VITAL MATHEMATICS

STATISTICS
Z – SCORE

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INTRODUCTION

The z – score is a numerical value that describes how far a data value deviates from the mean. The z – score is very similar to the standard deviation, but instead of expressing how all values deviate from the mean; z – score expresses one value.

Z – SCORE EQUATION

$$z = \frac{\mathrm{x} - \bar{x}}{s}$$

$\overline{x}\ (x - bar) - Sample\ mean$
$\mathrm{z} - \mathrm{z} - \mathrm{score}$
$x - Data\ value$
$s - sample\ standard\ deviation$

$$z = \frac{\mathrm{x} - \mu}{\sigma}$$

$\mu(mu) - Population\ mean$
$\sigma - population\ standard\ deviation$

SOLVING Z – SCORE

$$z = \frac{\mathrm{x} - \bar{x}}{s} \qquad z = \frac{\mathrm{x} - \mu}{\sigma}$$

STEP 1) Calculate the mean, if not given

$$\overline{x} = \frac{\Sigma x}{n} \qquad \mu = \frac{\Sigma x}{N}$$

STEP 2) Calculate the standard deviation, if not given

$$s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n - 1}} \qquad \sigma = \sqrt{\frac{\Sigma(x - \mu)^2}{N}}$$

STEP 3) Identify which x value is being examined, then subtract the mean

Example: $x - \bar{x} \quad or \quad x - \mu$

STEP 4) Divide step 3 by the standard deviation

Example: $\frac{STEP\ 3}{s} \quad or \quad \frac{STEP\ 3}{\sigma}$

STEP 5) Round STEP 4 to two decimal places

STEP 6) Provide conclusion

Z – SCORE EXAMPLE

Example 1: What is the z-score of 22in when the mean is 30in and the standard deviation is 2in?

Example 2) Find the z-score of 19, from the values below.

12, 15, 17, 13, 19, 20, 22, 14, 23, 25, 18

Concepts Concerning the Z – SCORE

The z-score has no units of measurement. If a x value has a z-score greater than 2 or less than -2, will be considered significantly high or significantly low, respectively. When a x value is less than the mean, the z-score will be negative. If three of four values within the z-score equation is identified, you can always find the fourth value using equation manipulation.

For example, when z-score, x value and mean are known, sample standard deviation can be found by

$$z = \frac{x - \bar{x}}{s} \underset{1}{\Rightarrow} \frac{1}{z} = \frac{s}{x - \bar{x}} \underset{2}{\Rightarrow} s = z(x - \bar{x})$$

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