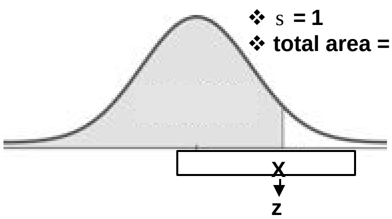
6-3

Applications of Normal Distributions

Table A-2 Standard Normal Distribution

Cumulative from left

- m = 0
- s = 1
- total area = to 1



1

Other Normal Distributions

If *m* ¹ 0 or *s* ¹ 1 (or both), we will convert values to standard scores using Formula 5-2, then procedures for working with all normal distributions are the same as those for the standard normal distribution.

Other Normal Distributions

If $\mu \neq 0$ or $\sigma \neq 1$ (or both), we will convert values to standard scores using Formula 5-2, then procedures for working with all normal distributions are the same as those for the standard normal distribution.

Formula 6-2

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

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Other Normal Distributions

If $\mu \neq 0$ or $\sigma \neq 1$ (or both), we will convert values to standard scores using Formula 5-2, then procedures for working with all normal distributions are the same as those for the standard normal distribution.

Formula 6-2

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

Round to 2 decimal places

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2

Converting to Standard Normal Distribution

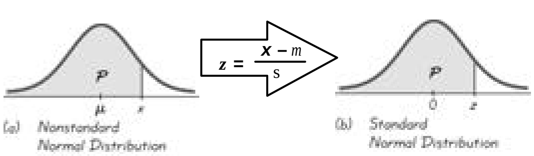

Figure 6-12

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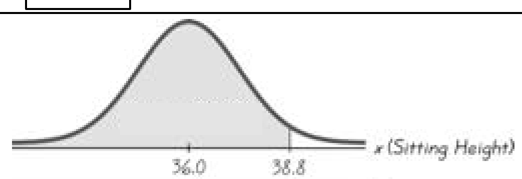
Example

The sitting height (from seat to top of head) of drivers must be considered in the design of a new car model. Men have sitting heights that are normally distributed with a mean of 36.0 in. and a standard deviation of 1.4 in. (based on anthropometric survey data from Gordon, Clauser, et al.). Engineers have provided plans that can accommodate men with sitting heights up to 38.8 in., but taller men cannot fit. If a man is randomly selected, find the probability that he has a sitting height less than 38.8 in. Based on that result, is the current engineering design feasible?

Probability of Sitting Heights Less Than 38.8 Inches

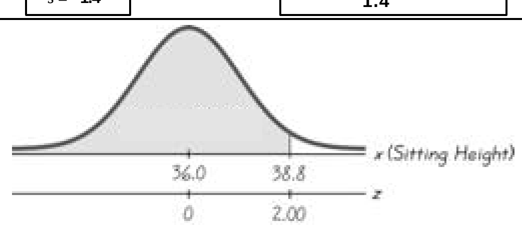
m = **36.0**
s = **1.4**



Probability of Sitting Heights Less Than 38.8 Inches

m = **36.0**
s = **1.4**

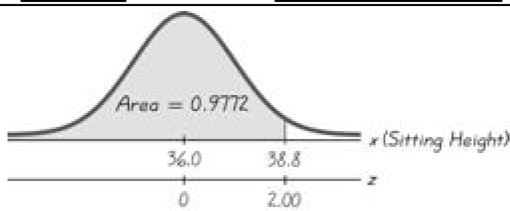
$$z = \frac{38.8 - 36.0}{1.4} = 2.00$$



Probability of Sitting Heights Less Than 38.8 Inches

$m = 36.0$
$s = 1.4$

$$z = \frac{38.8 - 36.0}{1.4} = 2.00$$



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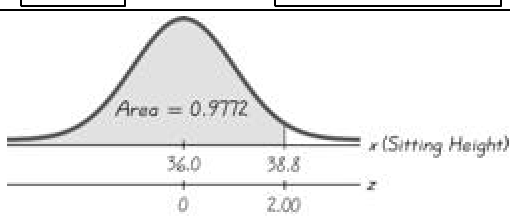
Probability of Sitting Heights Less Than 38.8 Inches

$m = 36.0$
$s = 1.4$

P (x < 38.8 in.) = P(z < 2)
= 0.9772



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Probability of Sitting Heights Less Than 38.8 Inches

P (x < 38.8 in.) = P(z < 2)
= 0.9772

Another interpretation:

97.72% of men have sitting heights less than 38.8 inches, meaning 2.28%of men will not fit in the car. The manufacturer must now decide whether it can afford to lose 2.28% of all male car drivers.

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The U.S. Army requires women’s heights to be between 58 in. and 80 in. Find the percentage of women meeting that height requirement. Are many women being denied the opportunity to join the Army because they are too short or too tall?

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