

PSYC 60 – Statistics
Spring 2012
Notes #3

Book: Chapter 5 – Standard Scores (z) and Normal Distribution

Z-score

*Video – YouTube: “ck12.org Normal Distribution Problems: z-score”
(Khan Academy, 8 mins)*

We need ways to identify values that are rare. Why?

How do we identify how rare a value is in a distribution?

Coin Flip Example

How many standard deviations above/below the mean

Example

Miles

| run: | dist from mean | sd's from mean |
|------|----------------|----------------|
| A | 5 | |
| B | 2 | |
| C | 3 | |
| D | 7 | |
| E | 3 | |
| F | 0 | |
| G | 4 | |
| H | 4 | |
| I | 8 | |

Procedure

1. Find mean and standard deviation
2. Calculate distance from score to mean
3. Divide distance by size of standard deviation

Formula

Comparing across different distributions

| | Quiz 1 ($\mu = 86, \sigma = 9.7$) | | | HW 1 ($\mu = 6.8, \sigma = 1.3$) | | |
|---------|--|-----------------------------|----------|---------------------------------------|-----------------------------|----------|
| | <u>X</u> | <u>X - μ</u> | <u>Z</u> | <u>X</u> | <u>X - μ</u> | <u>Z</u> |
| Mike | 80 | | | 7 | 0.2 | 0.15 |
| Steph | 95 | 9 | 0.93 | 9 | | |
| Kristin | 95 | 9 | 0.93 | 5 | -1.8 | -1.36 |
| Brad | 90 | 4 | 0.41 | 6 | -0.8 | -0.6 |
| Tristan | 70 | -16 | -1.65 | 7 | 0.2 | 0.15 |

Normal Distribution

Video - YouTube: "[ck12.org](https://www.youtube.com/watch?v=ck12.org) Normal Distribution Problems: Empirical Rule"
(Khan Academy, 10 mins)

Common in nature & society (Source: davidmlane.com/hyperstat, wikipedia.org/wiki/Normal_curve)

Based on a mathematical formula

Described completely by two variables: _____ and _____

Why is it useful?

For any given _____, we can determine the _____ that it will occur.

Standard Normal

A normal distribution in which the _____ = _____ and _____ = _____

If our data is in raw values, how do we use the standard normal?

Example

On a class exam worth 50 pts, the professor reports that the mean was 33 pts and the SD was 4 pts.

| | | | |
|------------------|---------|---------------|---------------|
| | Your | % of students | % of students |
| If you received: | z-score | below you | above you |

41

29

38.2

z-table

if we know _____, we can find the _____
also,

if we know _____, we can find the _____

| Table A ^a | | | | | | | | |
|---|-------|-------|------|-------|-------|------|-------|-------|
| PROPORTIONS (OF AREA) UNDER STANDARD NORMAL CURVE FOR VALUES OF z | | | | | | | | |
| A | B | C | A | B | C | A | B | C |
| | | | | | | | | |
| z | | | z | | | z | | |
| 0.00 | .0000 | .5000 | 0.56 | .2123 | .2877 | 1.12 | .3686 | .1314 |
| 0.01 | .0040 | .4960 | 0.57 | .2157 | .2843 | 1.13 | .3708 | .1292 |
| 0.02 | .0080 | .4920 | 0.58 | .2190 | .2810 | 1.14 | .3729 | .1271 |
| 0.03 | .0120 | .4880 | 0.59 | .2224 | .2776 | 1.15 | .3749 | .1251 |
| 0.04 | .0160 | .4840 | 0.60 | .2257 | .2743 | 1.16 | .3770 | .1230 |
| 0.05 | .0199 | .4801 | 0.61 | .2291 | .2709 | 1.17 | .3790 | .1210 |
| 0.06 | .0239 | .4761 | 0.62 | .2324 | .2676 | 1.18 | .3810 | .1190 |
| 0.07 | .0279 | .4721 | 0.63 | .2357 | .2643 | 1.19 | .3830 | .1170 |
| 0.08 | .0319 | .4681 | 0.64 | .2389 | .2611 | 1.20 | .3849 | .1151 |

x-z-p

Problem: The mean is 20, the standard deviation is 5, the score is 12. What percent of scores is below this score?

Problem: What score do you have to have to be in the top 10% of a distribution with $\mu = 3$ and $\sigma = 0.1$?

Problem: The distribution of IQs has a mean of 100 and a standard deviation of 15. What percent of scores are between 85 and 105?