

**Lecture 24.**

**See Chapter 10, section 2.**

**Definition.** Suppose  $X$  and  $Y$  are random variables on the same probability space. The *covariance of  $X$  and  $Y$*  is:

$$\text{Cov}(X, Y) := E\left(\left(X - E(X)\right)\left(Y - E(Y)\right)\right).$$

**Fact.**  $\text{Cov}(X, Y) = E(XY) - E(X)E(Y)$ .

**Fact.**  $\text{Var}(aX + bY) = a^2\text{Var}(X) + b^2\text{Var}(Y) + 2ab\text{Cov}(X, Y)$

*Problem.* Given a pair of random variables  $X, Y$  with joint pmf as follows, find  $\text{Cov}(X, Y)$

	$X = 1$	$X = 2$	$X = 3$
$Y = 1$	.1	.1	.2
$Y = 2$	.2	.3	.1

**Homework.** Problems 2, 5, 10, 12, 19, 20 in 10.2.