

- 1.) In a certain chemical process, it is very important that a particular solution that is to be used as a reactant have a pH of exactly 8.20. A method for determining pH that is available for solutions of this type is known to give measurements that are normally distributed with a mean equal to the actual pH and with a standard deviation of 0.02. Suppose 10 independent measurements yielded the following pH values:

8.18, 8.17, 8.16, 8.15, 8.17, 8.21, 8.22, 8.16, 8.19, 8.18

- (a) What conclusion can be drawn at the  $\alpha = 0.10$  level of significance?  
(b) What about at the  $\alpha = 0.05$  level of significance?
- 2.) An airline is interested in determining the proportion of its customers who are flying for reasons of business. How large should the sample be if the airline wants to be 99.0 percent sure that its estimate does not deviate from the actual value by more than 0.01?
- 3.) The capacities (in ampere-hours) of 10 batteries were recorded as follows:

140, 136, 150, 144, 148, 152, 138, 141, 143, 151

Assuming that a battery's capacity is normally distributed, determine

- (i) a 95% two-sided confidence interval for the mean,  
(ii) a 95% one-sided upper confidence interval for the mean, and  
(ii) a 95% two-sided confidence interval for the standard deviation  
of the underlying distribution.
- 4.) The following table contains 10 data pairs relating the yield of a laboratory experiment  $y_i$  to the temperature  $x_i$  at which the experiment was run.

$i$	1	2	3	4	5	6	7	8	9	10
$x_i$	100	110	120	130	140	150	160	170	180	190
$y_i$	45	52	54	63	62	68	75	76	92	88

- (i) Determine the estimators for the regression parameters and draw a scatter diagram for the sampled data above and the estimated regression line.  
(ii) Determine a 95% prediction interval for the yield of a single experiment which will be run at the temperature  $x_0 = 155$ .