Joint Distribution Practice Problems

Let X and Y be discrete random variables with joint probability mass function P(X=x,Y=y). Equate the terms and expressions on the left below with their corresponding formulas on the right.

1. ______ Cov(X,Y)	A. $E(X^2) - [E(X)]^2$
2. ______ E(Y)	B. $P(Y = y \mid X = x) = P(X = x, Y = y) / P(X = x)$
3. ______ V(X)	C. $P(X = x) = \sum_y P(X = x, Y = y)$
4. ______ Corr(X,Y)	D. $\sum_y yP(Y = y)$
5. ______ E(X|Y=y)	E. $V(X) + V(Y) - 2Cov(X,Y)$
6. ______ Conditional pmf of Y|X	F. $E[(X - \mu_X)(Y - \mu_Y)]$
7. ______ V(X-Y)	G. $Cov(X,Y) / [SD(X)SD(Y)]$
8. ______ Marginal of X	H. $\sum_x xP(X = x \mid Y = y)$
9. ______ V(Y)	I. $E[(Y - \mu_Y)^2]$

A. Suppose that X and Y have a discrete joint distribution for which the joint probability function is defined as follows: $f(x,y) = (x + y)/30$ for $x = 0,1,2$ and $y = 0,1,2,3$. Find the marginal probability mass functions for X and Y, and determine if X and Y are independent.

B. A merchant stocks a certain perishable item. He knows that on any given day he will have a demand for two, three, or four of these items, with probabilities 0.2, 0.3, and 0.5 respectively. He buys the items at a cost of 1 dollar and sells them for 1.20 dollars. Any items left at the end of the day represent a total loss. How many items should he stock to maximize his expected profit?