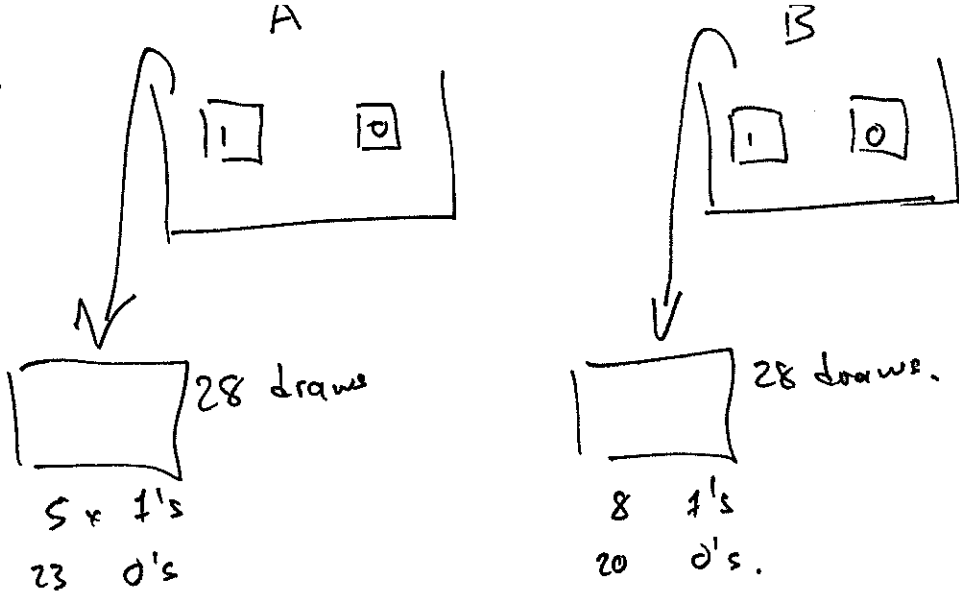




b)



$H_0$ : contents of the boxes are the same  
(Machine B is as reliable as machine A)

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

$$= \frac{3 - 0}{\text{SE diff}}$$

$$\leftarrow \sqrt{SE_A^2 + SE_B^2}$$

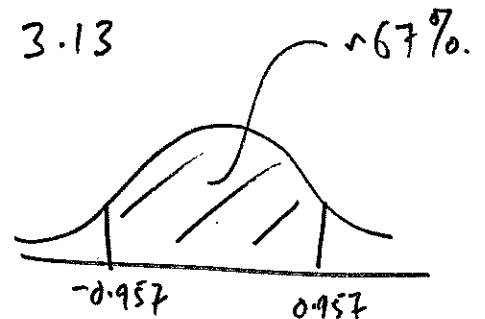
Assuming independence  
bet A and B

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

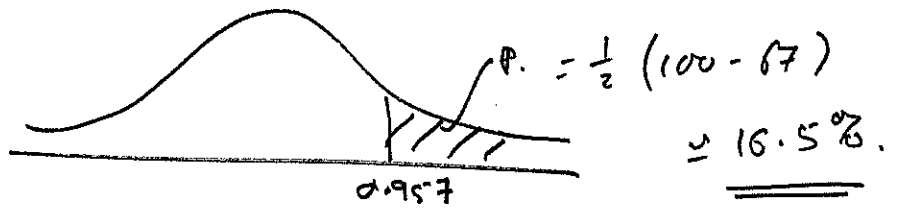
$$SE_B = \sqrt{28} \sqrt{\frac{8}{28} \times \frac{20}{28}}$$

$$SE_{diff} = 3.13$$

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



P-value



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

c). Test for independence

	A		
	wakes	not	
wakes	31	14	45
not	13	2	15
	44	16	60

observed values

	A		
	wakes	not	
wakes	33	12	
not	11	4	

expected values

$H_0$ : A and B break down independently.

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

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

$$\begin{aligned} \chi^2 &= \text{sum} \frac{(\text{observed} - \text{expected})^2}{\text{expected}} \\ &= \frac{(31-33)^2}{33} + \frac{(14-12)^2}{12} + \frac{(13-11)^2}{11} + \frac{(2-4)^2}{4} \\ &= 1.8. \end{aligned}$$

$$\# \text{ d.o.f.} = (m-1) \times (n-1) = 1.$$

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

cannot reject the null hypothesis that A and B are independent.

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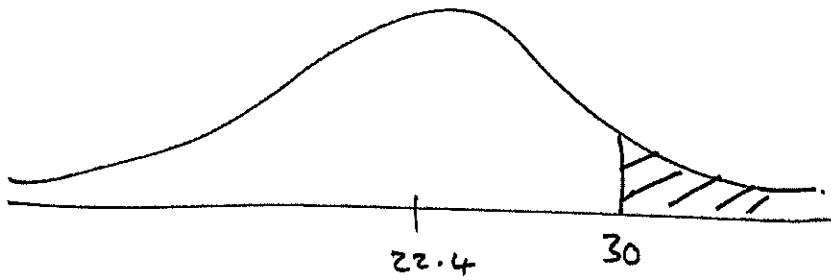
$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

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

20).

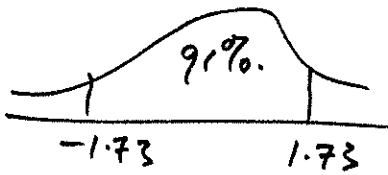
generic  
cookies



SD 4.4

30 in standard units

$$\frac{30 - 22.4}{4.4} = 1.73$$



% with > 30 chips

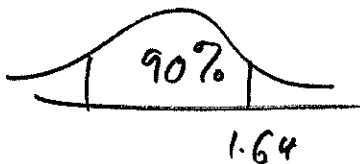
$$= \frac{1}{2}(100 - 91) = 4.5\%$$

chips  
chowls

mean 24.1  
SD 3.6

30 in standard units

$$\frac{30 - 24.1}{3.6} = 1.64$$



% with > 30 chips

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

b) Binomial probability.

$$n = 10$$

$$k = 6$$

$$p = 0.045$$

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

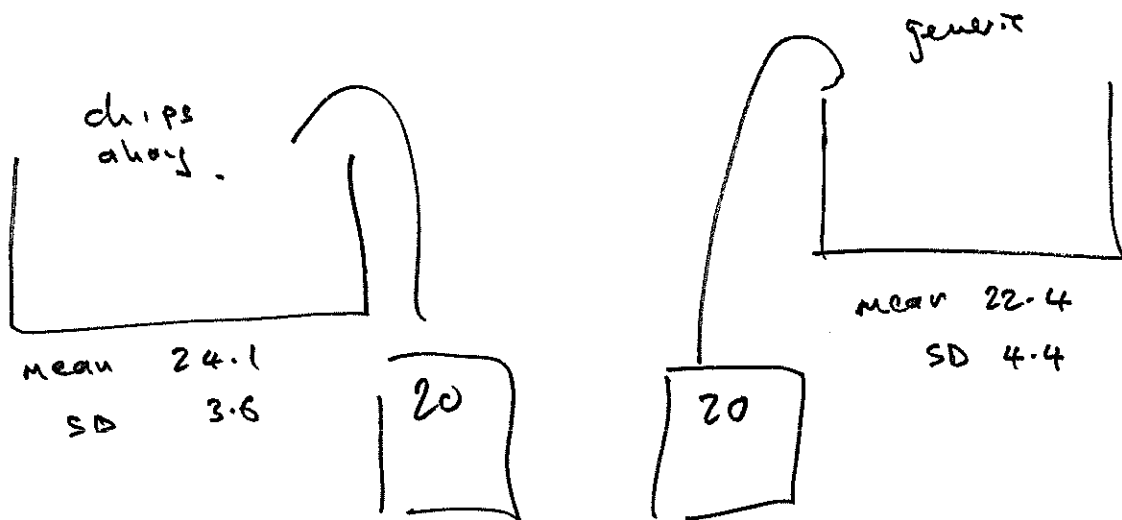
$$\frac{10 \times 9 \times 8 \times \dots \times 5 \times 4 \times 3 \times 2 \times 1}{6 \times 5 \times 4 \times 3 \times 2 \times 1 \times (4 \times 3 \times 2 \times 1)} \times (0.045)^6 \times (1-0.045)^4$$

$$\frac{10 \times 9 \times 8 \times 7}{4 \times 3 \times 2} \times ( )^6 ( )^4$$

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

c).

d).



$H_0$ : mean of both populations  
is the same

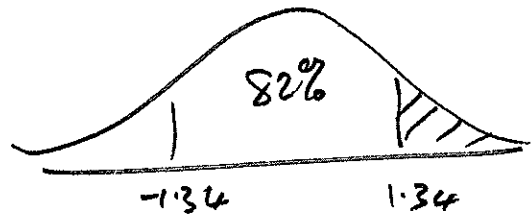
$$z = \frac{\text{observed diff} - \text{exp. diff}}{\text{SE diff}} = \frac{20 \times 24.1 - 20 \times 22.4}{20(24.1 - 22.4)} = 0$$

$$\text{SE chips along sum of} = \sqrt{\# \text{ draws}} \times \text{SD box} = \sqrt{20} \times 3.6$$

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

$$\text{SE diff} = \sqrt{(\sqrt{20} \times 3.6)^2 + (\sqrt{20} \times 4.4)^2} = 25.4$$

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



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

cannot reject the null hypothesis that both brands have same average # chips.

---

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

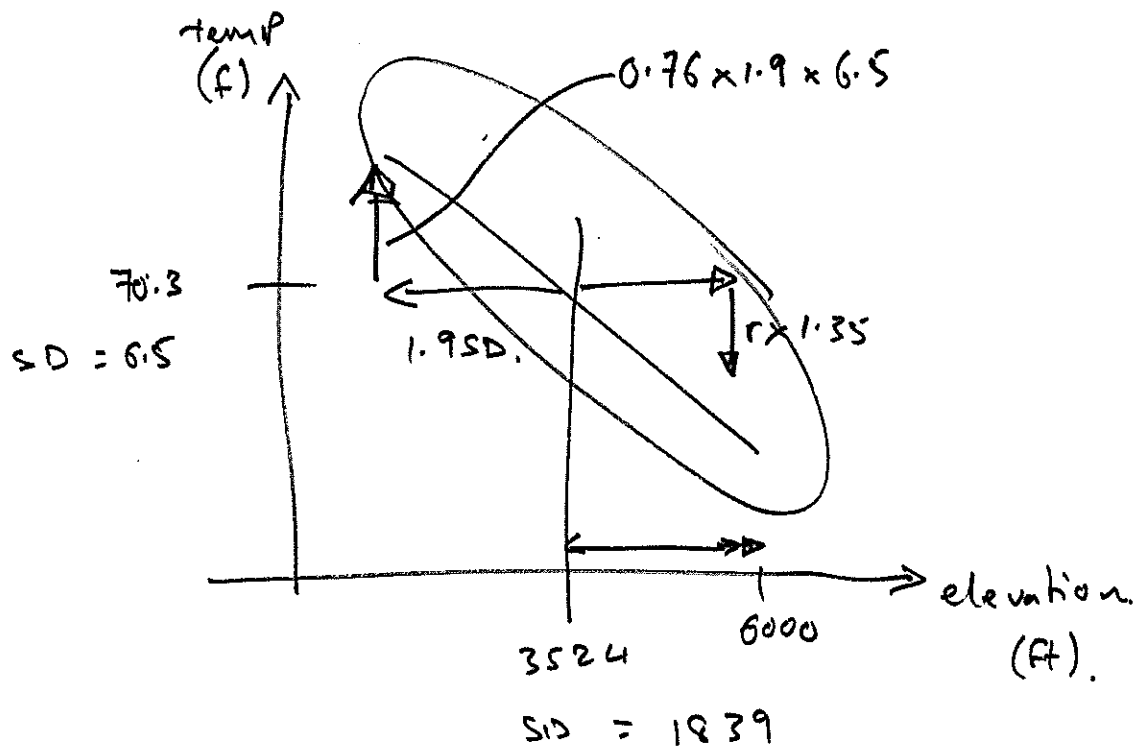
b) In terms of a null hypothesis:

H<sub>0</sub>: 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  $\frac{6000 - 3524}{1839} = 1.35$  SD elevation above mean

corresponding temp

is  $1.35 \times \frac{-0.76}{r}$  SD temp above mean temp

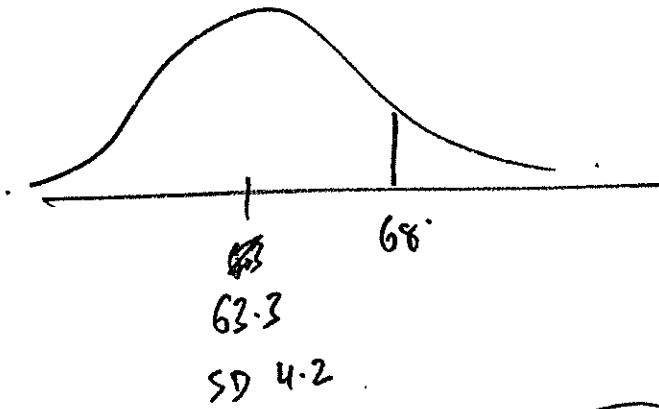
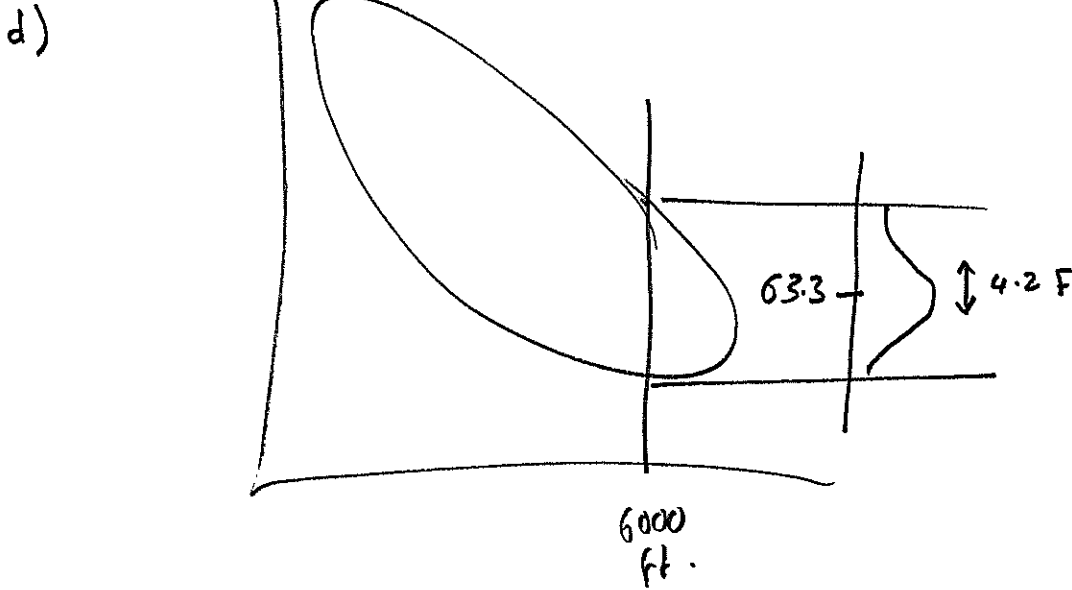
temp is  $70.3 - 1.35 \times 0.76 \times 6.5$   
 $= \underline{63.3 \text{ F.}}$

Sea level is 0 ft 0 is  $\frac{-3524}{1839} = 1.9$  SD below mean

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

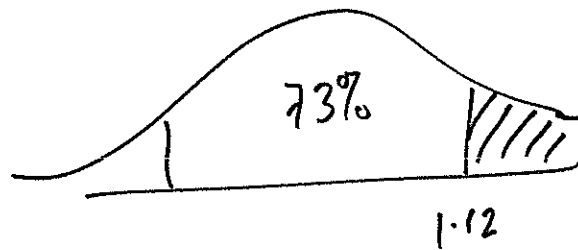
c) RMS error  $\sqrt{1-r^2} \times SD_{temp.}$

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

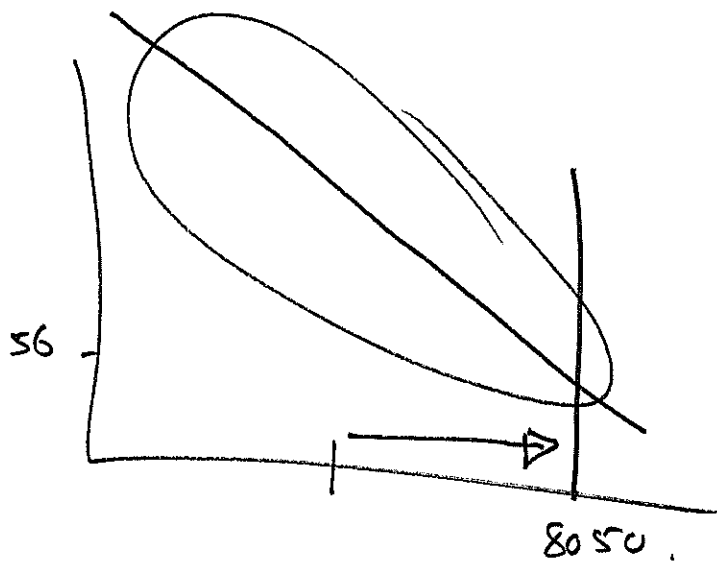


convert to standard units

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



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



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

$$\text{predicted mean} = 70.3 + \frac{8050 - 3524}{1839} \times \frac{(-0.76) \times 6.1}{r} \times \text{SD}_y$$

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

Regression towards mean  $\Rightarrow$  expect to record temp. higher than 56 F.

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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  $(1-0.99) \times 900$  9

c) - 
$$P(\text{cold} \mid \text{positive test}) = \frac{99}{99 + 9} \approx \underline{\underline{92\%}}$$