國立雲林科技大學
100學年度碩士班暨碩士在職專班招生考試試題

系所：工管所、資管系
科目：統計學(1)

(一) 選擇題：單選題，每題 5%。

1. A company has two production lines for plastic bottles, A and B. Two percent of the bottles coming off of line A are defective and 8% of those off of line B are defective. Line A produces three times as many bottles as Line B. If a bottle is selected at random and found to be defective, what is the probability that it came from line A?
(A) 0.04 (B) 0.035 (C) 0.15 (D) 0.4286 (E) 0.625

2. The probability of stock A rising is 0.3 and of stock B is 0.4. If stocks A and B are not independent and the probability of both stocks rising is 0.09, what is the probability that neither stock rises?
(A) 0.61 (B) 0.12 (C) 0.39 (D) 0.91 (E) 0.03

3. A thoroughbred horse-racing facility has opened a drive-through wagering booth. Research has shown that the number of visitors to this booth will be Poisson-distributed an average arrival rate of 3 customers per hour. What is the probability that more than 2 customers will arrive at this booth in any half-hour period?
(A) 0.0011 (B) 0.0133 (C) 0.4150 (D) 0.5850 (E) 0.9018

4. A new medicine has an 85% success rate. Twenty patients are treated with it. What is the mean and the standard deviation (SD) of this distribution?
(A) Mean = 17, SD = 1.597 (B) Mean = 17, SD = 2.55 (C) Mean = 3, SD = 1.597
(D) Mean = 3, SD = 2.55 (E) None of the above

5. From a group of six men and four women, a committee of four is to be chosen. What is the probability that this committee consists of exactly two men and two women?
(A) 1/10 (B) 5/7 (C) 1/14 (D) 3/7 (E) None of the above

6. In order for the _____ distribution to be used correctly, the probability of success must remain constant from trial to trial; if this assumption cannot be met, then the use of the _____ distribution is more appropriate.
(A) Binomial; Poisson
(B) Binomial; Hypergeometric
(C) Hypergeometric; Binomial
(D) Hypergeometric; Exponential
(E) Poisson; Hypergeometric

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7. A calculator manufacturer performs a test on its calculators and finds their working life to be normally distributed, with a mean of 2,150 hours and a standard deviation of 450 hours. What should the manufacturer advertise as the life of the calculators so that 90% of the calculators are covered?
(A) 2,555 (B) 1,947 (C) 1,410 (D) 1,745 (E) 1,574

8. The waist measurement of students in a college is normally distributed. The standard deviation is known to be five inches. It is found that 15% of the students have waist sizes less than 28 inches. What proportion of students will have waists between 30 and 35 inches?
(A) 0.3795 (B) 0.2389 (C) 0.1406 (D) 0.0983 (E) None of the above

9. When the probability that an estimator is close to the parameter it estimates increases as the sample size, n, increases, that estimator is said to be:
(A) Unbiased (B) Biased (C) Efficient (D) Consistent (E) Sufficient

10. The "no-show" rate at a popular resort hotel is 8%. If a random sample of 100 reservations is taken, what is the probability that the number of "no shows" will exceed 10?
(A) 0.0049 (B) 0.1788 (C) 0.2296 (D) 0.7704 (E) 0.8665

(二) 計算題：Problems (50%)

1. (15%) Let $X_1, X_2, \ldots, X_n$ be a random sample from $b(1,p)$, i.e., n Bernolli trials. If $Y = \sum_{i=1}^{n} X_i$,
(a) Show that $\overline{X} = Y/n$ is an unbiased estimator of p.
(b) Find $E\left[\overline{X}(1-\overline{X})/n\right]$.
(c) Find the value c so that $c\overline{X}(1-\overline{X})$ is an unbiased estimator of $Var(\overline{X})$.

2. (15%) If Y_1/n and Y_2/n are the respective independent relative frequencies of successes associated with the two binomial distributions $b(n, p_1)$ and $b(n, p_2)$, compute n such that the approximate probability that the random interval $Y_1/n - Y_2/n \pm 0.05$ covers $p_1 - p_2$ is at least 0.80.

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3. (20%) Use a computer software to fit a simple linear regression model to the oxygen purity (y) and hydrocarbon level (x). The output is shown in the following Table 1. Find the values of (1)~(10) in the table.

Table 1 Minitab Output for the Oxygen Purity Data

Regression Analysis

The regression equation is

Purity = 74.3 + 14.9 HC Level

Predictor	Coef	SE Coef	T	P
Constant	(1)	1.593	46.62	0.000
HC Level	14.947	1.317	(2)	0.000

S = 1.087 R-Sq = (3) R-Sq (adj) = 87.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	(4)	152.13	(5)	0.000
Residual Error	(6)	21.25	(7)		
Total	19	(8)			

Predicted Values for New Observations

New Obs	Fit	SE Fit	95.0% CI	95.0% PI
1	89.231	0.354	(88.486, (9))	((10) , 91.632)

Values of Predictors for New Observations

New Obs	HC Level
1	1.00

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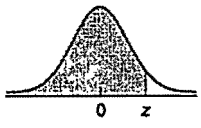
TABLE II (cont.)
Areas under the standard normal curve



	Second decimal place in z									
z	*0.00*	*0.01*	*0.02*	*0.03*	*0.04*	*0.05*	*0.06*	*0.07*	*0.08*	*0.09*
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

† For $z \geq 3.90$, the areas are 1.0000 to four decimal places.

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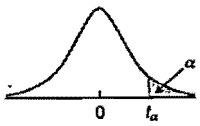
TABLE IV
Values of t_α



df	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	df
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
30	1.310	1.697	2.042	2.457	2.750	30
31	1.309	1.696	2.040	2.453	2.744	31
32	1.309	1.694	2.037	2.449	2.738	32
33	1.308	1.692	2.035	2.445	2.733	33
34	1.307	1.691	2.032	2.441	2.728	34
35	1.306	1.690	2.030	2.438	2.724	35
36	1.306	1.688	2.028	2.434	2.719	36
37	1.305	1.687	2.026	2.431	2.715	37
38	1.304	1.686	2.024	2.429	2.712	38
39	1.304	1.685	2.023	2.426	2.708	39
40	1.303	1.684	2.021	2.423	2.704	40
41	1.303	1.683	2.020	2.421	2.701	41
42	1.302	1.682	2.018	2.418	2.698	42
43	1.302	1.681	2.017	2.416	2.695	43
44	1.301	1.680	2.015	2.414	2.692	44
45	1.301	1.679	2.014	2.412	2.690	45
46	1.300	1.679	2.013	2.410	2.687	46
47	1.300	1.678	2.012	2.408	2.685	47
48	1.299	1.677	2.011	2.407	2.682	48
49	1.299	1.677	2.010	2.405	2.680	49

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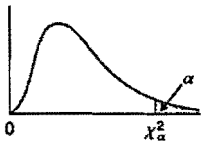
TABLE VII
Values of χ^2_α



df	$\chi^2_{0.995}$	$\chi^2_{0.99}$	$\chi^2_{0.975}$	$\chi^2_{0.95}$	$\chi^2_{0.90}$
1	0.000	0.000	0.001	0.004	0.016
2	0.010	0.020	0.051	0.103	0.211
3	0.072	0.115	0.216	0.352	0.584
4	0.207	0.297	0.484	0.711	1.064
5	0.412	0.554	0.831	1.145	1.610
6	0.676	0.872	1.237	1.635	2.204
7	0.989	1.239	1.690	2.167	2.833
8	1.344	1.646	2.180	2.733	3.490
9	1.735	2.088	2.700	3.325	4.168
10	2.156	2.558	3.247	3.940	4.865
11	2.603	3.053	3.816	4.575	5.578
12	3.074	3.571	4.404	5.226	6.304
13	3.565	4.107	5.009	5.892	7.042
14	4.075	4.660	5.629	6.571	7.790
15	4.601	5.229	6.262	7.261	8.547
16	5.142	5.812	6.908	7.962	9.312
17	5.697	6.408	7.564	8.672	10.085
18	6.265	7.015	8.231	9.390	10.865
19	6.844	7.633	8.907	10.117	11.651
20	7.434	8.260	9.591	10.851	12.443
21	8.034	8.897	10.283	11.591	13.240
22	8.643	9.542	10.982	12.338	14.041
23	9.260	10.196	11.689	13.091	14.848
24	9.886	10.856	12.401	13.848	15.659
25	10.520	11.524	13.120	14.611	16.473
26	11.160	12.198	13.844	15.379	17.292
27	11.808	12.879	14.573	16.151	18.114
28	12.461	13.565	15.308	16.928	18.939
29	13.121	14.256	16.047	17.708	19.768
30	13.787	14.953	16.791	18.493	20.599
40	20.707	22.164	24.433	26.509	29.051
50	27.991	29.707	32.357	34.764	37.689
60	35.534	37.485	40.482	43.188	46.459
70	43.275	45.442	48.758	51.739	55.329
80	51.172	53.540	57.153	60.391	64.278
90	59.196	61.754	65.647	69.126	73.291
100	67.328	70.065	74.222	77.930	82.358

TABLE VII (cont.)
Values of χ^2_α

$\chi^2_{0.10}$	$\chi^2_{0.05}$	$\chi^2_{0.025}$	$\chi^2_{0.01}$	$\chi^2_{0.005}$	df
2.706	3.841	5.024	6.635	7.879	*1*
4.605	5.991	7.378	9.210	10.597	*2*
6.251	7.815	9.348	11.345	12.838	*3*
7.779	9.488	11.143	13.277	14.860	*4*
9.236	11.070	12.833	15.086	16.750	*5*
10.645	12.592	14.449	16.812	18.548	*6*
12.017	14.067	16.013	18.475	20.278	*7*
13.362	15.507	17.535	20.090	21.955	*8*
14.684	16.919	19.023	21.666	23.589	*9*
15.987	18.307	20.483	23.209	25.188	*10*
17.275	19.675	21.920	24.725	26.757	*11*
18.549	21.026	23.337	26.217	28.300	*12*
19.812	22.362	24.736	27.688	29.819	*13*
21.064	23.685	26.119	29.141	31.319	*14*
22.307	24.996	27.488	30.578	32.801	*15*
23.542	26.296	28.845	32.000	34.267	*16*
24.769	27.587	30.191	33.409	35.718	*17*
25.989	28.869	31.526	34.805	37.156	*18*
27.204	30.143	32.852	36.191	38.582	*19*
28.412	31.410	34.170	37.566	39.997	*20*
29.615	32.671	35.479	38.932	41.401	*21*
30.813	33.924	36.781	40.290	42.796	*22*
32.007	35.172	38.076	41.638	44.181	*23*
33.196	36.415	39.364	42.980	45.559	*24*
34.382	37.653	40.647	44.314	46.928	*25*
35.563	38.885	41.923	45.642	48.290	*26*
36.741	40.113	43.195	46.963	49.645	*27*
37.916	41.337	44.461	48.278	50.994	*28*
39.087	42.557	45.722	49.588	52.336	*29*
40.256	43.773	46.979	50.892	53.672	*30*
51.805	55.759	59.342	63.691	66.767	*40*
63.167	67.505	71.420	76.154	79.490	*50*
74.397	79.082	83.298	88.381	91.955	*60*
85.527	90.531	95.023	100.424	104.213	*70*
96.578	101.879	106.628	112.328	116.320	*80*
107.565	113.145	118.135	124.115	128.296	*90*
118.499	124.343	129.563	135.811	140.177	*100*

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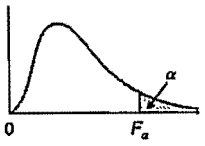
TABLE VIII
Values of F_α



dfd	α	dfn 1	2	3	4	5	6	7	8	9
	0.10	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
	0.05	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
1	0.025	647.79	799.50	864.16	899.58	921.85	937.11	948.22	956.66	963.28
	0.01	4052.2	4999.5	5403.4	5624.6	5763.6	5859.0	5928.4	5981.1	6022.5
	0.005	16211	20000	21615	22500	23056	23437	23715	23925	24091
	0.10	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
	0.05	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
2	0.025	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39
	0.01	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
	0.005	198.50	199.00	199.17	199.25	199.30	199.33	199.36	199.37	199.39
	0.10	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
	0.05	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
3	0.025	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47
	0.01	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
	0.005	55.55	49.80	47.47	46.19	45.39	44.84	44.43	44.13	43.88
	0.10	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
	0.05	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
4	0.025	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90
	0.01	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
	0.005	31.33	26.28	24.26	23.15	22.46	21.97	21.62	21.35	21.14
	0.10	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
	0.05	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
5	0.025	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68
	0.01	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
	0.005	22.78	18.31	16.53	15.56	14.94	14.51	14.20	13.96	13.77
	0.10	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
	0.05	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
6	0.025	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52
	0.01	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
	0.005	18.63	14.54	12.92	12.03	11.46	11.07	10.79	10.57	10.39
	0.10	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
	0.05	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
7	0.025	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82
	0.01	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
	0.005	16.24	12.40	10.88	10.05	9.52	9.16	8.89	8.68	8.51
	0.10	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
	0.05	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
8	0.025	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36
	0.01	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
	0.005	14.69	11.04	9.60	8.81	8.30	7.95	7.69	7.50	7.34

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(一) 選擇題：單選題，每題 5%。

1. A company has two production lines for plastic bottles, A and B. Two percent of the bottles coming off of line A are defective and 8% of those off of line B are defective. Line A produces three times as many bottles as Line B. If a bottle is selected at random and found to be defective, what is the probability that it came from line A?
(A) 0.04 (B) 0.035 (C) 0.15 (D) 0.4286 (E) 0.625

2. The probability of stock A rising is 0.3 and of stock B is 0.4. If stocks A and B are not independent and the probability of both stocks rising is 0.09, what is the probability that neither stock rises?
(A) 0.61 (B) 0.12 (C) 0.39 (D) 0.91 (E) 0.03

3. A thoroughbred horse-racing facility has opened a drive-through wagering booth. Research has shown that the number of visitors to this booth will be Poisson-distributed an average arrival rate of 3 customers per hour. What is the probability that more than 2 customers will arrive at this booth in any half-hour period?
(A) 0.0011 (B) 0.0133 (C) 0.4150 (D) 0.5850 (E) 0.9018

4. A new medicine has an 85% success rate. Twenty patients are treated with it. What is the mean and the standard deviation (SD) of this distribution?
(A) Mean = 17, SD = 1.597 (B) Mean = 17, SD = 2.55 (C) Mean = 3, SD = 1.597
(D) Mean = 3, SD = 2.55 (E) None of the above

5. From a group of six men and four women, a committee of four is to be chosen. What is the probability that this committee consists of exactly two men and two women?
(A) 1/10 (B) 5/7 (C) 1/14 (D) 3/7 (E) None of the above

6. In order for the _____ distribution to be used correctly, the probability of success must remain constant from trial to trial; if this assumption cannot be met, then the use of the _____ distribution is more appropriate.
(A) Binomial; Poisson
(B) Binomial; Hypergeometric
(C) Hypergeometric; Binomial
(D) Hypergeometric; Exponential
(E) Poisson; Hypergeometric

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7. A calculator manufacturer performs a test on its calculators and finds their working life to be normally distributed, with a mean of 2,150 hours and a standard deviation of 450 hours. What should the manufacturer advertise as the life of the calculators so that 90% of the calculators are covered?
(A) 2,555 (B) 1,947 (C) 1,410 (D) 1,745 (E) 1,574

8. The waist measurement of students in a college is normally distributed. The standard deviation is known to be five inches. It is found that 15% of the students have waist sizes less than 28 inches. What proportion of students will have waists between 30 and 35 inches?
(A) 0.3795 (B) 0.2389 (C) 0.1406 (D) 0.0983 (E) None of the above

9. When the probability that an estimator is close to the parameter it estimates increases as the sample size, n, increases, that estimator is said to be:
(A) Unbiased (B) Biased (C) Efficient (D) Consistent (E) Sufficient

10. The "no-show" rate at a popular resort hotel is 8%. If a random sample of 100 reservations is taken, what is the probability that the number of "no shows" will exceed 10?
(A) 0.0049 (B) 0.1788 (C) 0.2296 (D) 0.7704 (E) 0.8665

(二) 計算題：Problems (50%)

1. (15%) Let $X_1, X_2, \ldots, X_n$ be a random sample from $b(1,p)$, i.e., n Bernolli trials. If $Y = \sum_{i=1}^{n} X_i$,
(a) Show that $\overline{X} = Y/n$ is an unbiased estimator of p.
(b) Find $E\left[\overline{X}(1-\overline{X})/n\right]$.
(c) Find the value c so that $c\overline{X}(1-\overline{X})$ is an unbiased estimator of $Var(\overline{X})$.

2. (15%) If Y_1/n and Y_2/n are the respective independent relative frequencies of successes associated with the two binomial distributions $b(n, p_1)$ and $b(n, p_2)$, compute n such that the approximate probability that the random interval $Y_1/n - Y_2/n \pm 0.05$ covers $p_1 - p_2$ is at least 0.80.

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3. (20%) Use a computer software to fit a simple linear regression model to the oxygen purity (y) and hydrocarbon level (x). The output is shown in the following Table 1. Find the values of (1)~(10) in the table.

Table 1 Minitab Output for the Oxygen Purity Data

Regression Analysis

The regression equation is

Purity = 74.3 + 14.9 HC Level

Predictor	Coef	SE Coef	T	P
Constant	(1)	1.593	46.62	0.000
HC Level	14.947	1.317	(2)	0.000

S = 1.087 R-Sq = (3) R-Sq (adj) = 87.1%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	(4)	152.13	(5)	0.000
Residual Error	(6)	21.25	(7)		
Total	19	(8)			

Predicted Values for New Observations

New Obs	Fit	SE Fit	95.0% CI	95.0% PI
1	89.231	0.354	(88.486, (9))	((10) , 91.632)

Values of Predictors for New Observations

New Obs	HC Level
1	1.00

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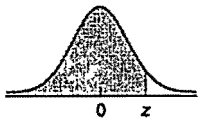
TABLE II (cont.)
Areas under the standard normal curve



	Second decimal place in z									
z	*0.00*	*0.01*	*0.02*	*0.03*	*0.04*	*0.05*	*0.06*	*0.07*	*0.08*	*0.09*
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

† For $z \geq 3.90$, the areas are 1.0000 to four decimal places.

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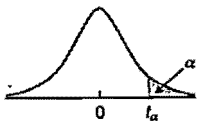
TABLE IV
Values of t_α



df	$t_{0.10}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$	df
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
30	1.310	1.697	2.042	2.457	2.750	30
31	1.309	1.696	2.040	2.453	2.744	31
32	1.309	1.694	2.037	2.449	2.738	32
33	1.308	1.692	2.035	2.445	2.733	33
34	1.307	1.691	2.032	2.441	2.728	34
35	1.306	1.690	2.030	2.438	2.724	35
36	1.306	1.688	2.028	2.434	2.719	36
37	1.305	1.687	2.026	2.431	2.715	37
38	1.304	1.686	2.024	2.429	2.712	38
39	1.304	1.685	2.023	2.426	2.708	39
40	1.303	1.684	2.021	2.423	2.704	40
41	1.303	1.683	2.020	2.421	2.701	41
42	1.302	1.682	2.018	2.418	2.698	42
43	1.302	1.681	2.017	2.416	2.695	43
44	1.301	1.680	2.015	2.414	2.692	44
45	1.301	1.679	2.014	2.412	2.690	45
46	1.300	1.679	2.013	2.410	2.687	46
47	1.300	1.678	2.012	2.408	2.685	47
48	1.299	1.677	2.011	2.407	2.682	48
49	1.299	1.677	2.010	2.405	2.680	49

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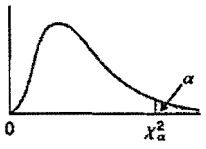
TABLE VII
Values of χ^2_α



df	$\chi^2_{0.995}$	$\chi^2_{0.99}$	$\chi^2_{0.975}$	$\chi^2_{0.95}$	$\chi^2_{0.90}$
1	0.000	0.000	0.001	0.004	0.016
2	0.010	0.020	0.051	0.103	0.211
3	0.072	0.115	0.216	0.352	0.584
4	0.207	0.297	0.484	0.711	1.064
5	0.412	0.554	0.831	1.145	1.610
6	0.676	0.872	1.237	1.635	2.204
7	0.989	1.239	1.690	2.167	2.833
8	1.344	1.646	2.180	2.733	3.490
9	1.735	2.088	2.700	3.325	4.168
10	2.156	2.558	3.247	3.940	4.865
11	2.603	3.053	3.816	4.575	5.578
12	3.074	3.571	4.404	5.226	6.304
13	3.565	4.107	5.009	5.892	7.042
14	4.075	4.660	5.629	6.571	7.790
15	4.601	5.229	6.262	7.261	8.547
16	5.142	5.812	6.908	7.962	9.312
17	5.697	6.408	7.564	8.672	10.085
18	6.265	7.015	8.231	9.390	10.865
19	6.844	7.633	8.907	10.117	11.651
20	7.434	8.260	9.591	10.851	12.443
21	8.034	8.897	10.283	11.591	13.240
22	8.643	9.542	10.982	12.338	14.041
23	9.260	10.196	11.689	13.091	14.848
24	9.886	10.856	12.401	13.848	15.659
25	10.520	11.524	13.120	14.611	16.473
26	11.160	12.198	13.844	15.379	17.292
27	11.808	12.879	14.573	16.151	18.114
28	12.461	13.565	15.308	16.928	18.939
29	13.121	14.256	16.047	17.708	19.768
30	13.787	14.953	16.791	18.493	20.599
40	20.707	22.164	24.433	26.509	29.051
50	27.991	29.707	32.357	34.764	37.689
60	35.534	37.485	40.482	43.188	46.459
70	43.275	45.442	48.758	51.739	55.329
80	51.172	53.540	57.153	60.391	64.278
90	59.196	61.754	65.647	69.126	73.291
100	67.328	70.065	74.222	77.930	82.358

TABLE VII (cont.)
Values of χ^2_α

$\chi^2_{0.10}$	$\chi^2_{0.05}$	$\chi^2_{0.025}$	$\chi^2_{0.01}$	$\chi^2_{0.005}$	df
2.706	3.841	5.024	6.635	7.879	*1*
4.605	5.991	7.378	9.210	10.597	*2*
6.251	7.815	9.348	11.345	12.838	*3*
7.779	9.488	11.143	13.277	14.860	*4*
9.236	11.070	12.833	15.086	16.750	*5*
10.645	12.592	14.449	16.812	18.548	*6*
12.017	14.067	16.013	18.475	20.278	*7*
13.362	15.507	17.535	20.090	21.955	*8*
14.684	16.919	19.023	21.666	23.589	*9*
15.987	18.307	20.483	23.209	25.188	*10*
17.275	19.675	21.920	24.725	26.757	*11*
18.549	21.026	23.337	26.217	28.300	*12*
19.812	22.362	24.736	27.688	29.819	*13*
21.064	23.685	26.119	29.141	31.319	*14*
22.307	24.996	27.488	30.578	32.801	*15*
23.542	26.296	28.845	32.000	34.267	*16*
24.769	27.587	30.191	33.409	35.718	*17*
25.989	28.869	31.526	34.805	37.156	*18*
27.204	30.143	32.852	36.191	38.582	*19*
28.412	31.410	34.170	37.566	39.997	*20*
29.615	32.671	35.479	38.932	41.401	*21*
30.813	33.924	36.781	40.290	42.796	*22*
32.007	35.172	38.076	41.638	44.181	*23*
33.196	36.415	39.364	42.980	45.559	*24*
34.382	37.653	40.647	44.314	46.928	*25*
35.563	38.885	41.923	45.642	48.290	*26*
36.741	40.113	43.195	46.963	49.645	*27*
37.916	41.337	44.461	48.278	50.994	*28*
39.087	42.557	45.722	49.588	52.336	*29*
40.256	43.773	46.979	50.892	53.672	*30*
51.805	55.759	59.342	63.691	66.767	*40*
63.167	67.505	71.420	76.154	79.490	*50*
74.397	79.082	83.298	88.381	91.955	*60*
85.527	90.531	95.023	100.424	104.213	*70*
96.578	101.879	106.628	112.328	116.320	*80*
107.565	113.145	118.135	124.115	128.296	*90*
118.499	124.343	129.563	135.811	140.177	*100*

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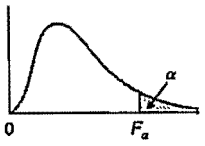
系所：工管所、資管系

科目：統計學(1)

TABLE VIII
Values of F_α



dfd	α	dfn 1	2	3	4	5	6	7	8	9
	0.10	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
	0.05	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54
1	0.025	647.79	799.50	864.16	899.58	921.85	937.11	948.22	956.66	963.28
	0.01	4052.2	4999.5	5403.4	5624.6	5763.6	5859.0	5928.4	5981.1	6022.5
	0.005	16211	20000	21615	22500	23056	23437	23715	23925	24091
	0.10	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
	0.05	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
2	0.025	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39
	0.01	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
	0.005	198.50	199.00	199.17	199.25	199.30	199.33	199.36	199.37	199.39
	0.10	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
	0.05	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
3	0.025	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47
	0.01	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
	0.005	55.55	49.80	47.47	46.19	45.39	44.84	44.43	44.13	43.88
	0.10	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
	0.05	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
4	0.025	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90
	0.01	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
	0.005	31.33	26.28	24.26	23.15	22.46	21.97	21.62	21.35	21.14
	0.10	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
	0.05	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
5	0.025	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68
	0.01	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
	0.005	22.78	18.31	16.53	15.56	14.94	14.51	14.20	13.96	13.77
	0.10	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
	0.05	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
6	0.025	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52
	0.01	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
	0.005	18.63	14.54	12.92	12.03	11.46	11.07	10.79	10.57	10.39
	0.10	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
	0.05	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
7	0.025	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82
	0.01	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
	0.005	16.24	12.40	10.88	10.05	9.52	9.16	8.89	8.68	8.51
	0.10	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
	0.05	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
8	0.025	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36
	0.01	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
	0.005	14.69	11.04	9.60	8.81	8.30	7.95	7.69	7.50	7.34

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科目: 經濟學(1)

本份試卷第一部分爲 20 題單選題，每題 3 分，請依題目順序將答案寫在答案卷上

1. Which of the following will cause an increase in the money multiplier
   (A) a reduction in high powered money
   (B) a decrease in the ratio of reserve to checkable deposits
   (C) an increase in high powered money
   (D) an increase in the public's preference for checking deposits as opposed to holding currency

2. Which of the following events will most likely cause an increase in money supply?
   (A) a decrease in the ratio of reserves to deposits
   (B) a central bank sale of bonds
   (C) a shift in public preferences away from checkable deposits to currency
   (D) all of the above

3. Which of the following events will cause the interest rate to increase?
   (A) an increase in income
   (B) an open market sale of bonds by the central bank
   (C) an increase in the ratio of reserves to deposits
   (D) all of the above

4. Suppose there is an increase in consumer confidence. Which of the following represents the complete list of variables that *must* increase in response to this increase in consumer confidence?
   (A) consumption and output
   (B) consumption, investment and output
   (C) consumption, output and the interest rate
   (D) consumption and investment

5. The natural level of employment will decrease when which of the following occurs?
   (A) a reduction in unemployment benefits
   (B) a reduction in the actual unemployment rate
   (C) a reduction in the markup of prices over costs
   (D) none of the above

6. For this question, assume that the economy is initially operating at the natural level of output. An increase in minimum wage will cause:
   (A) a reduction in the real wage in the medium run
   (B) ambiguous effects on the real wage in the medium run
   (C) no change in the real wage in the medium run

(D) an increase in the real wage in the medium run

7. As the proportion of labor contracts that index wages to prices declines, we would expect that:
   (A) nominal wages will become more sensitive to changes in unemployment
   (B) a reduction in the unemployment rate will now have a smaller effect on inflation
   (C) the natural rate of unemployment will decrease
   (D) the natural rate of unemployment will increase

8. Suppose individuals expect that interest rates will fall in the future. Also assume that the central bank wants to prevent any change in current output. Given this goal of the central bank, the central bank should implement a policy in the current period that:
   (A) shifts the IS curve leftward
   (B) shifts the LM curve upward
   (C) shifts the IS curve leftward and the LM curve upward
   (D) shifts the IS curve rightward

9. Suppose there is a fiscal expansion in the current period. This fiscal expansion will tend to cause a smaller increase in current output when:
   (A) an increase in the current interest rate causes expectations of expansionary monetary policy in the future.
   (B) an increase in the current interest rate causes an increase in expected future interest rates.
   (C) an increase in current output causes an increase in expected future output.
   (D) both A and B

10. If neither investment nor consumption depends on the interest rate, then the IS curve is _____ and _____ policy has no effect on output.
   (A) vertical; monetary
   (B) horizontal; monetary
   (C) vertical; fiscal
   (D) horizontal; fiscal

11. You are a fan of both Jolin and A-Mei. The two superstars will hold concerts at different places on the same day. You are willing to pay 3,000 for a ticket to Jolin's concert at most. The ticket to Jolin's concert is now sold for 2,000. One of your friends gives you a free ticket to A-Mei's concert. You can only go to one concert at the same time. Assume there are no other implicit or explicit costs of going to either concert. What is the opportunity cost of going to A-mei's concert?
   (A) 3,000 (B) 2,000 (C) 1,000 (D) 0

12. Which of the following is NOT a public good?
(A) A common park
(B) A lighthouse
(C) The national defense system
(D) The fireworks displayed on the top of Taipei 101 building.

13. The nature of Economic Cooperation Framework Agreement (ECFA) signed by Taiwan's Government and Mainland China is
(A) A free trade agreement
(B) A memorandum of understanding (MOU) of financial industry
(C) A peace agreement
(D) An agreement to facilitate capital and financial investment between Mainland China and Taiwan

14. Which of the following is NOT a source of market failure?
(A) Monopoly power
(B) Information asymmetry between buyer and seller
(C) Over-competition
(D) Externality

15. Which of the following is NOT a characteristic of competitive market equilibrium?
(A) Sellers are producers with the lowest production cost
(B) Buyers are consumers with the highest willingness to pay
(C) There are no other ways to make everyone better.
(D) Everyone will agree with the efficient and fairness of the equilibrium.

16. Suppose Taiwan's government adopt luxury tax on items such as expensive cars and private air planes. Which of the following statement is NOT true?
(A) The trading volume of luxury goods will decrease
(B) The price of luxury goods will increase
(C) The more elastic the demand of luxury good, the higher are the tax revenues.
(D) The more elastic the demand of luxury good, the heavier is the tax burden on the seller.

17. Who are the Nobel Prize winners in Economic Science in the year of 2010?
(A) Leonid Hurwicz , Eric S. Maskin , and Roger B. Myerson, for having laid the foundations of mechanism design theory
(B) Oliver E. Williamson, for his analysis of economic governance, especially the boundaries of

the firm

(C) Paul Krugman, for his analysis of trade patterns and location of economic activity

(D) Peter A. Diamond , Dale T. Mortensen, and Christopher A. Pissarides, for their analysis of markets with search frictions

18. The minimum wage in Taiwan had been increased from \$95 to \$98 dollar per hour in 2010. Which of the following is NOT true after the increase of minimum wage?

(A) The cost of production will increase and employers may layoff some workers and result in unemployment.

(B) This policy will not be helpful for those who earn more than \$100 dollar per hour

(C) The side effect of unemployment will be more severe when the labor demand is inelastic

(D) Most of the imported labor form the Philippines will also benefit from this policy.

19. Which of the following is a measure of income inequality?

(A) The Herfindahl index

(B) The Gini index

(C) The poverty line

(D) The Philip curve

20. Which of the following is a potential benefit of a monopolistic competition market form the point of view of social welfare?

(A) In the long-run equilibrium, firms earn zero profit and there is no deadweight lost

(B) Sellers provide a variety of goods

(C) In the short run, sellers set price equal to the marginal cost

(D) Sellers are not likely to practice price discrimination

本份試卷第二部分爲 3 大題計算題，每小題 4 分，未提供計算過程或說明者不計分。

1. (20 分) Consider the following IS-LM model with prices fixed at P=1 (assuming that we are in the short run):

$$\frac{M^d}{P} = Y - r$$

$$C = 1 + 0.5 \times Y$$

$$I = 1 - 0.5 \times r$$

$$G = \overline{G}$$

$$Y = C + I + G$$

$$\frac{M^s}{P} = \frac{\overline{M}}{P}$$

$$\frac{M^d}{P} \le \frac{M^s}{P}, \quad \text{with } \frac{M^d}{P} = \frac{M^s}{P} \text{ if } r > 0$$

$$r = i - \pi^e$$

$$\pi^e = 0$$

where M^d, M^s denotes money demand and money supply, respectively. $P, Y, r, C, I, G, i, \pi^e$ denote the price level, output, real interest rate, consumption, investment, government spending, nominal interest rate and inflation expectation, respectively.

(a) Derive the IS curve.

(b) Write down the LM curve.

(c) What is the equilibrium interest rate in the economy?

(d) What is the equilibrium output level in the economy?

(e) Suppose that the economy described above is going through a recession and the government is trying to stimulate the economy. When will monetary policy be effective in stimulating the economy?

2. (12 分) Consider the following game: A and B are roommates. They are considering whether to get a flu vaccine. If neither of them gets the vaccine, the probability of getting a flu (denote by p) is 0.5 for both of A and B. When only one of them get the vaccine, p=0.1 for the one who get the vaccine and p=0.2 for the one without the vaccination. If both of them get the vaccine, p=0.05 for A and B. Suppose the cost of getting a vaccination (denote by C) is 0.2. The payoff is calculated as (-p-C) for A and B.

(a) Do players in this game have dominating strategy? (please describe the strategy if your answer is yes)

(b) Is there any Nash Equilibrium in this game? (please find out all Nash Equilibriums if your answer is yes)

(c) Suppose Government import a safer and cheaper vaccine and therefore C decreases to 0.1, please find out all Nash Equilibriums if there are any.

3. (8 分) Mr. Wang hires some workers to provide car wash service. The price of car wash is 100, which is determined by the competitive market. The relationship between the number of worker hired and the number of car washed is shown below:

# Worker	1	2	3	4	5	6	7	8	9	10
# Car	2	16	30	43	52	59	66	71	73	74

(a) Suppose the wage is set at 1,100 by the labor market, how many workers will Mr. Wang hire?

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科目：微積分(2)

選擇題共20題，每題5分

1. A rectangle has perimeter 18 m. Express the area of the rectangle as a function $A(l)$ of the length l of one of its sides.

(a) $A(l)=18l+l^2$
(b) $A(l)=18l-l^2$
(c) $A(l)=9l+l^2$
(d) $A(l)=9l-l^2$

2. Find a number δ such that $\left|\sqrt{4x+1}-3\right|<0.4$ where $|x-2|<\delta$. Please give the answer correct to two decimal places, rounding **down** if necessary.

(a) 0.56
(b) 0.71
(c) 0.64
(d) 0.79

3. Determine the values of x for which the linear approximation $\frac{1}{(1+3x)^3}\approx 1-9x$ is accurate to within 0.15.

(a) $-0.65<x<0.66$
(b) $-1.03<x<0.24$
(c) $-0.57<x<0.68$
(d) $-0.04<x<0.06$

4. Two cars start moving from the same point. One travels south at 28 mi/h and the other travels west at 50 mi/h. At what rate is the distance between the cars increasing 4 hours later? Round the result to the nearest hundredth.

(a) 57.31 mi/h
(b) 55.31 mi/h
(c) 58.32 mi/h
(d) 57.34 mi/h

5. Use implicit differentiation to find an equation of the tangent line to the curve $y^2=x^3(10-x^2)$ at the point (1, 3).

(a) $y=3.33x$
(b) $y=4.33x-1.33$
(c) $y=5.33x-2.33$
(d) $y=6.33x-3.33$

6. Use Newton's method to approximate the root of $x^4 + x - 3 = 0$ in the interval [1, 2], correct to six decimal places. Use $x_1 = 1.5$ as the initial approximation.

(a) $x = 1.164036$
(b) $x = 1.164032$
(c) $x = 1.164033$
(d) $x = 1.164035$

7. For the given cost and demand functions, find the production level that will maximize profit.

$$C(x) = 680 + 11x + 0.04x^2, \quad p(x) = 16 - \frac{x}{100}$$

(a) $x = 66$
(b) $x = 50$
(c) $x = 42$
(d) $x = 54$

8. Find the value of the limit $\lim_{x\to\infty} \frac{x^7}{7^x}$.

(a) 7
(b) ∞
(c) 0
(d) 1

9. If $h(x) = x + \sqrt{x}$, find $h^{-1}(12)$.

(a) 9
(b) 8
(c) 6
(d) 11

10. For a function $y = \sin(2 \cdot \ln x)$, find the equation of the tangent line to the curve at the given point (1, 0).

(a) $y = -x + 1$
(b) $y = x - 1$
(c) $y = 2x - 2$
(d) $y = x$

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科目：微積分(2)

11. A particle move along a line. Its velocity (m/sec.) at time t is $v(t) = t^2 - t - 6$. Find the distance (m) traveled during the time period $1 \leq t \leq 4$

(a) 9/2
(b) -9/2
(c) 61/6
(d) -61/6

12. Find the area enclosed by the line $y = x - 1$ and the parabola $y^2 = 2x + 6$

(a) 16
(b) 18
(c) 20
(d) None of the above

13. Evaluate the integral $\int_1^2 \frac{\ln x}{x^2} dx$

(a) 0.5 - 0.5 ln2
(b) 0.5 ln2 - 0.5
(c) 0.5 + 0.5 ln2
(d) - 0.5 ln2 - 0.5

14. Find $\int \frac{1}{x^2-9} dx$

(a) $6 \ln\left|\frac{x-3}{x+3}\right| + C$

(b) $\frac{1}{6} \ln\left|\frac{x-3}{x+3}\right| + C$

(c) $6 \ln\left|\frac{x+3}{x-3}\right| + C$

(d) $\frac{1}{6} \ln\left|\frac{x+3}{x-3}\right| + C$

15. Evaluate $\int_1^\infty \frac{1}{(3x+1)^2} dx$

(a) 1/16
(b) -1/16
(c) 1/12
(d) -1/12

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16.Solve the equation $y' = x^2y$

(a) $y = Ae^{3x^3}$

(b) $y = Ae^{3x}$

(c) $y = Ae^{x/3}$

(d) $y = Ae^{x^3/3}$

17.Solve the differential equation $y' = x + 5y$

(a) $y = -\frac{1}{5}x - \frac{1}{25} + Ce^{5x}$

(b) $y = \frac{1}{5}x - \frac{1}{25} + Ce^{5x}$

(c) $y = \frac{1}{5}x - \frac{1}{25} + Ce^{-5x}$

(d) $y = -\frac{1}{5}x - \frac{1}{25} + Ce^{-5x}$

18.$f(x,y) = xe^{-x^2-y^2}$, find partial derivative $f_x(x, y)$

(a) $2xye^{-x^2-y^2}$

(b) $-2xye^{-x^2-y^2}$

(c) $e^{-x^2-y^2}(2x^2-1)$

(d) $e^{-x^2-y^2}(1-2x^2)$

19.$z = x^2 + xy + y^2$, $x = s + t$, $y = st$, use the Chain Rule to find $\frac{\partial z}{\partial s}$

(a) $x+2y+xs+2ys$

(b) $2x+y+xs+2ys$

(c) $x+2y+xt+2yt$

(d) $2x+y+xt+2yt$

20.Find the directional derivative of $f(x, y, z) = x^2 + y^2 + z^2$ at the point $P = (2,1,3)$ in the direction of the vector $u = [-2, -1, -3]$

(a) $-\sqrt{14}$

(b) $-2\sqrt{14}$

(c) $-3\sqrt{14}$

(d) $-4\sqrt{14}$