1. Which of the model forms (a) or (b) shown below best fits the given data? Substantiate your answer fully based on the numerical criteria. (16%)

(a) Model A: $Y = \beta_0 \beta_1^X$

(b) Model B: $Y = \beta_0 X^{\beta 1}$

X:	10	15	20	25	30	35	40
Y:	93	58	60	51	45	32	35

2. If daily demand for an inventory item is discrete uniformly distributed from 1 item to 10 items per day and the number of days in the reorder lead-time is a Poisson random variable with a mean of 7 days. Please determine a safety stock level that would guarantee a stock-out would occur during the reorder lead-time no more than 5% of the time. (Please apply Chebyshev's Inequality) (10%) (If $Y = \sum_{i=1}^{N} X_i$, $Var(Y) = E(N) \times Var(X) + [E(X)]^2 \times Var(N)$)

3. A miner is trapped in a mine containing three doors. The first door leads to a tunnel that takes him to safety after two-hour's travel. The second door leads to a tunnel that returns him to the mine after three-hour's travel. The third door leads to a tunnel that returns him to his mine after five hours. Assuming that the miner is at all times equally likely to choose any one the doors, what is the expected length of time until the miner reaches safety? (10%)

4. Cars pass an inspection point according to a Poisson process with a rate of 1 per minute. Half of all cars are American-made and half are Japanese.
(a) If we see 10 Japanese cars in the first hour, what is the expected value for the total number of cars to pass during that hour? (3%)
(b) If we come to the inspection point at a random time, what is the probability that the next car will be American? (3%)
(c) What is the probability that there are exactly 25 Japanese cars in the first hour? (4%)
(d) What is the probability that exactly half of the cars in the first hour are Japanese? (Note: This can only happen if there is an even number of cars!) (4%)

(背面仍有題目,請繼續作答)

5. A Financial analyst is interested in whether there was a significant change in profits for utilities from one period to another. A random sample of 11 companies from the Forbes 500 contributed the following data:

Company	Profits 1988	Profits 1989
Ohio Edison	218.9	361.0
Kentucky Utilities	79.4	82.3
PSI Holdings	99.1	125.2
Idaho Power	49.0	84.7
NY State E & G	171.5	157.8
Northeast Utilities	224.8	203.2
Southwestern Public Service	105.0	124.9
Pacific Corp.	446.8	465.6
Scana	120.7	122.6
Puget Sound Power & Light	128.2	117.7
Public Service Colorado	124.9	148.8

Source: Forbes , April 30 , 1990.

a. (5%) Should a test of independence or related samples be used?

b. (10%) Is there a difference in profits between the two years?
What assumptions be used ? (α=0.05)

6. A computer manufacturer is introducing a new product specifically targeted at the home market and wishes to compare the effectiveness of three sales strategies: Computer stores , home electronics stores , and department stores.
The number of sales by 15 salespeople are recorded below :

Electronics store: 5 , 4 , 3 , 3 , 3
Department store: 9 , 7 , 8 , 6 , 5
Computer store: 7 , 4 , 8 , 4 , 3

a. (10%) Test the hypothesis that there is no differnece between the means of the retailers (α=0.05) .

b. (10%) Select a post hoc test , if necessary , to determine which groups differ in mean sales (α=0.05) .

7. Let $\bar{X}$ and s_1^2 be the sample mean and variance , respectively of n_1 observations randomly selected from a population with mean μ_1 and variance σ_1^2. Similarly , define $\bar{y}$ and s_2^2 for an independent random sample of n_2 observations from a population with mean μ_2 and variance σ_2^2.

a. (5%) Derive a $(1-\alpha)$ 100% large sample confidence interval for $(\mu_1 - \mu_2)$.

b. (5%) Suppose X~N(x; μ_1, σ_1^2) and Y~N(y; μ_2, σ_2^2) , also $\sigma_1^2 = \sigma_2^2 = \sigma^2$, determine the pooled estimator of the common variance σ^2.

c. (5%) Suppose $\sigma_1^2 = \sigma_2^2 = \sigma^2$, and assumption of (2) , derive a $(1-\alpha)$ 100% small sample confidence interval for $\mu_1 - \mu_2$.

附表值：

$F_{12}^2(0.05) = 3.89$
$F_{14}^2(0.05) = 3.74$
$t_{12}(0.05) = 2.179$
$t_{10}(0.05) = 1.812$
$t_{20}(0.05) = 1.729$
$t_{20}(0.025) = 2.086$