(1)

(a) $P(\text{FIRST}) = \boxed{0.25}$

(b) $P(X=0) = \text{binompdf}(10, .25, 0)$

$\approx \boxed{0.056}$

(c) $P(X \geq 1) = 1 - \text{binomcdf}(10, .25, 0)$

$\approx \boxed{0.944}$

(d) $\mu = np \quad \mu = 10(.25) = \boxed{2.5}$

(e) $P(X \geq 7) = 1 - \text{binomcdf}(10, .25, 6)$

$\approx \boxed{0.0035} \approx \boxed{0.004}$

YES, IT WOULD BE UNUSUAL. 0.004 IS A VERY LOW PROBABILITY OF LESS THAN 1%.

OR

$\mu = np \quad \mu = (10)(.25) = 2.5 \quad \sigma = \sqrt{npq}$

$\sigma = \sqrt{(10)(.25)(.75)} \approx 1.4$

$\mu + 2\sigma$

$2.5 + 2(1.4) = 5.3$ SO YES, 7 IS MORE THAN TWO STD. DEVS ABOVE THE MEAN.

(2) DATA

SUBJECT	1	2	3	4	5	6	7	8	9	10
BEFORE	6.6	6.5	9.0	10.3	11.3	8.1	6.3	11.6	10.1	7.8
AFTER	6.8	2.4	7.4	8.5	8.1	6.1	3.4	2.0	4.9	2.1
DIFFERENCE	-.2	4.1	1.6	1.8	3.2	2.0	2.9	9.6	5.2	5.7

$H_0: \mu_d = 0$

claim → $H_1: \mu_d > 0$

$\alpha = 0.05$

CALCULATE STATS

$n = 10$

$\bar{d} = 3.59$

$S_d \approx 2.75$

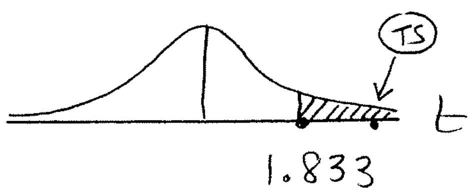
TEST STATISTIC

$$t = \frac{\bar{d} - \mu_d}{\frac{S_d}{\sqrt{n}}} \qquad t = \frac{3.59 - 0}{\frac{2.75}{\sqrt{10}}} \approx \boxed{4.127}$$

P-Value $\approx \boxed{0.001}$

$\boxed{\text{REJECT } H_0}$

CRITICAL VALUE



95% C.I.

$(1.62, 5.56)$

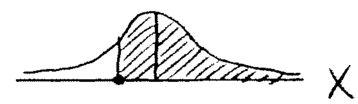
INTERVAL DOES NOT CONTAIN ZERO, REJECT H_0

THERE IS SUFFICIENT EVIDENCE TO SUPPORT THE CLAIM THAT THE SENSORY MEASUREMENTS ARE LOWER AFTER HYPNOTISM.

(3)

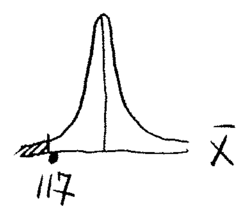
(a) $P(x > 117) = \text{normalcdf}(117, 1E99, 120, 8)$

$\approx \boxed{0.646}$



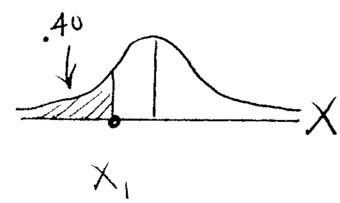
(b) $P(\bar{x} < 117) = \text{normalcdf}(-1E99, 117, 120, \frac{8}{\sqrt{60}})$

$\approx \boxed{0.0018}$



(c) $X_1 = \text{invNorm}(.40, 120, 8)$

$X_1 \approx \boxed{117.97}$



(4)

(a) $r \approx \boxed{0.727}$ @ $\alpha = 0.05$ $\boxed{t \approx 3.18}$

P-Value ≈ 0.011 $\boxed{\text{SIG. POS. LIN. CORR.}}$

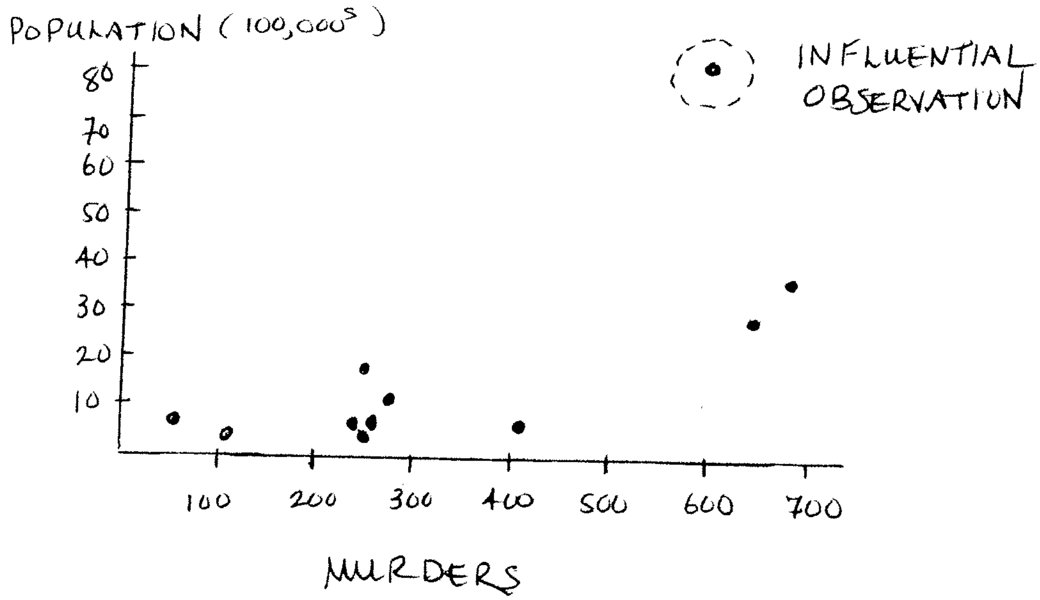
(b) $\hat{y} \approx -8.65 + 0.0825(120) \approx \boxed{1.25}$

($\approx$ 125,000)

(c) $r^2 \approx 0.529$ $\boxed{52.9\%}$

(d) $\boxed{\hat{y} \approx -8.65 + 0.08X}$

(e)



THIS CASE (590, 81) HAS A STRONG PULL ON THE SLOPE OF THE REGRESSION LINE.

REGRESSION LINE WITH POINT $\hat{y} \approx -8.65 + 0.08X$

REGRESSION LINE WITHOUT POINT $\hat{y} \approx -2.73 + 0.05X$

(5)

	US AIR		AMERICAN		DELTA		TOTAL
ON TIME	80	77.7	77	77.7	76	77.7	233
LATE	20	22.3	23	22.3	24	22.3	67
TOTAL	100		100		100		$\boxed{300}$

(a) $P(\text{AMERICAN OR DELTA}) = \frac{100}{300} + \frac{100}{300} = \boxed{\frac{200}{300}} \approx \boxed{0.667}$

(b) $P(\text{US AIR} \mid \text{ON TIME}) = \boxed{\frac{80}{233}} \approx \boxed{0.343} = \dfrac{80/300}{233/300}$

(c) $P(\text{LATE OR AMERICAN}) = \frac{67}{300} + \frac{100}{300} - \frac{23}{300} = \boxed{\frac{144}{300}}$

$= \boxed{0.48}$

(d) CONTINGENCY TABLE

H_0: arrival status is INDEPENDENT OF AIRLINE

H_1: arrival status is DEPENDENT upon AIRLINE

$\alpha = 0.05$ (OUR CHOICE)

TEST STAT

$\chi^2 = \sum \frac{(O-E)^2}{E}$ $\chi^2 = \frac{(80-77.7)^2}{77.7} + \cdots + \frac{(24-22.3)^2}{22.3} \approx \boxed{0.4996}$

P-Value $\approx \boxed{0.779}$ $\boxed{\text{Fail to REJECT } H_0}$

There IS NOT sufficient evidence to reject the claim that arrival status is INDEPENDENT of airline.

(6)

DATA

MEDICATION	PLACEBO
$n_1 = 4700$	$n_2 = 4300$
$x_1 = 301$	$x_2 = 357$
$\hat{p}_1 = \frac{301}{4700} \approx 0.064$	$\hat{p}_2 = \frac{357}{4300} \approx 0.083$

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

$$\bar{p} = \frac{301 + 357}{4700 + 4300}$$

$$\bar{p} = \frac{658}{9000} \approx 0.073$$

$$\bar{q} \approx 0.927$$

$H_0: \; P_1 = P_2$

claim $\rightarrow$ $H_1: \; P_1 < P_2$

$\alpha = 0.005$

TEST STATISTIC

$$Z = \frac{(\hat{P}_1 - \hat{P}_2) - (P_1 - P_2)}{\sqrt{\frac{\bar{p}\bar{q}}{n_1} + \frac{\bar{p}\bar{q}}{n_2}}}, \quad Z = \frac{(.064 - .083) - 0}{\sqrt{\frac{(.073)(.927)}{4700} + \frac{(.073)(.927)}{4300}}}$$

$$Z \approx \boxed{-3.455}$$

P-Value $\approx \boxed{0.0003}$

$\boxed{\text{REJECT } H_0}$

99% C.I.

$(-.033, -.005)$

INTERVAL DOES NOT CONTAIN ZERO, REJECT H_0

There is SUFFICIENT evidence to support the claim that the death rate is lower for those who took the medication than for those who took the placebo.

SINCE this is medical research AND human health and life is at stake, YES, a strict 0.005 level is appropriate.

(7) SAMPLE DATA

$n = 10 \quad \bar{x} = 24{,}124.3 \quad s \approx 2628.9$

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

95% CI
$\alpha = 0.05$
$\alpha/2 = 0.025$
USE PROGRAM $\boxed{\text{CISDEV}}$

$$\sqrt{\frac{(9)(2628.9)^2}{19.023}} < \sigma < \sqrt{\frac{(9)(2628.9)^2}{2.700}}$$

$$\boxed{1808.2 < \sigma < 4799.7}$$

We are 95% confident that the true population standard deviation is between \$1,808.20 and \$4,799.70.

(b) $$\bar{x} - E < \mu < \bar{x} + E$$

$$E = t_{\frac{\alpha}{2}} \cdot \frac{s}{\sqrt{n}}$$

95% CI
$\alpha = 0.05$
$\alpha/2 = 0.025$
T-Interval...

$$24{,}124.3 - E < \mu < 24{,}124.3 + E$$

$$E = (2.262) \cdot \frac{2628.9}{\sqrt{10}} \approx 1880.5$$

$$\boxed{22{,}244 < \mu < 26{,}005}$$

We are 95% confident that the true population mean is between \$22,244 and \$26,005.

(8) DATA

$n = 910 \quad k = 7$

DAY	SUN	MON	TUE	WED	THU	FRI	SAT
OBSERVED	118	119	127	137	129	146	134
EXPECTED	130	130	130	130	130	130	130

Claim → $H_0: P_1 = P_2 = P_3 = P_4 = P_5 = P_6 = P_7$

H_1: at least one proportion is NOT equal

$\alpha = 0.05$

TEST STATISTIC

$$\chi^2 = \sum \frac{(O-E)^2}{E} \qquad \chi^2 = \frac{(118-130)^2}{130} + \dots + \frac{(134-130)^2}{130}$$

$$\chi^2 \approx \boxed{4.585}$$

$\boxed{\text{Fail to Reject } H_0}$

$$\text{P-Value} \approx \boxed{0.598}$$

There is NOT sufficient evidence to reject the claim that fatal bicycle accidents occur with the same frequency on the different days of the week.

YES. We need to do a hypothesis test to know if the differences are random sample variation OR a statistically significant variation.

(9)

(a) n must be $\boxed{1738}$

(b) $\mu \pm 2\sigma$ $\boxed{.8 < \text{USUAL} < 9.2}$ NO, NOT UNUSUAL

$P(x=8) \approx 0.064$

$P(x \geq 8) \approx 0.122$

(c) There is sufficient evidence to support the claim that the percentage of voters is greater than 50%.

(d) $t \approx \boxed{-2.59}$, P-Value $\approx \boxed{0.012}$ $\boxed{\text{Reject } H_0}$

(e) $\bar{x} = \boxed{31.5}$ $s = \boxed{2.7}$

(f) $\tilde{x} = \boxed{11}$ $s^2 \approx \boxed{34.2}$

(g) 9 good 3 bad $n=12$

$P(\text{good AND good}) = \frac{9}{12} \cdot \frac{8}{11} = \boxed{\frac{6}{11}} \approx \boxed{0.545}$

(h) normalcdf(74, 1E99, 69, 2.8) $\boxed{3.7\%}$

(i) CV_t: ± 2.05

(j) $r \approx -0.083$ P-Val ≈ 0.861 NO LINEAR CORR

USE $\bar{y} \approx \boxed{9.3}$