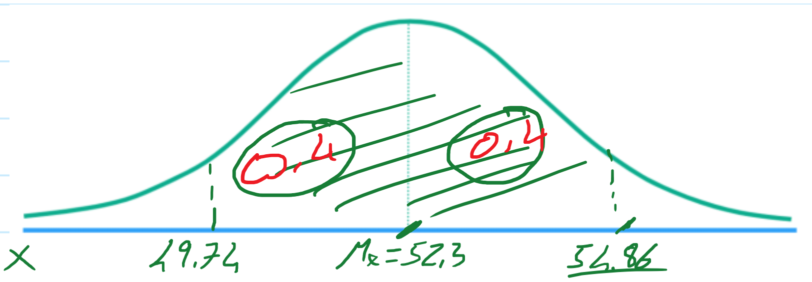
STAT PS3

3 Haziran 2025 Salı 17:52

In a recent survey of high school students, it was found that the average amount of money spent on entertainment each week was normally distributed with a mean of $52.30. Suppose you are told that there is an 80% probability that a randomly-selected student spends somewhere between $49.74 and $54.86. What is the standard deviation of the amount of money spent by high school students monthly?

$\mu_x = 52.30$ $\quad P(49.74 < X < 54.86) = 0.8$

$\sigma_x = ?$



$54.86 - 52.3$

$Z = \frac{X - \mu_x}{\sigma_x}$ $\quad 1.28 = \frac{54.86 - 52.3}{\sigma_x}$

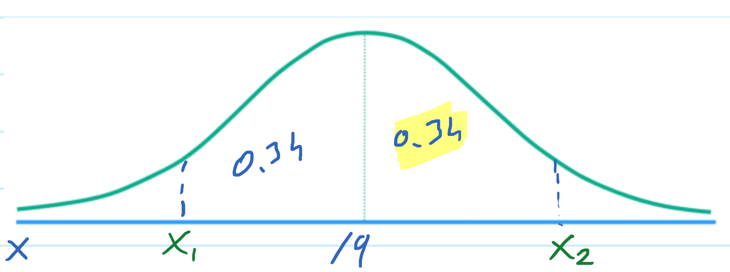
$\sigma_x = 2$ //

As part of their quality assurance program, the Autolite Battery Company conducts tests on battery life. For a particular D cell alkaline battery, the mean life is 19 hours. The useful life of the battery follows a normal distribution with a standard deviation of 1.2 hours. Answer the following questions.

a. About 68 percent of the batteries failed between what two values?
b. About 95 percent of the batteries failed between what two values?
c. Virtually all of the batteries failed between what two values?

$\mu_x = 19$ $\quad \sigma_x = 1.2$ $\quad$ Population

a)

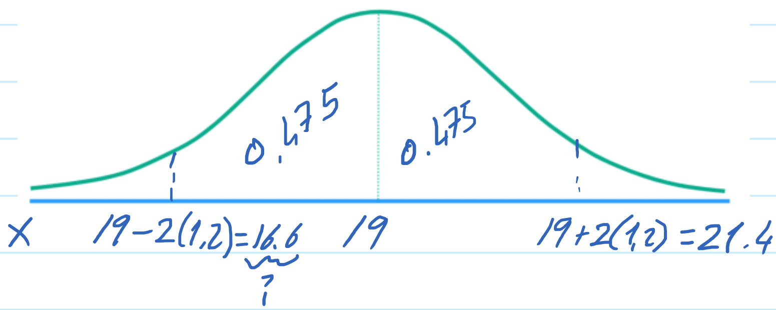


$Z \quad -0.99 \quad 0 \quad +0.99$

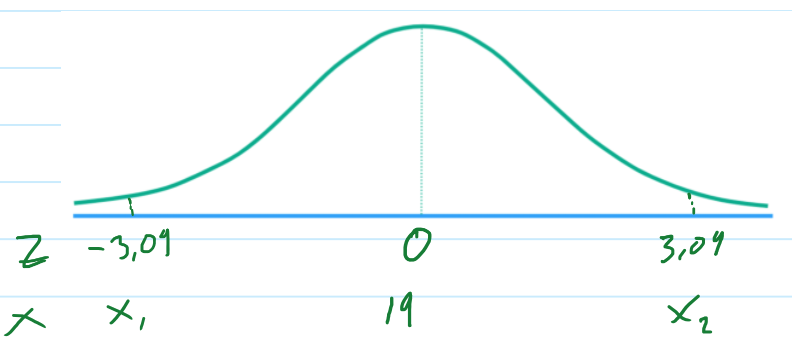
$$0.99 = \frac{x_2 - 19}{1.2} = \underline{20.188}$$

$$-0.99 = \frac{x_1 - 19}{1.2} = 17.812$$

b)



c)



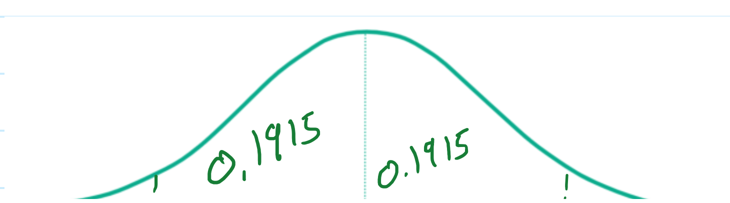
$$-3.09 = \frac{x_1 - 19}{1.2} \Rightarrow x_1 =$$

$$+3.09 = \frac{x_2 - 19}{1.2} \Rightarrow x_2 =$$

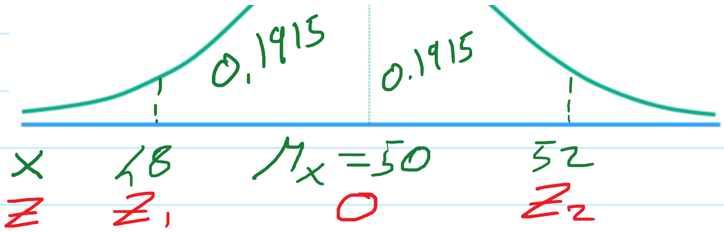
The lengths of screws produced in a factory follow a normal distribution with a mean $\mu = 50$ mm and a population variance $\sigma^2 = 16$ mm^2. What is the probability that a randomly chosen screw has a mean length will be between 48 mm and 52 mm?

$$P(48 < x < 52) = ?$$

$$z_1 = \frac{48 - 50}{4} = -0.5$$



$$z_2 = \frac{52 - 50}{4} = 0.5$$

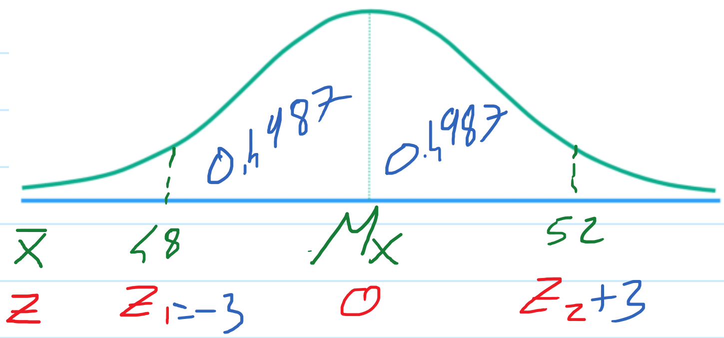


$Z_2 = \frac{52-50}{4} = 0.5$

The lengths of screws produced in a factory follow a normal distribution with a mean μ = 50 mm and a population variance σ² = 16 mm². A random sample of 36 screws is selected. What is the probability that the sample mean length will be between 48 mm and 52 mm?

$P(48 < \bar{X} < 52) = ?$

$Z_1 = \frac{48-50}{4/\sqrt{36}} = -3$



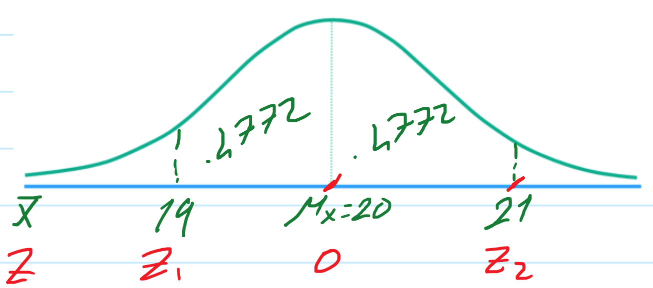
Suppose a research firm conducted a survey to determine the average amount of money steady smokers spend on cigarettes during a week. It is known that the money spent by steady smokers follow a normal distribution with a mean of 20$ and a standard deviation of 5$. If randomly 100 steady smokers are selected from this population, what is the probability that a sample of 100 steady smokers spend between $19 and $21?

$n = 100$

$\mu_x = 20 \qquad \sigma_x = 5$

$P(19 < \bar{X} < 21) = P(-2 < Z < +2) = .4772 + .4772$
$= ?$

$Z_1 = \frac{19-20}{5/\sqrt{100}} = -2$



$Z_2 = +2$

The Intelligence Quotient (IQ) test scores are normally distributed with a mean of 100 and a standard deviation of 15.

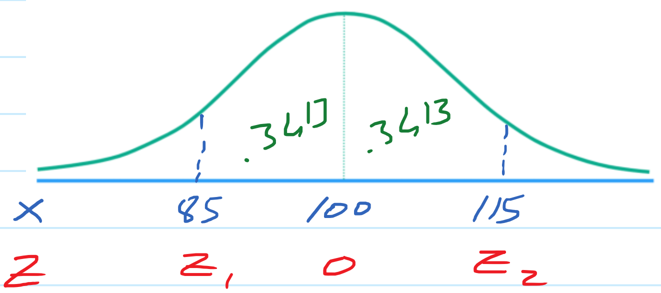
a. What is the probability that a person would score between 85 and 115?
b. You enrolled in a class of 25 students. What is the probability that the class' average IQ exceeds 130?
c. What IQ level seperates the upper %10 from the rest?

$\mu_x = 100$ ~~$\bar{X} = 100$~~

$\sigma_x = 15$ ~~$S_x = 15$~~

a) $P(85 < X < 115) = P(-1 < Z < +1)$

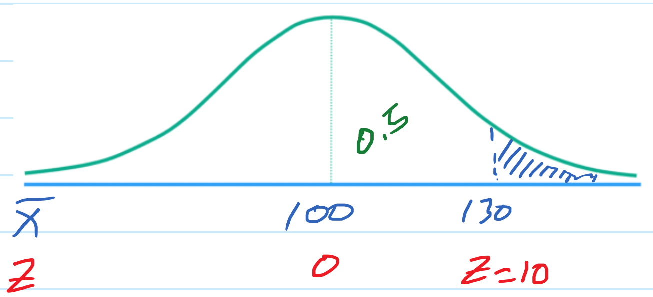
$= .3413 + .3413$



$$Z_2 = \frac{115-100}{15} = 1$$

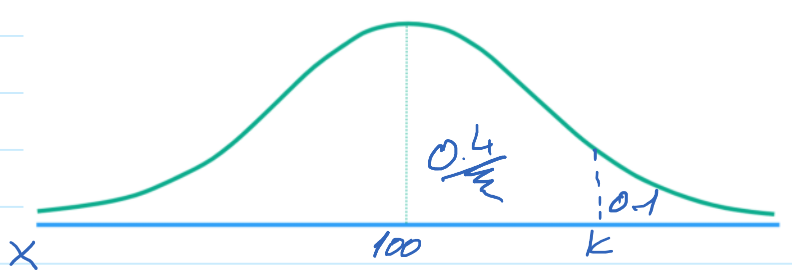
b) $P(\bar{X} > 130) = P(Z > 10) = .5 - .5$

$= 0$



$$Z = \frac{130-100}{15/\sqrt{25}} = 10$$

c) $P(X > k) = 10\%$ $k = ?$



?

$$Z = \frac{x - \mu_x}{\sigma_x}$$

$$1.28 = \frac{k - 100}{15}$$

$k = 119.2$