Stat 134: Section 21

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Problem 1

Here is a summary of Pre-SAT and SAT scores of a large group of students.

PSAT scores:	average: 1200	SD: 100
SAT scores:	average: 1300	SD: 90
	correlation: 0.6	

Assume the data are approximately bivariate normal in distribution.

a. Of the students who scored 1000 on the PSAT, about what percentage scored above average on the SAT?

b. Of the students who scored below average on the PSAT, about what percentage scored above average on the SAT?

c. About what percentage of students got at least 50 points more on the SAT than on the PSAT?

Ex 6.5.1 in Pitman's Probability

Problem 2

Let X and Y be independent standard normal variables.

a. For a constant k, find $\mathbb{P}(X > kY)$.

b. If $U = \sqrt{3}X + Y$, and $V = X - \sqrt{3}Y$, find $\mathrm{P}(U > kV)$.

c. Find $\mathbb{P}(U^2 + V^2 < 1)$.

d. Find the conditional distribution of X given $V = v$.

Ex 6.5.6 in Pitman's Probability

Problem 3

Heights and weights of a large group of people follow a bivariate normal distribution, with correlation 0.75. Of the people in the 90th percentile of weights, about what percentage are above the 90th percentile of heights? *Ex 6.5.3 in Pitman's Probability*

Problem 4

Let X and Y have bivariate normal distribution with parameters $\mu_X, \mu_Y, \sigma_X^2, \sigma_Y^2$, and ρ. Let $P(X > \mu_X, Y > \mu_Y) = q$. Find:

a. a formula for q in terms of ρ;

b. a formula for ρ in terms of q.

Ex 6.5.5 in Pitman's Probability