Answer the following questions (100%)

1. Suppose it is necessary for a candidate of city mayor to receive at least 60 percent of the vote to be elected. The current city mayor is interested in assessing his chances of being reelected. Thus, he conducted a survey of 1,000 people in the city of which 555 revealed that they planned to support the current mayor. (45%)

(1) Define X as the number of people in the sample who support the current city mayor. What is X distributed? (5%)

(2) Suppose the desired level of confidence is 95 percent. What is the margin of error (i.e., the bound on error) in the population proportion? If the city major wants the estimate to be within 2 percent of the population proportion, what is the required sample size? (10%)

(3) Explain your conclusion by hypothesis test to solve the city mayor's curiosity. How strongly would you or would you not reject the null hypothesis? (10%)

(4) According to your conclusion above, what is the possible error involved? (10%)

(5) If the null hypothesis is true, what is the probability that less than 580 people in this survey answered yes? (10%)

2. The manager of the department of human resources found that the mean and standard deviation of the length of workers' sickness leaves in a manufacturing company last year was 14 and 5 days, respectively. (15%)

(1) Approximately, what is the proportion of workers' sickness leaves in between 4 to 24 days? (5%)

(2) Suppose the management randomly draws ten workers and rank their sickness leaves and performance from one to ten. The worker who has the shortest sickness leaves ranks the first, and so on; while the one with the largest production ranks the first in their performance. What's your conclusion about the relationship between workers' sickness leave and performance? Why? ($\alpha = 0.05$, The critical value of Spearman's rank correlation coefficient test is: $r_{0.025}(10) = 0.648$.) (10%)

The Ranking of Workers' Sickness Leaves and Production

Worker #	1	2	3	4	5	6	7	8	9	10
Ranking (show up rate)	4	3	8	7	6	5	1	2	10	9
Ranking (production)	1	8	7	10	5	3	2	4	9	6

3. Two balls are randomly put into 4 boxes. Suppose each ball has equally likely probability of being put into any of the four boxes. Define X as the number of balls being thrown into the first box and the payoff function as $Y=2X^2$. Calculate the expected payoff and its variance. (10%)

4. A researcher is interested in investigating wages of college graduates in Taiwan. So he randomly draws 2,973 graduates and run the following regression (Assume that all the college graduates in the sample answer questions properly):

$$\ln(wage) = \beta_0 + \beta_1(Years\ of\ Schooling) + \beta_2(Work\ Experience) + \xi,$$

where ξ is a normally distributed error term. Suppose the sample deviation of ln(*wage*) equals 0.9907. The empirical results obtained are shown below:

$$\ln(wage) = 6.371 + 0.152 \times (Years\ of\ Schooling) + 0.097 \times (Work\ Experience) + \xi$$
$$(0.006)\quad (0.006)\qquad\qquad (0.03)$$

Values in the parentheses are the corresponding standard error. (30%)

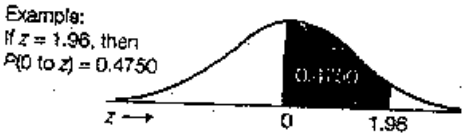
(1) Please complete the following ANOVA table and calculate the adjusted R^2 for this model. (10%)

Source	*SS*	*d.f.*	*MS*	*F*	*P-value*
SSR	806.7				0.00
SSE					
SST					

(2) How should the researcher conclude the importance of these two variables in the wage determination function from the econometric results? Please do all the necessary hypothesis tests in order to make your conclusion *precise*.(10%)

(3) Suppose the researcher suspects that the types of university might also play an essential role in determining a worker's earnings. Thus, he classifies all the samples into 3 categories, i.e., workers graduated from public university, private university and others (including 2- and 3-years college, etc.). How should he respecify the above model? If he also suspects that the workers' years of schooling and work experiences have the effects to the second order, how should he respecify the above model and obtain the corresponding marginal effects on workers' wage determination? (10%)

Areas under the Normal Curve



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990