**Diagram

Description automatically generated with low confidence8.4 The Normal Distribution – Overview**

**Diagram

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**Normal Distribution Properties**

* It’s a symmetric, unimodal and bell-shaped distribution

⇒ which implies mean = median = mode.

* Total area under curve (probability) is equal to 1 = 100%.
* Completely described by its mean 𝜇 (location) and standard deviation 𝞂 (spread).

Chart

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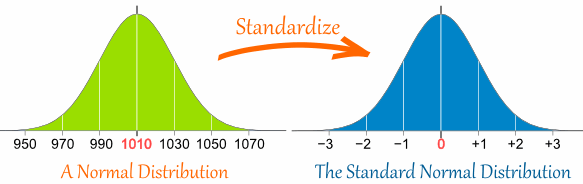
* The normal distribution allows us to find any probability, not just for points that lie exactly 1, 2, or 3 standard deviations (“steps”) away from the mean like with the empirical rule!

**Z-scores** (“Standard” scores in Hawkes Certify)

* Definition: A **z-score** standardizes observations based on the mean (center) and standard deviation (spread) of the distribution.

Formula:

* + Allows for comparisons on different scales.
  + Ex) ACT vs SAT
* Interpretation:
  + A **z-score** tells us how many standard deviations an observation is away from the mean.
  + The unit of a **z-score** is standard deviations.



*Z*

*X*

**Example 1**)For each data set with the stated and , find the standard score (z score) corresponding to the given observation, .

1. Which observation is further from the mean relatively?

Diagram

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**Finding probabilities based on the Normal Distribution**

* Handout: Normal Distribution Table
  + Use the handout to convert z-scores to percentiles (“left probabilities”).
  + ALWAYS gives probability LESS THAN Z: P(Z < z).
* Different types of probabilities
  + Left probability

Draw, Label and Shade curve

* + - Example: Find the total area under the standard normal curve (probability or percentage) to the left of z = 0.34.

Chart, line chart

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* + Right probability
    - Examples: Find the probability to the right of z = 0.34.

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Find the probability to the right of z = -1.2.

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* + Between probability

Why this works

* + - Chart, line chart

      Description automatically generatedExample: Find the probability between z1 = -0.12 and z2 = 2.27.

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* + Outside probability
    - Example: Find the probability to the left of z1 = -0.12 and to the right of z2 = 2.27.

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