Question 26 *(H7:4; B7.1.1, 7.2.3)*

This interval is so large as to be useless. We could shrink it by increasing the sample size from 1, or by reducing the desired confidence from 90%. The latter, however, may not be useful. [2]

Question 27 *(H7:3; B7.3.1)*

$$\begin{aligned}(\mu_-, \mu_+) &= \left(\overline{x} + \frac{q_{0.025}s}{\sqrt{20}}, \overline{x} + \frac{q_{0.975}s}{\sqrt{20}}\right)\\ &= \left(85 - \frac{2.093 \times 11}{\sqrt{20}}, 85 + \frac{2.093 \times 11}{\sqrt{20}}\right)\\ &= (79.85, 90.15),\end{aligned}$$

where q_α are quantiles from $t(19)$. [2]

Question 28 *(H5:5, 7:5; B5.3, 7.5)*

The important statistical concept here is the *central limit theorem*, which means that, since the sample is fairly large, we can reasonably assume that the distribution of the mean is approximately normal. This leads to an approximate confidence interval

$$\left(\overline{x} - \frac{1.645 \times s}{\sqrt{200}}, \overline{x} + \frac{1.645 \times s}{\sqrt{200}}\right),$$

using quantiles of the normal distribution ($q_{0.95} = 1.645$). [2]

Question 29 *(H8:5; B8 Intro)*

The statement is incorrect. The observed data 'are compatible with the hypothesis'. That is, the observed data have a high probability of occurring if the hypothesis is true, but that does not mean it is necessarily true. The investigator has no evidence that the hypothesis is incorrect. [2]

Question 30 *(H8:5, 2:3, S5; B8.3.1)*

For a binomial distribution $B(6, 0.5)$, the probability of observing zero successes is

$$P(N = 0) = p^0 q^6 = \left(\tfrac{1}{2}\right)^6 = \tfrac{1}{64} = 0.0156,$$

and, by symmetry, $P(N = 6) = 0.0156$. Hence, only about 0.031 of the time would we expect to observe so extreme a number of successes if the null hypothesis were true. This is a very small proportion of the time and hence we doubt the truth of the null hypothesis—we reject it. [4]

Question 31 *(H8:2; B8.2.1, 8.3)*

Any correct examples will do. For example

(a) a medical researcher wishes to know if treatment A is *better* than treatment B; [1]

(b) an educationalist wishes to know whether one method for teaching reading has different results from another. [1]

Question 32 *(H7:3; B8.2.3)*

One will work with the 20 *difference* measures, so that $t(19)$ will be appropriate. [1]