1. 7.2 t-distribution

There are 3 curves, unimonal & symmetric
Those are standard normal z distribution, t distribution with 5 degrees freedom, t distribution with one degree of freedom.
As the degree of freedom decreases curve of t distribution become flattened. as degree of freedom increases curve, distribution comes closer to normal.

The dashed lines, middle curve is the t-dist with 5 degrees freedom
The curve w/ smallest hight (dotted line) is the t-dist w/ 1 degree freedom
The solid line is the standard normal

2. 7.4

a) $n=26$ $t=2.485$
2 sided Ha, p-value = 0.02005
Since p > alpha, we fail to reject the null

b) $n=18$ $t=0.5$
2 sided Ha, p-value = 0.62348
Since p > alpha, we fail to reject the null

3. 7.6

a symmetric CI,

sample mean $\overline{x} = (65+77)/2 = 71$

$\overline{x} = 71$

moe $= \frac{1}{2}$ (length CI) $= (65-77)/2 = 6$

$E = 6$

Critical value $= t_{\alpha/2} = t_{0.05} = 1.711$

$E = t \cdot S/\sqrt{n}$

$$S = \frac{E}{2} \cdot \sqrt{n}$$

$$= \frac{6}{1.711} \cdot \sqrt{25}$$

$$\approx 17.533606$$

$S \approx 17.5336$

4. 7.10

since t^*_{df} being slightly larger than 2*, the CI formula mean$-t^*_{df}$ * SE will be smaller than mean$-$2*SE and mean$+t^*_{df}$ * SE will be larger than mean$+$2*SE So, the width of the CI will be wider for one using t^*_{df}

5.7.12

a) $H_o: \mu \leq 35$ offices not exposed

$H_a: \mu > 35$ officers exposed

b) 1. Sample is a simple random sample

2. The value of the population sd is not known

3. population normally distributed, $n > 30$

The requirements are satisfied, we can conduct a one-sample t-test

c) $H_o: \mu \leq 35$

$H_a: \mu > 35$

$\bar{x} = 124.32$

$s = 37.74$

$n = 52$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$= \frac{124.32 - 35}{37.74/\sqrt{52}}$$

$t = 17.067$

$df = n-1$

$= 52-1$

$= 51$

$\alpha = 0.05$

$t_{0.05, 51} = 1.675$ critical value

t-stat > CV so reject the null

It can be concluded that downtown police officers have a higher lead exposure than group in previous study

6. 7.16

a) True

b) True

c) True

d) False. each observation in one data set is subtracted from the corresponding observation of the other data set not from the average of the other set's observations

7. 7.18

a) not paired, groups are independent

b) paired, items same in both

c) not paired, groups are independent

8. 7.22

a) n = 200 mean = -0.545 sd = 8.887

$$-0.545 \pm 1.96 * \frac{8.887}{\sqrt{200}}$$

$= (-1.777, 0.687)$

b) We are 95% confident the average difference between the reading & writing scores of all students falls in interval $(-1.777, 0.687)$

c) The 95% CI has 0 value. ∴ null is not rejected. The CI provides that there is no real difference in the average scores

9. $\bar{x} = \frac{70}{7} = 10$

$var = \frac{0.48}{6} = 0.08$

$sd = \sqrt{0.08}$

≈ 0.282843

$\bar{x} = 10 \qquad s = 0.282843 \qquad n = 7 \qquad \alpha = 1 - 0.95 = 0.05$

$df = n - 1 = 6$

$cv = 2.447$

$\varepsilon = 2.447 \cdot \frac{0.282843}{\sqrt{7}}$

$= 0.261594$

$Lower = \bar{x} - \varepsilon = 10 - 0.261594$

≈ 9.738

$Upper = \bar{x} + \varepsilon = 10 + 0.261594$

≈ 10.262

$95\%\ CI = (9.738406,\ 10.261594)$

$9.738 < \mu < 10.262$

10. Test $\mu < 46$ t-dist

$H_0: \mu = 46$

$H_a: \mu < 46$

$\bar{x} = 42$ $s = 11.9$ $n = 12$ $\alpha = 0.05$ $df = 11$

$$t\text{-stat } \frac{42-46}{\frac{11.9}{\sqrt{12}}}$$

$t\text{-stat} \approx -1.1641$

p-value $P(t < -1.164)$

$= t\text{-dist}(-1.164, 11, 1) = 0.134446428$

$p\text{-val} = 0.1344$

$t\text{-crit} = -t_{\alpha, df} = -t_{0.05, 11} = -1.796$

Critical val $= -1.796$

Since $-1.16 \geq -1.796$, we fail to reject the null at 5% sig level, there is insufficient evidence to conclude $\mu < 46$.