

# 321 Section, Week 9

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What is the probability that when we randomly select a permutation of the 26 lowercase letters of the alphabet, that the first 13 are in alphabetical order?

Let  $E$  be the event that a randomly generated bit string of length 3 contains an odd number of 1s and let  $F$  be the event that the string starts with 1.  
Are  $E$  and  $F$  independent?

When a test for steroids is given to soccer players, 98% of the players taking steroids test positive and .5% of the players not taking steroids test positive. Suppose that 5% of soccer players take steroids. What is the probability that a soccer player who tests positive takes steroids?

What is the expected sum of the numbers that appear on two dice, each biased so that a 3 comes up twice as often as each other number?

Suppose we roll a die until it comes up 6 or we have rolled it 10 times. What is the expected number of times we roll the die?

Is  $R$  reflexive, symmetric, antisymmetric, transitive, if

- $R = \{(x,y) \mid xy \geq 1\}$
- $R = \{(x,y) \mid x \text{ and } y \text{ are both negative or both nonnegative}\}$
- $R = \{(x,y) \mid x \geq y^2\}$

Let  $R, S$  over  $\mathbf{R} \times \mathbf{R}$  be

$$R = \{(a,b) \mid a > b\}, S = \{(a,b) \mid a \geq b\}$$

- What is  $S \circ R$ ?

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Draw the matrix representation of

$$R = \{(1,2), (2,1), (2,2), (3,3)\}$$

How many nonzero entries does the matrix representing the relation  $R$  on

$A = \{1, 2, \dots, 100\}$  have

- $R = \{(a, b) \mid a > b\}$
- $R = \{(a, b) \mid a \neq b\}$
- $R = \{(a, b) \mid a = b+1\}$
- $R = \{(a, b) \mid a = 1\}$
- $R = \{(a, b) \mid ab = 1\}$

Draw the digraph for

$$R = \{(2,4), (3,1), (3,2), (3,4)\}$$

Draw the digraph for

$$R = \{(1,1), (1,4), (2,2), (3,3), (4,1)\}$$