編號： 571　系所：認知科學研究所　　科目：統計學

本試題是否可以使用計算機： ☑可使用 ， ☐不可使用 （請命題老師勾選）

1. (40 points) A psychological model suggests that the response probabilities of a certain experimental task follow a particular trinomial distribution:

$$p_1 = \pi^2,\ p_2 = 2\pi(1-\pi),\ \text{and}\ p_3 = (1-\pi)^2,$$

where $0 < \pi < 1$. Suppose that, in 60 independent trials, a subject responds 9, 33, and 18 times, respectively, for p_1, p_2 and p_3 categories.

(a) Find the value of π such that the likelihood of the subject's observations is maximized.

(b) Explain how one could check on the adequacy of the psychological model.

1(a) (20 points); 1(b) (20 points).

(背面仍有題目,請繼續作答)

2. (40 points) Three objects are located on a straight line at three locations L_1, L_2, and L_3. The distances of these locations to the origin ($d_1 < d_2 < d_3$) where a surveyor is standing are not precisely known. She proceeds to make the following measurements:

(i) She stands at the origin and measures the distances from there to L_1, L_2 and L_3. Denote these measurements by Y_1, Y_2 and Y_3.

(ii) She goes to location L_1 and measures the distances from there to L_2 and L_3. Denote these measurements by Y_4 and Y_5.

(iii) She goes to location L_2 and measures the distance from there to L_3. Denote this measurement by Y_6.

All six measurements are subject to error. Let's assume that these measurement errors have been made independently and that they follow the standard normal distribution (mean zero and standard deviation of one measurement unit).

(a) Explain how might the surveyor improve the precision of her estimate of the distance from the origin to location L_1 by combining these measurements?

(b) Provide a 95% confidence interval for the (true) distance d_1 based on your answer to (a). You only need to specify the formula and explain clearly how each term in the formula may be determined.

2(a) (20 points); 2(b) (20 points).

3. (20 points) Do women and men have different patterns of work behavior? A random sample of business school graduates was polled and classified by gender and work type. The results were tabulated as follows.

Work Type	Male	Female
Workaholics	52	78
Unengaged Workers	43	52
Relaxed Workers	24	27
Disenchanted Workers	37	30

How would you test whether there was a gender difference? You do not have to calculate the value of the test statistic, but explain clearly and unambiguously what the alternative and null hypotheses are, how the test statistic would be calculated, and how you would assess statistical significance.