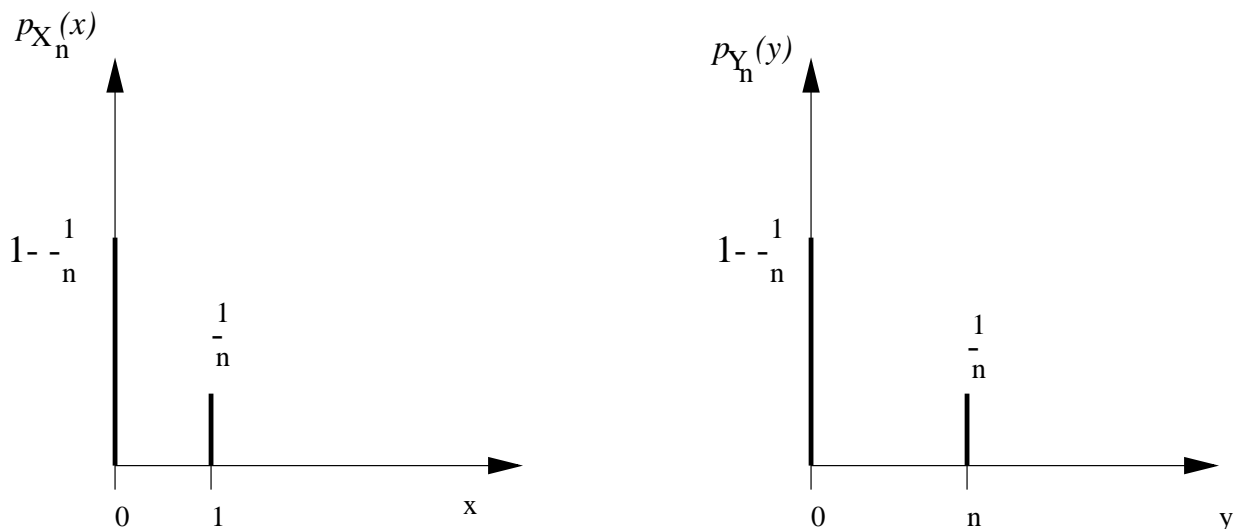


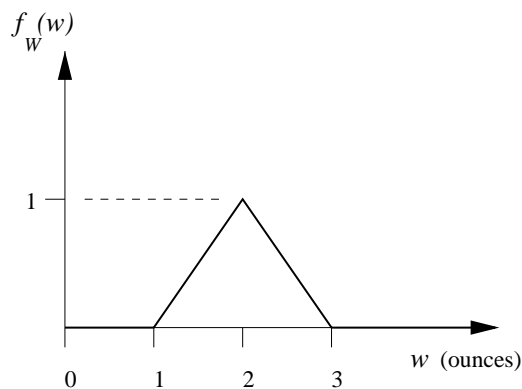
**Recitation 22**  
**May 5, 2005**

1. (Convergence Revisited)



Let  $X_n$  and  $Y_n$  have the distributions shown above.

- (a) Evaluate the expectation and variance for  $X_n$  and  $Y_n$ .
  - (b) What does the Chebyshev inequality tell us about the convergence of  $X_n$ ?
  - (c) What does the Chebyshev inequality tell us about the convergence of  $Y_n$ ?
  - (d) Is  $X_n$  convergent in probability? If so, to what value? Explain.
  - (e) Is  $Y_n$  convergent in probability? If so, to what value? Explain.
2. The weight of a Pernotti Parabolic Pretzel,  $W$ , is a continuous random variable described by the probability density function



$$f_W(w) = \begin{cases} 0 & w \leq 1 \\ w-1 & 1 \leq w \leq 2 \\ 3-w & 2 \leq w \leq 3 \\ 0 & 3 \leq w \end{cases}$$

- (a) What is the probability that 102 pretzels weigh more than 200 ounces?

- (b) What is the smallest integer (the pretzels are not only inedible, they are also unbreakable)  $n$  for which the total weight of  $n$  pretzels will exceed 200 ounces with probability 0.990?
3. We are laying out 25 plastic planks lengthwise, trying to make a path of about 1000 meters. The plastic planks are made in molds, and any variation in the lengths of the planks is due entirely to variation between different molds. The length in meters,  $X$ , of any particular mold used for making planks is independent of the length of all other molds.  $X$  is uniformly distributed between  $40 - \sqrt{3}$  and  $40 + \sqrt{3}$  meters.  $X$  has an expected value of 40 meters and a standard deviation of 1 meter. What is the probability that the resulting path will be within  $1000 \pm 7.5$  meters if we use 25 planks ...
- (a) ... all made from the same mold?
- (b) ... each made from a different mold?

Explain the difference between the answers to parts (a) and (b).