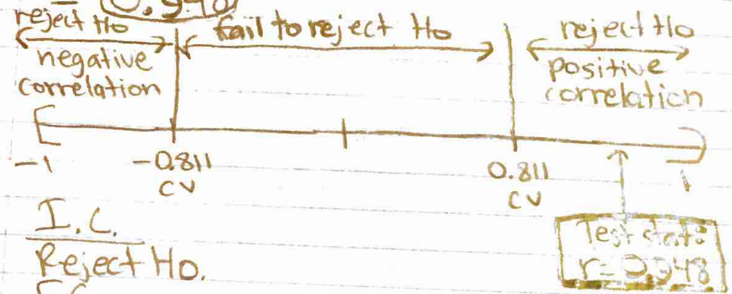
$$r = \frac{(6)(9639) - (51)(1108)}{\sqrt{(6)(439) - (51)^2} \cdot \sqrt{(6)(214{,}482) - (1108)^2}}$$

$$= 0.948$$



I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to support an existence of a positive linear correlation between overhead widths of seals from photographs and the weights of the seals at 5% significant level.

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HW Section 10.2 (cont.)

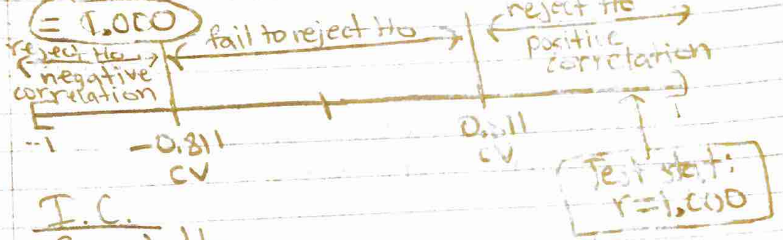
19)

(x) Redshift	0.0233	0.0539	0.0718	0.0395	0.0438	0.0103
(y) Distance	0.32	0.75	1.00	0.55	0.61	0.14

$\Sigma x = 0.2426$, $\Sigma x^2 = 0.01218812$, $n = 6$, $\alpha = 0.05$
$\Sigma y = 3.37$, $\Sigma y^2 = 2.3591$, $\Sigma xy = 0.169566$

$$r = \frac{6(0.169566) - (0.2426)(3.37)}{\sqrt{(6)(0.01218812) - (0.2426)^2} \cdot \sqrt{6(2.3591) - (3.37)^2}}$$

$= 1.000$



I.C.
Reject Ho.
F.C.
There is sufficient sample data evidence to support an existence of a strong positive linear correlation between amounts of redshift and distances to clusters of galaxies at 5% significant level. This suggests that the relationship between the two variables are very strong, and that distances can be directly computed from redshifts.

21)

(x) Overhead Width	7.2	7.4	9.8	9.4	8.8	8.4
(y) Weight	116	154	245	202	200	191

$\Sigma x = 51$, $\Sigma x^2 = 439$, $n = 6$, $\alpha = 0.05$
$\Sigma y = 1108$, $\Sigma y^2 = 214{,}482$, $\Sigma xy = 9{,}639$

reject Ho | fail to reject Ho | reject Ho

negative correlation | | positive correlation

-1 | -0.878 CV | | 0.878 CV | 1

Test stat:
$r=-0.959$

I.C.
Reject Ho.

F.C.
There is sufficient sample data evidence to support an existence of a strong negative linear correlation between lemon imports and # of crash fatality rates.* No, the result does NOT suggest that imported lemons cause car fatalities.

*at 5% significant level

(15)

(x) Enrollment	32	31	53	28	27	36	42	30	34	46
(y) Burglaries	103	103	86	57	32	131	15[illegible]	20	27	61

$\sum x = 359$, $\sum x^2 = 13{,}539$, $n=10$, $\alpha=0.05$
$\sum y = 877$, $\sum y^2 = 101{,}747$, $\sum xy = 33{,}741$

$$r=\frac{10(33{,}741)-(359)(877)}{\sqrt{(10)(13{,}539)-(359)^2}\cdot\sqrt{(10)(101{,}747)-(877)^2}}=0.561$$

reject Ho | fail to reject Ho | reject Ho

negative correlation | | positive correlation

-1 | -0.632 CV | | 0.632 CV | 1

Test stat:
$r=0.561$

I.C.
Fail to reject Ho.

F.C.
There is not sufficient sample data evidence to support a linear correlation between enrollments and burglaries.* Changing the enrollments to 32,000 will not change the result.

*at 5% significant level

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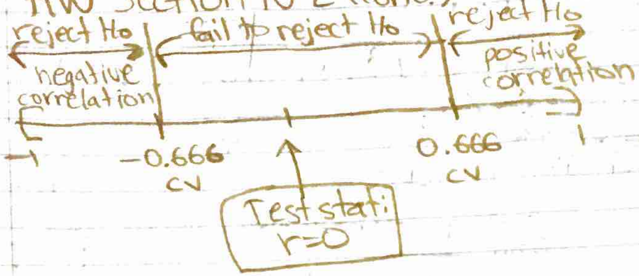
HW Section 10-2 (cont.)



I.C.:
Fail to reject Ho.

F.C.
There is not sufficient sample data evidence to support an existing linear correlation between the variables at 5% significant level.

(d) This means that a single pair of values can skew the possibility of there being a correlation, and it can change the correlation.

(13)

Lemons (x)	230	265	358	480	530
Crash (y)	15.9	15.7	15.4	15.3	14.9

$\Sigma x = 1863$, $\Sigma x^2 = 762{,}589$, $n=5$, $\alpha = 0.05$
$\Sigma y = 77.2$, $\Sigma y^2 = 1192.56$, $\Sigma xy = 28{,}571.7$

$$r = \frac{5(28{,}571.7) - (1863)(77.2)}{\sqrt{5(762{,}589) - (1863)^2} \cdot \sqrt{5(1192.56) - (77.2)^2}}$$

$$= \boxed{-0.959}$$

11 (a)

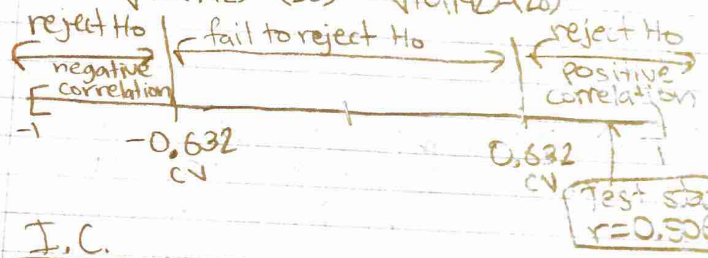
x	1	1	1	2	2	2	3	3	3	10
y	1	2	3	1	2	3	1	2	3	10

$\sum x = 28$, $\sum x^2 = 142$

$\sum y = 28$, $\sum y^2 = 142$, $\sum xy = 136$, $n = 10$

There appears to be a linear correlation

(b) $r = \dfrac{10(136) - (28)(28)}{\sqrt{10(142) - (28)^2} \cdot \sqrt{10(142) - (28)^2}} = 0.906$



I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to support an existence of a positive linear correlation between the variables at 5% significant level.

(c)

x	1	1	1	2	2	2	3	3	3
y	1	2	3	1	2	3	1	2	3

$\sum x = 18$, $\sum x^2 = 42$, $n = 9$

$\sum y = 18$, $\sum y^2 = 42$, $\sum xy = 36$

There does not appear to be a linear correlation.

$r = \dfrac{9(36) - (18)(18)}{\sqrt{(9)(42) - (18)^2} \cdot \sqrt{(9)(42) - (18)^2}} = 0$

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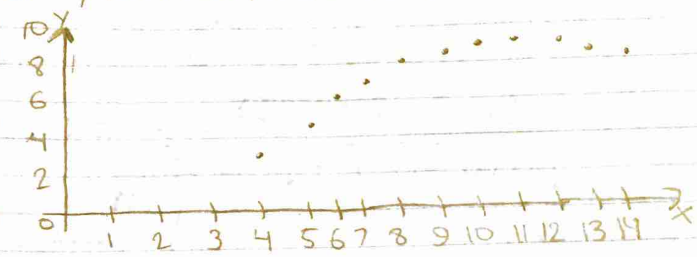
HW Section 10.2 (cont.)

⑨ ⓐ

x	10	8	13	9	11	14	6	4	12	7	5
y	9.14	8.14	8.74	8.77	9.26	8.10	6.13	3.10	9.13	7.26	4.74



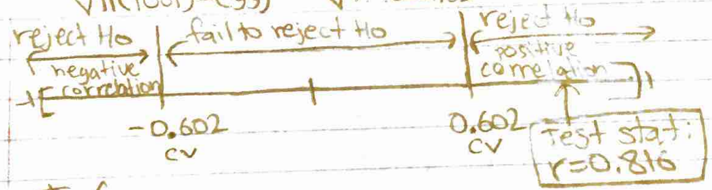
$H_0: \rho = 0$ $\quad \Sigma x = 99,\ \Sigma x^2 = 1001,\ \quad n = 11$

$H_1: \rho \neq 0$ $\quad \Sigma y = 82.51,\ \Sigma y^2 = 660.18,$

$\Sigma xy = 797.59$

ⓑ

$$r = \frac{11 \times (797.59) - (99)(82.51)}{\sqrt{11(1001) - (99)^2} \cdot \sqrt{11(660.18) - (82.51)^2}} = \boxed{0.816}$$



I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to support an existence of a positive linear correlation between x and y at 5% significant level.

ⓒ The scatterplot shows that the correlation is not linear.

the absence of 0 in the confidence interval.

(19)

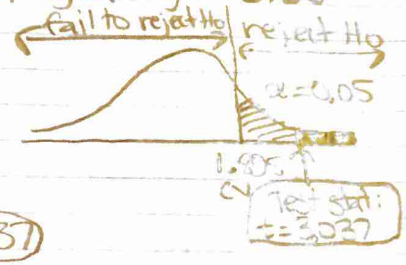
Before	6.6	6.5	9.0	10.3	11.3	8.1	6.3	11.6
After	6.8	2.4	7.4	8.5	8.1	6.1	3.4	2.0
d	-0.2	4.1	1.6	1.8	3.2	2.0	2.9	9.6

$\bar{d}=3.125$, $s_d=2.91$, $n=8$, $df=7$, $\alpha=0.05$

claim: $\mu_d > 0$

$H_0: \mu_d = 0$

$H_1: \mu_d > 0$ (RT)



Test stat:

$$t=\frac{3.125-0}{\frac{2.91}{\sqrt{8}}}=3.037$$

$0.005 < p\text{-value} < 0.01 < 0.05 = \alpha$, reject Ho

I.C.
Reject Ho.

E.C.
There is sufficient sample data evidence to support the claim that $\mu_d > 0$ at 5% significant level.

$$E = 2.365 \frac{(2.91)}{\sqrt{8}} = 2.433$$

$3.125 - 2.433 < \mu_d < 3.125 + 2.433$

$\boxed{0.69\text{ cm} < \mu_d < 5.56\text{ cm}}$

95% chance that mean difference is between 0.69cm and 5.56cm. Because the confidence interval does not include 0, it appears that hypnotism is effective in reducing pain.

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HW Section 9.4 (cont.)

15

Friday 6th	9	6	11	11	3	5
Friday 13th	13	12	14	10	4	12
d	-4	-6	-3	1	-1	-7

$\bar{d}=-3.33$, $s_d=3.01$, $n=6$, $df=5$, $\alpha=0.05$

claim: $\mu_d=0$

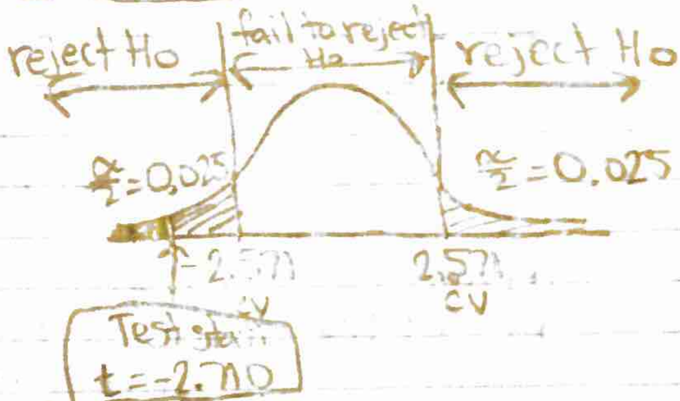
$H_0: \mu_d=0$

$H_1: \mu_d\neq 0$ (2T)

$0.05<\text{p-value}<0.02<0.05=\alpha$, reject Ho

Test stat:

$$t=\frac{-3.33-0}{\frac{3.01}{\sqrt{6}}}=-2.710$$



I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to warrant rejection of the claim that $\mu_d=0$ at 5% significant level.

$$E=2.571\frac{(3.01)}{\sqrt{6}}=3.159$$

$-3.33-3.159<\mu_d<-3.33+3.159$

$(-6.489<\mu_d<-0.171)$

95% chance that mean difference is between -6.489 and -0.171, which means that hospital admissions do seem to be affected with

(11) Taxi-Out 30 19 12 19 18 22 37 13 14 15 31 15
Taxi-In 12 13 8 21 17 11 12 12 15 26 9 11

d	18 6 4 -2 1 11 25 1 -1 -11 22 4

$\bar{d} = 6.5$, $s_d = 10.63$, $n=12$, $df=11$, $\alpha = 0.10$

Claim: $\mu_d > 0$

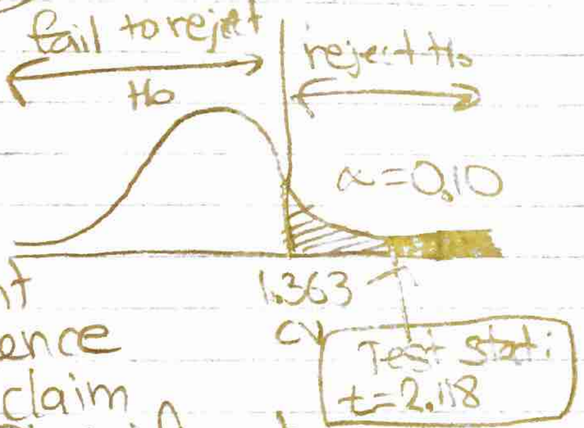
$H_0: \mu_d = 0$

$H_1: \mu_d > 0$ (RT)

$0.025 < \text{p-value} < 0.05 < 0.10 = \alpha$, reject H_0.

Test stat:

$$t = \frac{6.5 - 0}{\frac{10.63}{\sqrt{12}}} = 2.118$$



I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to support the claim that $\mu_d > 0$ at 10% significant level.

$$E = 1.796 \frac{(10.63)}{\sqrt{12}} = 5.5$$

$6.5 - 5.5 < \mu_d < 6.5 + 5.5$

$1.0 \text{ min} < \mu_d < 12.0 \text{ min}$

90% chance that mean difference is between 1.0 min and 12.0 min. It appears as if more of the blame is attributable to taxi-out times at JFK than taxi-in times, because the interval contains numbers > 0.

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HW Section 9.4

7 Actress 22 37 28 63 32

Actress	22	37	28	63	32
Actor	44	41	62	52	41
d	−22	−4	−34	+11	−9

ⓐ $\bar{d} = -11.6$ years

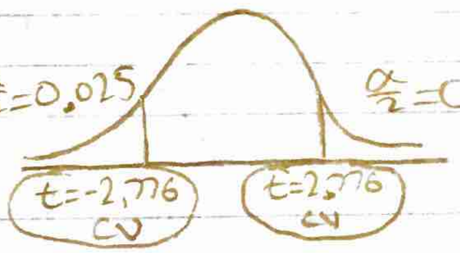
$n = 5$ $df = 4$

ⓑ $s_d = 17.21$ years $\alpha = 0.05$

ⓒ Test statistic:

$$t = \frac{-11.6 - 0}{\frac{17.21}{\sqrt{5}}} = -1.507$$

ⓓ



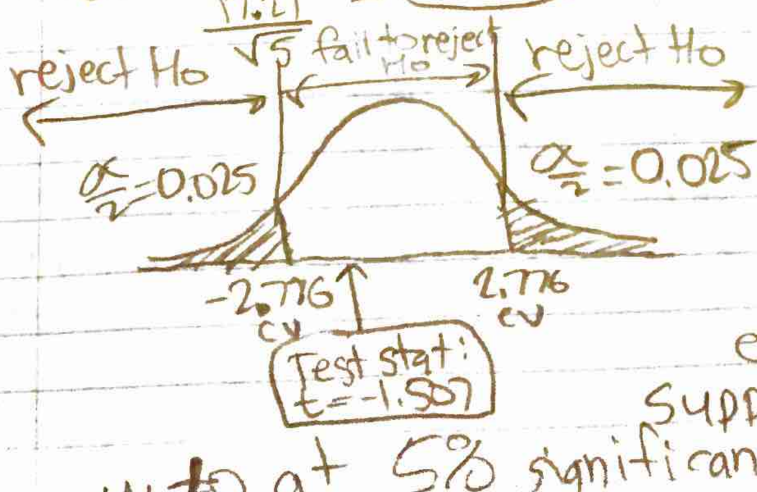
9 claim: $\mu_d \neq 0$ $\alpha = 0.05$

$H_0: \mu_d = 0$

$H_1: \mu_d \neq 0$ 2T

Test statistic:

$$t = \frac{-11.6 - 0}{\frac{17.21}{\sqrt{5}}} = -1.507$$



I.C.
Fail to reject Ho.

F.C.
There is not sufficient sample data evidence to support the claim that $\mu_d \neq 0$ at 5% significant level.

(21) pre-1964 quarters $n_1=40, \bar{x}_1=6.2677, s_1=0.4800$
post-1964 quarters $n_2=40, \bar{x}=5.6393, s_2=0.0612$

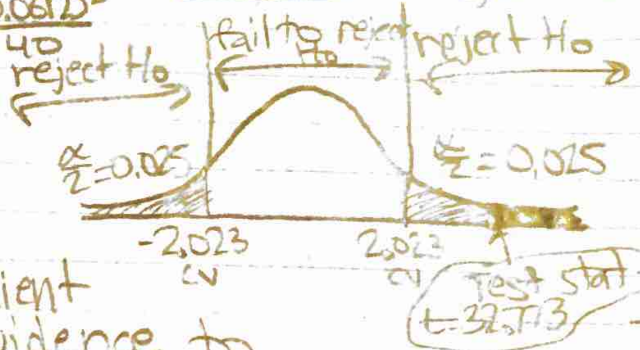
claim: $\mu_1=\mu_2$

Ho: $\mu_1=\mu_2$ $\qquad \alpha=0.05$, df$=39$

H_1: $\mu_1 \neq \mu_2$ (2T)

Test stat: $\qquad$ -p-value $<0.01 > 0.05=\alpha$, fail to reject Ho

$$t=\frac{(6.2677-5.6393)}{\sqrt{\frac{(0.4800)^2}{40}+\frac{(0.0612)^2}{40}}}=32.773$$



I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to warrant rejection of the claim that $\mu_1=\mu_2$ at 5% significant level. We can conclude because the difference is highly significant, even though the samples are small.

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A 12

HW Section 9.3 (cont.)

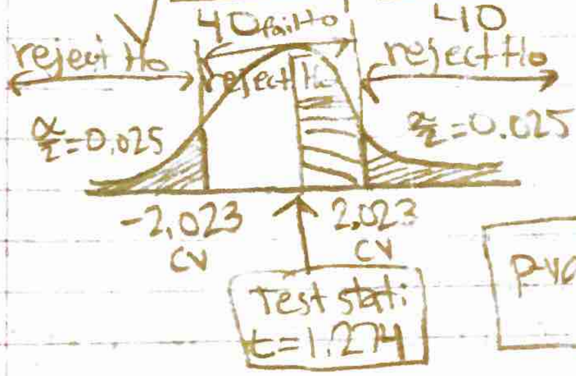
(15) Male BMI: $n_1=40$, $\bar{x}_1=28.44075$, $s_1=7.394076$
Female BMI: $n_2=40$, $\bar{x}_2=26.6005$, $s_1=5.359442$

claim: $\mu_1=\mu_2$
Ho: $\mu_1=\mu_2$ $\alpha=0.05$
H1: $\mu_1\neq\mu_2$ (2T)

Test stat:

$$t=\frac{(28.44075-26.6005)}{\sqrt{\frac{(7.394076)^2}{40}+\frac{(5.359442)^2}{40}}}=\boxed{1.274}$$

df=39



p-value >0.20>0.05=α, fail to reject Ho

I.C.
Fail to reject Ho.

F.C.
There is not sufficient evidence to warrant rejection the claim that $\mu_1=\mu_2$ (male and female BMI) at 5% significant level.

(b) $E=2.023\sqrt{\frac{(7.394076)^2}{40}+\frac{(5.359442)^2}{40}}=2.921046$

$1.84025-2.921046<\mu_1-\mu_2<1.84025+2.921046$

$-1.080796<\mu_1-\mu_2<4.761296$

95% chance that mean difference falls between -1.08 and 4.76.

(11) 4000 B.C. $n_1 = 30$, $\bar{x}_1 = 131.37$mm, $s_1 = 5.13$mm

(a) A.D. 150 $n_2 = 30$, $\bar{x}_2 = 136.17$mm, $s_2 = 5.35$mm

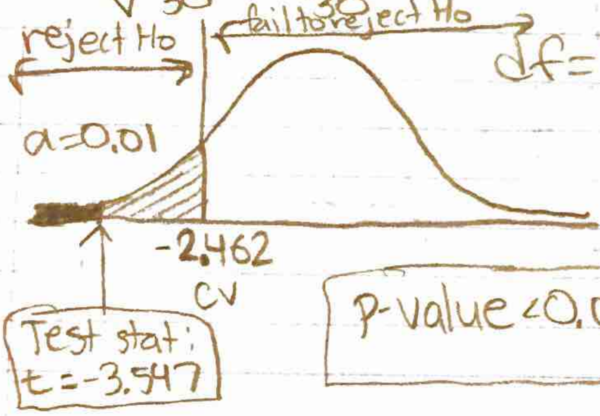
claim: $\mu_1 < \mu_2$

$H_0: \mu_1 = \mu_2$ $\alpha = 0.01$

$H_1: \mu_1 < \mu_2$ (LT)

Test stat:

$$t = \frac{(131.37 - 136.17)}{\sqrt{\frac{(5.13)^2}{30} + \frac{(5.35)^2}{30}}} = \boxed{-3.547}$$



$df = 30 - 1 = 29$

$\boxed{\text{p-value} < 0.005 < 0.01 = \alpha, \text{ fail to reject } H_0}$

I.C.

Reject Ho.

F.C.

There is sufficient sample data evidence to support the claim that $\mu_1 < \mu_2$ at 1% significant level.

(b) $E = 2.462\sqrt{\frac{(5.13)^2}{30} + \frac{(5.35)^2}{30}} = 3.332$

$(\bar{x}_1 - \bar{x}_2) - E < \mu_1 - \mu_2 < (\bar{x}_1 - \bar{x}_2) + E$

$\boxed{-8.13\text{mm} < \mu_1 - \mu_2 < -1.47\text{mm}}$

99% chance that mean difference falls between -8.13mm and -1.47mm.

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A12

HW Section 9.3

⑨

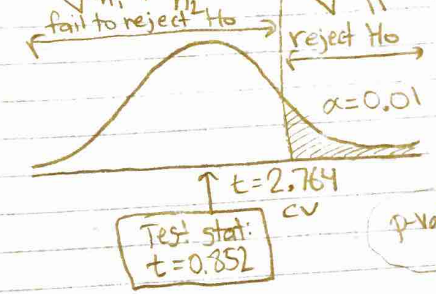
Men	Women
$n_1=11$	$n_2=59$
$\bar{x}_1=97.69°F$	$\bar{x}_2=97.45°F$
$s_1=0.89°F$	$s_2=0.66°F$

claim: $\mu_1>\mu_2$
$H_0: \mu_1=\mu_2$
$H_1: \mu_1>\mu_2$ RT
$\alpha=0.01$

Test stat:

$$t=\frac{(\bar{x}_1-\bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}=\frac{(97.69-97.45)}{\sqrt{\frac{(0.89)^2}{11}+\frac{(0.66)^2}{59}}}=0.852$$

df $= 11-1=10$, smaller



p-value $>0.10>0.01=\alpha$, fail to reject Ho.

I.C.
Fail to reject Ho.
F.C.
There is not sufficient sample data evidence to support the claim that $\mu_1>\mu_2$ at 1% significant level.

ⓑ $E=t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}=(2.764)\sqrt{\frac{(0.89)^2}{11}+\frac{(0.66)^2}{59}}$

$=0.779$

$\bar{x}_1-\bar{x}_2-E<\mu_1-\mu_2<\bar{x}_1-\bar{x}_2+E$
$97.69-97.45-0.779<\mu_1-\mu_2<97.69-97.45+0.779$
$\boxed{-0.54°F<\mu_1-\mu_2<1.02°F}$ 99% chance that the mean diff. falls between $-0.54°F$ and $1.02°F$.

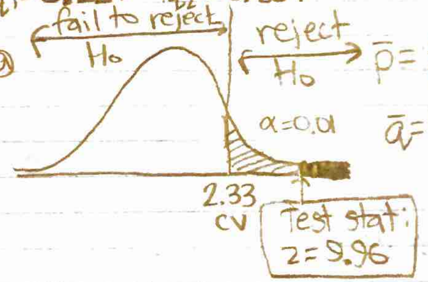
it means that p_1-p_2 could be zero, i.e., it appears that men and women have equal success in challenging calls.

(15)

TG	PG
$n_1 = 150$	$n_2 = 148$
$x_1 = 116$	$x_2 = 29$
$\hat{p}_1 = 0.773$	$\hat{p}_2 = 0.196$
$\hat{q}_1 = 0.227$	$\hat{q}_2 = 0.804$

Claim: $p_1 > p_2$
$H_0: p_1 = p_2$
$H_1: p_1 > p_2$ (RT)
$\alpha = 0.01$

(a)



$\bar{p} = \frac{116+29}{150+148} = 0.487$

$\bar{q} = 1-0.487 = 0.513$

Test stat:

$$z = \frac{(0.773-0.196)}{\sqrt{\frac{(0.487)(0.513)}{150} + \frac{(0.487)(0.513)}{148}}} = \boxed{9.96}$$

p-value $= 0.0001 < 0.01 = \alpha$, reject H_0

I.C.

Reject H_0.

F.C.

There is sufficient sample data evidence to support the claim that $p_1 > p_2$ at 1% significant level. Appears that oxygen treatment is effective.

p-value $= 0.0001 < 0.01 = \alpha$, reject H_0.

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Math 140

A12

HW Section 9.2 (cont.)

$\bar{p} = \frac{421+220}{1412+759} = 0.295$

$\bar{q} = 1-0.295 = 0.705$

Test stat:

$$z = \frac{(0.298-0.290)}{\sqrt{\frac{(0.295)(0.705)}{1412} + \frac{(0.295)(0.705)}{759}}} = 0.390$$

I.C.

Fail to reject Ho.

F.C.

There is not sufficient sample data evidence to warrant rejection of the claim that $p_1 = p_2$ at 5% significant level.

p-value $= 2(0.3483) = 0.6966 > 0.05 = \alpha$, fail to reject Ho

(b) $\hat{p}_1 - \hat{p}_2 - E < p_1 - p_2 < \hat{p}_1 - \hat{p}_2 + E$

$$E = z_{\alpha/2}\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}} = 1.96\sqrt{\frac{(0.298)(0.702)}{1412} + \frac{(0.290)(0.710)}{759}}$$

$= 0.040$

$0.008-0.040 < p_1-p_2 < 0.008+0.040$

$-0.032 < p_1 - p_2 < 0.048$

95% chance that the difference between $p_1 - p_2$ falls between -0.032 and 0.048.

(c) Since this confidence interval contains 0, Test stat:

$$z = \frac{(0.096-0.125)}{\sqrt{\frac{(0.116)(0.884)}{240} + \frac{(0.116)(0.884)}{520}}} = -1.16$$

I.C.

Fail to reject Ho.

F.C.

There is not sufficient sample data evidence to support $p_1 < p_2$ at 1% significant level.

P-value $= 0.1230 > 0.01 = \alpha$, fail to reject Ho.

(b) $E = 2.575\sqrt{\frac{(0.096)(0.904)}{240} + \frac{(0.125)(0.875)}{520}}$

$= 0.062$

$0.096-0.125-0.062 < p_1-p_2 < 0.096-0.125+0.062$

$-0.091 < p_1-p_2 < 0.033$

99% chance that the difference between p_1-p_2 falls between -0.091 and 0.033.

(c) Because the confidence interval contains 0, it means that p_1-p_2 could be zero, which means that there is no difference in the rate of left-handedness among males and females.

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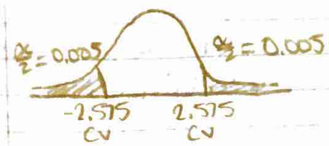
04-14-15
Math 140

A12

HW Section 9.2 (cont.)

(b) $\hat{p}_1-\hat{p}_2-E<p_1-p_2<\hat{p}_1-\hat{p}_2+E$

$E=z_{\alpha/2}\sqrt{\dfrac{\hat{p}_1\hat{q}_1}{n_1}+\dfrac{\hat{p}_2\hat{q}_2}{n_2}}$



$E=2.575\sqrt{\dfrac{(0.773)(0.227)}{150}+\dfrac{(0.196)(0.804)}{148}}$
$=0.122$

$0.773-0.196-0.122<p_1-p_2<0.773-0.196+0.122$
$\boxed{0.455<p_1-p_2<0.699}$

99% chance that the difference between p_1 & p_2 falls between 0.455 and 0.699.

(c) Because the confidence interval does not include 0, the oxygen treatment appears to be effective.

(17)

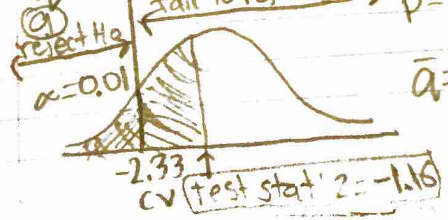
MG	FG
$n_1=240$	$n_2=520$
$x_1=23$	$x_2=65$
$\hat{p}_1=0.096$	$\hat{p}_2=0.125$
$\hat{q}_1=0.904$	$\hat{q}_2=0.875$

claim: $p_1<p_2$
$H_0: p_1=p_2$
$H_1: p_1<p_2$ (LT)
$\alpha=0.01$

$\bar{p}=\dfrac{23+65}{240+520}=0.116$

$\bar{q}=1-0.116=0.884$

(a)



support $p_1 \neq p_2$ at 5% significance level.

ⓑ $E = z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}} = (1.96)\sqrt{\frac{(0.889)(0.111)}{45} + \frac{(0.854)(0.146)}{103}}$

$= 0.114$

$\hat{p}_1 - \hat{p}_2 - E < p_1 - p_2 < \hat{p}_1 - \hat{p}_2 + E$

$0.035 - 0.114 < p_1 - p_2 < 0.035 + 0.114$

$-0.079 < p_1 - p_2 < 0.149$

ⓒ Since this confidence interval contains 0, it means that $p_1 - p_2$ could be zero, i.e, echinacea is not effective. It does not appear to have any effect on the infection rate.

95% chance that the difference between $p_1 - p_2$ falls between -0.079 and 0.149.

(13)

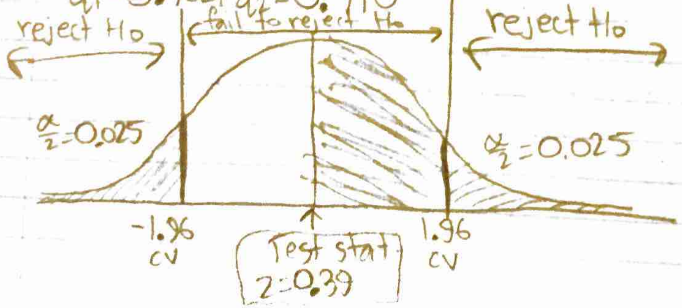
IG	PG
$n_1 = 1412$	$n_2 = 759$
$x_1 = 421$	$x_2 = 220$
$\hat{p}_1 = 0.298$	$\hat{p}_2 = 0.290$
$\hat{q}_1 = 0.702$	$\hat{q}_2 = 0.710$

claim: $p_1 = p_2$

$H_0: p_1 = p_2$

$H_1: p_1 \neq p_2$ (2T)

$\alpha = 0.05$



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$\boxed{A12}$

HW Section 9.2

11 a

IG	PG
$n_1 = 45$	$n_2 = 103$
$x_1 = 40$	$x_2 = 88$
$\hat{p}_1 = 0.889$	$\hat{p}_2 = 0.854$
$\hat{q}_1 = 0.111$	$\hat{q}_2 = 0.146$

$\alpha = 0.05$

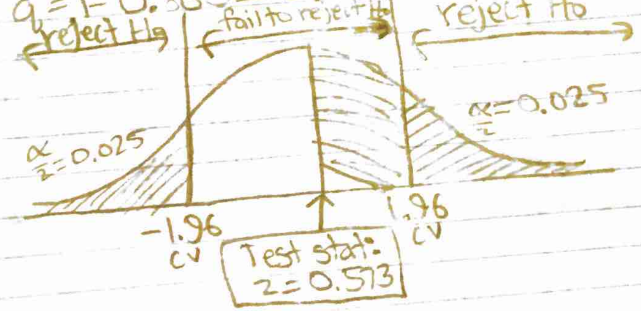
Claim: $p_1 \neq p_2$

$H_0: p_1 = p_2$

$H_1: p_1 \neq p_2$ 2T

$$\bar{p} = \frac{40+88}{45+103} = 0.865$$

$$\bar{q} = 1 - 0.865 = 0.135$$



Test stat

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - (\cancel{p_1 - p_2})^{0}}{\sqrt{\frac{\bar{p}\bar{q}}{n_1} + \frac{\bar{p}\bar{q}}{n_2}}} = \frac{0.889 - 0.854}{\sqrt{\frac{(0.865)(0.135)}{45} + \frac{(0.865)(0.135)}{103}}}$$

$$= \boxed{0.573}$$

$\boxed{PV = 0.5686 > 0.05 = \alpha, \text{ fail to reject Ho.}}$

I.C.
Fail to reject Ho.

F.C.
There is not sufficient sample data evidence to

to support the claim that $\sigma > 32.2$ ft. at 5% significant level.

· The standard deviation is greater, which means the new production method appears to be worse. The company should definitely take action to reduce the variation.

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HW Section 8.5 (cont.)

13 cont.) Test stat:

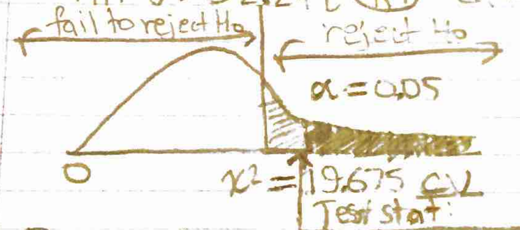
$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(15-1)(7.67)^2}{(22.5)^2} = \boxed{1.627}$$

$\boxed{\text{p-value} < 0.005 < 0.01 = \alpha, \text{ reject Ho}}$

Initial conclusion:
· Reject Ho.

Final conclusion:
There is sufficient sample data evidence to support the claim that $\sigma \leq 22.5$ years at 1% significant level.

15) $n = 12$, $s = 52.44$ ft, $\sigma = 32.2$ ft.
claim: $\sigma > 32.2$ ft.
Ho: $\sigma = 32.2$ ft. $\alpha = 0.05$
H1: $\sigma > 32.2$ ft (RT) $df = 11$



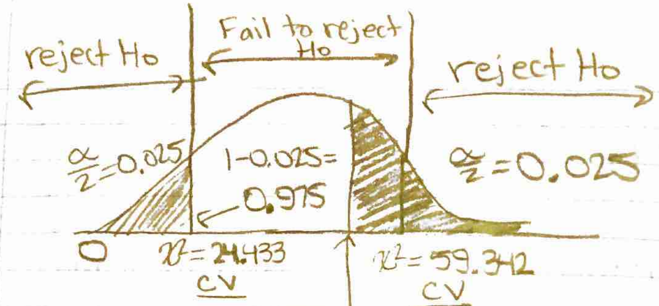
Test stat:

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(12-1)(52.44)^2}{(32.2)^2} = \boxed{29.175}$$

$\boxed{\text{p-value} < 0.005 < 0.05 = \alpha, \text{ reject Ho}}$

Initial conclusion:
· Reject Ho.

Final conclusion:
There is sufficient sample data evidence



$\frac{1}{2}$ p-value > 0.10

$\boxed{\text{p-value} > 0.20 > 0.05 = \alpha, \text{ fail to reject Ho}}$

<u>Initial conclusion:</u>

- Fail to reject Ho.

<u>Final conclusion:</u>

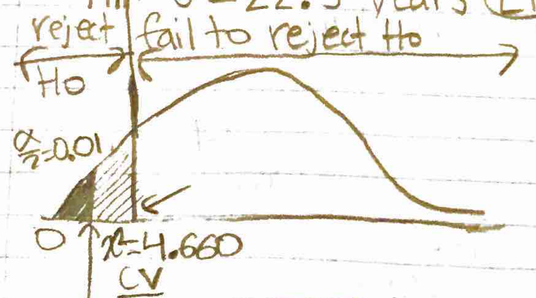
- There is not sufficient sample data evidence to support the claim that $\sigma = 10.0$ beats/min. at 5% significant level.

13 $n=15$, $s=7.67$ years, $\sigma=22.5$ years

Claim: $\sigma < 22.5$ years

Ho: $\sigma = 22.5$ years $\alpha = 0.01$

H1: $\sigma < 22.5$ years (LT) $df=14$



$\boxed{\text{Test stat: } \chi^2 = 1.627}$

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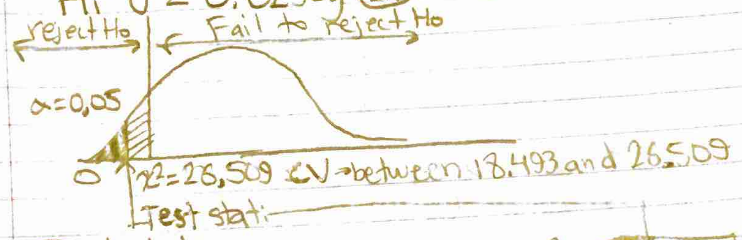
HW Section 8.5

⑦ $n=37$, $s=0.01648g$, $\sigma=0.0230g$

claim: $\sigma<0.0230g$

H_0: $\sigma=0.0230g$ $\quad\alpha=0.05$

H_1: $\sigma<0.0230g$ (LT) $\quad df=36$



Test stat:

$$\chi^2=\frac{(n-1)s^2}{\sigma^2}=\frac{(37-1)(0.01648)^2}{(0.0230)^2}=\boxed{18.483}$$

$\boxed{\text{P-value} < 0.005 < 0.05=\alpha, \text{ reject } H_0}$

Initial Conclusion:

- Reject H_0.

Final Conclusion:

- There is sufficient sample data evidence to support the claim that $\sigma<0.0230g$ at 5% significant level.

⑨ $n=40$, $s=10.3$ beats/min, $\sigma=10.0$ beats/min,
$df=39$

claim: $\sigma=10.0$ beats/min. $\quad\alpha=0.05$

H_0: $\sigma=10.0$ beats/min.

H_1: $\sigma\neq10.0$ beats/min. (2T)

Test stat:

$$\chi^2=\frac{(n-1)s^2}{\sigma^2}=\frac{(40-1)(10.3)^2}{(10.0)^2}=\boxed{41.375}$$

Initial conclusion:

Reject Ho.

Final conclusion:

There is sufficient sample data evidence to support the claim that $\mu > 4.0$ years at 1% significance level. The data has $n < 30$ and is not normally distributed, so it is not valid. However, the data that is given to us appears justified.

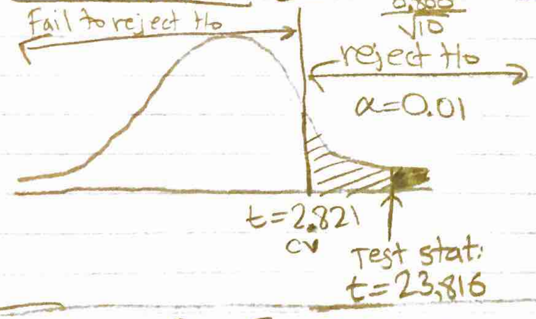
(23) $n = 10$, $\bar{x} = 69.825$ inches, $s = 0.800$ inches, $df = 9$

claim: $\mu > 63.8$ in.

Ho: $\mu = 63.8$ in. $\quad \alpha = 0.01$

H_1: $\mu > 63.8$ in (RT)

Test statistic: $t = \dfrac{69.825 - 63.8}{\frac{0.800}{\sqrt{10}}} = \boxed{23.816}$



$\boxed{\text{p-value} < 0.005 < 0.01 = \alpha, \text{ reject Ho}}$

Initial conclusion:

Reject Ho.

Final conclusion:

There is sufficient sample data evidence to suggest that $\mu > 63.8$ in. at 1% signifiant level. We can conclude that supermodels are taller than the typical woman.

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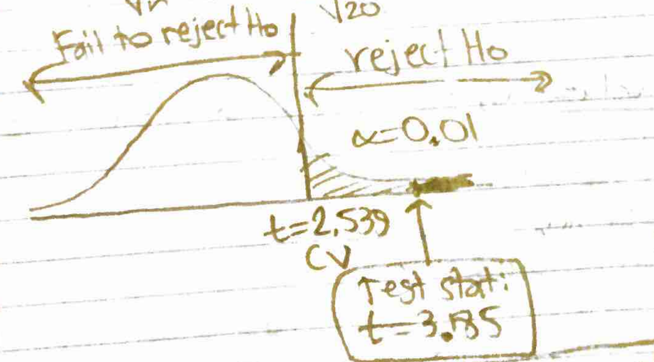
HW Section 8-4 (cont.)

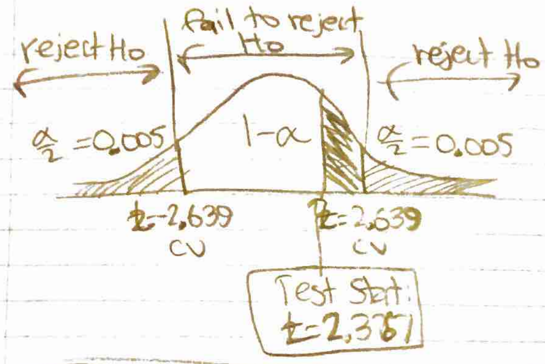
$\boxed{p\text{-value} < 0.005 < 0.01 = \alpha,\ \text{reject } H_0}$

Initial conclusion:
Reject H_0.
Final conclusion:
There is sufficient sample data evidence to support the claim that $\mu > 0$ lb. at 1% significant level. The diet appears to be effective, but does not appear to have practical significance because the mean weight loss is only 3 lb.

(19) $n=20$, $\bar{x}=6.5$ years, $s=3.5$ years, $df=19$
claim: $\mu > 4.0$ years
H_0: $\mu = 4.0$ years $\quad \alpha = 0.01$
H_1: $\mu > 4.0$ years (RT)
Test statistic:
$$t = \frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}} = \frac{6.5-4.0}{\frac{3.5}{\sqrt{20}}} = \boxed{3.185}$$



$\boxed{p\text{-value} < 0.005 < 0.01 = \alpha,\ \text{reject } H_0}$



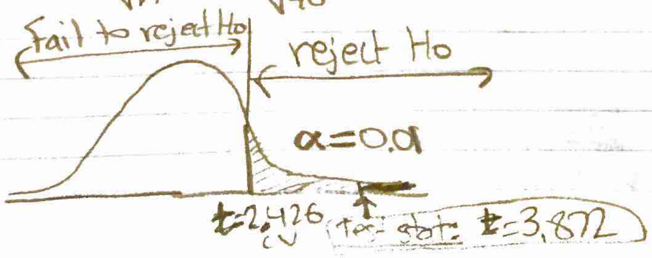
$\boxed{\text{p-value} > 0.02 > 0.01 = \alpha \text{, fail to reject } H_0}$

<u>Initial conclusion:</u>
Fail to reject H_0.
<u>Final conclusion:</u>
There is not sufficient sample data evidence to warrant rejection of the claim that $\mu = 33$ years at 1% significance level.

15 $n=40$, $\bar{x} = 3.0\text{lb}$, $s = 4.9\text{lb}$, $df = 39$
claim: $\mu > 0$ lb.
$H_0: \mu = 0$ lb. $\alpha = 0.01$
$H_1: \mu > 0$ lb RT

<u>Test statistic:</u>

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{3.0 - 0}{\frac{4.9}{\sqrt{40}}} = \boxed{3.872}$$



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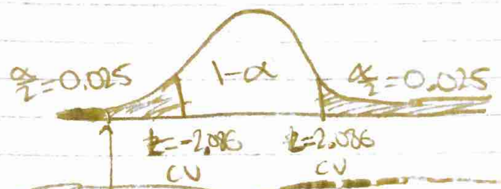
HW Section 8-4

7) $n=21$, $\mu=475$ HIC, $t=-2.242$, $df=20$

claim: $\mu=475$

$H_0: \mu=475$ $\qquad \alpha=0.05$

$H_1: \mu\neq 475$ 2T



$\boxed{\text{Test stat: } t=-2.242}$ $\qquad \boxed{0.02 < p\text{-value} < 0.05}$

df	0.02	0.05
20	2.528 *	2.086

$t=2.242$

11) $n=82$, $\bar{x}=35.9$ years, $s=11.1$ years

claim: $\mu=33$ years

$H_0: \mu=33$ years $\qquad \alpha=0.01$

$H_1: \mu\neq 33$ years 2T

Test statistic:

$$t=\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}}=\frac{35.9-33}{\frac{11.1}{\sqrt{82}}}=\boxed{2.367}$$

$df=81$

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HW Section 8.3 (cont.)

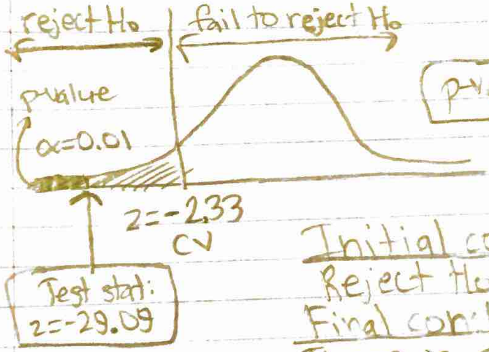
29) $n=870$, $\hat{p}=0.390$

claim: $p<0.791$ $\qquad q=1-0.791=0.209$

H_0: $p=0.791$ $\qquad \alpha=0.01$

H_1: $p<0.791$ LT

Test statistic: $z=\dfrac{\hat{p}-p}{\sqrt{\frac{pq}{n}}}=\dfrac{0.390-0.791}{\sqrt{\frac{(0.791)(0.209)}{870}}}=\boxed{-29.09}$



$\boxed{\text{p-value: } 0.0001<0.01\text{, reject } H_0}$

Initial conclusion:

Reject H_0.

Final conclusion:

There is sufficient sample data evidence to support the claim that $p<0.791$ at 1% significant level. Therefore, the jury selection does NOT seem to be fair.

p-value: 2(0.2514) = $\boxed{0.5028 > 0.005\text{, fail to reject } H_0}$

Initial conclusion:

Fail to reject H_0.

Final conclusion:

There is not sufficient sample data evidence to warrant rejection of the claim that $p = 0.000340$ at 0.5% significant level. Therefore, cellphone users should not be concerned about cancer of the brain or nervous system.

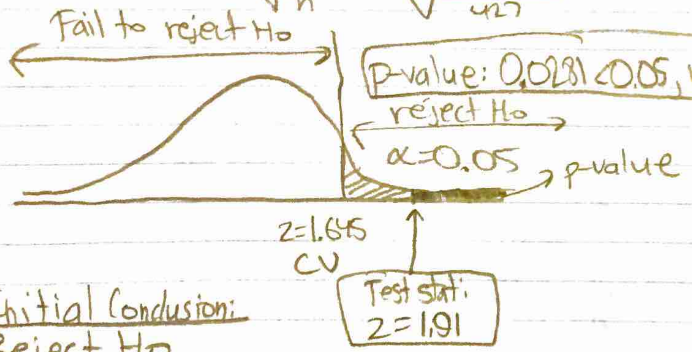
25 $n = 427$, $\hat{p} = 0.290$

claim: $p > 0.25$ $\quad q = 1 - 0.25 = 0.75$

H_0: $p = 0.25$ $\quad \alpha = 0.05$

H_1: $p > 0.25$ RT

Test statistic: $\dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \dfrac{0.290 - 0.25}{\sqrt{\frac{(0.25)(0.75)}{427}}} = \boxed{1.91}$



$\boxed{\text{p-value: } 0.0281 < 0.05\text{, reject } H_0}$

Initial Conclusion:

Reject H_0

Final conclusion:

There is sufficient sample data evidence to support the claim that $p > 0.25$ at 5% significant level.

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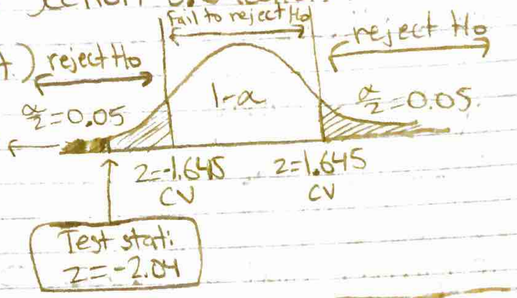
HW Section 8.3 (cont.)

15 (cont.)



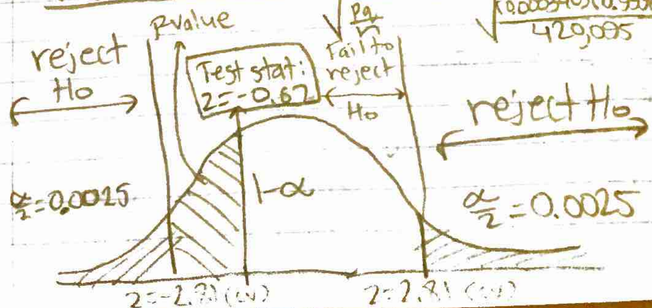
p-value: $2(0.0207) = \boxed{0.0414 < 0.10 = \alpha, \text{ reject Ho}}$

<u>Initial conclusion:</u>
Reject Ho.
<u>Final conclusion:</u>
There is sufficient sample data evidence to warrant rejection of the claim that p=0.50 at 10% significant level. However, their success rate of 43.9% appears to be an ineffective method.

19 $n = 420{,}095$ $x = 135$ $\hat{p} = \frac{135}{420{,}095} = 0.000321$

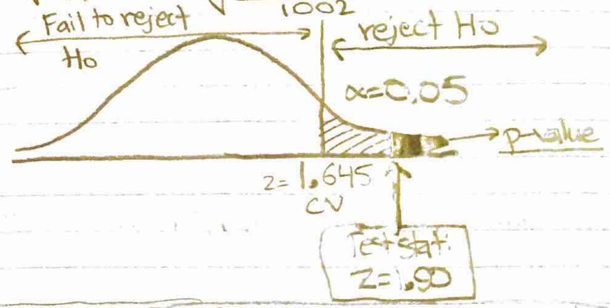
claim: $p = 0.000340$
Ho: $p = 0.000340$ $\alpha = 0.005$
H_1: $p \neq 0.000340$ 2T

<u>Test statistic:</u> $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.000321 - 0.000340}{\sqrt{\frac{(0.000340)(0.99966)}{420{,}095}}} = \boxed{-0.67}$



Test statistic:

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.530 - 0.50}{\sqrt{\frac{(0.50)(0.50)}{1002}}} = \boxed{1.90}$$



$\boxed{\text{p-value: } 0.0287 < 0.05 = \alpha, \text{ reject Ho.}}$

Initial Conclusion:

Reject Ho.

Final Conclusion:

There is sufficient sample data evidence to support the claim that $p > 0.50$ at 5% significant level.

15 $n = 280$, $x = 123$ $\hat{p} = \frac{123}{280} = 0.439$

claim: $p = 0.50$

H_0: $p = 0.50$ $\alpha = 0.10$

H_1: $p \neq 0.50$

Test statistic:

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.439 - 0.50}{\sqrt{\frac{(0.50)(0.50)}{280}}} = \boxed{-2.04}$$

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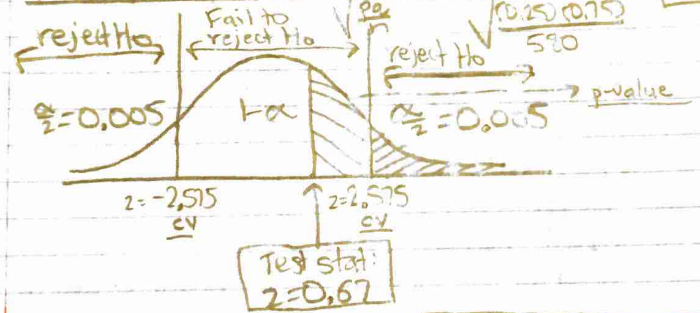
HW Section 8.3

(9) $n = 428 + 152 = 580$ total peas
$x = 152$ yellow peas , $\alpha = 0.01$
$\hat{p} = \frac{152}{580} = 0.262$

claim: $p = 0.25$ $\quad q = 1 - 0.25 = 0.75$
H_0: $p = 0.25$
H_1: $p \neq 0.25$ (2T)

Test statistic: $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{0.262 - 0.25}{\sqrt{\frac{(0.25)(0.75)}{580}}} = \boxed{0.67}$



p-value $= 2(0.2514) = \boxed{0.5028 > 0.01 = \alpha}$

Initial conclusion:
Fail to reject Ho.
Final conclusion:
There is not sufficient sample data evidence to warrant rejection of the claim that $p = 0.25$ at 1% significant level.

(11) $n = 1002$, $x = 531$ $\quad \hat{p} = \frac{531}{1002} = 0.530$
claim: $p > 0.50$
H_0: $p = 0.50$ $\quad \alpha = 0.05$
H_1: $p > 0.50$ (RT)

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HW Section 8.2

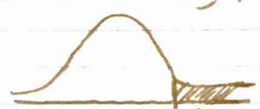
(5) a) claim: $p=0.20$
b) H_0 (null): $p=0.20$
H_1 (alternate): $p \neq 0.20$

(7) a) claim: $\mu \leq 76$
b) H_0: $\mu = 76$
H_1: $\mu > 76$

(15) $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$ where $n=40, s=2.28, \sigma=5.00$

$\chi^2 = \frac{(40-1)(2.28)^2}{(5.00)^2} = 8.110$

(17) $z=2.00$, $p>0.5$, right-tailed test



$z=2.00$

$p=0.0228$

critical value: $z=1.645$

(25) $\alpha > 0.05$
p-value: $p=0.0010$
a) Because p-value is less than α, we reject H_0.
b) There is sufficient evidence that the percentage of blue M&M's is greater than 5%.

(29) a) claim: $p>0.5$ H_0: $p=0.5$ H_1: $p>0.5$
b) $\alpha=0.01$ c) normal distribution
d) right-tail e) $z=1.00$
f) $p=0.1587$ g) critical value: $z=2.33$
h) area of critical region $=0.0099$ or 0.01

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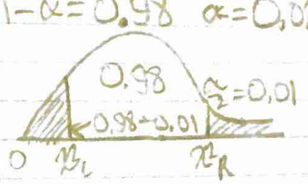
HW Section 7.4 (cont.)

15 (cont). and successful applicants ($3.74 < \sigma < 7.5$ years), so age is not a factor in being an unsuccessful/successful applicant. However, there is a bigger age group among unsuccessful applicants.

(17) 98% confidence, $n = 37$, $s = 0.01648$, $\bar{x} = 2.4991$
$1 - \alpha = 0.98$ $\alpha = 0.02$ $\frac{\alpha}{2} = 0.01$
$df = 37 - 1 = 36$



df	0.99	0.01
36	$\rightarrow$ 22.164 (χ^2_L)	$\rightarrow$ 63.691 (χ^2_R)

$$\frac{(36)(0.01648)^2}{63.691} < \sigma^2 < \frac{(36)(0.01648)^2}{22.164}$$

$$0.0001535107692 < \sigma^2 < 0.000441132144$$

$$0.01239g < \sigma < 0.02100 \text{ grams}$$

· 98% confidence that our population standard deviation is between 0.01239g and 0.02100 grams.

(21) The sample size is 768 people. Because the distribution is skewed, there does not appear to be a normal distribution. Therefore, the computed sample size is most likely incorrect.

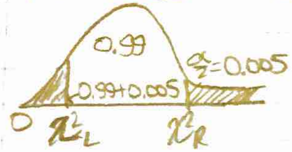
· 90% confidence that our population standard deviation is between 0.253 ppm and 0.701 ppm.

(15) Age of Unsuccessful Applicants:

99% confidence, $n=23$, $s=7.2$, $\bar{x}=47.0$

$1-\alpha=0.99$ $\alpha=0.01$ $\frac{\alpha}{2}=0.005$

$df=23-1=22$



df	0.995	0.005
22	→ 8.643 (χ^2_L)	→ 42.796 (χ^2_R)

$$\frac{(22)(7.2)^2}{42.796} < \sigma^2 < \frac{(22)(7.2)^2}{8.643}$$

$26.64921955 < \sigma^2 < 131.9541826$

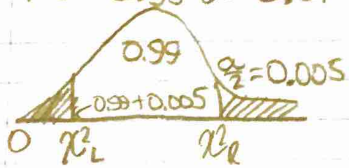
$5.2 < \sigma < 11.5$ years

Age of Successful Applicants:

99% confidence, $n=29$, $s=5.0$, $\bar{x}=44.5$

$1-\alpha=0.99$ $\alpha=0.01$ $\frac{\alpha}{2}=0.005$

$df=29-1=28$



df	0.995	0.005
28	→ 12.461 (χ^2_L)	→ 50.993 (χ^2_R)

$$\frac{(28)(5.0)^2}{50.993} < \sigma^2 < \frac{(28)(5.0)^2}{12.461}$$

$13.72737435 < \sigma^2 < 56.17526683$

$3.7 < \sigma < 7.5$ years

· There is some overlap between the confidence interval of unsuccessful applicants ($5.2 < \sigma < 11.5$ years)...

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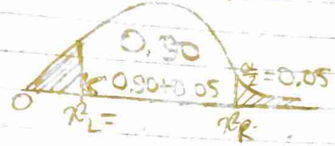
HW Section 7.4

(9) 90% confidence, $n=106$, $s=0.62$
$1-\alpha=0.90$ $\alpha=0.10$ $\frac{\alpha}{2}=0.05$
$df=106-1=105$



df	0.95	0.05
106	→ 77.929 (χ^2_L)	→ 124.342 (χ^2_R)

$$\frac{(n-1)s^2}{\chi^2_R} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_L}$$

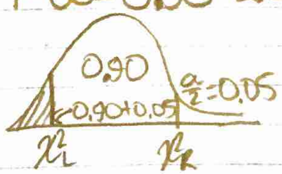
$$= \frac{(106-1)(0.62)^2}{124.342} < \sigma^2 < \frac{(106-1)(0.62)^2}{77.929}$$

$$= 0.3246047192 < \sigma^2 < 0.5179329903$$

$$= \boxed{0.570°F < \sigma < 0.720°F}$$

· 90% confidence that our population standard deviation is between 0.570°F and 0.720°F.

(13) 90% confidence, $n=7$, $s=0.366$, $\bar{x}=0.72$
$1-\alpha=0.90$ $\alpha=0.10$ $\frac{\alpha}{2}=0.05$
$df=7-1=6$



df	0.95	0.05
6	→ 1.635 (χ^2_L)	→ 12.592 (χ^2_R)

$$\frac{(7-1)(0.366)^2}{12.592} < \sigma < \frac{(7-1)(0.366)^2}{1.635}$$

$$= 0.0638290978 < \sigma^2 < 0.4915816514$$

$$\boxed{= 0.253\text{ ppm} < \sigma < 0.701\text{ ppm}}$$

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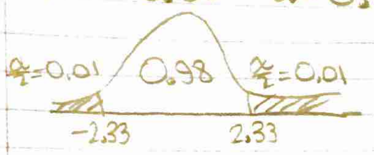
HW Section 7.3 (cont.)

29 $\sigma = \frac{2400-600}{4} = 450$

$1-\alpha = 0.98$ $\alpha = 0.02$ $\frac{\alpha}{2} = 0.01$ $z_{\frac{\alpha}{2}} = 2.33$



$E = 100$

$n = \left(\frac{z_{\frac{\alpha}{2}} \cdot \sigma}{E}\right)^2 = \left(\frac{2.33 \times 450}{100}\right)^2 = 109.935 = 110$ people

-The margin of error of 100 points is too high to estimate the mean SAT score.

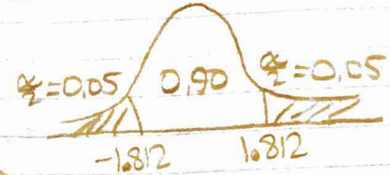
(19) $\bar{x}=0.938\ W/kg,\ s=0.423\ W/kg,\ n=11$

$1-\alpha=0.90$

$\alpha=0.10 \quad \frac{\alpha}{2}=0.05$

$df=11-1=10$

$t_{\frac{\alpha}{2}}=1.812$



$E=(1.812)\left(\frac{0.423}{\sqrt{11}}\right)=0.231$

$0.938-0.231<\mu<0.938+0.231$

$0.707\ W/kg<\mu<1.169\ W/kg$

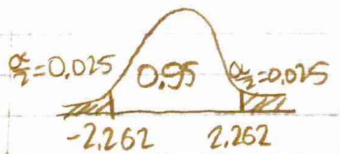
The confidence interval is below the standard of 1.6 W/kg, which means that the mean of the phones are living up to the standards. However, there could be individual phones that are higher than 1.6 W/kg.

(21) $\bar{x}=11.05\frac{ug}{g},\ s=6.46\frac{ug}{g}\ n=10$

$1-\alpha=0.95 \quad \alpha=0.05 \quad \frac{\alpha}{2}=0.025$

$df=10-1=9$

$t_{\frac{\alpha}{2}}=2.262$



$E=(2.262)\left(\frac{6.46}{\sqrt{10}}\right)=4.621$

$11.05-4.261<\mu<11.05+4.261$

$\boxed{6.79\ ug/g<\mu<15.31\ ug/g}$

We cannot say that the population mean is less than 7 ug/g because it falls in between the confidence interval, which shows that the population mean might be less or greater than the safety standard.

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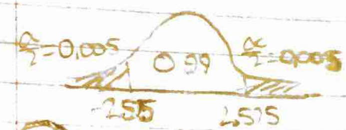
HW Section 7.3

7) a) $df = 40 - 1 = 39$ $\quad \boxed{t_{\alpha/2} = 2.708}$

b) $1-\alpha = 0.99 \quad \alpha = 0.01 \quad \frac{\alpha}{2} = 0.005$



$\boxed{z_{\alpha/2} = 2.575}$

11) $\bar{x} = 12{,}898 \quad s = 7719$

$1-\alpha = 0.95 \quad \alpha = 0.05 \quad \frac{\alpha}{2} = 0.025$

$df = n-1 = 5-1 = 4 \quad t_{\alpha/2} = 2.776$

$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}} = (2.776) \cdot \frac{7719}{\sqrt{5}} = 9582.9$

$12{,}898 - 9582.9 < \mu < 12{,}898 + 9582.9$

$\boxed{3315.1 < \mu < 22{,}480.9}$

thousands of \$ thousands of \$

\$1 from Jobs is an extreme outlier that messes up the confidence interval.

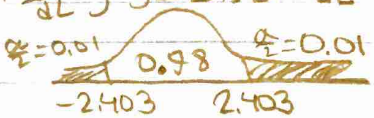
15) $n = 49 \quad \bar{x} = 0.4 \frac{mg}{dL}, \quad s = 21.0 \frac{mg}{dL}$

$1-\alpha = 0.98$

$\alpha = 0.02 \quad \frac{\alpha}{2} = 0.01$

$df = 49 - 1 = 48$

$t_{\alpha/2} = 2.403$



$E = (2.403)\left(\frac{21.0}{\sqrt{49}}\right) = 7.209$

$0.4 - 7.209 < \mu < 0.4 + 7.209$

$\boxed{-6.8 \text{ mg/dL} < \mu < 7.6 \text{ mg/dL}}$

Because the confidence interval includes 0, this suggests that garlic is <u>NOT</u> effective reducing cholesterol.

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HW Section 7.2 (cont.)

(29) $E = 0.03$ $\quad 1-\alpha = 0.90 \quad \alpha = 0.10 \quad \frac{\alpha}{2} = 0.05$
$z_{\alpha/2} = 1.645$

$$n = \frac{(z_{\alpha/2})^2 (0.25)}{E^2} = \frac{(1.645)^2 (0.25)}{(0.03)^2} = 751.67$$

$= \boxed{752}$ Republicans needed for sample size

(35) a) $E = 0.05$ $\quad 1-\alpha = 0.90 \quad \alpha = 0.10 \quad \frac{\alpha}{2} = 0.05$
$z_{\alpha/2} = 1.645$

$$n = \frac{(1.645)^2 (0.25)}{(0.05)^2} = 270.6025 = \boxed{271}$$ adults must be surveyed.

b) $\hat{p} = 0.85, \ \hat{q} = 0.15, \ E = 0.05, \ z_{\alpha/2} = 1.645$

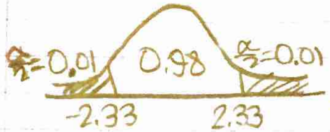
$$n = \frac{(z_{\alpha/2})^2 \hat{p}\hat{q}}{E^2} = \frac{(1.645)^2 (0.85)(0.15)}{(0.05)^2} = 138.007275$$

$= \boxed{139}$ adults must be surveyed

c) No, surveying adults at the nearest college is more of a convenience sample, and not a true representation of the population of adults.

The intervals must be wider to show the true proportion values.

(25) $n=100$, $p=0.08$, $q=1-0.08=0.92$
$1-\alpha=0.98$ $\alpha=0.02$ $\frac{\alpha}{2}=0.01$ $z_{\frac{\alpha}{2}}=2.33$



$E=z_{\frac{\alpha}{2}}\sqrt{\frac{pq}{n}}$

$E=(2.33)\sqrt{\frac{(0.08)(0.92)}{100}}$

$E=0.0632$

$0.08-0.0632<p<0.08+0.0632$

$0.0168<p<0.143$

No, the claimed rate of 13% could be accurate as 0.3 falls between the true population proportion values of 0.0168 and 0.143.

(27) a) $n=420{,}095$, $\hat{p}=0.000321$ $\hat{q}=0.9997$
$1-\alpha=0.90$ $\alpha=0.10$
$\frac{\alpha}{2}=0.05$ $z_{\frac{\alpha}{2}}=1.645$

$E=(1.645)\sqrt{\frac{(0.000321)(0.9997)}{420{,}095}}=0.0000455$

$0.000321-0.0000455<p<0.000321+0.0000455$

$0.000276<p<0.000367$

Between 0.0276% and 0.0367% of cell phone users who develop cancer.

b) No, the rates seem similar as 0.0340% falls between the true population proportion values of 0.0276% and 0.0367%.

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HW Section 7.2 (cont.)

d) If touch therapists would have been able to guess the correct hand, then their proportion of success would have been much greater than 0.5. However, the sample success rate of 0.439 and true population proportion values of 0.363 to 0.515 shows that they DO NOT have the ability to select the correct hand by sensing an energy field.

23 $n=514$, $\hat{p}=0.459$

a) $0.459 = \frac{x}{514}$ $\quad \boxed{x = 236 \text{ people}}$

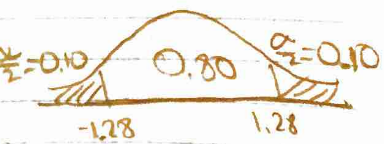
b) $\hat{p}=0.459$ $\quad \hat{q}=1-0.459=0.541$
$1-\alpha=0.99$ $\quad \alpha=0.01$ $\quad \frac{\alpha}{2}=0.005$ $\quad z_{\frac{\alpha}{2}}=2.575$

$$E=(2.575)\sqrt{\frac{(0.459)(0.541)}{514}} = 0.0567$$

$$0.459-0.0567 < p < 0.459+0.0567$$
$$\boxed{0.402 < p < 0.516}$$

c) $\hat{p}=0.459$ $\quad \hat{q}=0.541$ $\quad 1-\alpha=0.80$ $\quad \alpha=0.20$
$\frac{\alpha}{2}=0.10$ $\quad z_{\frac{\alpha}{2}}=1.28$

$$E=(1.28)\sqrt{\frac{(0.459)(0.541)}{514}}$$



$$E = 0.0281$$
$$0.459-0.0281 < p < 0.459+0.0281$$
$$\boxed{0.431 < p < 0.487}$$

d) 99% confidence interval is wider because higher confidence allows the data for the true value of the population proportion to be seen.

(17) $n=945$, $x=879$

a) $\hat{p} = \frac{879}{945} = \boxed{0.930}$ $q = 1-0.930 = 0.070$

b) $E = Z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}}$ 95% confidence

$E = 1.96 \sqrt{\frac{(0.930)(0.070)}{945}}$ $1-\alpha = 0.95$ $\alpha = 0.05$

$\frac{\alpha}{2} = 0.025$ $Z_{\frac{\alpha}{2}} = 1.96$

$\boxed{E = 0.0163}$

$0.930 - 0.0163 < p < 0.930 + 0.0163$

$\boxed{0.914 < p < 0.946}$

c) Yes, the XSORT method is effective because the true proportion between intervals 0.914 and 0.946 is much greater than 0.5 due to chance.

(19) $n=280$, $x=123$

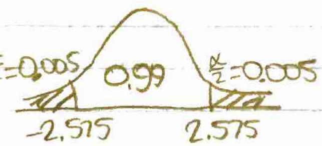
a) Proportion via random guesses should be 0.5.

b) $\hat{p} = \frac{123}{280} = \boxed{0.439}$ $q = 1-0.439 = 0.561$

c) $E = Z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}\hat{q}}{n}}$ $1-\alpha = 0.99$ $\alpha = 0.01$

$\frac{\alpha}{2} = 0.005$ $Z_{\frac{\alpha}{2}} = 2.575$

$E = (2.575) \sqrt{\frac{(0.439)(0.561)}{280}}$



$E = 0.0764$

$0.439 - 0.0764 < p < 0.439 + 0.0764$

$\boxed{0.363 < p < 0.515}$

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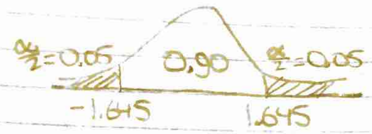
HW Section 7.2

7) Find $z_{\alpha/2}$ for $\alpha = 0.10$. $\frac{\alpha}{2} = 0.05$



$\boxed{z_{\alpha/2} = 1.645}$

9) $0.0641 < p < 0.186$

$\hat{p} = \frac{0.0641 + 0.186}{2} = 0.125$

$E = 0.186 - 0.125 = 0.061$

$\boxed{0.125 \pm 0.061}$

11) $(0.0268, 0.133)$

$\boxed{0.0268 < p < 0.133}$

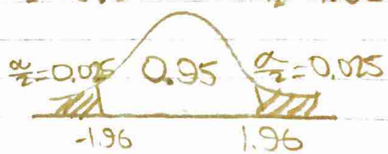
13) $n = 1002$, $x = 531$ 95% confidence interval

a) $\hat{p} = \frac{531}{1002} = \boxed{0.530}$ $\quad \hat{q} = 1 - 0.53 = 0.47$

b) $E = z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$ $\quad 1-\alpha = 0.95$ $\quad \alpha = 0.05$

$\frac{\alpha}{2} = 0.025$ $\quad z_{\alpha/2} = 1.96$

$E = (1.96)\sqrt{\frac{(0.53)(0.47)}{1002}}$



$\boxed{E = 0.0309}$

c) $0.53 - 0.0309 < p < 0.53 + 0.0309$

$\boxed{0.499 < p < 0.561}$

d) We have 95% confidence that the population proportion is between the intervals 0.499 and 0.561.

(c) $P\left(\frac{22.00-22.65}{0.80/\sqrt{64}} < z < \frac{23.00-22.65}{0.80/\sqrt{64}}\right)$

$= P(-6.5 < z < 3.5) = 0.9999 - 0.0001$
$= \boxed{0.9998}$ This probability is extremely high, however it does NOT suggest that an order for 64 hats will likely fit each of the 64 randomly selected women because these hats must fit the individual women, not the mean from these women.

(15) a) $\mu = \frac{3500\text{lb}}{25} = \boxed{140\text{lb./passenger}}$

b) $P\left(z > \frac{140-182.9}{40.8/\sqrt{25}}\right) = P(z > -5.26) = 1 - 0.0001$
$= 0.9999$

c) $P\left(z > \frac{175-182.9}{40.8/\sqrt{20}}\right) = P(z > -0.87) = 1 - 0.1922$
$= 0.8078$

d) No, the capacity of 20 passengers is NOT safe because the mean weight will very likely (80.78%) be exceeded for each male which, in turn, would exceed the total load capacity that is 3500lb.

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HW Section 6.5

7. $\mu = 205.5\text{cm}, \sigma = 8.6\text{cm}$

a) $P\left(\frac{218.4-205.5}{8.6} < z\right) = P(z > 1.5) = 1 - 0.9332$
$= 0.0668$

b) $P\left(z > \frac{204-205.5}{8.6/\sqrt{9}}\right) = P(z > -0.52) = 1 - 0.3015$
$= 0.6985$

c) Part B is a normal distribution because the original population had a normal distribution, meaning that it will be normal for any sample size.

9. $\mu = 205.5\text{cm}, \sigma = 8.6\text{cm}$

a) $P\left(\frac{179.7-205.5}{8.6} < z < \frac{231.3-205.5}{8.6}\right) = P(-3.00 < z < 3.00)$

$= 0.9987 - 0.0013 = \boxed{0.9974}$

b) $P\left(\frac{204.0-205.5}{8.6/\sqrt{40}} < z < \frac{206.0-205.5}{8.6/\sqrt{40}}\right)$

$= P(-1.10 < z < 0.37) = 0.6443 - 0.1357 = \boxed{0.5086}$

13. $\mu = 22.65\text{in}, \sigma = 0.80\text{in.}$

a) $P\left(\frac{21.00-22.65}{0.80} < z < \frac{25.00-22.65}{0.80}\right)$

$= P(-2.1 < z < 2.94) = 0.9984 - 0.0197 = \boxed{0.9787}$
or 97.87% of women can fit into these hats.

b) $x = \mu + z \cdot \sigma = 22.65 + (-1.96)(0.80) = 21.08\text{in.}$
$x = 22.65 + (1.96)(0.80) = 24.22\text{ in.}$
21.08 in. to 24.22 in.

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HW Section 6.3 (cont.)

27) $\mu = 268$ days, $\sigma = 15$ days

a) $P\left(\frac{308-268}{15} \leq z\right) = P(z \geq 2.67) = 1 - 0.9962$
$= 0.0038$ or 0.38% of pregnancy lasting 308 days or longer. Very rare circumstance, or the husband is not the father.

b) $x = \mu + z \cdot \sigma = 268 + (-1.88)(15) = 239.8$ days or 240 days

31) $\mu = 24.0$ chocolate chips, $\sigma = 2.6$ chocolate chips

$x = \mu + z \cdot \sigma = 24.0 + (-2.33)(2.6) = 17.9$ chocolate chips

$x = 24 + (2.33)(2.6) = 30.1$ chocolate chips

$\boxed{P_1 = 17.9 \text{ chocolate chips}, P_{99} = 30.1 \text{ chocolate chips}}$

- These numbers show an unusually low and an unusually high number of chocolate chips in a cookie. Knowing these numbers will allow the manufacturer to stay within reasonable limits when making the cookies.

No, many men will be qualified.

c) $z = \frac{x-\mu}{\sigma}$

$x = \mu \pm z \cdot \sigma = 63.8 + (-2.05)(2.6) = 58.5 \text{ in.}$

$x = 63.8 + (2.05)(2.6) = 69.1 \text{ in.}$

The new requirements for women will be 58.5 in. and 69.1 in.

d) $x = \mu + z \cdot \sigma = 69.5 + (-2.33)(2.4) = 63.9 \text{ in.}$

$x = 69.5 + (2.33)(2.4) = 75.1 \text{ in.}$

The new requirements for men will be 63.9 in. to 75.1 in.

23 4 ft. 8 in. = 48+8 = 56.0 in.

6 ft. 3 in. = 72+3 = 75.0 in.

a) $P\left(\frac{56.0-63.8}{2.6} < z < \frac{75.0-63.8}{2.6}\right) = P(-3.00 < z < 4.31)$

$= 0.9999 - 0.0013 = 0.9986$ or 99.86% of women meet the height requirement.

b) $P\left(\frac{56.0-69.5}{2.4} < z < \frac{75.0-69.5}{2.4}\right)$

$= P(-5.63 < z < 2.29) = 0.9890 - 0.0001 = 0.9889$ or 98.89% of men meet the height requirement.

c) $x = \mu + z \cdot \sigma = 63.8 + (-1.645)(2.6) = 59.5 \text{ in.}$

$x = 69.5 + (1.645)(2.4) = 73.4 \text{ in.}$

The new height requirements will be 59.5 in. to 73.4 in.

HW Se

27 $\mu =$

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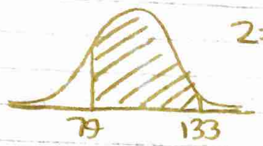
HW Section 6.3

7



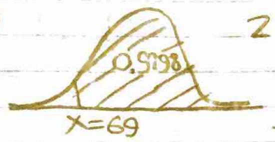
$z = \frac{x-\mu}{\sigma}$ where $\mu = 100, \sigma = 15$

$P\left(\frac{79-100}{15} < z \frac{133-100}{15}\right) =$

$= P(-1.4 < z < 2.2)$

$= 0.9861 - 0.0808 = \boxed{0.9053}$

11



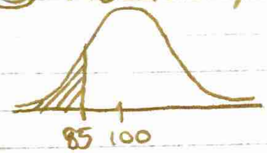
$z = -2.05 \quad \mu = 100, \sigma = 15$

$x = \mu + z \cdot \sigma$

$x = 100 + (-2.05)(15)$

$x = 69.25 \rightarrow 69$

13 Probability of IQ score less than 85



$z = \frac{85-100}{15} = -1.0$

$P(z < -1.0) = 0.1587$ or 15.87% that an IQ score would be < 85.

21 a) $\mu = 63.8$ in, $\sigma = 2.6$ in.

$P\left(\frac{62-63.8}{2.6} < z < \frac{78-63.8}{2.6}\right) = P(-0.69 < z < 5.43)$

$= 0.9999 - 0.2451 = 0.7548$ or 75.48% will meet the height requirement. No, many women will be qualified.

b) $\mu = 69.5$ in, $\sigma = 2.4$ in.

$P\left(\frac{62-69.5}{2.4} < z \frac{78-69.5}{2.4}\right) = P(-3.13 < z < 3.54)$

$= 0.9999 - 0.0009 = 0.9990$ or 99.90% of men will meet the height requirement.

(49) a. $P(-1<z<1) = 0.8413 - 0.1587 = 0.6826$ or 68.26%

b. $P(-2<z<2) = 0.9772 - 0.0228 = 0.9544$

$1.00 - 0.9544 = 0.0456$ or 4.56%

c. $P(-1.96<z<1.96) = 0.9750 - 0.0250 = 0.9500$ or 95.00%

d. $P(0-2(1)<z<0+2(1)) = 0.9772 - 0.0228 = 0.9544$ or 95.44%

e. $P(-3<z<3) = 0.9987 - 0.0013 = 0.9974$

$1.00 - 0.9974 = 0.0026$ or 0.26%

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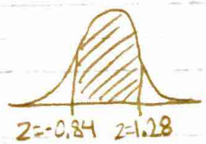
HW Section 6.2

(11)

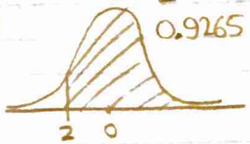


$P(-0.84 < z < 1.28) =$
$0.8997 - 0.2005 = 0.6992$
or 69.92%

(13)

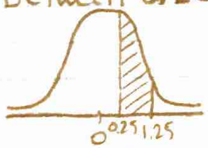
$\boxed{z = 1.23}$

(15)



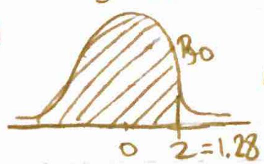
$z = -1.45$

(25) Between 0.25 and 1.25



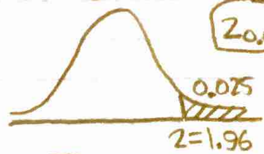
$P(0.25 < z < 1.25) =$
$0.8944 - 0.5987 = 0.2957$

(37)



$P = 0.9000$ $P(z < 1.28) = 0.8997$
$z = 1.28$

(41) $z_{0.025}$



$\boxed{z_{0.025} = 1.96}$

(45) About 68.26% of the area is between $z=-1$ and $z=1$.
$P(-1 < z < 1) = 0.8413 - 0.1587 = 0.6826$ or 68.26%

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HW Section 5-4

5 $n=60$, $p=0.2$, $q=1-0.2=0.80$

mean: $\mu = n \cdot p = (60)(0.2) = 12.0$ correct guesses

standard deviation: $\sigma = \sqrt{(60)(0.2)(0.8)} = 3.10$ correct guesses

maximum usual: $12 + 2(3.10) = 18.2$ " "

minimum usual: $12 - 2(3.10) = 5.8$ " "

11 $n=100$, $p=0.20$, $q=1-0.2=0.8$

a)

mean: $\mu = (100)(0.2) = 20.0$

standard deviation: $\sigma = \sqrt{(100)(0.2)(0.8)} = 4.0$

b)

$\overbrace{12 \quad 16 \quad 20 \quad 24 \quad 28}^{\text{usual}}$

25 is NOT unusually high, because it is within two standard deviations. The claimed rate of 20% is **NOT** wrong.

17 $n=370$, $p=0.20$, $q=1-0.2=0.8$

a) mean: $\mu = (370)(0.20) = 74.0$

standard deviation: $\sigma = \sqrt{(370)(0.2)(0.8)} = 7.69$

b)

58.6 66.3 74 81.7 89.4

- 90 is an unusually high number because it is above 89.4 and beyond two standard deviations.

39 a) $n=14, x=13, p=0.5, q=1-0.5=0.5$

$$P(13) = \frac{14!}{13!(14-13)!}(0.5)^{13}(0.5)^{1} = 0.000854$$

b) $n=14, x=14, p=0.5, q=0.5$

$$P(14) = \frac{14!}{14!(14-14)!}(0.5)^{14}(0.5)^{0} = 0.0000610$$

c) $P(13 \text{ or more}) = 0.000854 + 0.0000610 =$ 0.000915

d) **Yes**, these results show that the XSORT method is effective. The reason for this is because the probability of getting 13 or more girls out of 14 births with a 50% rate is extremely unlikely, $p = 0.000915$. Probability is much less than $p = 0.05$, which means that 13 or more is an unusually high number. The XSORT method is able to overcome this highly unlikely scenario and produce with great efficiency.

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HW Section 5.3

7. This procedure results in a binomial distribution.

11. This procedure results in a binomial distribution because only two responses were noted; "smartphones" or "other."

17. Probability that # of x correct answers is more than 2.
$P = 0.051 + 0.006 = 0.057$

21. $n=8,\ x=3,\ p=0.45,\ q=1-0.45=0.55$
$$P(3) = \frac{8!}{3!(8-3)!}(0.45)^3(0.55)^5$$
$P(3) = 0.257$ 25.7% chance that among 8 blood donors, three of them will have Group O blood.

25. $P(\text{at least } 2) = 0.033 + 0.132 + 0.297 + 0.356 + 0.178 = 0.996$
- It is reasonable to expect at least two peas with green pods will be obtained if more experimentation is required because the probability is extremely high (0.996...)

33. $n=20,\ x=12,\ p=0.48,\ q=1-0.48=0.52$
$$P(12) = \frac{20!}{12!(20-12!)}(0.48)^{12}(0.52)^8 = 0.101$$
- No, 12 is not an unusual number because the probability of 0.101 is greater than $p=0.05$.

(15)

Number of girls x	$P(x)$	$x \cdot P(x)$	$x^2 \cdot P(x)$
0	0.001	0	0
1	0.010	0.010	0.010
2	0.044	0.088	0.176
3	0.117	0.351	1.053
4	0.205	0.820	3.280
5	0.246	1.230	6.150
6	0.205	1.230	7.380
7	0.117	0.819	5.733
8	0.044	0.352	2.816
9	0.010	0.090	0.810
10	0.001	0.010	0.100
		$\Sigma x \cdot P(x) = 5$	$\Sigma x^2 P(x) = 27.508$

$\mu = 5.0$ $\sigma = \sqrt{(27.508) - (5)^2} = 1.6$[illegible]

(16) range rule of thumb: $S = \frac{7-3}{5} = \frac{4}{5} = 0.8 \uparrow 1$

3.4 4.2 5.0 5.8 6.6
(3) (4) (6) (7)

Based on this result, 1 girl in 10 births is unusually low because it is not within 2 standard deviations of the mean.

(21) a) $P(3\text{cars}) = 0.041$
b) $P(3 \text{ or more cars}) = 0.041 + 0.005 = 0.046$
c) Probability from Part B is more relevant.
d) Three is an unusually high number of failures because $p = 0.046$, which is less than 0.05 (or 5%).

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HW Section 5-2

7

x	$P(x)$	$x \cdot P(x)$	$x^2 \cdot P(x)$
0	0.0625	0	0
1	0.2500	0.2500	0.2500
2	0.3750	0.750	1.50
3	0.2500	0.750	2.25
4	0.0625	0.250	1.00
		$\Sigma x P(x) = 2.0$	$\Sigma = 5$

Probability Distribution:
mean: $\mu = \Sigma x\, P(x) = 2.0$
standard deviation: $\sigma = \sqrt{5-(2)^2} = 1.0$

9 This is not a probability distribution because the probabilities add up to 0.601, which is far from the requirement of 1.0.

11

x	$P(x)$	$x \cdot P(x)$	$x^2 \cdot P(x)$
0	0.041	0	0
1	0.200	0.200	0.200
2	0.367	0.734	1.468
3	0.299	0.897	2.691
4	0.092	0.368	1.472
		$\Sigma x \cdot P(x) = 2.199$	$\Sigma x^2 \cdot P(x) = 5.831$

Probability Distribution:
$\mu = 2.20$ $\sigma = \sqrt{5.831-(2.199)^2} = 0.998 = 1.0$

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3 ✓

HW Section 4.2

(7) 4.4, 4.5, 4.6, 4.7, 4.8

Correct answer of 4.8 being the correct mean is $\boxed{\frac{1}{5} \text{ or } 0.2.}$

(13) Traffic light. $\boxed{25\% = \frac{1}{4} = 0.25}$

(15) True/false test question: $\boxed{\frac{1}{2} = 0.50}$

(17) SAT multiple choice: $\boxed{\frac{1}{5} = 0.2}$

(31) $\frac{10,427,000}{135,933,000} = \boxed{0.0767 \text{ or } 7.67\%}$

- It is likely for a car to be in a crash since the probability is greater than 5% (or 0.05). This suggests that driving is dangerous since a crash is likely to occur.

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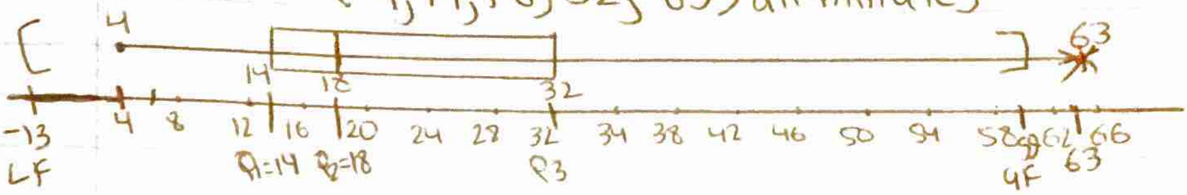
HW Section 3.4 (cont.)

(31) 5-number summary is = (4, 14, 18, 32, 63) all minutes



$LF = 14 - 1.5(18) = -13$
$UF = 32 + 1.5(18) = 59$
} any # outside of these are outliers

(13) For men: $\bar{x} = 175$ cm, $s = 7$ cm, $x = 247$ cm

$$z = \frac{247-175}{7} = 10.3$$

For women: $\bar{x} = 162$ cm, $s = 6$ cm, $x = 236$ cm

$$z = \frac{236-162}{6} = 12.3$$

- Relative to the population of gender, the woman is taller because her z value of 12.3 is greater than the man's z value of 10.3. This means that she is more standard deviations above the mean than the man.

(17) 213 sec:

Percentile of 213 sec $= \frac{3}{24} \times 100 = 12.5\%$

· When we round, we get the 13th percentile.

(21) P_{60}: $L = \frac{60}{100} \times 24 = 14.4 \uparrow$ 15th value on the list

$P_{60} = 251$ seconds

(31) 4, 6, 7, 9, 14, 15, 15, 16, 18, 18, 25, 26, 30, 32, 41, 45, 55, 63

min = 4	· $Q_1 = P_{25}$ $L = \frac{25}{100} \times 18 = 4.5 \uparrow 5$
$Q_1 = 14$	$Q_1 = P_{25} = 14$
$Q_2 = 18$	· $Q_2 = P_{50}$ $L = \frac{50}{100} \times 18 = 9$
$Q_3 = 32$	$Q_2 = \frac{18+18}{2} = 18$
max = 63	· $Q_3 = P_{75}$ $L = \frac{75}{100} \times 18 = 13.5 \uparrow 14$
	$Q_3 = 32$

$IQR = Q_3 - Q_1 = 32 - 14 = 18$

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HW Section 3.4

5. a. Executive Branch $\bar{x}$ net worth $= \$4{,}939{,}455$
Obama net worth $= \$3{,}670{,}505$
$\$4{,}939{,}455 - \$3{,}670{,}505 = \$1{,}268{,}950$

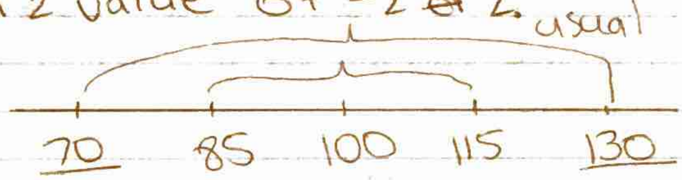
b. $s = \dfrac{1{,}268{,}950}{7{,}775{,}948} = $ 0.16 standard deviations

c. $z = \dfrac{x - \bar{x}}{s} = \cancel{3{,}85}\ \dfrac{3{,}670{,}505 - 4{,}939{,}455}{7{,}775{,}948} = -0.16$

d. Obama's net worth is usual because -0.16 falls between -2 and 2.

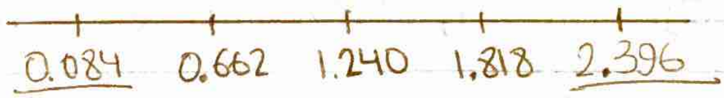
9. a. The unusual IQ scores would be separated from the usual IQ scores with a z value of -2 and ~~or~~ 2.

b.



The IQ scores that separate the unusual from the usual are 70 and 130.

11.



$\bar{x} = 1.240$, $s = 0.578$
- The magnitudes that separate the unusual earthquakes from the usual are 0.084 and 2.396.

-12.3 years is not too far behind the standard deviation value of 11.1 years.

39

Verbal IQ Score of Subject Exposed to Lead	Frequency	x	f·x	$f \cdot x^2$
50-59	4	54.5	218	11,881
60-69	10	64.5	645	41,602.5
70-79	25	74.5	1862.5	138,756.25
80-89	43	84.5	3633.5	307,030.75
90-99	26	94.5	2457	232,186.5
100-109	8	104.5	836	87,362
110-119	3	114.5	343.5	39,330.75
120-129	2	124.5	249	31,000.5
	$\Sigma f = 121$		$\Sigma f x =$ 10,244.5	$\Sigma f \cdot x^2 = 889,150.25$

$$s = \sqrt{\frac{121(889,150.25) - (10,244.5)^2}{121(120)}} = \sqrt{\frac{2,637,400}{14,520}}$$

$$s = \sqrt{181.639185} = \boxed{13.5}$$

-IQ standard deviation of 13.5 is extremely close to the computed value, used by formula 3-4, of 13.4.

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HW Section 3.3 (cont.)

33. $\bar{x} = 77.5$ beats/min
$s = 11.6$ beats/min

54.3 65.9 77.5 89.1 100.7

Having a pulse rate of 99 beats/min for a female is not unusual since it fits within 2 standard deviations of the mean, $\bar{x} = 77.5$.

37.

Age of Best Actress When Oscar Was Won	Frequency	x	f·x	$f \cdot x^2$
20-29	27	24.5	661.5	16206.75
30-39	34	34.5	1173	40468.5
40-49	13	44.5	578.5	25743.25
50-59	2	54.5	109	5940.5
60-69	4	64.5	258	16641
70-79	1	74.5	74.5	5550.25
80-89	1	84.5	84.5	7140.25
	$\Sigma f = 82$		$\Sigma fx = 2939$	$\Sigma fx^2 = 117{,}690.5$

$$s = \sqrt{\frac{n[\Sigma(f \cdot x^2)] - [\Sigma(f \cdot x)]^2}{n(n-1)}}$$

$$s = \sqrt{\frac{82(117{,}690.5) - (2939)^2}{82(82-1)}} = \sqrt{\frac{1012900}{6642}}$$

$$s = \sqrt{152.4992472} = 12.3 \text{ years}$$

d) The values of variation would be zero if there were to be no lead.

(5) a) range $= 15 - 4 = \boxed{11 \text{ years}}$

b) variance:

$\Sigma x^2 = 4^2 + 4^2 + 4^2 + 4^2 + 4^2 + 4^2 + 4.5^2 + 4.5^2 + 4.5^2 + 4.5^2 + 4.5^2 + 4.5^2 + 6^2 + 6^2 + 8^2 + 9^2 + 9^2 + 13^2 + 13^2 + 15^2 = 1078.5$

$\Sigma x = 4+4+4+4+4+4+4.5+4.5+4.5+4.5+4.5+4.5+6+6+8+9+9+13+13+15 = 130$

$s^2 = \dfrac{20(1078.5) - (130)^2}{20(20-1)} = \boxed{12.29 \text{ years}^2}$

c) standard deviation:

$s = \sqrt{12.29} = \boxed{3.51 \text{ years}}$

d) No, it is not unusual to earn in 12 years because it is only two standard deviations away from the average, which is 6.5.

(29) range $= 2.95 - 0.00 = 2.95$

$s = \dfrac{\text{range}}{4} = \dfrac{2.95}{4} = \boxed{0.738}$

$\Sigma x = 59.21$

$\Sigma x^2 = 87.0185$

$n = 50$

$s = \sqrt{\dfrac{50(87.0185) - (59.21)^2}{50(50-1)}} = 0.587$

-0.738 is not that much different than the computed standard deviation of $s = 0.587$.

(31) range $= 36 - 0$

$\Sigma x^2 = 10{,}478$ $\quad \Sigma x = 496$

$n = 33$

$s = \dfrac{\text{range}}{4} = \dfrac{36}{4} = \boxed{9.0 \text{ years}}$

$s = \sqrt{\dfrac{33(10{,}478) + (496)^2}{33(32)}} = 9.7 \text{ years}$

-9.0 years is close to the computed standard deviation of $s = 9.7$ years.

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HW Section 3.3

#5 332 302 235 225 100 90 88 84 75 67

a) range = $332-67 = \boxed{\$265.0 \text{ million}}$

b) variance: $s = \sqrt{\dfrac{n\Sigma(x^2)-(\Sigma x)^2}{n(n-1)}}$

$\Sigma x^2 = 332^2+302^2+235^2+225^2+100^2+90^2+88^2+84^2+75^2+67^2 = \underline{350292}$

$\Sigma x = 332+302+235+225+100+90+88+84+75+67 = \underline{1598}$

$s^2 = \dfrac{10(350292)-(1598)^2}{10(10-1)} = \dfrac{949316}{90} = \$10{,}548.0 \text{ million}^2$

c) standard deviation: $s = \sqrt{10548.0} = \$102.7 \text{ million}$

d) This list cannot be used to learn anything about the standard deviation of the annual earnings of celebrities because most celebrities do not make this type of money.

13. 3.0 6.5 6.0 5.5 20.5 7.5 12.0 20.5 11.5 17.5

a) range = $20.5-3.0 = \boxed{17.5 \, \mu g/g}$

b) variance:

$\Sigma x^2 = (3.0)^2+(6.5)^2+(6.0)^2+(5.5)^2+(20.5)^2+(7.5)^2+(12.0)^2+(20.5)^2+(11.5)^2+(17.5)^2 = \underline{1596.75}$

$\Sigma x = 3.0+6.5+6.0+5.5+20.5+7.5+12.0+20.5+11.5+17.5 = \underline{100.5}$

$s^2 = \dfrac{10(1596.75)-(100.5)^2}{10(10-1)} = \dfrac{\cancel{3367.25}\ 3757.25}{90} = 41.75(\mu g/g)^2 \quad \cancel{37.41(\mu g/g)^2}$

c) standard deviation: $\cancel{s = \sqrt{37.41} = 6.12 \, \mu g/g}$

$s = \sqrt{41.75} = 6.46 \, \mu g/g$

$\bar{x} = \frac{10244.5}{121} = 84.7 \rightarrow$ computed mean

$84.4 \rightarrow$ actual mean

Once again, the computed mean is close to the actual mean (84.7 and 84.4).

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HW Section 3.2 (cont.)

#29

Age of Best Actress When Oscar Was Won	Frequency (f)	Class Midpoint (x)	f·x
20-29	27	24.5	661.5
30-39	34	34.5	1173
40-49	13	44.5	578.5
50-59	2	54.5	109
60-69	4	64.5	258
70-79	1	74.5	74.5
80-89	1	84.5	84.5
	$\Sigma f = 82$		$\Sigma(f \cdot x) = 2939$

$\bar{x} = \frac{2939}{82} = \boxed{35.8 \text{ years}}$ → computed means

35.9 years → actual means

- The computed mean of 35.8 years is very close to the actual mean of 35.9 years.

#31

Verbal IQ Score of Subject Exposed to Lead	f	x	f·x
50-59	4	54.5	218
60-69	10	64.5	645
70-79	25	74.5	1862.5
80-89	43	84.5	3633.5
90-99	26	94.5	2457
100-109	8	104.5	836
110-119	3	114.5	343.5
120-129	2	124.5	249
	$\Sigma f = 121$		$\Sigma(f \cdot x) = 10244.5$

15. a) mean $= \bar{x} = \frac{4+4+4+4+4+4+4+4.5+4.5+4.5+4.5+4.5+4.5 + 6+6+8+9+9+13+13+15}{20}$

$= \boxed{6.5 \text{ years}}$

b) median $= \boxed{4.5 \text{ years}}$

c) mode $= \boxed{4 \text{ and } 4.5 \text{ years}}$

d) midrange $= \frac{15+4}{2} = \boxed{9.5 \text{ years}}$

- Based on these results, it is common to earn a bachelor's degree in 4 years, but it typically takes longer than that.

21. a) mean of white drivers:

$\bar{x} = \frac{74+77+69+71+77+69+72+75+74+72}{10} = \boxed{73 \text{ mi/h}}$

median of white drivers: $\frac{74+72}{2} = \boxed{73 \text{ mi/h}}$

b) mean of African American drivers:

$\bar{x} = \frac{79+70+71+76+76+74+71+75+74+74}{10} = \boxed{74 \text{ mi/h}}$

meadian of " " drivers: $\boxed{74 \text{ mi/h}}$

- Based on this data, drivers of both races seem to speed equally. The mean of African American drivers are only 1 mi/h more than white drivers, which is insignificant enough to draw a distinction because the difference is so small.

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3 ✓

HW Section 3.2

#5 332 302 235 225 100 90 88 84 75 67

a) mean $= \bar{x} = \dfrac{332+302+235+225+100+90+88+84+75+67}{10}$

$= \boxed{\$159.8 \text{ million}}$

b) median $= \boxed{\$95.0 \text{ million}} = \dfrac{100+90}{2} = 95.0$

c) mode = none

d) midrange $= \dfrac{332+67}{2} = \boxed{\$199.5 \text{ million}}$

- No, this Top 10 list cannot be used to learn anything about the mean annual earnings of all celebrities because most celebrities do not make this type of money.

#7 371 356 393 544 326 520 501

a) mean $= \bar{x} = \dfrac{371+356+393+544+326+520+501}{7}$

$= \boxed{430.1 \text{ hic}}$

b) median $= \boxed{393.0 \text{ hic}}$

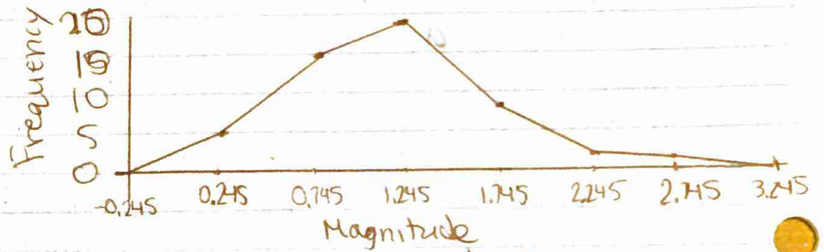
c) mode = none

d) midrange $= \dfrac{544+326}{2} = \boxed{435.0 \text{ hic}}$

- Hyundai Elantra appears to be the safest. Because of the varied results, some small cars appear to be safer than others.

19.

Magnitude	Frequency
0.00-0.49	5
0.50-0.99	15
1.00-1.49	19
1.50-1.99	7
2.00-2.49	2
2.50-2.99	2



These magnitudes appear to have a normal distribution in the frequency polygon. The magnitudes increase until they reach a maximum, and then begin to decrease, creating roughly mirror images from the left and right side.

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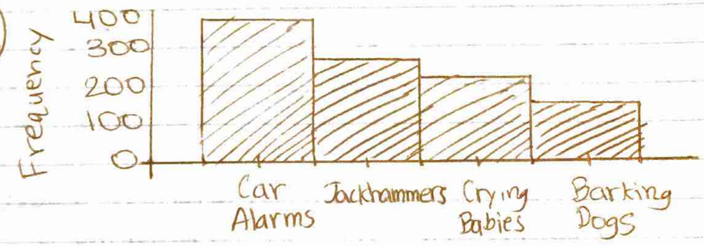
HW Section (2.4)

13.

4	5
5	3395753
6	67111
7	1118556
8	4

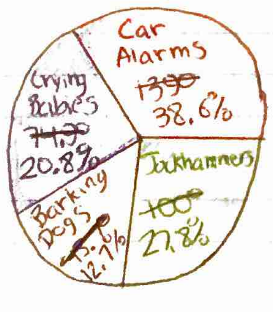
-No, this is not a normal distribution because this does not produce a bell shape. The numbers do not show a mirror image.

15.

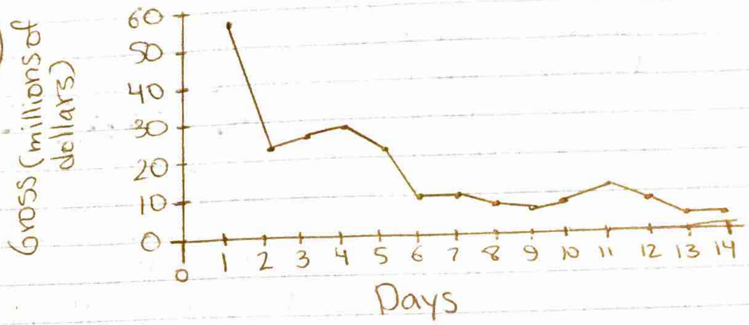


17.

Most Frustrating Sound	Freq.	Rel. Freq.	Degree
Car Alarms	388	0.386	138.96°
Jackhammers	279	0.278	100°
Crying Babies	209	0.208	74.9°
Barking Dogs	128	0.127	45.7°

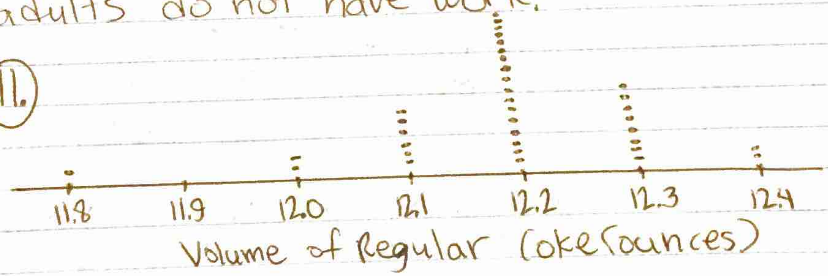


9.



- The first day had the highest gross since many fans were excited to rush out and see the film ~~Meanwhite~~, as soon as it came out. Meanwhile, the third and fourth values were also high because they were Friday and Saturday, which is a popular time to see ~~movies~~ a film since students are out of school and most adults do not have work.

11.



- Yes, these points suggest that the volumes are from a population with a normal distribution as it produces a bell shape, which produces an approximate mirror image from the left and right side. The can with 11.8 ounces is the outlier.

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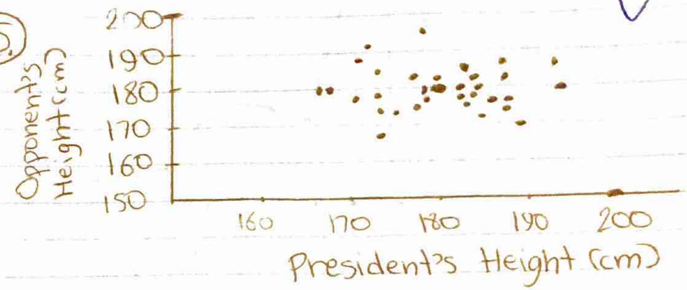
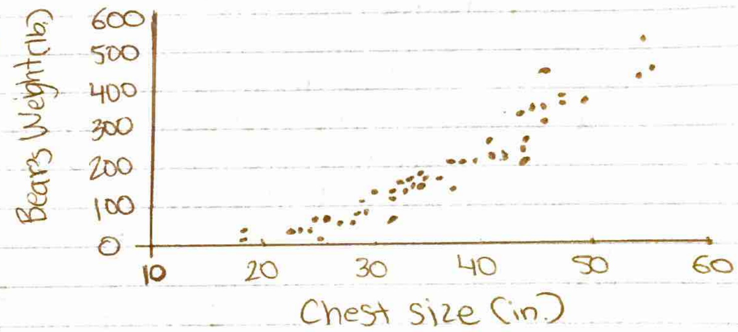
HW Section 2.4

#5



- There does NOT appear to be a correlation between the President's Height and their Opponent's height.

#7

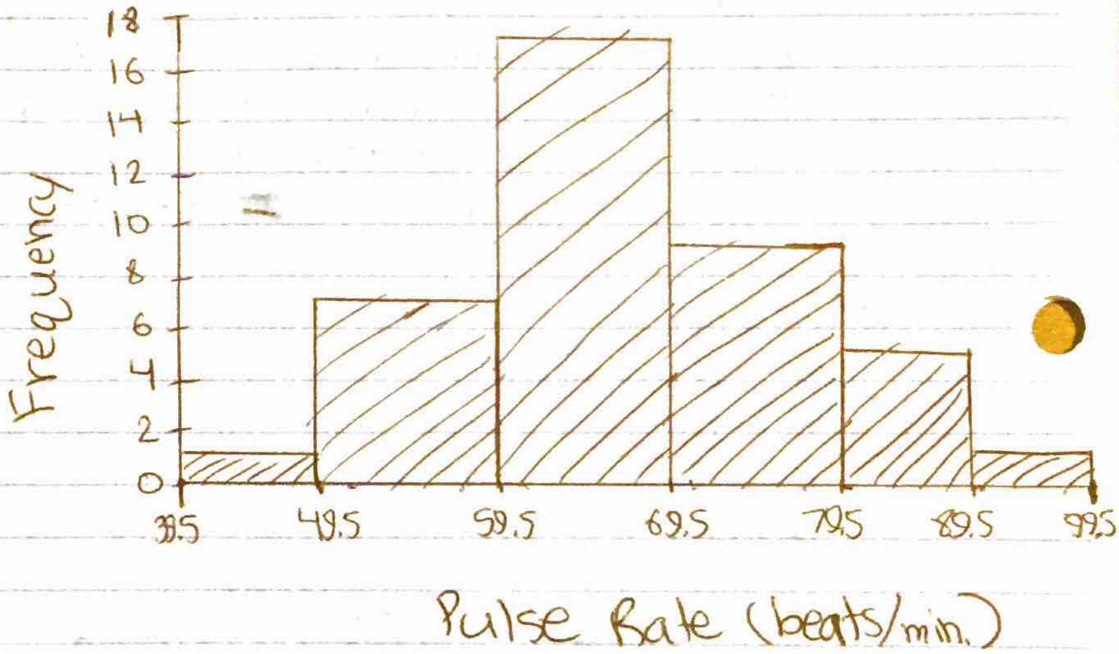


Yes, there is a correlation showing that bears with larger chest sizes tend to weigh more.

#9. (on next page)

(11.)

Pulse	Frequency
40-49	1
50-59	7
60-69	17
70-79	9
80-89	5
90-99	1



This histogram appears to have a normal distribution because the data increases to a maximum before it decreases, while at the same time having similar frequencies on the left and right side of the histogram that produces an approximate "mirror image."

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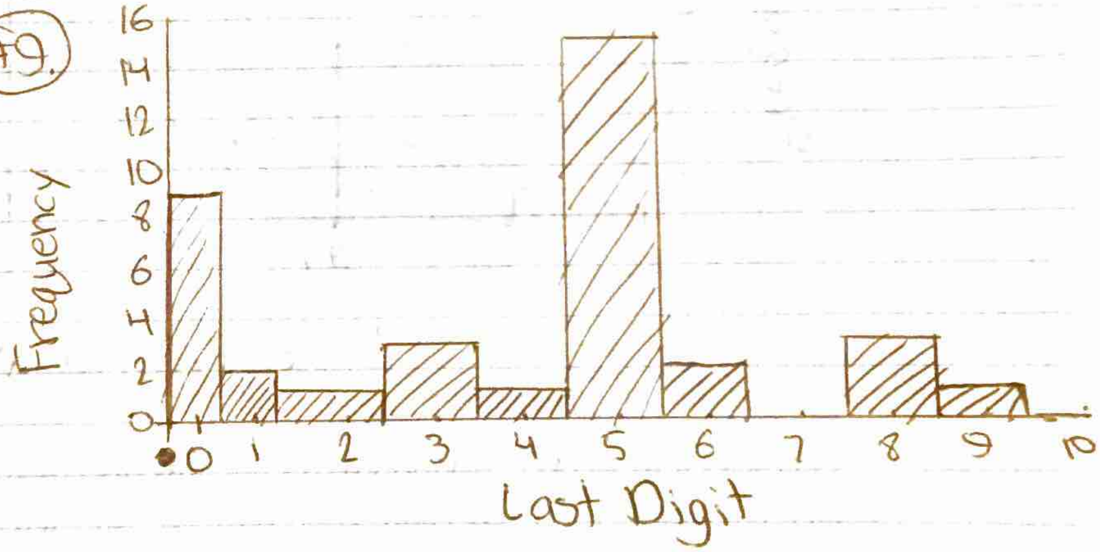
HW Sections 2.2 & 2.3 (cont.)

$\boxed{2.3}$

#5) The approximate number of people are ~~200.~~ 200.

#7) The height of the tallest person is 108 inches. This is depicted to the far right of the histogram. Yes, this height is an outlier because no other height comes remotely close to it. This height is an error because no one is that tall (108 inches ~~=~~ 9 feet!).

#9.



The numbers 0 and 5 were reported most often, so it appears that they were not measured. Because of this, the heights are inaccurately reported.

Last Digit of Height	Frequency
0	9
1	2
2	1
3	3
4	1
5	15
6	2
7	0
8	3
9	1

• Due to the high numbers of 0's and 5's, it looks as if these numbers were reported instead of measured. Because of this, these results are inaccurate.

29.

People aboard the Titanic	Relative Frequency
Male Survivors	16.2%
Males Who Died	62.8%
Female Survivors	15.5%
Females Who Died	5.5%

Relative Frequency of Male Survivors = $\frac{361}{2223} \times 100\% = 16.2\%$

RF of Males Who Died = $\frac{1395}{2223} \times 100\% = 62.8\%$

RF of Female Survivors: $\frac{345}{2223} \times 100\% = 15.5\%$

RF of Females Who Died: $\frac{122}{2223} \times 100\% = 5.5\%$

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HW Sections 2.2-2.3 (cont.)

15(cont.). The noticeable difference is that the actresses are younger than the actors.

17.

Age (years) of Best Actress When Oscar Was Won	Cumulative Frequency
Less than 30	27
Less than 40	(27+34) = 61
Less than 50	(61+13) = 74
Less than 60	(74+2) = 76
Less than 70	(76+4) = 80
Less than 80	(80+1) = 81
Less than 90	(81+1) = 82

18.

Age (years) of Best Actor When Oscar Was Won	Cumulative Frequency
Less than 30	1
Less than 40	(1+26) = 27
Less than 50	(27+35) = 62
Less than 60	(62+13) = 75
Less than 70	(75+6) = 81
Less than 80	(81+1) = 82

19. Class Width: $\frac{9-0}{10} = 0.9 \approx 1.0$

On the next page...

nov

Class Boundaries: 49.5, 59.5, 69.5, 79.5, 89.5, 99.5, 109.5, 119.5, 129.5

(11) No, ~~Figure~~ Exercise 5 does not have a normal distribution. This is because the frequencies preceding the maximum (34) ~~are~~ does not produce a mirror image with the numbers (frequencies) that follow the maximum. Therefore, the distribution does not appear symmetric.

(13)

White Blood Cell Count of Males	Frequency
3.0-4.9	4
5.0-6.9	7
7.0-8.9	18
9.0-10.9	7
11.0-12.9	4

Remaining Three Frequencies

(15)

Age When Oscar Was Won	Relative Frequency (Actresses)	Relative Frequency (Actors)
20-29	32.9%	1.2%
30-39	41.5%	31.7%
40-49	15.9%	42.7%
50-59	2.4%	15.9%
60-69	4.9%	7.3%
70-79	1.2%	1.2%
80-89	1.2%	0%

Relative Frequency for Actresses (20-29): $\frac{27}{82} \times 100\% =$ 32.9%

Relative Frequency for Actor (20-29): $\frac{1}{82} \times 100\% = \boxed{1.2\%}$

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HW Sections 2.1-2.3

3/3

2.2

#5

Age (years) of Best Actress When Oscar Was Won	Frequency
20-29	27
30-39	34
40-49	13
50-59	2
60-69	4
70-79	1
80-89	1

Class Width: 30-20= $\boxed{10}$
Class Midpoints: 24.5, 34.5, 44.5, 54.5, 64.5, 74.5, 84.5
Class Boundaries: 19.5, 29.5, 39.5, 49.5, 59.5, 69.5, 79.5, 89.5

#7

Verbal IQ Score of Subject Exposed to Lead	Frequency
50-59	4
60-69	10
70-79	25
80-89	43
90-99	26
100-109	8
110-119	3
120-129	2

Class Width: 60-50= $\boxed{10}$
Class Midpoints: 54.5, 64.5, 74.5, 84.5, 94.5, 104.5, 114.5, 124.5