

2. Woman's standardized height = $\frac{172 - 159}{6} \doteq 2.17$

Man's standardized height = $\frac{186 - 171}{7} \doteq 2.14$

\Rightarrow Woman has the higher score.

3. (a) p stands for the proportion of Californians with negative Rh-factor.

$H_0: p = 0.15$ vs. $H_a: p < 0.15$

- (b) The test statistic, \hat{p} , should be approximately normal by the Central Limit Theorem for sample proportions, since our rule of thumb is met

$$np = (612)(0.15) = 91.8 > 10$$

$$n(1-p) = (612)(0.85) = 520.2 > 10.$$

(c) $SE_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{(0.15)(0.85)}{612}} \doteq 0.0144$

If we use $\hat{p} = \frac{74}{612} = 0.1209$ (unstandardized), we get our P-value from

$$\text{pnorm}(0.1209, 0.15, 0.0144).$$

We can standardize our test statistic

$$Z = \frac{0.1209 - 0.15}{0.0144} \doteq -2.02,$$

and get the same P-value from the command

$$\text{pnorm}(-2.02).$$

- (d) Since $0.02195 > 0.01$, we fail to reject H_0 at the 1% level.

(e) $n \geq \left(\frac{z^*}{M}\right)^2 \hat{p}(1-\hat{p}) = \left(\frac{1.96}{0.01}\right)^2 (0.15)(0.85) = 4898.04$.

So we require a sample size of at least $n = 4899$.

- (f) For 84% confidence we choose z^* at the 92nd percentile:

$$\text{qt}(0.92)$$

4. (a) This is \bar{X} , a sample statistic.
- (b) Only (i) and (iii) are bootstrap samples.
- (c) A bootstrap distribution for \bar{X} is centered on the original sample mean, 3.055.
- (d) His bootstrap distribution, like the sampling distribution of \bar{X} when n is only 8, will be normal if the underlying population distribution of prices for a gallon of gas is normal.
- (e) These numbers can be used as lower/upper bounds on a 88% confidence interval for μ , the mean price per gallon of gas in the population.
5. (a) The theorem is the Central Limit Theorem.
 It applies if our sample is an iid (or approximately so) and if \bar{X}_1 comes from a large enough sample size ($n \geq 30$ generally, but no requirement if the underlying population is normal, which appears unlikely from the dot plot of the sample from Population 1). Here, $n_1 = 649$, which is certainly large enough.
- (b)
- | | | | |
|--------------------------------|-------|-----------------------|-----------------------|
| <u>point estimate</u> | \pm | <u>critical value</u> | <u>standard error</u> |
| $\bar{X}_1 - \bar{X}_2 = 0.57$ | | 2 | 12.409 |
- 95% CI: (24.25, 25.39)
- (c) Option (iv) (Some others earned partial credit, but compare them with the common misinterpretations described in Lock 5, Section 3.2.)