SAMPLE FINAL 2 — PART B

1. (a) (i) 2 Factors

1. Type of Therapy (2 levels)
2. Type of Medication (3 levels)

(ii) 2 levels × 3 levels = 6 treatments

		Therapy: Cog. Beh.	Therapy: Psycho
Med.	Zoloft	1	2
	Paxil	3	4
	Effexor	5	6

Treatment 1: Cog. Beh. Therapy and Zoloft
2: Psychodynamic and Zoloft
3. Cog. Beh. and Paxil
4. Psycho and Paxil
5. Cog. Beh and Effexor
6. Psycho and Effexor

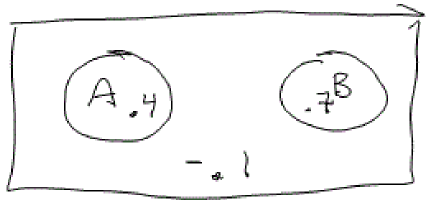
(iii) Amount of improvement in their depression
(iv) Severity of Depression (Mild or Severe)

(b) Take the 180 subjects with Mild depression and randomly split them into 6 groups of 30 each and then randomly assign one group to each treatment.
We will also split the 120 subjects with severe depression randomly into 6 groups of 20 each. Then randomly assign one group to each treatment.

(c) Because experiments use randomization, replication, and control of outside factors they can prove cause and effect.
Yes, if one treatment shows a significant improvement, we can say that treatment caused the improvement.

2. (a) $P(A) = .4$ $\quad P(B) = .7$

If A and B disjoint



(Three probabilities must add to 1.)

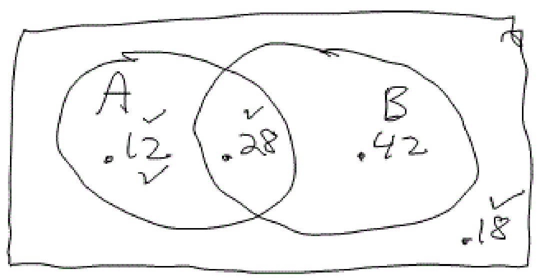
A probability can't be −.1!

A and B cannot be disjoint.

(b) A and B are independent, then

$P(A \text{ and } B) = P(A) \times P(B)$

$P(A \text{ and } B) = .4 \times .7 = \underline{.28}$



$P(A \text{ or } B^c)$

$= .12 + .28 + .18$

$= \boxed{.58}$

3. $n = 30$, $\bar{x} = 33.73$, $\sigma = 18.50$

(a) Class size is a <u>discrete</u> quantitative variable (you could have 20 people in a class, or 21, but you could never have 20.2 people in a class). Therefore, this could not be a normal distribution because the normal distribution is continuous.

(b)

Stem	Leaf
1	0 1 4 4 5 7 8
2	0 2 2 2 3 6 6 7 8
3	1 3 4 4 6
4	2 4 9
5	0 5
6	2 8
7	7
8	2

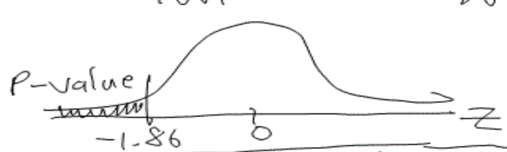
This is a single-peaked, right-skewed distribution.

(c) Since n is large ($n=30$), the distribution of the sample mean, $\bar{x}$, will be approximately normal by Central Limit Theorem. Therefore it is still appropriate to use inference methods that rely on normality.

(d) National average is 40, this university is lower.

$H_0: \mu = 40$ vs $H_a: \mu < 40$

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{33.73 - 40}{18.50/\sqrt{30}} = -1.86 = \text{test statistic}$$



P-value = .0314

$\alpha = 1\%$

Do not reject H_0.

$\boxed{\text{We are not convinced that this university has lower class sizes than the national average.}}$

EXTRA: Interpret the P-value.

Assuming the average class size is 40, there is a .0314 probability that our test statistic would be -1.86 or lower. [that our sample would have an average of 33.73 or lower.]

4. Matched pairs → $n = 8$ restaurants each restaurant gets 2 treatments (Male / Female); we only care about the difference in scores for each restaurant:

$$n = 8 \quad \bar{x} = -2.7 \quad (F-M)$$
$$s = 2.9$$

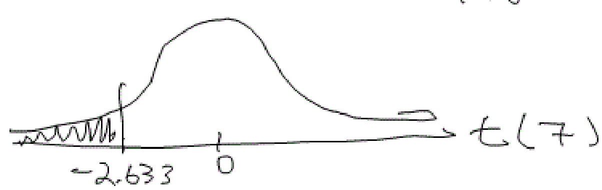
Let μ = mean difference $(F-M)$

$H_0: \mu = 0$ vs $H_a: \mu < 0$

(If $\mu < 0$, Females are served faster than males at a given restaurant.)

use t with $df = n-1 = 7$

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{-2.7 - 0}{2.9/\sqrt{8}} = -2.633 \text{ test statistic}$$



P-value is between .01 and .02

$\alpha = 1\%$ We cannot reject H_0

We are not convinced that females are served faster than males.

(b) Assuming females and males are served equally fast, there is between a .01 and .02 probability that we would get a test statistic of -2.633 or lower. (that the mean difference would be -2.7 minutes or lower.)