THE UNIVERSITY OF SYDNEY
MATH1905 Statistics Advanced

Semester 2 **Tutorial Week 11 – Solutions** 2011

1. Answer (d) $H_0 : \mu = 7$ against $H_1 : \mu > 7$.

2. Answer (c) P-value $= \mathrm{P}\left(t_{35} \geq \dfrac{7.6 - 7}{1.5/\sqrt{36}}\right) = \mathrm{P}(t_{35} \geq 2.4) =$ `1-pt(2.4,35)` $= 0.011$ (3dp).

3. To 3dp: $t_9(0.025) =$ `qt(0.975,9)` $= 2.262$. Thus a 95% CI is (25.75,29.05). A 90% CI would not be larger because $t_9(0.05) =$ `qt(0.95,9)` $= 1.833$.

4. (a) $z_{0.005} = 2.576$: a 99% CI is (3.09,10.01) or you can alternatively write 6.55 ± 3.46.

(b) We need $2 \times 2.567 \times 12/\sqrt{n} = 4$ which gives $n = \lceil 238.9 \rceil = 239$.

5. Using the normal approximation to the binomial

$$\hat{p} \sim \mathcal{N}(p, p(1-p)/n,$$

where p is the proportion of type O blood. An approximate 95% CI for p is,

$$13/30 \pm 1.96 \times \sqrt{\frac{13/30 \times 17/30}{30}} = (0.26, 0.61)$$

a conservative CI is therefore (0.43 ± 0.18).

6. (a) $\hat{p} = 32/50 = 0.64$, an approximate 95%-CI for p is

$$\hat{p} \pm 1.96\sqrt{\hat{p}(1-\hat{p})/50} = 0.64 \pm 0.133 \quad \text{or} \quad (0.507, 0.773)$$

(b) A conservative CI for p is

$$\hat{p} \pm 1.96\sqrt{1/(4n)}.$$

To ensure that the $\pm$ factor is no more than 0.01 we need

$$\frac{1.96}{2\sqrt{n}} \leq 0.01.$$

Thus a sample of size $n \geq 98^2 = 9,604$ is sufficient.

(c) $n = 10,000$ the conservative 95%-CI is:

$$0.514 \pm \frac{1.96}{\sqrt{4 \times 10000}} = 0.514 \pm 0.0098.$$