THE UNIVERSITY OF SYDNEY
SCHOOL OF MATHEMATICS AND STATISTICS

Semester 1MATH1015 (Biostatistics) Solution to Practice Quiz 2 in P.264 of the textbook 2012

1. (c) $n = 12$ & $p = 0.3$. From binomial table, $P(< 3) = P(\leq 2) = 0.2528$.

2. (d) Use `pbinom(25,40,0.7)-pbinom(18,40,0.7)`

3. NA

4. (b) $n = 100$, $p_0 = 0.1$ and $\hat{p} = \frac{8}{100}$. $Z = \frac{\hat{p}-p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{0.08-0.1}{\sqrt{\frac{0.1(1-0.1)}{100}}} = -0.667$. Since the test stat. is small, the P-value will be large.

5. (c) $P(|Z| < k) = 0.99 \Rightarrow P(-k < Z < k) = 0.99 \Rightarrow P(Z < k) = 0.995 \Rightarrow k = 2.575$ from the normal table.

6. (d) $X \sim N(10, 3^2)$; $P(X \geq 13) = P(Z \geq \frac{13-10}{3}) = P(Z > 1) = 1 - 0.8413 = 0.1587$

7. (e) $n = 15$ and $X \sim N(200, 5^2)$. Hence $\bar{X} \sim N(200, 5^2/16)$, i.e. $N(200, (5/4)^2)$.
$P(\bar{X} > 208) = P(Z > \frac{208-200}{5/4}) = P(Z > 6.4) = 0.0000$. Since 6.4 is too large in the normal table, the upper area will be very small.

8. (a) $X_1 + X_2 \sim N(10 + 8, 4^2 + 3^2)$, i.e. $N(18, 5^2)$.
$P(X_1 + X_2) \geq 29) = P(Z \geq \frac{29-18}{5}) = P(Z \geq 2.2) = 1 - 0.9861 = 0.0139$.

9. (e) $n = 16$ and $X \sim N(1000, 50^2)$. Hence $\bar{X} \sim N(1000, 50^2/16)$, i.e. $N(1000, (50/4)^2)$.
$P(\bar{X} < 975) = P(Z < \frac{975-1000}{50/4}) = P(Z < -2) = 1 - 0.9772 = 0.0228$.

10. (c)

11. (d) $n = 26$ and so df=$26 - 1 = 25$. Since the test statistic $t_{\text{obs}} = 2.04$ is positive, more extreme means more positive, or greater.

12. (c) From t-table with df=12, $P(t_{12} < -2.3) = P(t_{12} > 2.3)$ in (0.025, 0.01).

13. (a) $n = 5$ and so df=$5 - 1 = 4$. For 95% CI, the upper area=(1-0.95)/2=0.025. Hence $t_{4,0.025} = 2.776$

14. (d) $n = 15$ and so df=$15 - 1 = 14$. The P-value = $P(t_{14} < \frac{\bar{y}-\bar{x}}{s_d/\sqrt{n}}) = P(t_{14} < \frac{112-119}{9.2/\sqrt{15}}) = P(t_{14} < \frac{-7\sqrt{15}}{9.2})$. The inequality sign is "<" because the test statistic is negative and more extreme difference means even more negative test statistic.

15. (d)

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> x=scan(file=url("http://www.maths.usyd.edu.au/math1015/r/drink.txt"))
> t.test(x,mu=2)

        One Sample t-test

data:  x
t = 0.1142, df = 49, p-value = 0.9095
alternative hypothesis: true mean is not equal to 2
95 percent confidence interval:
 1.988055 2.013385
sample estimates:
mean of x
  2.00072
```