4.2 Suppose that you are testing the following hypotheses where the variance is known: H_0:μ = 100, H_1:μ > 100.

Find the P-value for the following values of the test statistic.

(a) Z_0 = 2.50

$P(z > 2.5) = P(z \leq -2.5) = 0.0062$

(b) Z_ 0 = 1.95

$P(z > 1.95) = P(z \leq -1.95) = 0.0256$

(c) Z_0 = 2.05

$P(z > 2.05) = P(z \leq -2.05) = 0.0202$

(d) Z_0 = 2.36

$P(z > 2.36) = P(z \leq -2.36) = 0.0091$

4.3 Suppose that you are testing the following hypotheses where the variance is unknown: H_0: μ = 100, H_1: $\mu \neq$ 100.

The sample size is n = 20. Find bounds on the P-value for the following values of the test statistic.

N = 20 自由度 = 20 – 1 = 19 雙尾檢定

(a) t_0 = 2.75

P-value = 2*(1-T.DIST(2.75,19,TRUE)) = 0.013

(b) t_0 = 1.86

P-value = 2*(1-T.DIST(1.86,19,TRUE)) = 0.078

(c) t_0 = −2.05

P-value = 2*(1-T.DIST(2.05,19,TRUE)) = 0.054

(d) t_0 = −1.86

P-value = 2*(1-T.DIST(1.86,19,TRUE)) = 0.078

4.5 The inside diameters of bearings used in an aircraft landing gear assembly are known to have a standard deviation of σ=0.002cm. A random sample of 15 bearings has an average inside diameter of 8.2535 cm.

(a) Test the hypothesis that the mean inside bearing diameter is 8.25 cm. Use a two-sided alternative and α=0.05.

$Z_{0.0025} = 1.96$ n = 15

$|Z_0| = |(\bar{x} - \mu_0) / (\sigma/\sqrt{(n)})| = |(8.2535-8.25) / (0.002/\sqrt{(15)}| = 6.77772 > 1.96$

Reject H_0, we canot say the mean inside bearing diameter is 8.25 cm.

(b) Find the P-value for this test.

The P-value is <0.00001 (out of range)

(c) Construct a 95% two-sided confidence interval on the mean bearing diameter.

$[(\bar{x} - Z_{\alpha/2})/ (\sigma/\sqrt{(n)}), (\bar{x} + Z_{\alpha/2})/ (\sigma/\sqrt{(n)})]$

$= [8.2535 – 1.96(0.002/\sqrt{(15)}) , 8.2535 + 1.96(0.002/\sqrt{(15)})]$

$= [8.25249, 8.25451]$

4.8 A new process has been developed for applying photoresist to 125-mm silicon wafers used in manufacturing integrated circuits. Ten wafers were tested, and the following photoresist thickness measurements (in angstroms × 1000) were observed: 13.3987, 13.3957, 13.3902, 13.4015, 13.4001, 13.3918, 13.3965, 13.3925, 13.3946, and 13.4002.

$\bar{x}$ = 13.39618 = 13.3962 n = 10 σ 未知→使用 t 分配 s = 0.0039 自由度 = 9

	sum	sum/10	(x-x\bar)^2	s
13.3987	133.9618	13.39618	6.3504E-06	0.003908623
13.3957			2.304E-07	
13.3902			3.57604E-05	
13.4015			2.83024E-05	
13.4001			1.53664E-05	
13.3918			1.91844E-05	
13.3965			1.024E-07	
13.3925			1.35424E-05	
13.3946			2.4964E-06	
13.4002			1.61604E-05	

(a) Test the hypothesis that mean thickness is 13.4 × 1000 Å. Use and assume a two-sided alternative.

$t_{0.025}(9) = 2.262$

$t = (\bar{x} - \mu) / (s/\sqrt{(n)}) = (13.3962 - 13.4) / (0.0039/\sqrt{(10)}) = -3.08119 < 2.262$

reject H_0, we cannot say that mean thickness is 13.4 × 1000 Å.

(b) Find a 99% two-sided confidence interval on mean photoresist thickness. Assume that thickness is normally distributed.

$t_{0.005}(9) = 3.25$

$[\bar{x} - 3.25(s/\sqrt{(n)}), \bar{x} + 3.25(s/\sqrt{(n)})]$

$= [13.3962 - 3.25(0.0039/\sqrt{(10)}), 13.3962 + 3.25(0.0039/\sqrt{(10)})]$

$=[13.39219, 13.40021]$

(c) Does the normality assumption seem reasonable for these data?

Yes, because most of them are in the range of the 99% two-sided confidence interval.