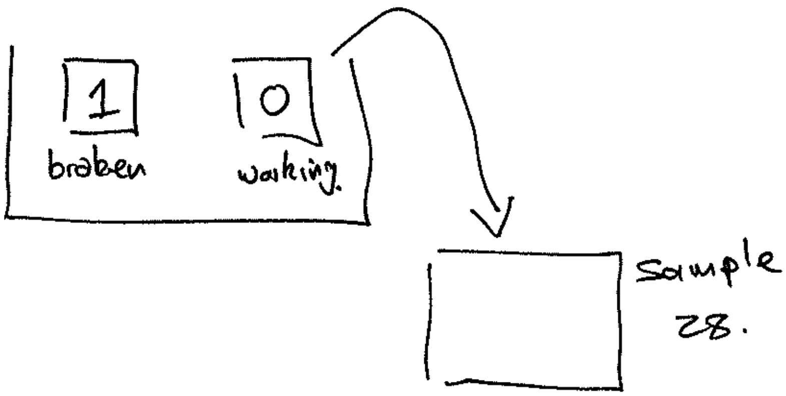
95% CI is expected value $\pm\ 2\times \cancel{SE}\,.\,SE$



5 × 1's.
23 × 0's

$$SE\ \underline{\text{sum}}\ \text{of draws} = \sqrt{\#\text{draws}} \times SD_{box}$$

$$= \sqrt{\#\text{draws}}\ \sqrt{\underset{1\text{'s}}{\text{fraction}} \times \underset{0\text{'s}}{\text{fraction}}}$$

$$= \sqrt{28} \times \sqrt{\frac{5}{28} \times \frac{23}{28}} = 2.03$$

$$SE \text{ on fraction} = \frac{SE \text{ on sum}}{\#\text{ draws}} = \frac{2.03}{28}$$

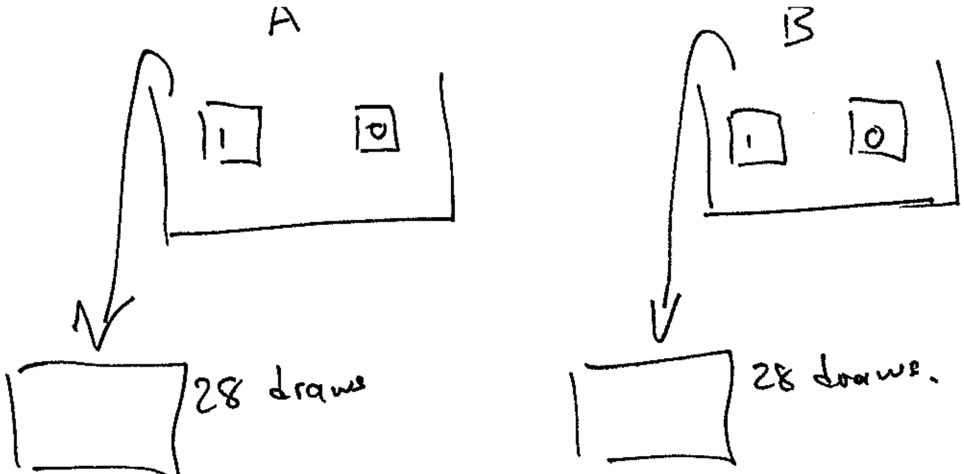
$$SE \text{ on } \% = SE \text{ on fraction} \times 100\% = \simeq 7\%$$

$$\text{Expected value is } \frac{5}{28} \simeq 18\%.$$

$$95\%\ CI = 18 \pm 2\times 7 \quad \text{or} \quad \underline{\underline{18 \pm 14\%}}$$

$$\text{or} \quad 4 \rightarrow 32.\%$$

b).



5 × 1's   8 1's

23 0's   20 0's.

Ho: contents of the boxes are the same

(Machine B is as reliable as machine A)

$$z = \frac{\text{observed } \cancel{\text{expected}} \text{ difference} - \text{expected difference}}{\text{SE difference}}$$

$$= \frac{3 - 0}{\text{SE diff}} \leftarrow \sqrt{SE_A^2 + SE_B^2}$$

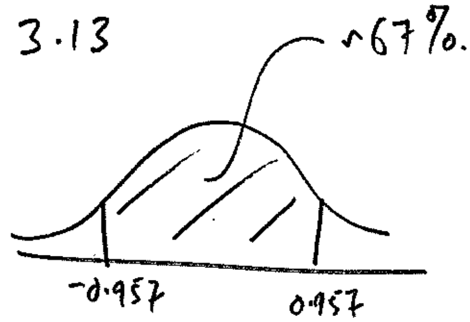
Assuming independence bet A and B

$$SE_A = \sqrt{28} \times \sqrt{\frac{5}{28} \times \frac{23}{28}}$$

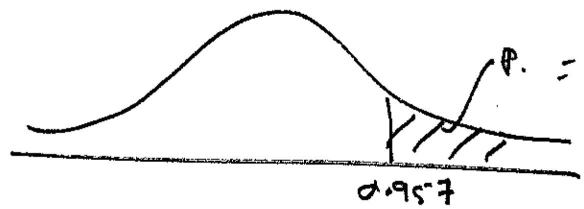
$$SE_B = \sqrt{28} \sqrt{\frac{8}{28} \times \frac{20}{28}}$$

$SE_{diff} = 3.13$

$$z = \frac{3}{3.13} = 0.957$$



P-value



$p = \frac{1}{2}(100 - 67) \simeq 16.5\%$.

$p > 5\%$ so cannot reject the null hypothesis that A and B are equally reliable.

---

c). Test for independence

Observed values:

		A: works	A: not	
B	works	31	14	45
	not	13	2	15
		44	16	60

Expected values:

		A: works	A: not
B	works	$\boxed{33}$	12
	not	11	4

Ho: A and B break down independently.

$$\text{expected value} = \frac{(\text{row total}) \times (\text{col total})}{\text{table total}}$$

$$\text{expected value for A + B both working} = \frac{45 \times 44}{60}$$

$$X^2 = \text{sum} \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

$$= \frac{(31-33)^2}{33} + \frac{(14-12)^2}{12} + \frac{(13-11)^2}{11} + \frac{(2-4)^2}{4}$$

$$= 1.8.$$

$\#$ d.of. $= (m-1) \times (n-1) = 1.$

from table p-value is between 30% and 10%.

<u>cannot</u> reject the null hypothesis that A and B are independent.

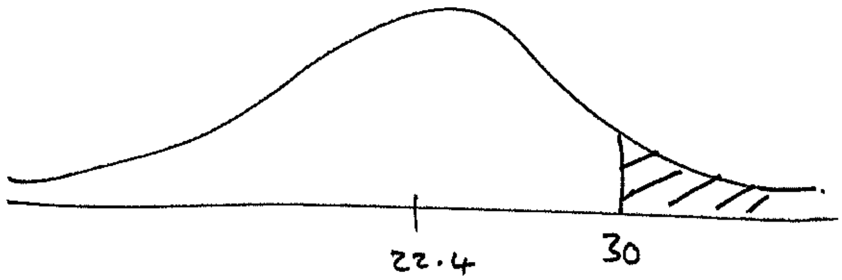
$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A) \times P(B)$$ – assuming independence.

$$P(A \text{ or } B) = \frac{5}{28} + \frac{8}{28} - \frac{5}{28} \times \frac{8}{28}$$

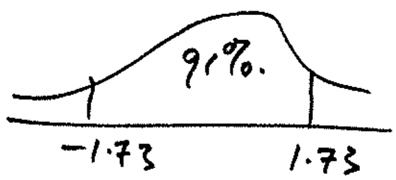
20).

generic cookies



SD 4.4

30 in standard units $\dfrac{30-22.4}{4.4} = 1.73$



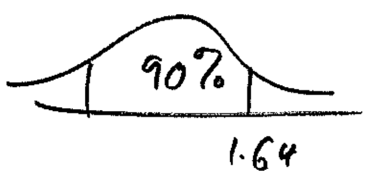
% with > 30 chips

is $\frac{1}{2}(100-91) \approx 4.5\%$.

chips ahoy! mean 24.1

SD 3.6

30 in standard units $\dfrac{30-24.1}{3.6} = 1.64$



% with > 30 chips

$\frac{1}{2}(100-90) \approx \underline{\underline{5\%}}$

b) Binomial probability.

$n = 10$

$k = 6$

$p = 0.045$

$$\binom{10}{6} \times 0.045^6 \times (1-0.045)^{10-6}$$

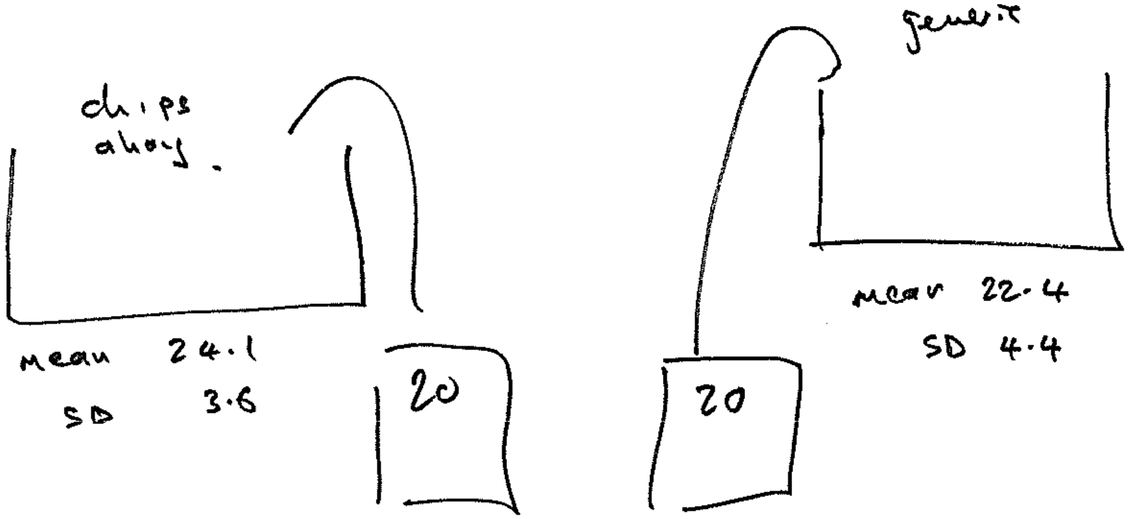
$$\frac{10 \times 9 \times 8 \cdot \cancel{6 \times 5 \ldots \times 2 \times 1}}{(\cancel{6 \times 5 \times 4 \times 3 \times 2 \times 1}) \times (4 \times 3 \times 2 \times 1)} \times (0.045)^6 \times (1-0.045)^4$$

$$\frac{90 \times 9 \times 8 \times 7}{4 \times 3 \times 2} \times (\ )^6 (\ )^4$$

$= \underline{1.5 \times 10^{-6}}.$

c).

d).



Ho: mean of both populations is the same

$20 \times 24.1 - 20 \times 22.4$

$$z = \frac{\text{observed diff} - \text{exp. diff}}{\text{SE diff}} = \frac{20(24.1 - 22.4) - 0}{}.$$

$$\text{SE chips ahoy (sum of)} = \sqrt{\#\,\text{draws}} \times \text{SD box}$$

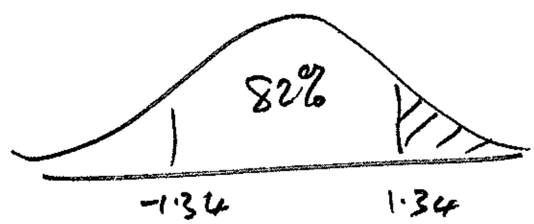
$$= \sqrt{20} \times 3.6$$

$$\text{SE generic} = \sqrt{20} \times 4.4$$

$$\text{SE diff} = \sqrt{(\sqrt{20} \times 3.6)^2 + (\sqrt{20} \times 4.4)^2}$$

$$= 25.4$$

$$z = \frac{34}{25.4} = 1.34$$



$$\text{p-value} = \frac{1}{2}(100 - 82) = \underline{\underline{9\%}}.$$

<u>cannot</u> reject the null hypothesis that both brands have same average # chips.

a) "Does doodling improve or hinder attention to the primary task?"

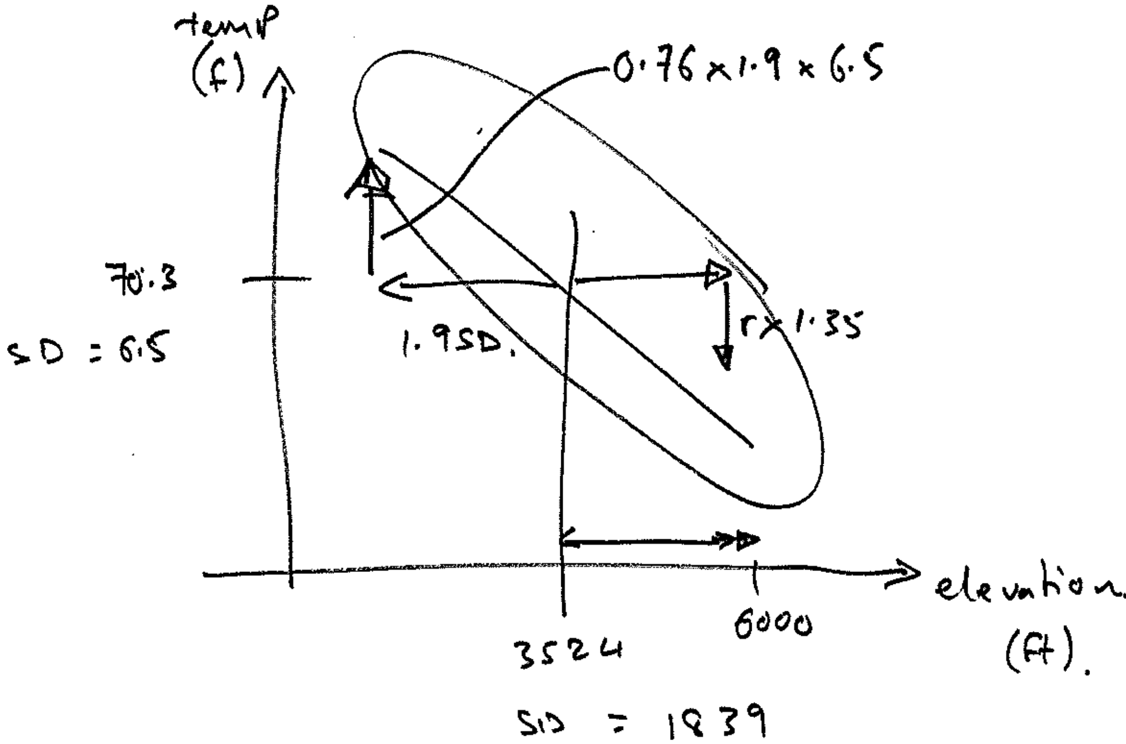
b) In terms of a null hypothesis:

Ho: Doodling does not affect a person's attention to the primary task

c) controlled experiment

d) Each subject will know if they are doodling or not.

e) Doodling while working can be beneficial.



6000 is $\dfrac{6000 - 3524}{1839} = 1.35$ SD elevation above mean

corresponding temp

is $1.35 \times \underbrace{-0.76}_{r}$ SD_{temp} above mean temp

temp is $70.3 - 1.35 \times 0.76 \times 6.5$

$= \underline{63.3\text{ F}}.$

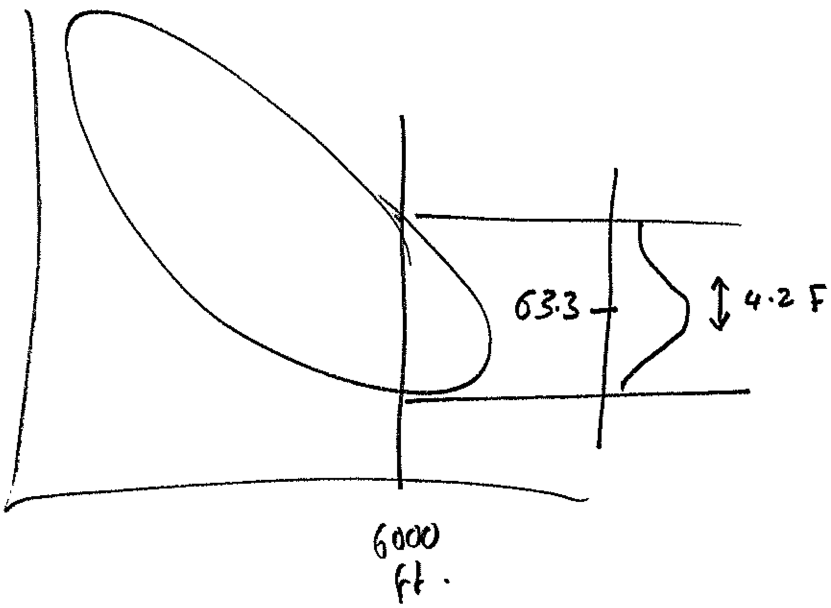
sea level is 0 ft $\quad$ 0 is $\dfrac{-3524}{1839} = 1.9$ SD below mean

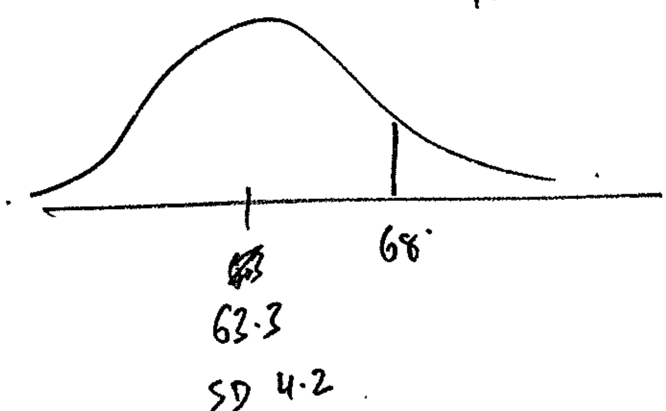
temp $\quad 70.3 + 0.76 \times 1.9 \times 6.5 = \underline{79.4^{\circ}}.$

c) RMS error $\sqrt{1-r^2} \times SD_{temp.}$

$= \sqrt{1-0.76^2} \times 6.5 = \underline{\underline{4.2\text{ F.}}}$

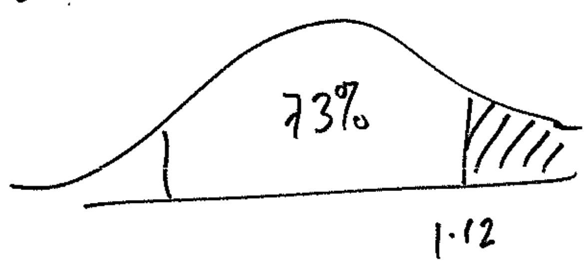
d)



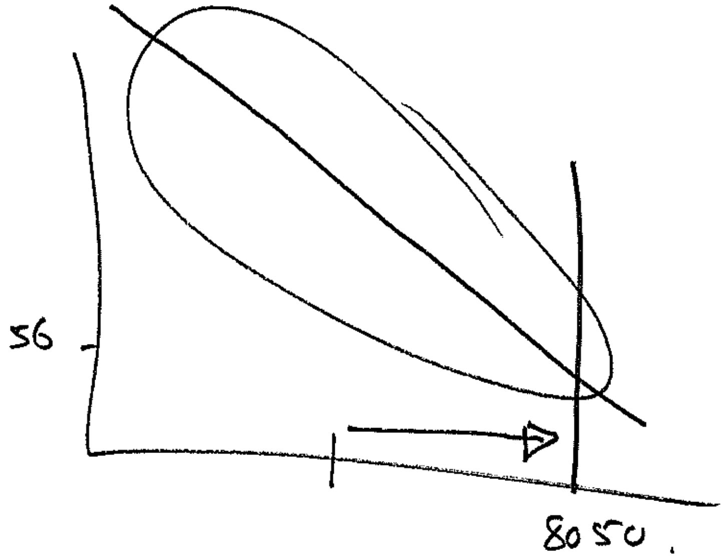


convert to standard units

$\frac{68 - 63.3}{4.2} = 1.12.$



$\frac{1}{2}(100-73) = \underline{13.5\%}$.



IS 56 F above or below the mean temp at 8050 ft?

$$\text{predicted mean} = 70.3 + \underbrace{\frac{8050 - 3524}{1839}}_{\#\text{SD above mean in se}} \times \underbrace{(-0.76)}_{r} \times \underbrace{8.}_{\text{SD}}$$

$$= \underline{58\text{F}}.$$

Regression towards mean => expect to record temp. higher than 56 F.

a) 99%. – because the test is 99% accurate.

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b). 10% of people have colds.

population of size 1000

i) how many people have a cold 100

ii) how many people with cold test positive 99

(iii) how many people don't have colds 900

(iv) how many of people who don't have a cold will test positive $(1-0.99) \times 900$ $\underline{9}$

c). $P(\text{cold} \mid \text{positive test}) = \dfrac{99}{99+9} \hat{=} \underline{\underline{92\%}}.$