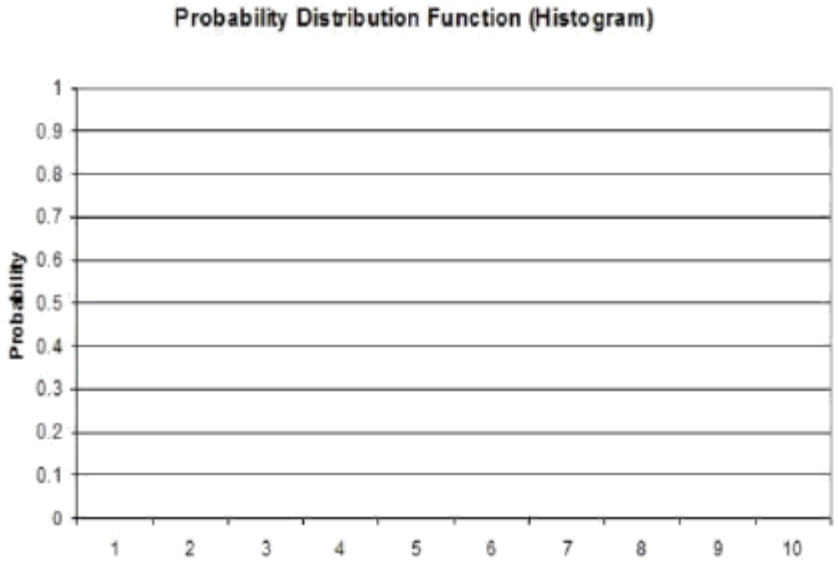
Worksheet completed on _____

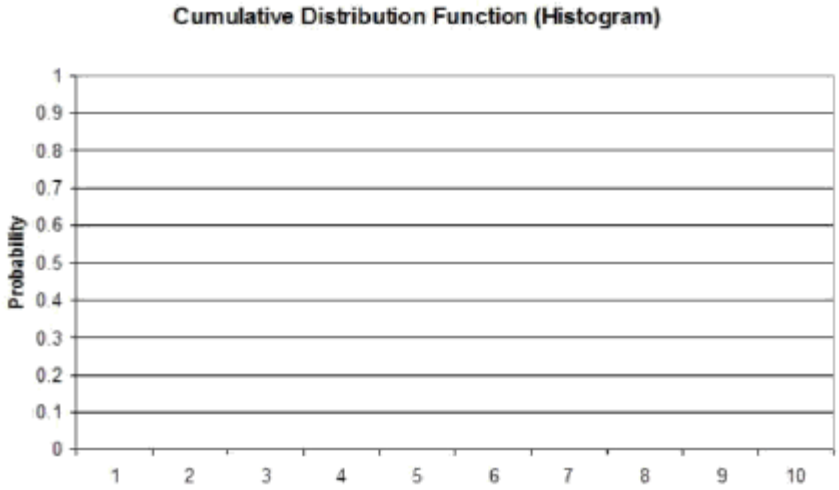
(Primer) Think of something really stupid and say it loud.

(A) Remembering probability and cumulative density functions

(A.1) In my hand are ten playing cards with the numbers 1 (joker), 2, 3, 4, 5, 6, 7, 8, 9, and 10. Suppose I shuffle the cards well and then randomly choose one card. In the figure below, draw the histogram for the probability any particular card will be drawn.



(A.2) Now draw a cumulative histogram, indicating the probability I will draw each card OR a card with a smaller number.



Worksheet completed on _____

(B) Insurance—Suppose you own an insurance company that pays individuals an *indemnity* of $1,000 each time they draw a card with the number 3 or less.

(B.1) What is the indemnity you must pay if someone draws a 7 card?

(B.2) What is the indemnity you must pay if someone draws a 2 card?

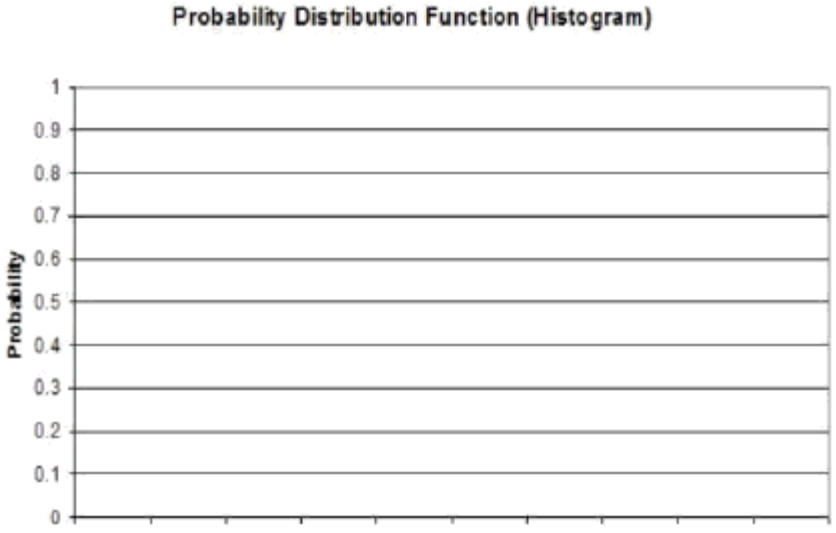
(B.3) What is the probability of having to pay this indemnity?

(B.4) Suppose you sold this policy many, many times. What is the average or expected indemnity (*expected payout*) you would pay on any given draw?

(B.5) What is the minimum premium you should charge for the policy, in order for your average or expected profits to be positive?

(C) Another Insurance—Suppose you own an insurance company that pays individuals an *indemnity* of $1,000 each time they draw a card with the number 1, $2,000 if they draw a number 2, $3,000 if they draw a number 3, and nothing if they draw a 4 or higher. The company charges $1,000 for the policy, which it receives regardless of the card drawn.

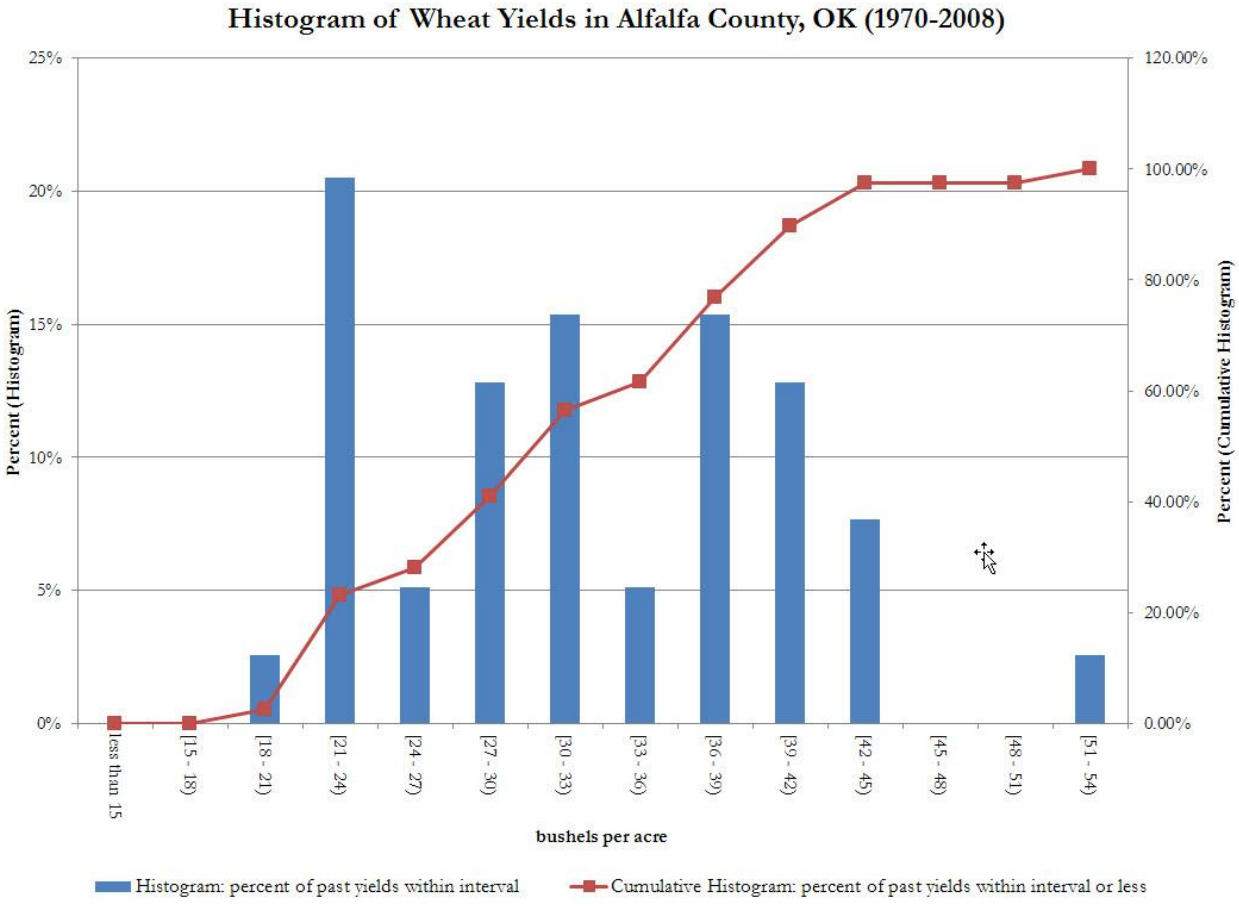
(C.1) Draw a histogram of the company's profits for any particular draw. You will have to determine the values on the x-axis.



(C.2) You must compute the Value-at-Risk (VaR) for your insurance company using a 20% threshold. This means you must determine the amount of money the company would lose on the 20th worst draw out of 100 draws. Put differently, you must determine the losses in which there is a 20% chance of realizing that loss or worst, and an 80% chance of realizing something better than that loss. Put differently one more time, the loss where the sum of the histogram bars at that loss or worst equals 20%.

(D) Use the image and information below to answer the following questions.

Suppose we sell a very simple crop insurance policy that pays Alfalfa County wheat farmers $50 per acre whenever yields are less than or equal to 21 bushels per acre. Because we don't know what next year's yield will be we don't know if we will have to pay out $50 per acre. We can, however, calculate the *expected payout*, which is the $50 per acre times the probability yields will be less than or equal to 21. Eye-balling this probability, it seems about 2.5%.



Worksheet completed on _____

(D.1) What is the expected (or average) crop insurance indemnity?

(D.2) Given your answer to D.1, what is the breakeven premium for this insurance policy, where any premium less than the breakeven premium is expected to lose money and any premium above it is expected to make money?

(D.3) Suppose you set the premium 20% higher than the breakeven premium. What is this premium?

(D.4) If yields are 40 bushels per acre what are your profits from selling the policy?

(D.5) If yields are 30 bushels per acre what are your profits from selling the policy?

(D.6) If yields are 15 bushels per acre what are your profits from selling the policy?