Section 6-2

Applications of Normal Distributions

NONSTANDARD NORMAL DISTRIBUTIONS

If $\mu \neq 0$ or $\sigma \neq 1$ (or both), we will convert values to standard scores using the formula

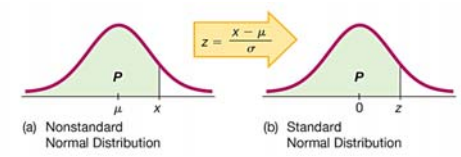
$$z = \frac{x - \mu}{\sigma}$$

then procedures for working with all normal distributions are the same as those for the standard normal distribution.

NOTE: We will round z scores to 2 decimal places.

FINDING AREAS WITH NONSTANDARD NORMAL DISTRIBUTIONS WITH TABLE A-2

1. Sketch a normal curve, label the mean and the specific x values, then ***shade*** the region corresponding to the desired probability.
2. For each relevant value x that is a boundary for the shaded region, use the formula to convert the value to a z score.
3. Refer to Table A-2 to find the area of the shaded region. This area is the desired probability.



FINDING AREAS WITH NONSTANDARD NORMAL DISTRIBUTIONS WITH TI-83/84

To find the area between two x values, press **2nd VARS** (for **DIST**) and select **2:normalcdf(**. Then enter the two x values separated by a comma followed by another comma, the mean, a comma, and then the standard deviation.

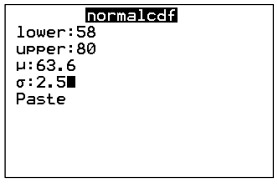
To find the area between 58 and 80 when $\mu = 63.6$ and $\sigma = 2.5$, your calculator display should look like:

normalcdf(58,80,63.6,2.5)

FINDING AREAS WITH NONSTANDARD NORMAL DISTRIBUTIONS WITH TI-84 NEW OS

To find the area between two x values, press **2nd VARS** (for **DIST**) and select **2:normalcdf(**. Then enter the two x values separated by a comma followed by another comma, the mean, a comma, and then the standard deviation.

To find the area between 58 and 80 when $\mu = 63.6$ and $\sigma = 2.5$, your calculator display should look like:



CAUTIONS

- ***Don't confuse z scores and areas***. Remember ***z* scores are *distances* along the horizontal scale**, but **areas are *regions* under the normal curve**. Table A-2 list *z* scores in the left columns and across the top row, but areas are found in the body of the table.
- ***Choose the correct (right/left) side of the graph***. A value separating the top 10% from the others will be on the right side of the graph, but a value separating the bottom 10% will be on the left side of the graph.

CAUTIONS (CONCLUDED)

- A *z* score must be ***negative*** whenever it is located on the ***left*** half of the normal distribution.
- **Areas** (or **probabilities**) are positive or zero values, but they are ***never negative***.

FINDING VALUES FROM KNOWN AREAS USING TABLE A-2

1. Sketch a normal distribution curve, enter the given probability or percentage in the appropriate region of the graph, and identify x value(s) being sought.
2. Use Table A-2 to find the z score corresponding to the cumulative left area bounded by x.
3. Use the formula, enter values for μ, σ, and the z score, then solve for x. Note that the formula can be rewritten as:
$$x = \mu + (z \cdot \sigma)$$
4. Refer to the sketch of the curve to verify that the solution makes sense in the context of the graph and in the context of the problem.

FINDING VALUES FROM KNOWN AREAS USING TI-83/84

To find the value corresponding to a known area, press **2nd VARS** (for **DIST**) and select **3:invNorm(**. Then enter the total area to the left of the value, the mean, and the standard deviation.

To find the value corresponding to 0.3786, a cumulative area to the left, when $\mu = 10$ and $\sigma = 2$, your calculator display should look like:

invNorm(.3786,10,2)

FINDING VALUES FROM KNOWN AREAS USING TI-84 NEW OS

To find the value corresponding to a known area, press **2nd VARS** (for **DIST**) and select **3:invNorm(**. Then enter the total area to the left of the value, the mean, and the standard deviation.

To find the value corresponding to 0.3786, a cumulative area to the left, when $\mu = 10$ and $\sigma = 2$, your calculator display should look like: