Question

The intelligence quotients (IQs) of 16 students from one area of a city showed a mean of 107 and a standard deviation of 10, while IQ of 14 students from another area of the city showed a mean of 112 and a standard deviation of 8. Is there a significant difference between IQs of the two groups at significance level of (a) 0.01 and (b) 0.05?

Solution

Performing independent samples t-test, not assuming equal variances.

Assumptions: both populations must be normal.

The null hypothesis: the mean IQs are equal.

The alternative hypothesis: the mean IQs are different.

Degrees of freedom: df = min(N1, N2) − 1 = 13

The standard error:

$$SE = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} = \sqrt{\frac{10^2}{16} + \frac{8^2}{14}} = 3.2896$$

The test statistics:

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - 0}{SE} = \frac{107 - 112}{3.2896} = -1.52$$

The two-tailed cumulative probability value associated with the given t-statistic can be determined from the Student's t-distribution table or calculated using the technology (function T.DIST.2T() of MS Excel).

For df = 13 and t = -1.52, p = 0.152

Since the p-value is greater than both α values, fail to reject the null hypothesis at both significance levels.

The samples do not provide sufficient evidence to conclude the difference between the mean IQs.