

---

---

### Elementary Statistics – Test 3 Review– Chapters 7 and 8

---

---

1. In a random sample of 16,405 babies who were born stillborn, 8,609 were male. Construct a 99% confidence interval for the proportion of stillborn babies who are male. Source: *Annual Statistical Review*, 1956.
2. Using the data from problem #1, what sample size would have been necessary for a two percentage point error?
3. From a random sample of 51 litters of rats, the mean litter size is 6.11, with an assumed population standard deviation is 2.27. Construct a 94% confidence interval for the mean litter size of rats (these values are based on data gathered by *King* in 1924).
4. Using the data from problem #3, what sample size would have been necessary for a maximum error of 0.1 rats?
5. Hyoscine is a drug which was once used to improve sleep. In 1908, William *Student* Gosset (the developer of Student's  $t$  distribution) studied this drug by measuring amounts of sleep gained by ten different patients. The mean sleep gained was 2.33 hours, with a standard deviation of 2.00 hours. Assuming that these values are selected from a normal population, construct a 96% confidence interval for the mean amount of sleep gained by people taking hyoscine.
6. In a random sample of 16,405 babies who were born stillborn, 8,609 were male. Test the claim at 1% significance that more than 51.5% of stillborn babies are male.
7. From a random sample of 51 litters of rats, the mean litter size is 6.11, with an assumed population standard deviation is 2.27. Test the claim that the mean litter size is equal to seven, against the claim that the mean is not seven. Use 2% significance.
8. In 1908, William *Student* Gosset studied the drug Hyoscine by measuring amounts of sleep gained by ten different patients. The mean sleep gained was 2.33 hours, with a standard deviation of 2.00 hours. Assuming that these values are selected from a normal population, test the claim at 6% significance that the mean amount of sleep gained is less than 3 hours.
9. At the same time that William *Student* Gosset studied Hyoscine using 10 different patients, he also studied another drug, Hyoscyamine, with those same ten patients. The results are tabulated below.

Patient #	Hyoscine	Hyoscyamine
1	1.9	0.7
2	0.8	-1.6
3	1.1	-0.2
4	0.1	-1.2
5	-0.1	-0.1
6	4.4	3.4
7	5.5	3.7
8	1.6	0.8
9	4.6	0.0
10	3.4	2.0

Test the claim at 1% significance that the mean sleep gained is higher for Hyoscine than for Hyoscyamine. Assume that the population of differences is normal.

10. Suppose that a quantitative variable has standard deviation,  $\sigma$ . Use the properties of expected value and variance to prove that the standard deviation of sample means from this population (from samples of size  $n$ ) is equal to  $\frac{\sigma}{\sqrt{n}}$ . (Hint: begin with the variance of sample means,  $Var(\bar{x})$ .)
11. Suppose that a population has proportion,  $p$ . Prove that the standard deviation of sample proportions,  $\hat{p}$  (from samples of size  $n$ ), is equal to  $\sqrt{\frac{pq}{n}}$ . (Hint: begin with  $Var(\hat{p})$ .)