

this time: normal curve;  
 next time: experimental design

hope 1 due this Fri @ canvas by 11.59 pm  
 AMS 9 17 April  
 Q: what % of butterflies had

wing length  $\leq 3.56$  cm?

A<sub>1</sub> (exact): from raw data

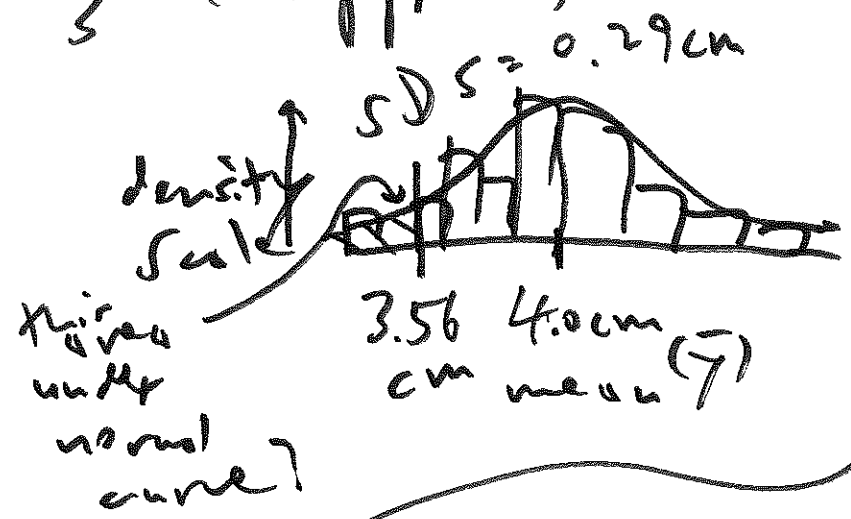
data:  $\frac{2}{24} = \frac{1}{12} = 8.3\%$

A<sub>2</sub>: (approx):

draw hist. on density scale, work out area under hist bars to left of 3.56 cm

A<sub>3</sub>: (approx):

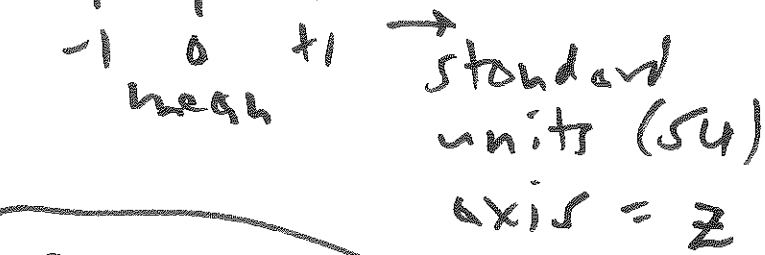
$\begin{bmatrix} 12 \\ 12 \\ \vdots \\ 12 \end{bmatrix}$   $\begin{bmatrix} c \\ \vdots \\ c \end{bmatrix}$   
 mean  $\mu$  mean  $\mu$   
 SD 0 SD 0



$-\infty < \bar{y} < +\infty$

$s \geq 0$  ← SDs can't be negative

SD 1 68% = 0.68  
 Standard normal curve

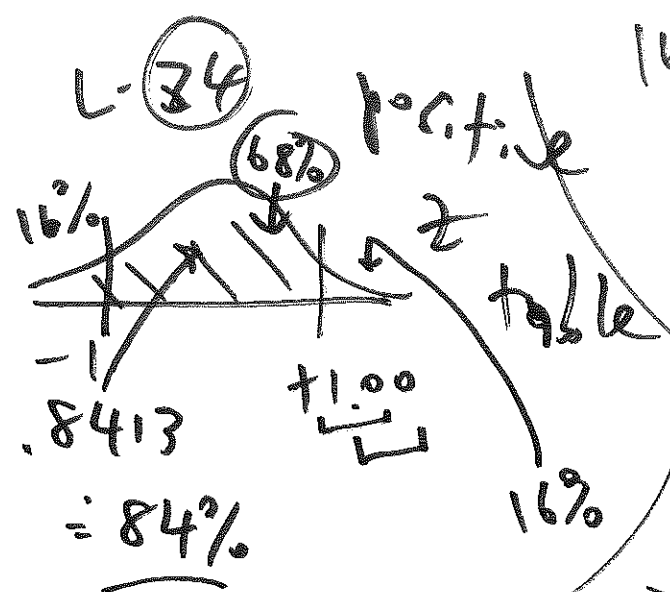
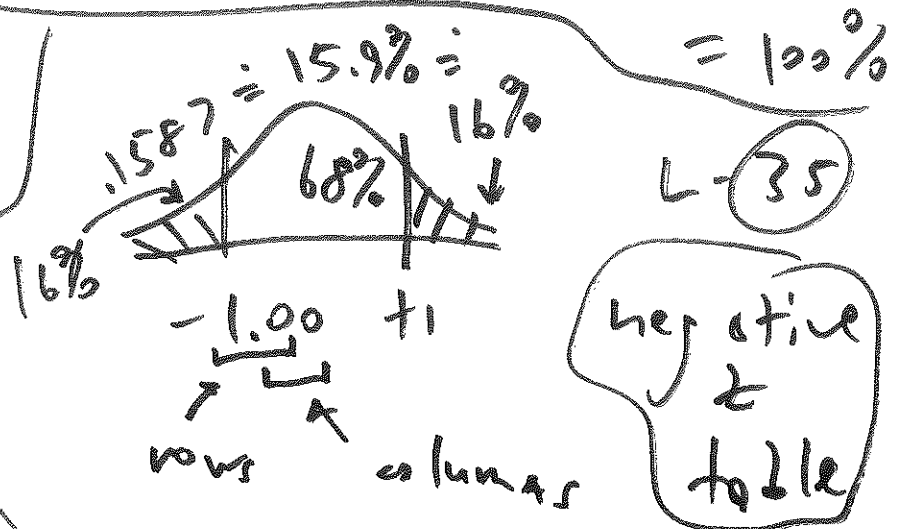


Math Fact: All normal curves satisfy the Empirical Rule exactly.

2 facts about normal curve:  
 (on densit)

① area under curve = 1  
 total

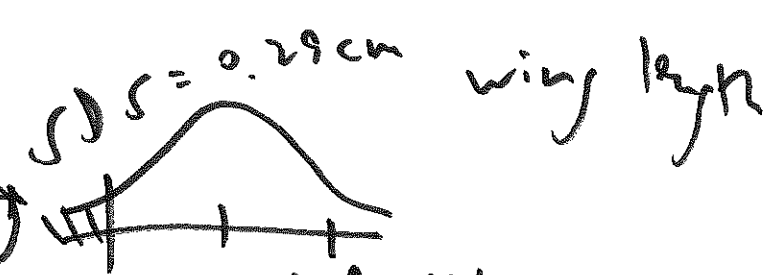
② symmetric



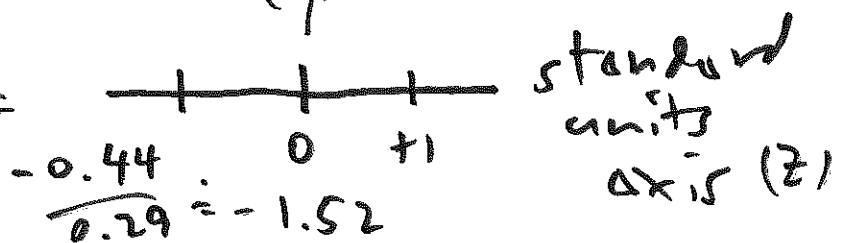
negative z table

converting to standard units =

$$z = \frac{3.56 \text{ cm} - 4.0 \text{ cm}}{0.29 \text{ cm}} =$$



3.56 cm (y)  
 4.0 cm (x)  
 4.29 cm (y)  
 raw units axis (y)



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

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

$$z \text{ (standard units)} = \frac{\# - \text{mean}}{s}$$

to go from z to y:

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

ch. 2  
L-67 experimental design

R-41 + R-50 : recommend. read now

Y: brain anatomy (outcome)	weight of cortex (quant. cont. ratio) in mg	Subjects:
X: psychological environment (treatment)	enriched (T) group vs. deprived (C) (manipulate X)	rats

can't experiment on people: **ethics** (informed consent)

can we survey: ask people about X, do brain scan to see their Y

Q: does (683) differ from (647) (4)

by an amount that's large in

practical terms

A<sub>1</sub>: get expert information

practically significant (practsig)

$$A_2: \frac{683 \text{ mg} - 647 \text{ mg}}{647 \text{ mg}} = \frac{+36 \text{ mg}}{647 \text{ mg}} = +5.6\%$$