

11. *Aki's Breadhouse*, an authentic German bakery in Minneapolis' Northeast neighborhood, sells gourmet pretzels for \$2.50 each. His (variable) production costs are \$0.50 per pretzel, so Aki will make a profit of \$2.00 for every pretzel he sells. On any given day the demand for Aki's pretzels follows (approximately) a continuous uniform distribution between 100 and 200. At the end of the day Aki has to discard any leftover pretzels so he will lose his production costs of \$0.50 for every discarded pretzel. How many pretzels should Aki bake each day in order to maximize his expected profit?

- A. 140 B. 150 C. 160 D. 170 E. 180

12. When Donald Drumpf gives a campaign speech, let X denote the number of times he insults women, immigrants, or muslims, and let Y denote his popularity (in percentage points) among Republican voters. Suppose X and Y (approximately) follow a bivariate normal distribution with $\mu_X = 12$, $\sigma_X^2 = 4$, $\mu_Y = 50$, $\sigma_Y^2 = 25$, and $\rho = 0.4$.¹

(a) Given that "The Donald" dishes out 15 insults, what is the probability that his popularity will increase to at least 53%. That is, find $\mathbb{P}(Y \geq 53 | X = 15)$?

- A. 0.30 B. 0.35 C. 0.40 D. 0.45 E. 0.50

(b) Compute $\text{Var}(X + Y)$.

- A. 29 B. 33 C. 37 D. 129 E. 229

(c) **BONUS:** What is $\text{Var}(2X - 3Y)$?

(No need to show your work, but you can earn extra credit if you state the correct answer here.)

¹Yes, sadly, in his case ρ is positive!