Clinic Consultant Module Spring 19

Quiz 4

Student Name:

1. **True or False**
   a) As the confidence level goes up, the reliability goes up (**T** or F)

   b) In a sample of 100 steel wires the average breaking strength is 50kN, with a standard deviation of 2kN. A 99% confidence interval for the mean breaking strength of this type of wire is (49.484, 50.516). (**T** or F) ---$50 \pm 2.58*2/\sqrt{100}$

   c) Refer to the same problem in 1(b), an engineer claims that the mean breaking strength is between (49.7, 50.3), the confidence level of his statement is 75% (T or **F**)

   $\overline{X} = 50,\ s = 2,\ n = 100,$ so the upper confidence bound 50.3 satisfies $50.3 = 50 + z_{\alpha/2}(2/\sqrt{100})$.
   Solving for $z_{\alpha/2}$ yields $z_{\alpha/2} = 1.50$.
   The area to the right of $z = 1.50$ is $1 - 0.9332 = 0.0668$, so $\alpha/2 = 0.0668$.
   The level is $1 - \alpha = 1 - 2(0.0668) = 0.8664$, or 86.64%.

   d) Refer to the same problem 1(b), 120 wires must be sampled to achieve a 95% confidence interval specifying the mean breaking strength to within ±0.3kN (T or **F**)
   $Z*2/\sqrt{x} = 0.3$ ➔ $1.96*2/\sqrt{x} = 0.3$ → x=171

2. **In a simple random sample of 70 cars registered in a certain state, 28 of them were found to have emission levels that exceed a state standard. What proportion of the cars in the sample had emission levels that exceed the standard, and what is a 98% confidence interval for this proportion?**

   a) 0.5, (0.294, 0.517)
   b) 0.4, (0.294, 0.517)
   c) 0.5, (0.272, 0.538)
   d) 0.4, (0.272, 0.538)

   $X = 28,\ n = 70,\ \tilde{p} = (28 + 2)/(70 + 4) = 0.405405,\ z_{.01} = 2.33.$
   The confidence interval is $0.405405 \pm 2.33\sqrt{0.405405(1 - 0.405405)/(70 + 4)}$, or $(0.272,\ 0.538)$.

3. **Refer to the same problem in 2, what is the sample size to specify the proportion that exceed the standard to within ±0.10 with 98% confidence**

   a) 127
   b) 130
   c) 126
   d) 129

   Let n be the required sample size.
   Then n satisfies the equation $0.10 = 2.33\sqrt{\tilde{p}(1 - \tilde{p})/(n + 4)}$.
   Replacing $\tilde{p}$ with 0.405405 and solving for n yields $n = 127$.

4. **The failure pressures in kPa, for five panels constructed with 6d smooth shank nails, are 3.32, 2.53, 3.45, 2.38, 3.01. The data are assumed to be unbiased and normally distributed. Find a 95% confidence interval for the mean failure pressure for this type of roof panel?**

   a) (2.352, 3.524)
   b) (1.3012, 1.3218)
   c) (203.81, 206.45)
   d) None of the above

$\overline{X} = 2.938$, $s = 0.47199$, $n = 5$, $t_{5-1,.025} = 2.938$.
The confidence interval is $2.938 \pm 2.938(0.47199/\sqrt{5})$, or $(2.352, 3.524)$.

Calculate st. dev =sqrt (SUM (each element – mean)^2/n-1)

5. **A 95% confidence interval for a population mean is computed from a sample size of 400. Another 95% confidence interval will be computed from a sample of size 100 drawn from the same population. The interval from the sample of size 400 will be approximately _____as the interval from the sample of size 100**

a) One half as wide
b) Twice as wide
c) One fourth as wide
d) Four times as wide