Stat 50 - Elementary Statistics — Winter 2020

Quiz 6: 6.1-6.3 — Dr. Jorge Basilio

NAME (PRINT): Solutions SCORE: ____________

SIGNATURE: ____________________

Directions

- YOU ARE ALLOWED TO USE A CALCULATOR ON THIS EXAM. (Ti83/Ti83+/Ti84/Ti84+/Ti84+CE-T, or scientific calculator)
- Handwriting should be neat and legible. If I cannot read your writing, zero points will be given.
- Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credits unless work is clearly shown. *If in doubt, ask for clarification.*
- Leave answers in exact form (as simplified as possible), unless told otherwise.
- Put a $\boxed{\text{box around your final answer}}$ where applicable.

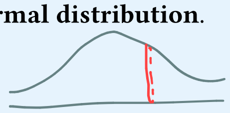
Quiz (28 points)

Problem 1: 4 pts (1 pts each)

TRUE or **FALSE** (please spell out/write the entire word for credit). *(No work needed)*

(a) FALSE The distribution of all values of ~~any~~ some random variable is called a **normal distribution**.

(b) TRUE For **continuous** random variables X, $P(X \geq b) = P(X > b)$.



vs

(c) FALSE A **statistic** is a characteristic of the ~~population~~. sample

(d) FALSE ~~All~~ standard **normal distributions** have the same mean and standard deviations.

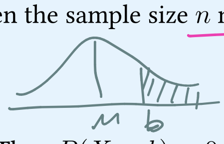
Problem 2: 6 pts (1 pt each blank)

Fill in the blanks:

(a) List one **unbiased** estimators: μ, σ^2, $\hat{p}$.

(b) List one **biased** estimators: Med, σ, range

(c) If X is a random variable that is not normally distributed, then the sample size n needs to be >30 (greater than 30) in order to use the sampling distribution $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \sigma/\sqrt{n}$.



(d) Let $b > \mu$ and X be a normally distributed random variable. Then $P(X > b) = 0.5$ - $P(\mu < x < b)$.

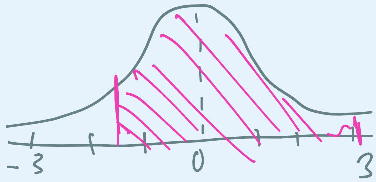
(e) In a normal distribution, $x = -2$ and $z = 6$. This tells us that $x = -2$ is 6 standard deviations to the right of the mean.

Problem 3: 9 pts (3 pts each)

To earn full credit: sketch the appropriate distribution curve, indicate the probability by shading, label the points on the axes, and show what you enter into the calculator (as we do on our worksheets).

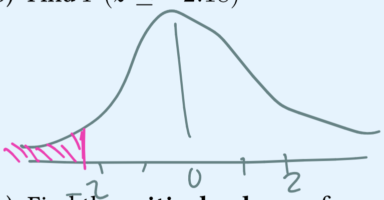
Assume that Z is the random variable with the standard normal distribution. $\rightarrow \mu = 0,\ \sigma = 1$

(a) Find $P(-1.43 < z < 3.01)$



$P(-1.43 < z < 3.01) = \text{normalcdf}(-1.43, 3.01, 0, 1) = \boxed{0.922}$

(b) Find $P(z \leq -2.18)$

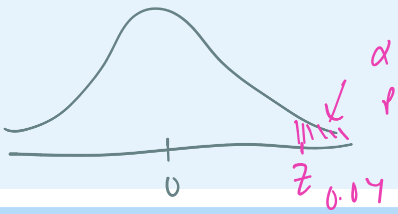


$P(z \leq -2.18) = P(z < 0) - P(-2.18 < z < 0)$

$= 0.5 - \text{normalcdf}(-2.18, 0, 0, 1)$

$= \boxed{0.015}$ or $\boxed{0.0146}$

(c) Find the **critical value** z_α for $\alpha = 0.04$



$z_{0.04} = \text{invNorm}(0.04, 0, 1, \text{RIGHT})$

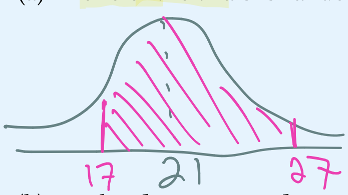
$= \boxed{1.75}$

Problem 4: 9 pts (3 pts each)

To earn full credit: sketch the appropriate distribution curve, indicate the probability by shading, label the points on the axes, and show what you enter into the calculator (as we do on our worksheets).

Suppose that the duration of a particular type of criminal trial is known to be normally distributed with a mean of 21 days and a standard deviation of 4 days. Let X be the number of days for a randomly selected trial. Round all answers to 4 decimal places where possible.

(a) If one of the trials is randomly chosen, find the **probability** that it lasted between 17 and 27 days.



$P(17 < x < 27) = \text{normalcdf}(17, 27, 21, 4)$

$= \boxed{0.7745}$

(b) Within **how many days** are all trials completed in the shortest 30% of the time (bottom 30%)? ↳ x

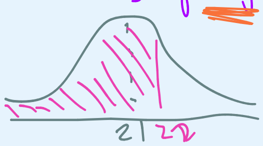
$x = \text{invNorm}(0.3, 21, 4, \text{LEFT})$

$= \boxed{18.9 \text{ days}}$ $\boxed{19 \text{ days}}$

(c) If **five trials** are randomly chosen, find the probability that they lasted **less than** 22 days.

↳ sampling dist

$\mu_{\bar{x}} = \mu = 21 \qquad \sigma_{\bar{x}} = \sigma/\sqrt{n} = 4/\sqrt{5}$



$P(\bar{x} < 22) = P(\bar{x} < 21) + P(21 < \bar{x} < 22)$

$= 0.5 + \text{normalcdf}(21, 22, 21, 4/\sqrt{5}) = \boxed{0.7119}$

(d) (BONUS, 3 pts) If one of the trials is randomly chosen, find the probability that it lasted **at least** 25 days.