

### HW 3: Stat 430[Chapter 2: Hypothesis Tests]

- (a) Suppose we suspected an unusual distribution of blood groups in patients undergoing one type of surgical procedure (procedure X, say).

We know that the expected distribution for the entire population is 44% group O, 45% group A, 8% group B and 3% group AB.

A random sample of routine pre-operative blood grouping results (for people getting procedure X) is collected 187 consecutive patients:

Blood Group	Frequency
O	67
A	83
B	29
AB	8
Total	187

Test at 1% level the hypothesis that proportions of blood groups of people getting procedure X follows the usual proportions found in the entire population.

- (b) We want to test whether the choice of rental car sizes and day of the week (weekend or weekday) are two independent categories, based on the following set of 100 observations from the rental car agency:

rental day \ type	sub-compact	compact	mid-size	other
weekend	2	6	9	3
weekday	26	38	9	7

Conduct the test of independence at 5% level to see if there is any relation between the two categories.

- (c) A set of researchers want to establish that peak expiratory flow rate (PEFR) of asthma patients decrease after exposure to cold weather (!) They made 9 asthma patients walk in a cold winter's day and measured PEFR before and after the walk.

Patient	before	after
1	312	300
2	242	201
3	340	232
4	388	312
5	296	220
6	254	256
7	391	328
8	402	330
9	290	231

Under the assumptions that the data is from a normal distribution, conduct a test at 5% level to verify the claim that the mean PEFR is less after the walk. How does the conclusion change if you carry out the test at 0.05%?

- (d) To test if the performance in Verbal SAT scores have less variance for girls than boys, the following data is collected for 21 boys and 21 girls taking the exam:

Girls' Scores(X): 530 570 550 410 680 470 600 660 510 520 570 490 390 500 360 760 510 320 410 400 440  
 Boys' Scores(Y): 490 560 530 540 540 360 470 380 450 600 540 510 440 440 440 590 460 490 570 470 430

Let  $\sigma_x$  and  $\sigma_y$  represent the true standard deviations of all girls' and all boys' Verbal SAT scores respectively. Test at 5% level of significance:

$$H_0 : \sigma_x \leq \sigma_y \text{ vs. } H_1 : \sigma_x > \sigma_y$$