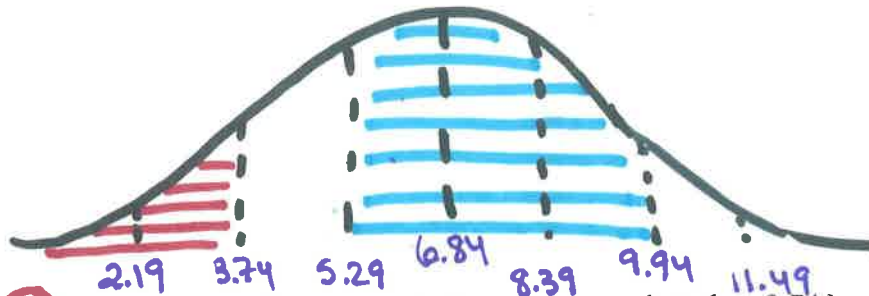


EXAMPLE 2: The distribution of Iowa Test of Basic Skills (ITBS) vocabulary scores for 7th grade students in Gary, Indiana, is close to Normal. Suppose the distribution is $N(6.84, 1.55)$.

a) Sketch the Normal density curve for this distribution.



b) What percent of ITBS vocabulary scores are less than 3.74?

2.5%

c) What percent of the scores are between 5.29 and 9.94?

81.5%

Standard Normal Distribution

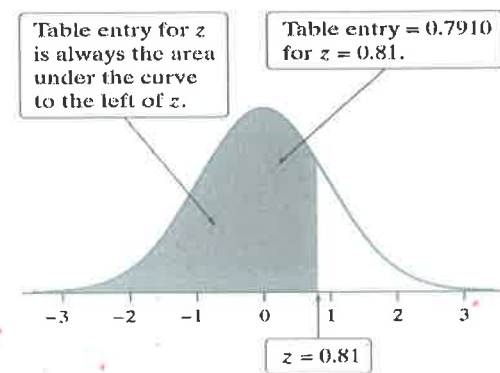
- Normal distribution with mean 0 and standard deviation 1.
- ❖ **The Standard Normal Table:** Because all Normal distributions are the same when we standardize, we can find areas under any Normal curve from a single table.

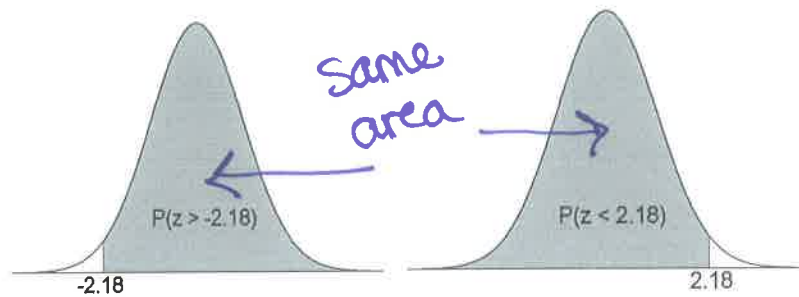
Table A is a table of areas under the standard Normal curve. The table entry for each value z is the Area under the curve to the left of z .

EXAMPLE 1:

- Suppose we want to find the proportion of observations from the standard Normal distribution that are less than 0.81. .7910
- What is $P(z < -2.0)$? .0228
- What is $P(z < 2.0)$? .9772
- Find $P(z < 0.46)$. .6772
- Find $P(z < -2.74)$. .0031
- Find the proportion of observations from the standard Normal distribution that are between -1.25 and 0.81.

$$.7910 - .1056 = .6854$$



Symmetry Property:

If you want to find $P(z > a)$, you can find $1 - P(z < a)$ or $P(z < -a)$

Normal Distribution Calculations (4-step process):

- 1. State:** Express the problem in terms of the observed variable x .
- 2. Plan:** Draw a picture of the distribution and shade the area of interest under the curve.
- 3. Do:** Perform calculations.

Standardize x to restate the problem in terms of a standard Normal variable z .

Use **Table A** (or your calculator) and the fact that the total area under the curve is 1 to find the required area under the standard Normal curve.

- 4. Conclude:** Write your conclusion in the context of the problem.

You MUST do all 4 steps on the AP Exam!

EXAMPLE 2: When Tiger Woods hits his driver, the distance the ball travels is normally distributed with mean distance of 304 yards and standard deviation of 8 yards. What percent of Tiger's drives travel between 305 and 325 yards?

$X =$ distance ball travels



$$z_1 = \frac{305 - 304}{8} = .13$$

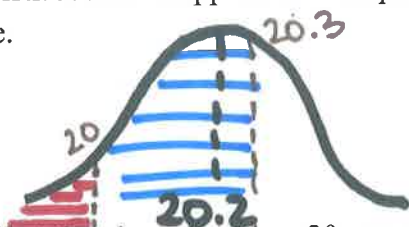
$$z_2 = \frac{325 - 304}{8} = 2.63$$

Find $P(305 < x < 325)$

$$P(x < 325) - P(x < 305)$$

$$.9957 - .5517 = \boxed{44.4\%}$$

EXAMPLE 3: A Company produces "20 ounce" jars of picante sauce. The true amounts of sauce in the jars of this brand follow a normal distribution. Suppose the company's "20 ounce" jars follow an $N(20.2, 0.125)$ distribution curve.



a. What proportion of the jars are under-filled (i.e., have less than 20 ounces of sauce)?

$$P(x < 20) \quad z = \frac{20 - 20.2}{.125} = -1.6$$

$$= .055$$

or 5.5%

b. What proportion of the sauce jars contain between 20 and 20.3 ounces of sauce?

$$P(20 < x < 20.3) \quad z = \frac{20.3 - 20.2}{.125} = 0.8$$

$$.7881 - .0548$$

= .7333 or 73.3%

c. 99% of the jars of this brand of picante sauce will contain more than what amount of sauce?



19.91 oz

EXAMPLE 4: The cars in Clunkerville have a mean age of 12 years and a standard deviation of 8 years. What percentage of cars are more than 4 years old?

Cannot solve → we aren't told "normally distributed"

EXAMPLE 5: SAT I math scores are scaled so that they are approximately normal, with mean about 511 and standard deviation about 112. A college wants to send letters to students scoring in the top 20% on the exam. What SAT I math score should the college use as the dividing line between those who get letters and those who don't?



$$.8416 = \frac{x - 511}{112}$$

$$x = 605.26$$

About 606