**MARKS**

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4. In an audit of industrial accounts, 200 accounts were obtained bya equiprobable ('simple random') selecting from a total of 5,000 accounts outstanding, and the amount overdue (*i.e.*, owing for more than 30 days) was recorded. The sample average was found to be \$110.00 and the sample s.d. was \$48.00. Find an approximate 90% confidence interval for the *total* amount owing on overdue accounts.

This question involves finding an approximate 90% confidence interval for $_T\mathbf{Y}$, the *total* amount owing on overdue accounts.

We have: $\mathbf{N} = 5{,}000$, $n = 200$, $\overline{y} = \$110.00\ (= \overline{y})$, $s = \$48.00\ (= s)$, $_{.1}t^*_{199} = 1.65255$ for 90% confidence.

Then: $s\sqrt{\frac{1}{n} - \frac{1}{\mathbf{N}}} = 1.5\sqrt{\frac{1}{200} - \frac{1}{5{,}000}} = \$3.325\ 537\ 55.$

Hence, an approximate 90% confidence interval for $_T\mathbf{Y}$, the *total* amount owing on overdue accounts, is:

$$\mathbf{N}\overline{y} \pm 1.65255 \times \mathbf{N} \times \hat{s.d.}(\overline{Y}) = 5{,}000 \times 110.00 \pm 1.65255 \times 5{,}000 \times 3.325\ 538 \implies (522{,}522,\ 577{,}478)$$

or about (\$522,000, \$578,000).

With a sample size as large as 200, it is reasonabe to hope for a reasonably accurate normal approximation for the distribution of $\overline{\mathbf{Y}}$ consequence of the Central Limit Theorem; also, to find the relevant $t$ value for 199 degrees of freedom, we interpolate linearly between the values for 195 and 200 degrees of freedom.

(\$522,000, \$578,000)
90% confidence interval