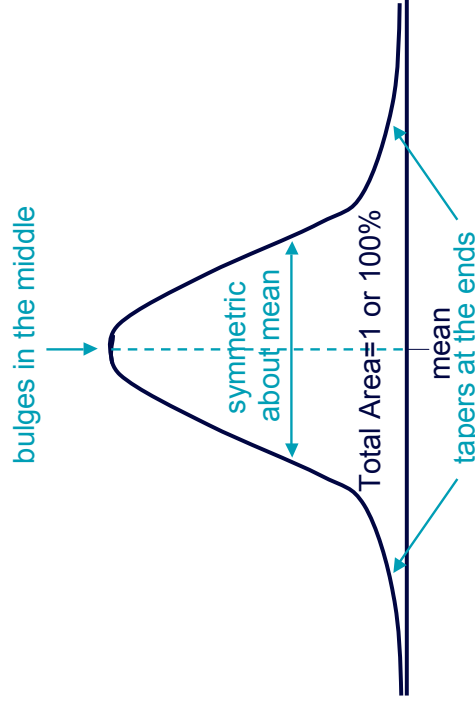# Lecture 11/Review Chapter 8
Normal Practice Exercises
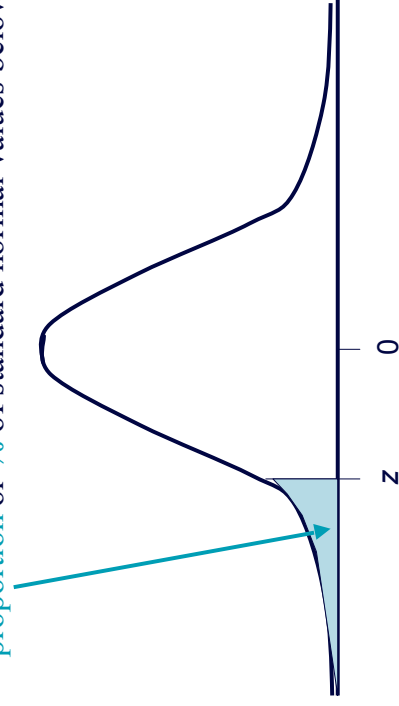
- Strategies to Solve 2 Types of Problem
- Examples

Properties of Normal Curve (*Review*)

bulges in the middle

symmetric about mean

Total Area=1 or 100%

mean
tapers at the ends

Standardizing Values of Normal Distribution

Put a value of a normal distribution into perspective by standardizing to its z-score:

$$z = \frac{\text{observed value - mean}}{\text{standard deviation}}$$

If we know the z-score, we can convert back:

observed value = mean + (z × standard deviation)

Using Table 8.1 page 157

- For a given standard score z, the table shows the proportion or % of standard normal values below z.

z   0

Strategies for 2 Types of Problem

A. Given normal value, find proportion or %:

- ☐ Calculate $z=$(observed−mean)/sd [sign + or −?]
- ☐ Look up proportion in Table [adjust if asked for proportion *above* or *between*, not *below*]

B. Given proportion or %, find normal value:

- ☐ [adjust if asked for proportion *above* or *between*] Locate proportion in Table, find z.
- ☐ Unstandardize: observed = mean + (z × sd)

SKETCH! *We'll assume all examples today follow a normal curve...*
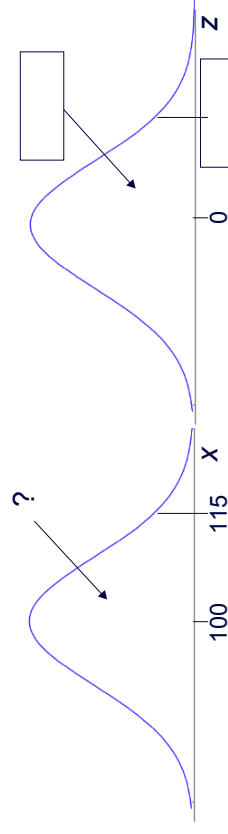

Example: *Normal Exercise #1A*

- ☐ **Background**: Scores *x* have mean 100 pts, sd 10 pts.
- ☐ **Question:** What % are below 115 pts?
- ☐ **Response:**
- ☐ Table→

Answer: _____ % are below 115 pts.

?

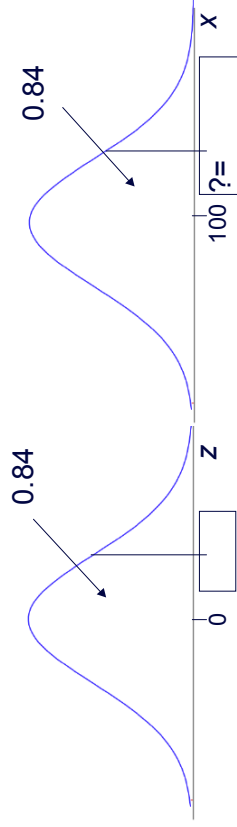100   115   x

0   z

Example: *Normal Exercise #1B*

- ☐ **Background**: Scores *x* have mean 100 pts, sd 10 pts.
- ☐ **Question:** The lowest 84% are below how many pts?
- ☐ **Response:** Table→

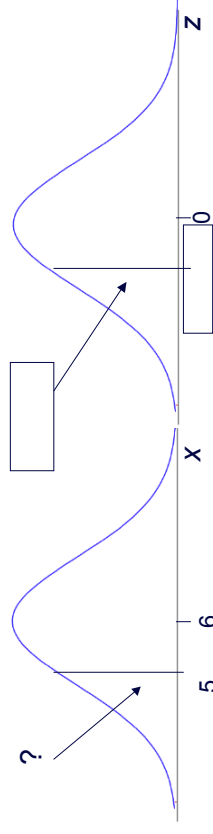Unstandardize to *x*=

Answer: The lowest 84% are below _____ pts.

0.84

0   z

0.84

100 ?=   x

Example: *Normal Exercise #2A*

- ☐ **Background**: Sizes *x* have mean 6 inches, sd 1.5 inch.
- ☐ **Question:** What % are below 5 inches?
- ☐ **Response:**
- ☐ Table→

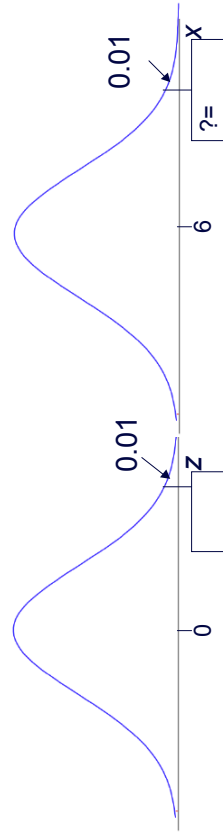Answer: _____ % are below 5 inches.

?

5   6   x

0   z

Example: *Normal Exercise #2B*

- **Background**: Sizes *x* have mean 6 inches, sd 1.5 inch.
- **Question:** The tallest 1% are above how many inches?
- **Response:** 0.01 *above*←→

Unstandardize to

Answer: The tallest 1% are above _____ inches.
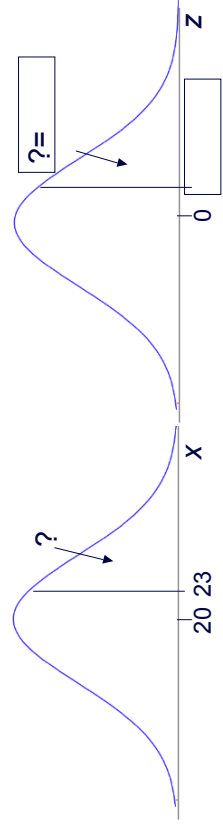
0.01

0.01

?=

0   z   6   x

Example: *Normal Exercise #3A*

- **Background**: No. of cigarettes *x* has mean 20, sd 6.
- **Question:** What % are more than 23 cigarettes?
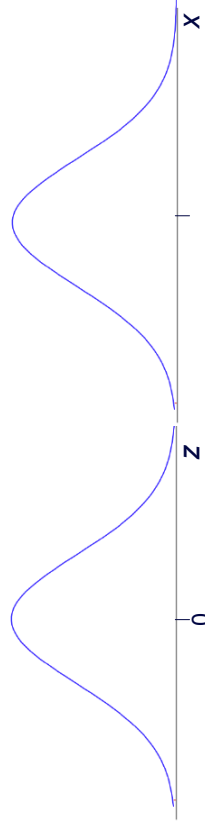- **Response:** *z* =

Table→

Answer: _____ % are more than 23 cigarettes.

?

?=

20 23   x   0   z

Example: *Normal Exercise #3B*

- **Background**: No. of cigarettes *x* has mean 20, sd 6.
- **Question:** 90% are more than how many cigs?
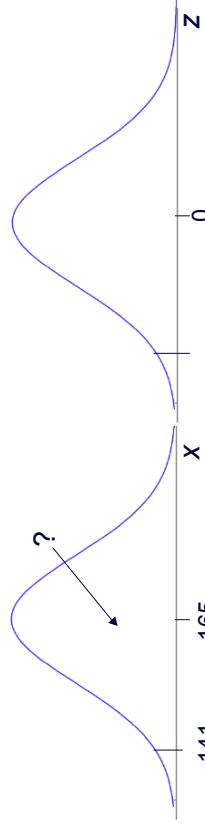- **Response:**

Answer: 90% are above _____ cigarettes.

0   z   x

Example: *Normal Exercise #4A*

- **Background**: Wts *x* have mean 165 lbs, sd 12 lbs.
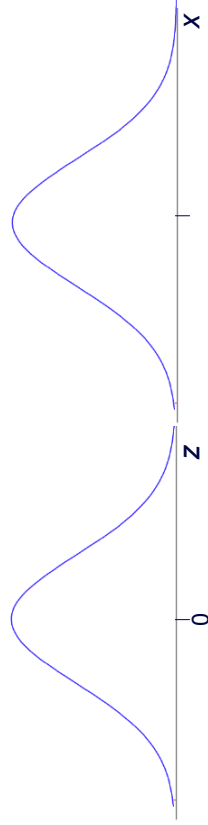- **Question:** What % are more than 141 lbs?
- **Response:** *z* =

Table→

Answer: _____ % are more than 141 lbs.

?

141   165   x   0   z

Example: *Normal Exercise #4B*

- **Background**: Weights x have mean 165 lbs, sd 12 lbs.
- **Question:** The lightest 2% are below how many lbs?
- **Response:**

Answer: The lightest 2% are below _____ lbs.

Example: *Normal Exercise #5*

- **Background**: No. of people x has mean 4, sd 1.3.
- **Question:** What % of the time is x between 2 and 6?
- **Response:**

Example: *Normal Exercise #6*

- **Background**: Duration x has mean 11 years, sd 2 years.
- **Question:** What % of the time is x between 14 and 17?
- **Response:**

Example: *Normal Exercise #7*

- **Background**: Earnings x have mean $30K, sd $8K.
- **Question:** What % of the time is x bet. $20K and $22K?
- **Response:**

"Off the Chart"

For extreme negative z values, proportion below is approx. 0, proportion above is approx. 1.

For extreme positive z values, proportion below is approx. 1, proportion above is approx. 0.

Example: *Normal Exercise #8*

☐ **Background**: Amts. x have mean 300 ml, sd 3 ml.

☐ **Question:** What % of the time is x …?

(a) <280 ml (b) > 280 ml (c) < 315 ml (d) >315 ml

☐ **Response:**

(a)

(b)

(c)

(d)

Empirical Rule *(Review)*

For any normal curve, approximately

☐ 68% of values are within 1 sd of mean

☐ 95% of values are within 2 sds of mean

☐ 99.7% of values are within 3 sds of mean
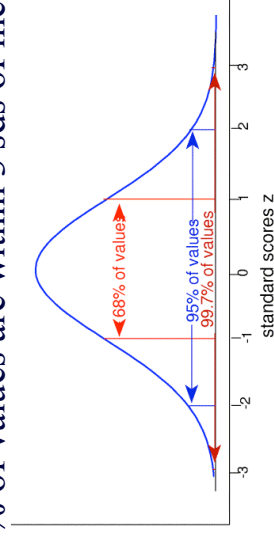
Example: *Normal Exercise #9*

☐ **Background**: Consider Examples 1(b), 4(a).

☐ **Question:** What does Empirical Rule tell us?

☐ **Response:**

1(b) mean=100, sd=10.

4(a) mean=165, sd=12.