AMS 7 - Lecture 4.17.18

THIS TIME: Normal Curve

NEXT TIME: Experimental Design

HWK #1 due Friday on canvas @ 11:59pm

▷ Resources

* MSI Sessions (Evan Hetland)
  ↳ ehetland@ucsc.edu

SCHEDULE

Mondays	4-5pm	OLC (Oaks learning center)
Tuesdays	11:40AM-12:40Pm	OLC
Thursdays	1:30 - 2:30PM	Crown 201
Fridays	1:20 - 2:20PM	OLC

* LSS Tutoring
  ↳ slugsupport.ucsc.edu or lss.ucsc.edu
* OFFICE HOURS
  ↳ TAs & Professor Draper

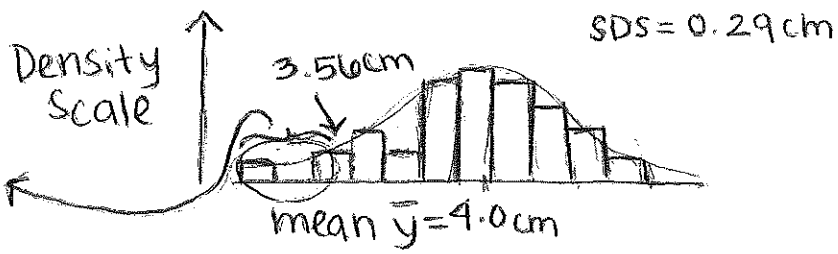
- Data Analysis

(L-16) → Question: what percent of the butterflies had wing length ≤ 3.56 cm?

↳ Answer 1 (exact):
from the raw data, $2/24 = 1/12 \cong 8.3\%$.

↳ Answer 2 (approx.):
draw histogram on density scale and work out area under histogram bars to left of 3.56cm

↳ Answer 3 (approx.):
impose a normal curve on top of the histogram on the density scale



What is the area under normal curve?

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* SD cannot be negative $s \geq 0$

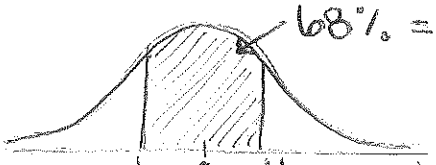
$\begin{bmatrix} 12 \\ 12 \\ \vdots \\ 12 \end{bmatrix}$ $\begin{bmatrix} c \\ c \\ c \end{bmatrix}$ $-\infty < \bar{y} < +\infty$

SD = 0 SD = 0

mean = 12 mean = c

→ Standard Normal Curve

L-34



Pure numbers with no units

Math Fact: All normal curves satisfy the Empirical Rule exactly.

* Two Facts about Normal Curve
  - ↳ on the density scale
  1) Area under curve (total) = 1 or 100%.
  2) Symmetric Bell curves

Negative Z-table

L-35

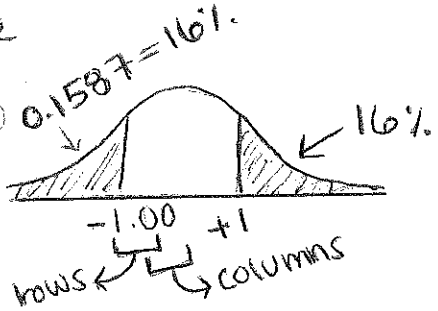
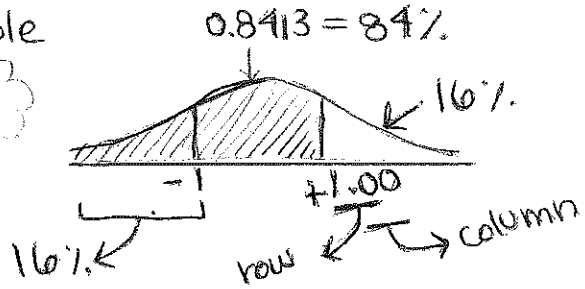


table only has decimal values. Convert to %.

0.1587 = 15.9% = 16%

positive Z-table

L-34



100% - 84% = 16%.

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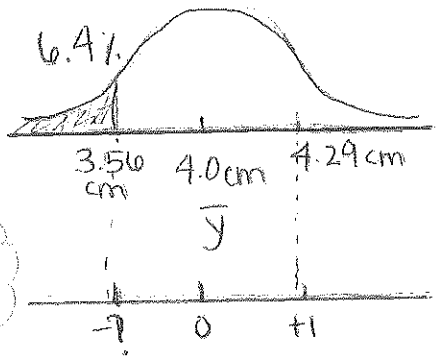
• Wing length example

SDS = 0.29 cm



HW #1 Prob 4

Compare relationship of numbers

*converting to standard units

$$z = \frac{3.56\,cm - 4.0\,cm}{0.29\,cm} = \frac{-0.44}{0.29} \doteq -1.52$$

z has no units (pure #s)

Use the (−) table

−1.5 >>> column .02

↳ 0.0643 ≐ 6.4%

* To get from raw units to standard units (y to z):

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

standard units ↘ ← mean

↑ standard Deviation

$$y = \bar{y} + s \cdot z$$

↑ raw units

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Chapter 2 : Experimental Design

*Read article from R−41 → R−50 (recommended)

↳ chemical & Anatomical Chemistry of Brain

2.1 • Randomized Controlled Experiments

- Case study >>> Psychobiology

Does the psychological environment affect the anatomy of the brain in mammals?

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Y = Brain anatomy (outcome)
X = Psychological environment (treatment)

* Y → dependent variable
* X → independent variable

▷ Can't experiment on people (manipulate) due to ethics
↳ can run a survey & ask people, with informed consent, about X, & do brain scan to see their Y

L-72

subjects: rats (n=120)
Y → Weight of cortex in mg (quant. & continous) ratio scale
X → enriched (T) vs. deprived (C)
↑ treatment ↑ control

Cortex Weight

Enriched	Deprived
$\bar{y}_1 = 683$mg	$\bar{y}_2 = 647$mg

*Does 683 differ from 647 by an amount that's large in practical terms?

* Get expert information (about cortex)
* $\frac{683mg - 647mg}{647mg} = \frac{36}{647} = 0.0556$ mg

5.6 %. ←
T Bigger than C