

Section 6.4: Measures of Relative standing

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measures of relative standing -

- give an indication of the position of an individual data point with respect to the rest of the data

example: you ran a race and your time was 54 minutes

54 minutes

is this good or bad? how can you tell?

you want to compare this to everyone else's result, right?

measures: percentiles (we will not cover)

z-score

z-score:

for populations,

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

where x = data point of interest

μ = population mean

σ = population std dev

for samples,

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

s

where \bar{x} = sample mean

s = sample std dev

z is then the number of standard deviations above the mean that the data point is

- if z is negative, then the data point is below the mean

notation: $|z|$ is the absolute value of z
(how far from the origin z is)

$$|3| = 3$$

$$|-3| = 3$$

$$|0| = 0$$

so, how likely are various z -scores?

$|z| > 2$ - for any distribution, will happen $< 25\%$ of the time (Tcheby's)

- for unimodal and roughly symmetric, will happen $\sim 5\%$ of the time

so $|z| > 2$ is somewhat unlikely

$|z| > 3$ - for any distribution, will happen $< 11\%$ of the time (Tcheby)

- for unimodal and roughly symmetric, will happen $\sim 0.3\%$ of the time

so $|z| > 3$ is very unlikely

and in this class, we will characterize any

$|z| \leq 2$ as likely


example: Ten DVDs were picked at random from Pat's DVD collection, and the number of Academy Awards (oscars) won by each movie was recorded.

results: 0, 0, 1, 2, 0, 0, 2, 0, 11, 1

The standard deviation for this data set is 3.37. Calculate the z-score for any outliers and state whether those data points are likely or unlikely.

answer: $\bar{x} = 1.7$
 $s = 3.37$

$$\begin{aligned} z &= \frac{x - \bar{x}}{s} \\ &= \frac{11 - 1.7}{3.37} \\ &= 2.761158 \\ &= 2.76 \end{aligned}$$

unlikely 

(in general, we round z to 2 decimal places)

note: Lord of the Rings: Return of the King was not a typical movie