

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 1 hour and 56 minutes

but how did everyone else do?

measures: percentiles (we will not cover)

z-score

z-score:

for populations, it's

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

where x = data point of interest

μ = population mean

σ = population standard deviation

for samples, it's

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

where \bar{x} = sample mean
 s = sample standard deviation

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

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so, how likely are various z -scores?

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

$$|3| = 3$$

$$|-3| = 3$$

$$|0| = 0$$

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

for mound-shaped, will happen
~ 5% of the time
(~ 2.5% for $z > 2$,
~ 2.5% for $z < -2$)

so $|z| > 2$ is somewhat unlikely

$|z| > 3$ - for any distribution, will happen
≤ 1% of the time (Tcheby)

- for mound-shaped, will happen
~ 0.3% of the time
(~ 0.15% above, ~ 0.15% below)

so $|z| > 3$ is very unlikely

example: Ten DVDs were picked at random
from Pat's collection, and the number
of Oscars^(awards) won by each movie was
recorded.

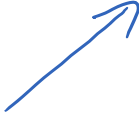
results: 0, 0, 1, 2, 0, 0, 2, 0, 11, 1

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

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

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

unlikely 

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