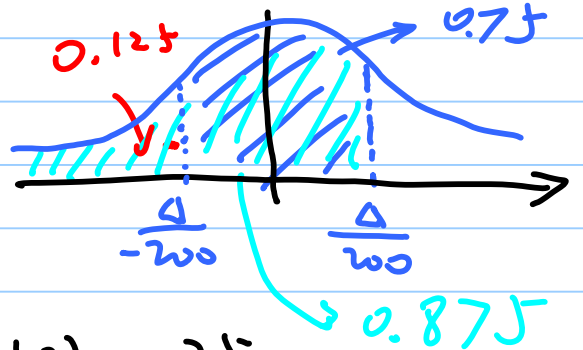
Note Title 9/4/2013

if $X \sim N(1000, 200^2)$ new question is

$$P(|X-1000| < \Delta) = 0.75$$

define $Z = \frac{X-1000}{200}$ then $Z \sim N(0,1)$ $X = 200Z + 1000$

$$P(|X-1000| < \Delta) = P\left(|Z| < \frac{\Delta}{200}\right) = 0.75$$

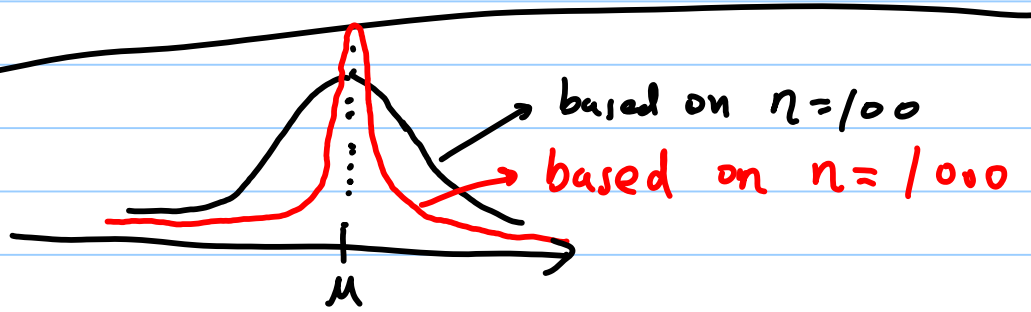


from normal table, we know

$$P(Z \le 1.2) = 0.875 \rightarrow P(|Z| \le 1.2) = 0.75$$

so $\Delta = 1.2 \times 200 = 240$

$$\bar{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$$



$p(\sum^{10} X_i > 7) = ?$ $\quad E[X_i] = 0.5 \quad (\mu) \quad Var(X_i) = \frac{1}{12} \quad (\sigma^2)$

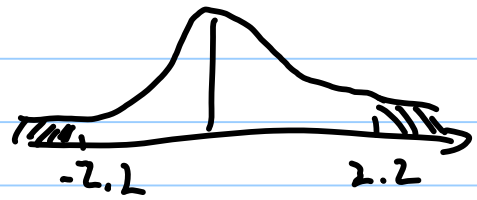
define r.v. $Y = \dfrac{\sum^{10} X_i - 5}{\sqrt{\frac{1}{12} \times 10}}$ then $Y \sim N(0,1)$

$\sum^{10} X_i = \sqrt{\frac{10}{12}} \cdot Y + 5$

$p(\sum^{10} X_i > 7) = p(\sqrt{\frac{10}{12}} Y > 2) = p(Y > 2.2)$

$= 1 - p(Y \le 2.2) = 1 - 0.986 = 0.014$

$p(Y \le -2.2) = 0.014 \Rightarrow p(Y \le 2.2) = 1 - p(Y \le -2.2)$



- p(1,1)=0.5, p(1,2)=0.1, p(2,1)=0.1, p(2,2)=0.3
- Q: Calculate the pmf of X given that Y=1 ⇒ $P(X=1|Y=1)$, $P(X=2|Y=1)$

$P(X=1, Y=1) = 0.5$

$$P(X=1|Y=1) = \frac{P(X=1, Y=1)}{P(Y=1)}$$

(A: $X=1$, B: $Y=1$)

$$= \frac{0.5}{0.6} = 5/6$$

$$P(Y=1) = P(Y=1, X=1) + P(Y=1, X=2)$$
$$= 0.5 + 0.1 = 0.6$$

$$P(X=2|Y=1) = 1 - P(X=1|Y=1) = 1/6$$

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if fix $N=n$, $Y = \sum_{i=1}^{n} X_i$ $\quad E[Y|N=n] = E[\sum_{i=1}^{n} X_i] = n \cdot E[X]$

$$E[Y] = E_N[n \cdot E[X]] = E[X] \cdot E[N]$$