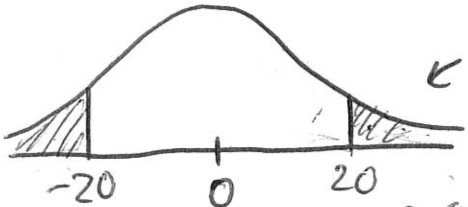
ex Pop $\mu = 540$ $\sigma = 50$

$n_1 = 32$ $n_2 = 50$

$\bar{X}_1 - \bar{X}_2 \sim N\left(\overset{0}{\mu - \mu}, \frac{50^2}{32} + \frac{50^2}{50}\right)$

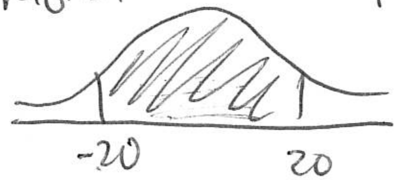
$P(|\bar{X}_1 - \bar{X}_2| > 20)$

$\sigma_{\bar{X}_1 - \bar{X}_2} = 11.319$



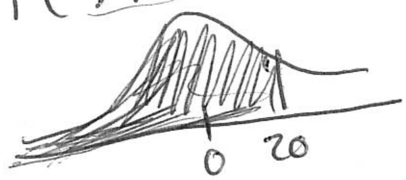
$\leftarrow N(0, 11.319^2)$

no more than 20 $P(|\bar{X}_1 - \bar{X}_2| \le 20)$

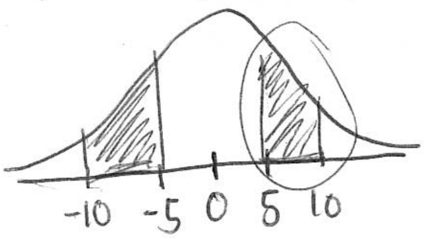


not same as $\swarrow$ $\bar{X}_1 \le \bar{X}_2 + 20$

$P(\bar{X}_1 - \bar{X}_2 \le 20)$



$P(5 \le |\bar{X}_1 - \bar{X}_2| \le 10)$



$= 2 \cdot P(\bar{X}_1 - \bar{X}_2 \in [5, 10])$

$\sigma_A = \sigma_B = 1$

$n_A = n_B = 18$

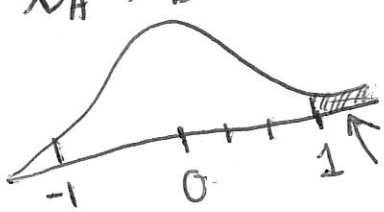
If $\mu_A = \mu_B$ $\Big\}$ $\bar{X}_A - \bar{X}_B \sim N\left(\mu_A - \mu_B = 0, \frac{\sigma_A^2}{n_A} + \frac{\sigma_B^2}{n_B}\right)$

$\sim N\left(0, \left(\frac{1}{3}\right)^2\right)$

$\frac{1^2}{18} + \frac{1^2}{18} = \frac{2}{18} = \frac{1}{9}$

$\hookrightarrow \sigma_{\bar{x}_A - \bar{x}_B} = \frac{1}{3}$

we observe $\bar{x}_A - \bar{x}_B = 1$



.0013

ex $\mu = 40$ $\sigma = 2$ $n = 36$

$P(S_n > 1458) \Leftrightarrow P\left(\frac{S_n}{36} > \frac{1458}{36}\right)$

$\Rightarrow P(\overline{X} > 40.5)$

$\boxed{\overline{X} = \frac{S_n}{n} = \frac{\sum_{i=1}^{n} X_i}{n} \qquad n\overline{X} = S_n}$

Given n people what is the probability at least 2 share a birthday? year 365 days

$n=2$

$1 - P(\text{no 2 people share a birthday})$

$n=2 \quad 1 - \frac{364}{365} = \frac{1}{365}$

$n=3 \quad 1 - \frac{364}{365}\frac{363}{365}$

$n=4 \quad 1 - \frac{365 \cdot 364 \cdot 363 \cdot 362}{365 \cdot 365 \cdot 365 \cdot 365}$

$n \quad 1 - \frac{P(365, n)}{(365)^n} = 1 - \frac{\overbrace{365 \cdot 364 \cdots (365-n+1)}^{n \text{ factors}}}{365 \cdot 365 \cdots 365}$