AP Stats $\boxed{11.3-6, 10}$

$\boxed{11.3}$ $SE = 37/\sqrt{4} = 18.5$

$\boxed{11.4}$ a) df | ... .05

5 | $\boxed{2.015}$

b) .99 left means .01 right

$\boxed{2.518}$

$\boxed{11.5}$ a) $n-1=14$ $\boxed{t^* = 2.145}$

b) $n-1=19$ .75 left → .25 right

$\boxed{t^* = 0.688}$

$\boxed{11.6}$ a) $n=10$ $C=95\%$ t^* for 9 df $= \boxed{2.262}$

b) $n=20$ $C=99\%$ t^* for 19 df $= \boxed{2.861}$

c) $n=7$ $C=80\%$ t^* for 6 df $= \boxed{1.440}$

$\boxed{11.10}$ a) $n=6$ $\bar{x} = 5.3667$ $SE_{\bar{x}} = \dfrac{.66533}{\sqrt{6}} = \boxed{.2716}$

df=5

b) $5.3667 \pm 2.015(.2716)$

$5.3667 \pm .5473$

$(4.8194, 5.9140)$

We can be 90% confident that the patient's mean phosphate level is between 4.82 and 5.91 milligrams of phosphate per deciliter of blood.

APStats $\boxed{11.7, 9, 11-14}$

$\boxed{11.7}$ $H_0: \mu = 0$ $n = 15$ $t = 1.82$
$H_a: \mu > 0$

a) $df = 15 - 1 = 14$

b) $1.761 - 2.145$

$p \rightarrow .05$ $.025$

c) The p-value must be between .025 and .05

d) If $\alpha = .05$ $p < \alpha$. Yes, it is significant

If $\alpha = .01$ $p \nless \alpha$. No it is not significant

$\boxed{11.9}$ $n = 4$ $\bar{x} = \boxed{1.75}$ $SE_{\bar{x}} = .1291/\sqrt{4} = \boxed{.06455}$

$df = 3$

b) 90% $t^* = 2.353$ $1.75 \pm 2.353(.06455)$

$1.75 \pm .1519$

$(1.598, 1.902)$

$\boxed{11.11}$ $H_0: \mu = 1.3$ where μ is the mean absolutely
$H_a: \mu$ 1.3 retractory period for poisoned rats

$n = 4$ $df = 3$ $t = \dfrac{1.75 - 1.3}{.06455} = 6.97$

$5.841 < t < 7.453$

$.005 > \text{p-value} > .0025$

There is strong evidence against Ho. $(p < .005)$.
We conclude that DDT does slow nerve recovery.

$\boxed{11.12}$ a) μ is the mean difference between the yields for variety A and variety B

$\mu = \mu_A - \mu_B$

$n = 10$

$\bar{x} = .34$

$s = .83$

b) $H_0: \mu = 0$ where ↑

$H_a: \mu > 0$

c) $t = \dfrac{.34 - 0}{.83/\sqrt{10}} = \boxed{1.295}$ $df = 9$

p-value $= .1137$

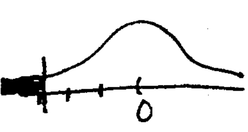
There is not enough evidence to reject Ho.
The observed difference could be due to chance.

$\boxed{11.13}$ a) Randomly assign 12 or 13 people to group A (which will turn the right-hand knob first) and the rest to group B.

b) μ is the mean difference between right-handed times and left-handed times (for each right-handed person).

$H_0: \mu = 0$ $(\mu_R - \mu_L)$ (in other words... $\mu_R = \mu_L$ $\mu_R < \mu_L$)

$H_a: \mu < 0$



c) $\bar{x} = -13.32$ $SE_{\bar{x}} = \dfrac{22.936}{\sqrt{25}} = 4.5872$

$df = 24$

$t = \dfrac{-13.32 - 0}{22.936/\sqrt{25}} = \boxed{-2.9037}$ p-value $= \boxed{.0039}$

Reject Ho

We conclude that there is a significant difference between right and left-hand times. Right-hand times are less.

$\boxed{11.14}$ $\bar{x} = -13.32$ 90% $t^* = 1.711$

$$-13.32 \pm 1.711\left(\frac{22.936}{\sqrt{25}}\right)$$

$$-13.32 \pm 7.849$$

$$(-21.169, -5.471)$$

There is a difference of between 5.5 and 21.2 seconds between right- and left hand times.

$\bar{x}_R = 104.12$ $\bar{x}_L = 117.44$

What % of "left-hand times" is "right-hand times":

$$\frac{x}{100} = \frac{104.12}{117.44} \qquad 88.66\%$$

Right handed students working on right-handed threads would complete their task in about 89% of the time it would take them if they were working with left-handed threads.

AP Stats 11.16 – 18, 25, 26

$\boxed{11.16}$ $n = 200$ $H_0: \mu = 0$ where μ is the mean
$\bar{x} = 332$ $H_a: \mu > 0$ increase in credit card charges
$s = 108$

a) $t = \dfrac{332 - 0}{108/\sqrt{200}} = 43.5$ p-value ≈ 0
Reject H_0

We have evidence to conclude that the mean increase in credit card charges is greater than zero.

b) $332 \pm t^*(108/\sqrt{200}) \Rightarrow (312.14, 351.86)$

c) We have an SRS and the sample size is large. We have no outliers so we meet the criteria for the t-test.

d) Make the offer to an SRS of 200 customers and choose another SRS of 200 as a control group. Compare the mean increase for the groups.

$\boxed{11.17}$ The distribution is slightly skewed right but there are no outliers.

$H_0: \mu = 224$ where μ is the mean dimension
$H_a: \mu \neq 224$ of the crankshafts.

$t = \dfrac{224.0019 - 224}{.0618/\sqrt{16}} = .1254$ $p = .9019$
fail to reject H_0

We do not have evidence to conclude that the dimension differs from 224.

$\alpha = .05$

$\boxed{11.18}$ $n = 12$ $\bar{x} = 104.13$ $s = 9.397$

$H_0: \mu = 105$ where μ is the mean
$H_a: \mu \neq 105$ reading of all detectors

9	2
9	578
10	024
10	55
11	1
11	9
12	2

$$t = \frac{104.13 - 105}{9.397/\sqrt{12}} = -.3195 \quad p = .7554$$

fail to reject H_0

There is not sufficient evidence to conclude that the detectors readings differ from 105.

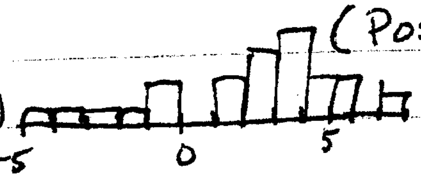
$\boxed{11.25}$ a) SEM standard error of the mean

b) $n = 3$ $\quad .01 = s/\sqrt{3}$ so $s = .01\sqrt{3} \approx .01732$

c) 90% $t^* = 2.920$ $df = 2$

$.84 \pm 2.920(.01) \Rightarrow (.8108, .8692)$

$\boxed{11.26}$ a) $H_0: \mu = 0$ where μ is the mean increase in
$H_a: \mu > 0$ test scores for Spanish teachers.
(Post test − Pre test)

b) 

slightly skewed left.
no extreme values.

c) $t = \frac{1.45 - 0}{3.2/\sqrt{20}} = 2.0244$ $\quad p = .0286$

Reject H_0 for $\alpha = .05$
Fail to reject H_0 for $\alpha = .01$

d) $1.45 \pm t^*(3.20/\sqrt{20})$

$1.45 \pm 1.2385 \Rightarrow (.2115, 2.6885)$

We are 90% confident that the mean increase in listening score was between .2115 and 2.6885.

AP Stats 11.31 -35, 39

$\boxed{11.31}$ a) two sample b) matched pair

$\boxed{11.32}$ a) single sample b) two sample

$\boxed{11.33}$ a) $H_0: \mu_1 = \mu_2$ where μ_1 is the beta-blocker mean pulse rate and μ_2 is the placebo mean pulse rate.
$H_a: \mu_1 < \mu_2$

$\bar{x}_1 = 65.2$
$s_1 = 7.8$
$\bar{x}_2 = 70.3$
$s_2 = 8.3$

$t = -2.453$
$p = .0086$ $df = 57.8$ Reject Ho at $\alpha = .05$ and $\alpha = .01$

We have evidence to conclude that beta-blockers do reduce the pulse rate.

b) $(-10.64, .439)$

$\boxed{11.34}$ $H_0: \mu_1 = \mu_2$ where μ_1 is the mean number of larvae in the control group and μ_2 is the mean # of larvae in the malathion group
$H_a: \mu_1 > \mu_2$

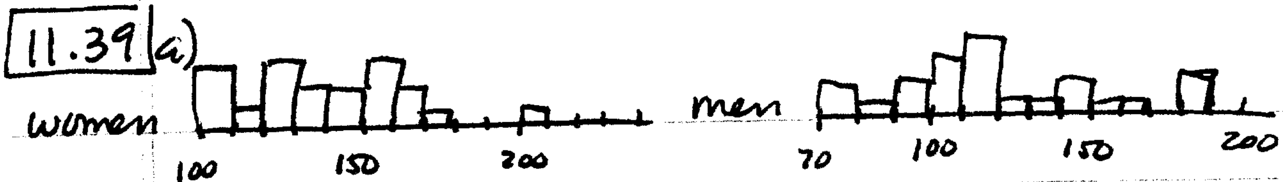
$n_1 = 13$
$\bar{x}_1 = 3.47$
$s_1 = 1.21$
$\bar{x}_2 = 1.36$
$s_2 = .52$
$n_2 = 14$

$t = 5.809$
$p = .00001$ $df = 16$ Reject Ho at $\alpha = .01$
We have evidence to conclude that malathion reduces the number of larvae on oats.

$\boxed{11.35}$ a) $t = 7.36$ if n is large the t distribution can be approximated with the normal distribution. If $z = 7.36$ the p-value would be very small.

b) $df = 33 - 1 = 32$

$\boxed{11.39}$ a)



slightly skewed right — one possible outlier

slightly skewed right — two possible outliers

b) $H_0: \mu_W = \mu_M$ where μ_W is the mean SSHA score for women and μ_M is the mean for men at this college.
$H_a: \mu_W > \mu_M$

$t = 2.056 \quad p = .0236$

Since the sum of the sample sizes is almost 40 we may use the t-procedure (with some caution.)

We have evidence to conclude that the mean score for women is higher than for men.

c) for $\mu_W - \mu_M$ $(3.5377, 36.073)$

We are 90% confident that the mean difference between the scores for men and women is between 3.5 and 36.1 (with women scoring higher).

AP Stats 11.43 – 47

$\boxed{11.43}$ $n_1 = 10$ $\bar{x}_1 = 4.18$ $s_1 = .479$ skilled
$n_2 = 8$ $\bar{x}_2 = 3.01$ $s_2 = .959$ unskilled

a) $H_0: \mu_1 = \mu_2$ where μ_1 is the mean velocity of
$H_a: \mu_1 > \mu_2$ the knee for skilled rowers,
μ_2 for unskilled rowers.

b) $t = 3.1583$ $p = .0052$ $(.0104/2)$ $df = 7$ or 9.8
Reject H_0

We have evidence to conclude that the mean knee velocity for skilled rowers is greater than that for novice rowers.

c) $(.495, 1.845)$ using $df = 9.8$

$\boxed{11.44}$ $n_1 = 10$ $\bar{x}_1 = 70.37$ $s_1 = 6.10$ skilled
$n_2 = 8$ $\bar{x}_2 = 68.45$ $s_2 = 9.04$ unskilled

$H_0: \mu_1 = \mu_2$ where μ_1 is the mean weight of
$H_a: \mu_1 \neq \mu_2$ skilled rowers and μ_2 for unskilled.

$t = 0.5143$ $p = .6165$ fail to reject H_0

We do not have evidence to conclude that the weight of skilled rowers differs from the weight of novice rowers.

$\boxed{11.45}$ (27.915, 32.085)

We can say with 99% confidence that the mean difference between SAT scores for males and females is between 27.9 and 32.1

It is not necessary for the distribution to be normal because the sample size is very large.

$\boxed{11.46}$ $H_0: \mu_1 = \mu_2$ where μ_1 is the mean hemoglobin level of breast-fed infants and μ_2 for formula fed babies.

$H_a: \mu_1 \neq \mu_2$

$t = 1.654$ $p = .1065$ fail to reject H_0

We do not have evidence to conclude that the mean hemoglobin level of formula fed infants differs from breast-fed babies.

b) (−.2021, 2.0021)

c) We assume that both groups are SRSs and that both groups are normally distributed.

d) This is not an experiment. The mothers chose the feeding method. This may confound the conclusions by introducing other factors that affected the choice.

$\boxed{11.47}$ $H_0: \mu_1 = \mu_2$ where μ_1 is the ego strength
$H_a: \mu_1 \neq \mu_2$ for the low-fitness group and μ_2 is for the high-fitness group.

$t = -8.238$ $p = 3.909 \times 10^{-8} \approx 0$

Reject H_0 at $\alpha = .01$ or $.05$

We can conclude that there is a significant difference between the low- and high-fitness groups in the ego strength personality factor.

b) The subjects are all college professors and they all volunteered for a fitness program. there may be confounding factors in this study.