Joseph Spafford
A. Miller Math 331
03/19/2012
Homework for 03-19

48 A
49 A
50 A

03-19-48

$P(|X-\mu| \geq \varepsilon) \leq \frac{V}{\varepsilon^2} \Rightarrow P(|X-\mu| < \varepsilon) \geq 1-\frac{V}{\varepsilon^2}$

given that X is a Bernoulli of independent trials,

$P(|X-np| < \varepsilon) \geq 1-\frac{np(1-p)}{\varepsilon^2}$

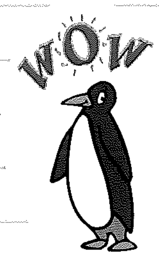
Now let $\varepsilon = .01\frac{n}{3} = \frac{n}{300}$

$P(|X-\frac{n}{3}| < \frac{n}{300}) \underset{\text{at least}}{\geq} 1-\frac{n \cdot 2}{9} \cdot \frac{90{,}000}{n^2} = 1-\frac{20{,}000}{n}$

For this prob. to be 99% $1-\frac{20{,}000}{n}$ must $= .99$

so,

$-\frac{20{,}000}{n} = .99-1$



$-20{,}000 = -.01n$

$n = \frac{20{,}000}{.01} = \boxed{2{,}000{,}000}$

03-19-49

$X \geq 0 \quad \mu = E(X) \quad P(X<3) < \frac{1}{5}$

$P(X \geq \alpha) \leq \frac{\mu}{\alpha}$ Markov's Inequality

$\therefore$

$\mu \geq \alpha P(X \geq \alpha)$ so $\mu \geq 3 P(X \geq 3)$

as $P(X<3) < \frac{1}{5}$ $P(X \geq 3) \geq \frac{4}{5}$

$\mu \geq 3 \cdot P(X \geq 3) \geq \boxed{\frac{12}{5}}$

cont. on next side.

03-19-(58)

a.) $P(-2\sigma < X-\mu < 2\sigma)$

$= P(|X-\mu| < 2\sigma)$

by Chebyshev's inequality

$P(|X-\mu| < \varepsilon) \geq 1 - \frac{v}{\varepsilon^2}$

$\therefore P(|X-\mu| < 2\sigma) \geq 1 - \frac{\cancel{v}}{4 \cdot \cancel{\sigma^2}} = \frac{3}{4} = .75$ ✓

b.) Let ε be 3σ

so

$P(|X-\mu| < 3\sigma) \geq 1 - \frac{v}{9\sigma^2} = \frac{8}{9} = .\overline{8} \geq .88$ ✓

$\therefore P(|X-\mu| < 3\sigma) \geq .88$