1. Normal!

$n = 10$

$\bar{x} = 2.33$

$s = 2.0022$

1.9 0.8 1.1 0.1 -0.1

4.4 5.5 1.6 4.6 3.4

Sum = 23.3 $\frac{23.3}{10} = 2.33$

$x_i - \bar{x}$ $(x_i - \bar{x})^2$

$1.9 - 2.33 = -0.43^2 = 0.1849$
$0.8 - 2.33 = -1.53^2 = 2.3409$
$1.1 - 2.33 = -1.23^2 = 1.5129$
$0.1 - 2.33 = -2.23^2 = 4.9729$
$-0.1 - 2.33 = -2.43^2 = 5.9049$
$4.4 - 2.33 = 2.07^2 = 4.2849$
$5.5 - 2.33 = 3.17^2 = 10.0489$
$1.6 - 2.33 = -0.73^2 = 0.5329$
$4.6 - 2.33 = 2.27^2 = 5.1529$
$3.4 - 2.33 = 1.07^2 = 1.1449$

Sum = 36.081

Std dev

$\sqrt{\frac{36.081}{9}} = 2.0022$

Interpret

2b ← See this

I did all this for nothing.

a) Find and interpret a 90% C.I.

$1 - 0.90 = \frac{0.1}{2} = 0.05 \to z_{0.05} \to 1.645$

$2.33 \pm 1.645 \frac{2.0022}{\sqrt{10}}$

$2.33 \pm 1.0415 \to (1.288, 3.372)$

(1.288, 3.372) We are 90% confident that the mean increase in sleep hours on patients receiving is between 1.288 and 3.372 hours.

1) b) Based on your C.I. in part A, was the drug effective in increasing sleep? Explain.

I would say the drug was effective as 0 was not in the confidence interval. The implication would then be that everyone has had more sleep by some amount.

c) Interpret the C.I. in context.

With a 90% confidence interval, we can be 90% confident that the confidence interval contains the population mean. If we were to take multiple samples of 10, over the long run, 90% of those samples would have the true value of the mean.

2. $n = 120$
$\bar{x} = 16.2$
$s = 3.75$

$$\bar{x} \pm z_{\alpha/2} \frac{s}{\sqrt{n}}$$

a) Construct a 96% C.I.

$1 - 0.96 = 0.04 \quad \frac{0.04}{2} = 0.02 \rightarrow z_{0.02} \rightarrow 2.05$

$16.2 \pm 2.05 \frac{3.75}{\sqrt{120}}$

$16.2 \pm 0.7017 \rightarrow \boxed{(15.498, 16.902)}$

b) When we say that we are 96% confident about the interval in part A, what we mean is that we expect to see a sample with a value between 15.498 and 16.902 96% of the time.

c) Using $s = 3.75$ min, how many workers should we sample to cover the mean up ± 0.3 min with 96% of confidence?

$n = ?$

$\bar{x} = 16.2$

$s = 3.75$

$2.05 \frac{3.75}{\sqrt{n}} = 0.3$

$\frac{3.75}{\sqrt{n}} = \frac{0.3}{2.05}$

$\frac{3.75}{\sqrt{n}} = 0.146 \cdot \sqrt{n}$

$\sqrt{n} = \frac{3.75}{0.146}$ $\quad \sqrt{n} = 25.625$

$n = 656.64$

$\boxed{n = 657}$

d) Manager claims mean time less than 16.75 min. With what level of confidence can this claim be made?

$Z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{16.75 - 16.2}{3.75/\sqrt{120}} \approx 1.606$

$P(Z < 1.61) = 0.9463 \rightarrow \boxed{94.63\%}$

3. 50 New $\bar{x} = 495.6$ MHz $\quad S_x = 19.4$ MHz

50 Old $\bar{y} = 481.2$ MHz $\quad S_y = 14.3$ MHz

* Independent

a) Find 90% C.I. for difference

90% → 1.645

$495.6 - 481.2 \pm 1.645 \sqrt{\frac{19.4^2}{50} + \frac{14.3^2}{50}}$

$1.645 \sqrt{7.5272 + 4.0898}$

$14.4 \pm 5.606 \rightarrow \boxed{(8.79, 20.01)}$

b) Interpret the C.I. in part A in context

We are 90% confident that the difference in mean speed between both speeds of drives is between 8.79 and 20.01 MHz. If we were to take multiple samples to find the difference of mean times, over the long run, 90% of those samples would have the true mean difference in speed.

c) If you were to repeat this process 1000 times, about how many of the intervals would you expect to contain the true mean difference.

If I were to repeat this process 1000 times, I would expect about 900 of the intervals to contain the true mean difference in speed.

4. $n = 1000$ $\frac{420}{1000} = 0.42$

a) Find 92% C.I.

$1 - 0.92 = \frac{0.08}{2} = 0.04 \to z_{0.04} \to 1.75$

$x = n + 4 = 1004$ $\tilde{p} = \frac{420 + 2}{1004} = 0.4203$

$x = 420$

$0.4203 \pm 1.75\sqrt{\frac{0.4203(1-0.4203)}{1004}}$

$\boxed{(0.393, 0.448)}$

Cont'd

b) A group claims proportion of actors who were happy with their agents is less than 45%. With what level of confidence can this statement be made?

Claim $p < 0.45$

$$0.45 = 0.4203 - Z_\alpha \sqrt{\frac{(0.4203)(1-0.4203)}{74}}$$

$$Z_\alpha = \frac{0.45 - 0.4203}{\sqrt{\frac{(0.4203)(1-0.4203)}{74}}} = 0.517$$

$$P(Z < 0.52) = 0.6985 \rightarrow \boxed{69.85\%}$$