UNIVERSIDAD DE SEVILLA

DEPARTMENT OF
EXPERIMENTAL PSYCHOLOGY

Design and Data Analysis in Psychology I
PRACTICE LESSON 6
School of Psychology
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Exercise 1. We obtained a sampling distribution of means formed by samples of 200 participants that come from a population with a standard deviation of 10. Calculate the standard error of this sampling distribution.

$n = 200$
$\sigma = 10$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{200}} = \frac{10}{14.142} = 0.707$$

Exercise 2. We obtained a sampling distribution of means with a standard error of 4 and formed by samples of 100 participants. Calculate the standard deviation in the population.

$\sigma_{\bar{x}} = 4$
$n = 100$
$\sigma = ?$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \rightarrow 4 = \frac{\sigma}{\sqrt{100}} \rightarrow 4 = \frac{\sigma}{10} \rightarrow 40 = \sigma$$

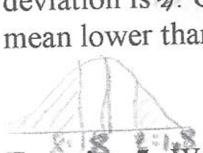
Exercise 3. We obtained a sampling distribution of means with a standard error of 4. It comes from a population with a standard deviation of 16. Calculate the size of the samples that form the distribution.

$\sigma_{\bar{x}} = 4$
$\sigma = 16$
$n = ?$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \rightarrow 4 = \frac{16}{\sqrt{n}} \rightarrow 4\sqrt{n} = 16 \rightarrow \sqrt{n} = \frac{16}{4} = 4 \rightarrow n = 4^2 = 16$$

Exercise 4. The arithmetic mean of a test in a population is 20 and the standard deviation is ~~5~~ 10. Calculate the probability of obtaining a sample of ~~100~~ 81 participants with a mean lower than ~~19~~ 18

$\mu = 20$
$\sigma = 10$
$n = 81$
$\bar{x} < 18$



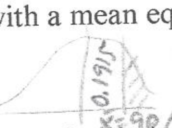
$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{18 - 20}{0.353} = \frac{-2}{1.111} = -1.8$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{81}} = \frac{10}{9} = 1.111$$

$p = 0.5 - 0.4641 = 0.0359$

Exercise 5. We obtained a sampling distribution of means with a mean of 80 and a standard error of 20. Calculate the probability of obtaining a sample of 100 participants with a mean equal or higher than 90.

$\mu_{\bar{x}} = 80 = \mu$
$\sigma_{\bar{x}} = 20$
$n = 100$
$\bar{x} \geq 90$

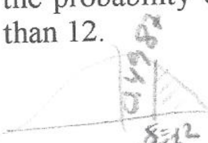


$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{90 - 80}{20} = \frac{10}{20} = 0.5$$

$p = 0.5 - 0.1915 = 0.308$

Exercise 6. A population presents a mean of 10 and a standard deviation of 4. Calculate the probability of obtaining a sample of ~~150~~ 36 participants with a mean equal or higher than 12.

$\mu = 10$
$\sigma = 4$
$n = 36$
$\bar{x} \geq 12$



$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{12 - 10}{0.667} = \frac{2}{0.667} = 3$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{4}{\sqrt{36}} = \frac{4}{6} = 0.667$$

$p = 0.5 - 0.4987 = 0.0013$

Exercise 7. A population presents a mean of 70 kilos and a standard deviation of 10 in the variable weight. If we would obtain 1.000 samples of 64 participants, how many are expected to ~~be~~ have a mean in weight higher than ~~60~~ 68 kilos?

$\mu = 70$
$\sigma = 10$
$n = 64$
$\bar{x} > 68$
1000 samples

$$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{68 - 70}{1.25} = \frac{-2}{1.25} = -1.6$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{10}{\sqrt{64}} = \frac{10}{8} = 1.25$$

$p = 0.5 + 0.4452 = 0.9452$ (for 1 sample)

- The mean is going to be higher than 68 in 945 samples of the 1000 obtained

$\mu = 60$
$\sigma = 8$
$n = 25$

$z = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}} = \frac{64 - 60}{1.6} = \frac{4}{1.6} = 2.5$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{25}} = \frac{8}{5} = 1.6$

$p = 0.062 \cdot 2 = 0.0124$

Exercise 8. In a population, the mean is 60 and the standard deviation, 8. Calculate the probability of obtaining a sample of 25 participants with a mean separated from the mean of the population in at least 4 points.

Exercise 9. Calculate the standard error of a sampling distribution of proportions if it is formed by samples with 49 participants and the proportion of the population is 0.6.

$n = 49$
$\pi = 0.6$

$\sigma_p = \sqrt{\frac{\pi(1-\pi)}{n}} = \sqrt{\frac{0.6 \cdot 0.4}{49}} = \sqrt{\frac{0.24}{49}} = 0.07$

Exercise 10. Calculate the standard error of a sampling distribution of proportions if it is formed by samples with 81 participants and the proportion of the population is 0.5.

$n = 81$
$\pi = 0.5$

$\sigma_p = \sqrt{\frac{\pi(1-\pi)}{n}} = \sqrt{\frac{0.5 \cdot 0.5}{81}} = \sqrt{\frac{0.25}{81}} = 0.056$

Exercise 11. Calculate the number of participants that form the samples of a sampling distribution of proportions taking into account that, in the population, the proportion was 0.2 and the standard ~~deviation,~~ error was 0.02.

$\pi = 0.2$
$\sigma_p = 0.02$

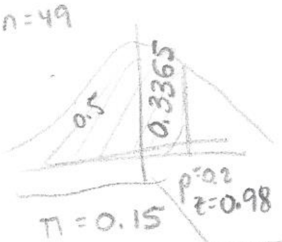
$\sigma_p = \sqrt{\frac{\pi(1-\pi)}{n}} \rightarrow 0.02 = \sqrt{\frac{0.2(1-0.2)}{n}} \rightarrow 0.02^2 = \frac{0.16}{n} = 0.02^2 n = 0.16 \quad n = \frac{0.16}{0.02^2} = 400$

Exercise 12. It is believed that 15% of the population smokes. Calculate the probability of obtaining a sample of 49 participants where 10 of them or less smoke.

$n = 49$

$z = \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}} = \frac{0.2 - 0.15}{\sqrt{\frac{0.15(1-0.15)}{49}}} = \frac{0.05}{0.051} = 0.98$

0.85 0.0026²



$\pi = 0.15$

$p = \frac{10}{49} = 0.2$

$p = 0.8365$