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Homework 1: Due Friday 5/22/2020

STAT-145-02

6.1 Practice

25. Suppose a normal distribution has a mean of six and a standard deviation of 1.5. What is the *z*-score of *x* = 5.5?

$$z = \frac{x - \overline{x}}{\sigma} \tag{1}$$
$$z = \frac{5.5 - 6}{1.5}$$
$$\underline{\overline{|z = -0.33|}}$$

26. In a normal distribution, *x* = 5 and *z* = –1.25. This tells you that *x* = 5 is __ 1.25 __ standard deviations to the __ right __ (right or left) of the mean.

27. In a normal distribution, *x* = 3 and *z* = 0.67. This tells you that *x* = 3 is __ 0.67 __ standard deviations to the __ left __ (right or left) of the mean.

28. In a normal distribution, *x* = –2 and *z* = 6. This tells you that *x* = –2 is __ 6 __ standard deviations to the __ left __ (right or left) of the mean.

6.1 Homework

64. The systolic blood pressure (given in millimeters) of males has an approximately normal distribution with mean $\mu = 125$ and standard deviation $\sigma = 14$. Systolic blood pressure for males follows a normal distribution.

    1. Calculate the *z*-scores for the male systolic blood pressures 100 and 150 millimeters.

$$z = \frac{x - \overline{x}}{\sigma} \tag{2}$$
$$z = \frac{100 - 125}{14}$$
$$z = -1.79$$

$$z = \frac{x - \overline{x}}{\sigma}$$
$$z = \frac{150 - 125}{14}$$
$$z = 1.79$$

65. If a male friend of yours said he thought his systolic blood pressure was 2.5 standard deviations below the mean, but that he believed his blood pressure was between 100 and 150 millimeters, what would you say to him?

    I would probably tell him that he was incorrect, and show him the math.

66. Kyle's doctor told him that the *z*-score for his systolic blood pressure is 1.75. Which of the following is the best interpretation of this standardized score? The systolic blood pressure (given in millimeters) of males has an approximately normal distribution with mean μ = 125 and standard deviation σ = 14. If *X* = a systolic blood pressure score then *X* ~ *N* (125, 14).

    1. Which answer(s) is/are correct? (Highlighted is answer)

        1. Kyle's systolic blood pressure is 175.
        2. Kyle's systolic blood pressure is 1.75 times the average blood pressure of men his age.
        3. Kyle's systolic blood pressure is 1.75 above the average systolic blood pressure of men his age.
        4. Kyles's systolic blood pressure is 1.75 standard deviations above the average systolic blood pressure for men.

    2. Calculate Kyle's blood pressure.

$$\begin{aligned} z &= \frac{x - \overline{x}}{\sigma} \\ z\sigma &= x - \overline{x} \\ z\sigma + \overline{x} &= x = (1.75 * 14) + 125 \\ &\underline{\overline{|x = 149.5mm|}} \end{aligned} \tag{3}$$

67. Height and weight are two measurements used to track a child's development. The World Health Organization measures child development by comparing the weights of children who are the same height and the same gender. In 2009, weights for all 80 cm girls in the reference population had a mean μ = 10.2 kg and standard deviation σ = 0.8 kg. Weights are normally distributed. *X* ~ *N*(10.2, 0.8). Calculate the *z*-scores that correspond to the following weights and interpret them.

    1. 11 kg

$$\begin{aligned} z &= \frac{x - \overline{x}}{\sigma} \\ z &= \frac{11kg - 10.2kg}{0.8} \\ &\underline{\overline{|z = 1|}} \end{aligned} \tag{4}$$

    2. 7.9 kg

$$\begin{aligned} z &= \frac{x - \overline{x}}{\sigma} \\ z &= \frac{7.9kg - 10.2kg}{0.8} \\ &\underline{\overline{|z = -2.88|}} \end{aligned} \tag{5}$$

    3. 12.2 kg

$$\begin{aligned} z &= \frac{x - \overline{x}}{\sigma} \\ z &= \frac{12.2kg - 10.2kg}{0.8} \\ &\underline{\overline{|z = 2.5|}} \end{aligned} \tag{6}$$

68. In 2005, 1,475,623 students heading to college took the SAT. The distribution of scores in the math section of the SAT follows a normal distribution with mean μ = 520 and standard deviation σ = 115.

    1. Calculate the *z*-score for an SAT score of 720. Interpret it using a complete sentence.

$$
\begin{aligned}
z &= \frac{x - \overline{x}}{\sigma} \\
z &= \frac{720 - 520}{115} \\
\underline{\overline{|z = 1.739|}}
\end{aligned}
\tag{7}
$$

    This Z-score means that a score of 720 is 1.739 standard deviations above the mean.

    2. What math SAT score is 1.5 standard deviations above the mean? What can you say about this SAT score?
    This SAT score is significantly higher than the average, but still statistically significant.

    3. For 2012, the SAT math test had a mean of 514 and standard deviation 117. The ACT math test is an alternate to the SAT and is approximately normally distributed with mean 21 and standard deviation 5.3. If one person took the SAT math test and scored 700 and a second person took the ACT math test and scored 30, who did better with respect to the test they took?

$$
\begin{aligned}
z_{SAT} &= \frac{x - \overline{x}}{\sigma} \\
z_{SAT} &= \frac{700 - 520}{115} \\
z_{SAT} &= 1.565 \\
z_{ACT} &= \frac{x - \overline{x}}{\sigma} \\
z_{ACT} &= \frac{30 - 21}{5.3} \\
z_{ACT} &= 1.698 \\
z_{ACT} &> z_{SAT}
\end{aligned}
\tag{8}
$$

Because Z-scores can be compared regardless of the data they were created from, (due to being divided by the standard deviation, removing units) the person who took the ACT math test scored higher.