Statistical Inference - Confidence Intervals and Hypothesis Tests

Exercise 1 - Confidence interval

A company is selling shampoo and one of their offerings is a 200 ml bottle. If the mean amount calculated for a sample of 100 bottles is 200 ml and the standard deviation 2 ml, what is the range within which the mean amount of shampoo in a bottle is expected to be found with a confidence of 95%?

Exercise 2 - Hypothesis test

The company from Exercise 1 has measured the shampoo amounts in 100 bottles and found that the mean value is 197 ml. Test the null hypothesis that the mean amount poured by the machine is 200 ml, with a significance level of $\alpha = 1\%$.

Appendix

Upper-tail percentage points of the standard normal distribution

The table gives the values of z for which $P(Z > z) = p$, where the distribution of Z is $N(0, 1)$.

p	z	p	z	p	z	p	z	p	z
.50	0.000	.15	1.036	.025	1.960	.010	2.326	$.0^34$	3.353
.45	0.126	.14	1.080	.024	1.977	.009	2.366	$.0^33$	3.432
.40	0.253	.13	1.126	.023	1.995	.008	2.409	$.0^32$	3.540
.35	0.385	.12	1.175	.022	2.014	.007	2.457	$.0^31$	3.719
.30	0.524	.11	1.227	.021	2.034	.006	2.512	$.0^45$	3.891
.25	0.674	.10	1.282	.020	2.054	.005	2.576	$.0^41$	4.265
.24	0.706	.09	1.341	.019	2.075	.004	2.652	$.0^55$	4.417
.23	0.739	.08	1.405	.018	2.097	.003	2.748	$.0^51$	4.753
.22	0.772	.07	1.476	.017	2.120	.002	2.878	$.0^65$	4.892
.21	0.806	.06	1.555	.016	2.144	.001	3.090	$.0^61$	5.199
.20	0.842	.050	1.645	.015	2.170	$.0^39$	3.121	$.0^75$	5.327
.19	0.878	.045	1.695	.014	2.197	$.0^38$	3.156	$.0^71$	5.612
.18	0.915	.040	1.751	.013	2.226	$.0^37$	3.195	$.0^85$	5.731
.17	0.954	.035	1.812	.012	2.257	$.0^36$	3.239	$.0^81$	5.998
.16	0.994	.030	1.881	.011	2.290	$.0^35$	3.291	$.0^95$	6.109