

1. Let  $X$  be a random variable with the following PF:

$$f_x(x) = \begin{cases} \frac{x^2}{10} & \text{for } x = -2, -1, 0, 1, 2 \\ 0 & \text{otherwise.} \end{cases}$$

Find  $\text{Var}(X)$ .

2. Let  $X$  have variance 5 and  $Y$  have variance 4. Assume that  $X$  and  $Y$  are independent. Find the following:

(a)  $\text{Var}(2X + 2)$

(b)  $\text{Var}(2X + 3Y + 1)$ .

(c)  $\text{SD}(Y)$ .

3. Suppose you are checking the widgets at a factory where 10% of all widgets are known to be defective.

(a) You take a lot of 100 widgets and check for defective ones. Let  $X$  be the number of defective items. What is the mean and variance of  $X$ ?

(b) You stand at the conveyor belt of widgets and examine them one by one. What is the probability that the 6th one is the first one you find to be defective?

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- (c) You stand at the conveyor belt of widgets and examine them one by one. What is the average number of widgets you'll expect to examine before you find the defective one?
- (d) You stand at the conveyor belt of widgets and examine them one by one. What is the probability that you will have looked at 15 working widgets before you find the 2nd defective widget?
- (e) Suppose you find defective widgets at the rate of 5 per hour on average. Let  $X$  be the number of the defective widgets you find in the next hour. What is the probability that  $X=6$ ?