

科目：統計學

系所組：統計資訊學系應用統計碩士班

1. (20%)

- (1) 投擲一個公正骰子 2 次，試求點數和大於 10 的機率為何？
 (2) 投擲一個公正骰子 10 次，令 X 及 Y 分別代表”點 1”及”點 6”的次數，求 $P(X=2 \text{ 或 } Y=5)$ 。
 (3) 投擲一個骰子 300 次，各點數出現的次數如下表所示

點數	1	2	3	4	5	6
次數	35	60	52	65	55	33

在顯著水準 $\alpha=0.05$ 下，試檢定該骰子是否為一個公正骰子？

2. (15%) 學校餐廳販賣的蘋果重量分布呈現常態分配，平均重量是 μ 公克，標準差為 5，隨機抽出 12 顆蘋果，測量其重量。

- (1) 假設 $\mu=50$ ，試問總重量超過 620 公克的機率為何？
 (2) 如果測量總重量為 620 公克，試檢定平均重量 μ 是否大於 50？($\alpha=0.05$)

3. (25%) 已知 $\sum_{i=1}^{12} x_i = 408$, $\sum_{i=1}^{12} x_i^2 = 18447$, $\sum_{i=1}^{12} y_i = 828$, $\sum_{i=1}^{12} y_i^2 = 71061$, $\sum_{i=1}^{12} x_i y_i = 31237$

- (1) 假設迴歸模型為 $Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$ ，試求最小平方迴歸線。
 (2) 承題(1)，試求此模型的判定係數並解釋其意義。
 (3) 假設迴歸模型為 $Y_i = \beta_2 x_i + \varepsilon_i$ ，試求最小平方迴歸線。

4. (20%) 變異數分析表如下

變異來源	平方和	自由度	均方	F 值
處理(treatment)	700	(B)	(C)	(E)
誤差(error)	(A)	9	(D)	
總和	970	11		

- (1) 試寫出表中 A, B, C, D, E 數字。
 (2) 試檢定因子 (factor) 是否顯著？($\alpha=0.05$)

5. (20%) 假設隨機變數 X 與 Y 的聯合機率密度函數為

$$f(x,y) = \begin{cases} 3x & 0 \leq y \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

- (1) 試問 X 與 Y 是否獨立？
 (2) 試求 $P(X \leq 3/4 | Y = 1/2)$ ？

※注意：1. 考生須在「彌封答案卷」上作答。

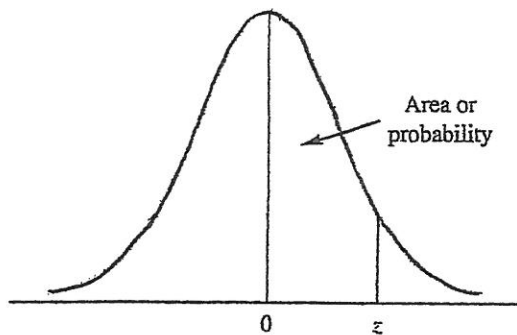
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Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean and z is .3944.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4986	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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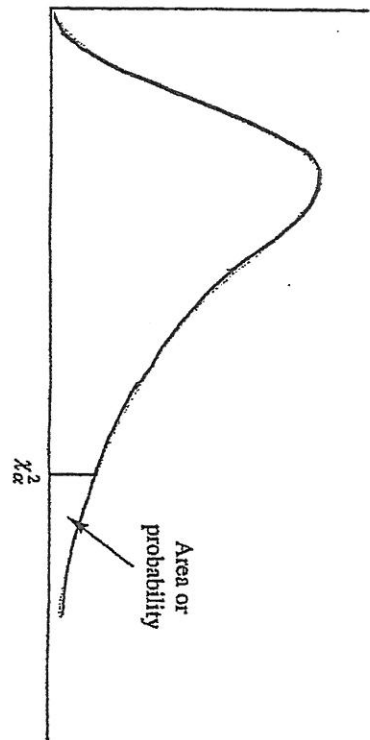
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CHI-SQUARE DISTRIBUTION



Entries in the table give χ^2_α values, where α is the area or probability in the upper tail of the chi-square distribution. For example, with 10 degrees of freedom and a .01 area in the upper tail, $\chi^2_{.01} = 23.2093$.

Degrees of Freedom	Area in Upper Tail									
	.995	.99	.975	.95	.90	.10	.05	.025	.01	.005
1	392.704 × 10 ⁻¹⁰	157.088 × 10 ⁻⁹	982.069 × 10 ⁻⁹	393.214 × 10 ⁻⁸	.0157908	2.70554	3.84146	5.02389	6.63490	7.87944
2	.0100251	.0201007	.0506356	.102587	.210720	4.60517	5.99147	7.37776	9.21034	10.5966
3	.0717212	.114832	.215795	.351846	.584375	6.25139	7.81473	9.34840	11.3449	12.8381
4	.206990	.297110	.484419	.710721	1.063623	7.77944	9.48773	11.1433	13.2767	14.8602
5	.411740	.554300	.831211	1.145476	1.61031	9.23635	11.0705	12.8325	15.0863	16.7496
6	.675727	.872085	1.237347	1.63539	2.20413	10.6446	12.5916	14.4494	16.8119	18.5476
7	.989265	1.239043	1.68987	2.16735	2.83311	12.0170	14.0671	16.0128	18.4753	20.2777
8	1.344419	1.646482	2.17973	2.73264	3.48954	13.3616	15.5073	17.5346	20.0902	21.9550
9	1.734926	2.087912	2.70039	3.32511	4.16816	14.6837	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55821	3.24697	3.94030	4.86518	15.9871	18.3070	20.4831	23.2093	25.1882
11	2.60321	3.05347	3.81575	4.57481	5.57779	17.2750	19.6751	21.9200	24.7250	26.7569
12	3.07382	3.57056	4.40379	5.22603	6.30380	18.5494	21.0261	23.3367	26.2170	28.2995
13	3.56503	4.10691	5.00874	5.89186	7.04150	19.8119	22.3621	24.7356	27.6883	29.8194
14	4.07468	4.66043	5.62872	6.57063	7.78953	21.0642	23.6848	26.1190	29.1413	31.3193
15	4.60094	5.22935	6.26214	7.26094	8.54675	22.3072	24.9958	27.4884	30.5779	32.8013
16	5.14224	5.81221	6.90766	7.96164	9.31223	23.5418	26.2962	28.8454	31.9999	34.2672
17	5.69724	6.40776	7.56418	8.67176	10.0852	24.7690	27.5871	30.1910	33.4087	35.7185
18	6.26481	7.01491	8.23075	9.39046	10.8649	25.9894	28.8693	31.5264	34.8053	37.1564
19	6.84398	7.63773	8.90655	10.1170	11.6509	27.2036	30.1435	32.8523	36.1908	38.5822

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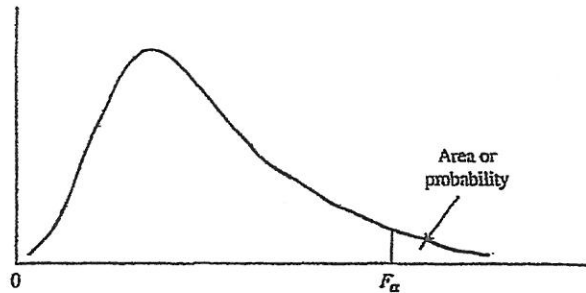
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F DISTRIBUTION



Entries in the table give F_{α} values, where α is the area or probability in the upper tail of the F distribution. For example, with 12 numerator degrees of freedom, 15 denominator degrees of freedom, and a .05 area in the upper tail, $F_{.05} = 2.48$.

Table of F_{α} Values

Denominator Degrees of Freedom	Numerator Degrees of Freedom																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

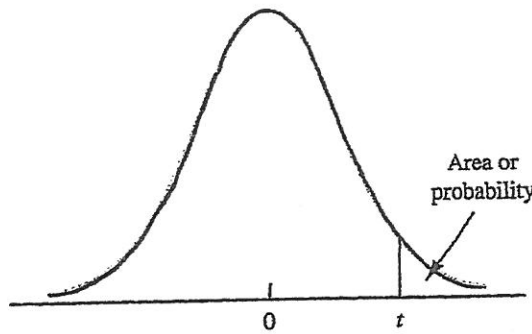
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t DISTRIBUTION



Entries in the table give t values for an area or probability in the upper tail of the t distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

Degrees of Freedom	Area in Upper Tail				
	.10	.05	.025	.01	.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
∞	1.282	1.645	1.960	2.326	2.576

This table is reprinted by permission of Oxford University Press on behalf of The Biometrika Trustees from Table 12, Percentage Points of the t -Distribution, by E. S. Pearson and H. O. Hartley, *Biometrika Tables for Statisticians*, Vol. 1, 3rd ed., 1966.

※注意：1.考生須在「彌封答案卷」上作答。

2.本試題紙空白部分可當稿紙使用。

3.考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。

科目：計算機概論

系所組：統資系統碩士班

Multiple Choice Questions (80%)

- Which of the following is *not* an example of an output device?
 - scanner
 - printer
 - display
 - speaker
- A _____ is a website that offers a variety of Internet services from a single, convenient location.
 - LISTSERV
 - portal
 - microblog
 - cache
- The _____ is the method the Internet uses to store domain names and their corresponding IP addresses.
 - File Transfer Protocol (FTP)
 - top-level domain (TLD)
 - domain name system (DNS)
 - W3C
- A(n) _____ is a special-purpose computer that functions as a component in a larger product.
 - server
 - thin client
 - ultrabook
 - embedded computer
- Some people use the term _____ to refer to the case that contains and protects the motherboard, internal hard drive, memory, and other electronic components of the computer from damage.
 - USB hub
 - phablet
 - system unit
 - mainframes
- Mobile payment apps use a payment system on phones equipped with a(n) _____, which stores data that is transmitted to a contactless terminal and verified as a legitimate sale.
 - QR chip
 - NFC chip
 - EULA
 - cookie
- A(n) _____ is a device intended to stop network intrusions before they attempt to affect your computer or network maliciously.
 - hardware firewall
 - anti-spam program
 - pop-under blocker
 - quarantine drive
- A _____ is a program or set of instructions in a program that allows users to bypass security controls when accessing a program, computer, or network.
 - zombie
 - botnet
 - back door
 - session cookie
- A(n) _____ is a set of characters that the originator of the data uses to encrypt the text and the recipient of the data uses to decrypt the text.
 - cipher
 - plaintext
 - public key
 - encryption key
- In the machine cycle, the _____ operation

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科目：計算機概論

系所組：系統資訊系統碩士班

- obtains a program or application instruction or data item from memory.
- executing
 - storing
 - decoding
 - fetching
11. An aspect of cloud computing that allows developers to create, test, and run their solutions on a cloud platform without having to purchase or configure the underlying hardware and software is known as _____.
- DaaS
 - IaaS
 - SaaS
 - PaaS
12. _____ displays use organic molecules that are self-illuminating and, thus, do not require a backlight.
- OLED
 - TFT
 - LED
 - CCFL
13. _____ measures the amount of time it takes a storage device to locate an item on a storage medium and/or the time requires to deliver an item from memory to the processor.
- Access time
 - Rpm(s)
 - Transfer time
 - Response time
14. Which of the following is *not* an advantage of SSDs over hard disks?
- more durable
 - faster transfer time
 - lighter weight
 - higher storage capacity
15. Placing a computer in _____ mode saves any open documents and running programs or apps to an internal hard drive before power is removed from the computer or device.
- sleep
 - hibernate
 - kernel
 - suspended
16. With _____, the operating system allocates a portion of a storage medium to function as additional RAM.
- Live USB
 - virtual memory
 - spooling
 - spoofing
17. The practice used by some ISPs that provides a certain amount of data usage at the optimal speed is known as _____.
- bluebugging
 - IP hijacking
 - throttling
 - capping
18. A _____ is a network that connects computers and devices in an individual's workspace using wired and wireless technology.
- LAN
 - BAN
 - PAN
 - WAN
19. Which of the following is *not* an advantage of a database approach?
- data integrity
 - reduced data redundancy
 - shared data

※ 注意：1.考生須在「彌封答案卷」上作答。

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科目：計算機概論

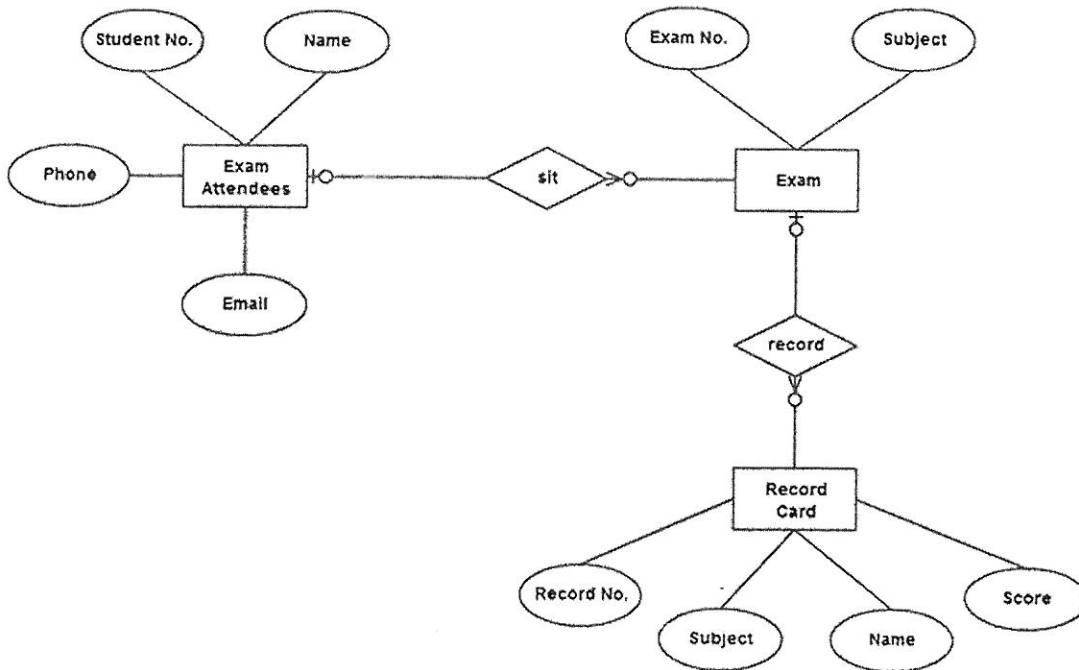
系所組：統資系並統碩士班

- d. requires less memory, storage, and processing power than file processing systems
- 20. Which of the following is *not* a phase in the SDLC?

- a. planning
- b. normalizing
- c. implementation
- d. analysis

Essay Questions (20%)

1. Convert the following Entity Relationship Diagram to its corresponding database schema. Make your assumptions if necessary.



2. Write a function sum() in any programming language or pseudo code you know which outputs the requested f(n) by giving any integer n:

$$\begin{cases} f(n) = n * n + f(n-1), \text{ for } n > 0 \\ f(n) = 0, \text{ for } n \leq 0 \end{cases}$$

※ 注意：1. 考生須在「彌封答案卷」上作答。
 2. 本試題紙空白部份可當稿紙使用。
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科目：微積分

系所組：統計資訊學系應用統計碩士班

1. 請用文字的方式,將 $\lim_{x \rightarrow a} f(x) = L$ 所定義的極限其意函寫下(請用文字及口語化的方式把極限定義之含義完整寫下,除了本題目使用過的符號,如函數值 $f(x)$,自變數 x ,實數值 a ,及實數值 L ,之外,請勿使用其他數字或數學符號)(10%)
2. 某夜市紅豆餅攤商發現,當紅豆餅售價為 x 元時,當日消費量為 $300 - x^2$.但由於夜市規定不可惡性競爭,也不可剝削消費者, x 必需至少 5 元,至多 15 元,也就是 $5 \leq x \leq 15$.請依此回答以下問題:
 - a. 當售價為 5 元時,當日的消費量為多少? (5%)
 - b. 當售價為 15 元時,當日的營業額(總收入)為多少? (5%)
 - c. 當售價為 x 元時,當日的營業額(總收入)多少? (5%)
 - d. 將營業額表示成 x 的函數 $f(x)$. (5%)
 - e. 求出 $f(x)$ 的導函數(10%)
 - f. 求出 $f(x)$ 的臨界數(critical number) (10%)
 - g. 每顆紅豆餅的售價為幾元時,他當日可以有最高營業額? (10%)
3. 請求解下列式子(各 10%):
 - a. $\int x dx$
 - b. $\int (10 - x) dx$
 - c. $\int_1^9 \sqrt{10 - x} dx$
 - d. $\int_{-3}^7 |x - 4| dx$

※ 注意：1. 考生須在「彌封答案卷」上作答。

2. 本試題紙空白部份可當稿紙使用。

3. 考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。