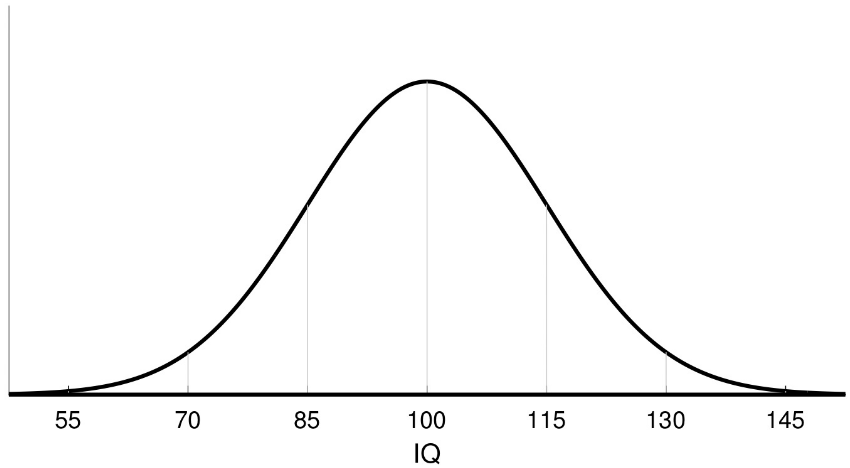
Here is the distribution of IQ scores:

$$z = \frac{x - \mu}{\sigma} = \frac{x - 100}{15} \ldots$$



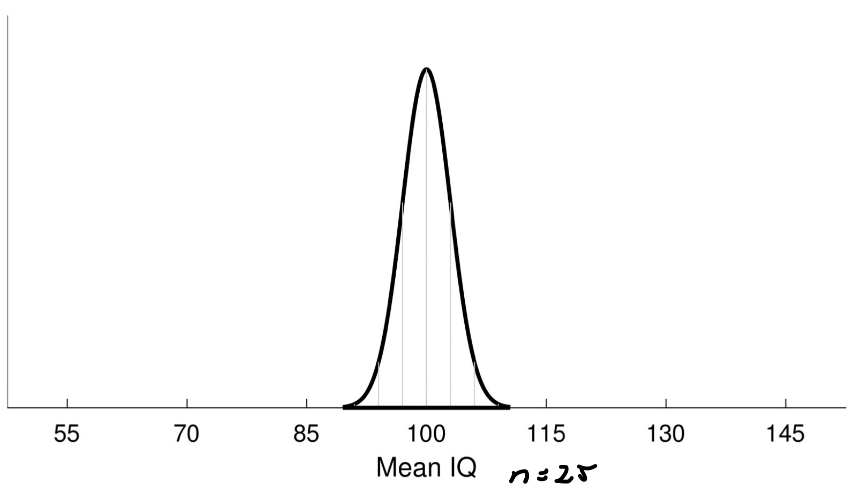
Suppose you have a sample size of 25. what does the distribution of means look like?

Central Limit Theorem.

1) $\mu_{\bar{x}} = \mu_x = 100$

2) $\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}} = \frac{15}{\sqrt{25}} = \frac{15}{5} = 3$

3) the distribution of means will be normal



1) What is the probability that a sample mean will be greater than 105? $(n=25)$

$\mu_{\bar{x}} = \mu_{\bar{x}} = 100$

$\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}} = \frac{15}{\sqrt{25}} = 3$

$\bar{x} = 105$

$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{105-100}{3} = 1.67$

$Pr(z \geq 1.67) = \underline{0.0475}$

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2) Let $n=100$ $pr(\bar{x} \leq 99)$? $\mu_{\bar{x}} = 100$ $\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}} = \frac{15}{\sqrt{100}} = \frac{15}{10} = 1.5$

$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{99-100}{1.5} = -.67$

$Pr(z=1) = 0$

$Pr(\bar{x} \leq 99) = Pr(z < -.67)$

$Pr(Z > 0.67) = \underline{0.2514}$

$Pr(\bar{x} < 99 \text{ or } \bar{x} > 101)$?

$= P(\bar{x} < 99) + Pr(\bar{x} > 101)$

$= 0.2514 + 0.2514 = \underline{0.5028}$

About $\frac{1}{2}$ of the means will be between 99 and 101.

3) Suppose heights of men in a population has a mean of 70 inches and a standard deviation of 2.8 inches. If we sample 25 men, what is the mean height for the 95th percentile point (P_{95})?

$\mu_x = 70$, $\sigma_x = 2.8$, $n = 25$

$\mu_{\bar{x}} = 70$, $\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}} = \frac{2.8}{5} = 0.56$

z score for $P_{95} = 1.64$

$\bar{x} = 70 + (1.64)(0.56)$

$= 70.9$ inches

$$\boxed{z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} \qquad \bar{x} = \mu_{\bar{x}} + z\,\sigma_{\bar{x}}}$$