

考試科目	統計學	系所別	財政學系	考試時間	2 月 2 日(四) 第四節
------	-----	-----	------	------	----------------

說明：

- 作答時請完整列出過程，評分同時考量答案完整性及正確性
- 查表過程中，若本試題所提供之統計附表無對應數值，請使用最接近之查表數值代替。

**Question 1 (20%)**

The table below shows the winning percentages for 5 professional baseball teams during the 2021 and 2022 season. Let X denote the winning percentage in 2022 and Y denote the percentage in 2021.

Teams	2022 (X)	2021 (Y)
Monkey	0.603	0.479
Elephant	0.595	0.574
Snake	0.496	0.427
Lions	0.410	0.557
Fighter	0.397	0.466

- Find  $E\left(\frac{X+Y}{2}\right)$  and  $V\left(\frac{X+Y}{2}\right)$
- What is the correlation coefficient between the 2021 and 2022 season winning percentages?

**Question 2 (15%)**

A poll was taken this year asking college students if they support the bill to raise minimum wage by NT\$2,000. A similar poll was taken five years ago. Results are summarized below.

	Sample Size	Number of Responses in Support of the Bill
Present Sample	300	150
Previous sample	275	121

- Find the 99% confidence interval for the *current* support of the bill.
- Suppose the researcher wants to reduce the margin of error of the 95% confidence interval to be within  $\pm 2$  percentage points. How large a sample should be taken the next time when she conducts the survey?
- At 5% significance level, test whether the the support for the bill has increased in the past 5 years.

**Question 3 (15%)**

A salesperson contacts at most 10 potential customers every day. Each day, he randomly selects 10 individuals to be contacted and 15% of the contacted persons would make the purchase based on his past experience.

- How many sales can he expect to make each day?
- Suppose the manager promises him a bonus if he can make at least 3 sales in a day. What is the likelihood that the salesperson can earn the bonus?

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。
----	-------------------------------

考試科目	統計學	系所別	財政學系	考試時間	2 月 2 日(四) 第四節
------	-----	-----	------	------	----------------

**Question 4 (15%)**

A manager wants to compare the error rates of three auditors in the firm. Random samples of five performance reports were reviewed for each auditor. The results appear in the table below:

*Error Rates for the Auditors*

Auditor 1	Auditor 2	Auditor 3
12	4	9
15	8	3
13	6	5
14	5	7
17	4	4

- Set up the complete ANOVA Table.
- Test at the 5% significance level to determine whether the mean error rates for the three auditors differ.

**Question 5 (35%)**

To predict the stopping distance of their automobiles, a car company collects a sample of 50 observations and develops a simple linear regression model to test the relationship between a vehicle's speed and its stopping distance. The variable "stopping distance" (denoted by *distance*) is measured in feet and the variable "speed" (denoted by *speed*) is measured in miles per hour (mph). After the estimation, the software package produced the following output:

	Estimate	Standard Error
Intercept	-17.5791	6.7584
Speed	3.9324	0.4155

- Residual standard error: 15.38
- Average speed in the sample: 15.4
- F-statistics: 89.567

Answer the following questions based on the given information.

- What is the estimated regression equation?
- What is the sample average of stopping distance?
- At 0.05 level of significance, test whether the stopping distance is related to the vehicle's speed.
- Provide the 95% confidence interval for the expected stopping distance when the driver is driving at 15.4 mph.
- Compute the correlation coefficient between speed and distance.
- Comment on the good of fit for the regression model.

備註

- 作答於試題上者，不予計分。
- 試題請隨卷繳交。

考 試 科 目	統計學	系 所 別	財政學系	考 試 時 間	2 月 2 日(四) 第 四 節
---------	-----	-------	------	---------	------------------

## Cumulative Probabilities for Standard Normal Distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
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

考試科目	統計學	系所別	財政學系	考試時間	2月2日(四)第四節
------	-----	-----	------	------	------------

Student's t-Distribution

Degrees of Freedom		Area in Upper Tail					Degrees of Freedom		Area in Upper Tail				
Freedom	0.2	0.1	0.05	0.025	0.01	0.005	Freedom	0.2	0.1	0.05	0.025	0.01	0.005
1	1.376	3.078	6.314	12.706	31.821	63.657	51	0.849	1.298	1.675	2.008	2.402	2.676
2	1.061	1.886	2.920	4.303	6.965	9.925	52	0.849	1.298	1.675	2.007	2.400	2.674
3	0.978	1.638	2.353	3.182	4.541	5.841	53	0.848	1.298	1.674	2.006	2.399	2.672
4	0.941	1.533	2.132	2.776	3.747	4.604	54	0.848	1.297	1.674	2.005	2.397	2.670
5	0.920	1.476	2.015	2.571	3.365	4.032	55	0.848	1.297	1.673	2.004	2.396	2.668
6	0.906	1.440	1.943	2.447	3.143	3.707	56	0.848	1.297	1.673	2.003	2.395	2.667
7	0.896	1.415	1.895	2.365	2.998	3.499	57	0.848	1.297	1.672	2.002	2.394	2.665
8	0.889	1.397	1.860	2.306	2.896	3.355	58	0.848	1.296	1.672	2.002	2.392	2.663
9	0.883	1.383	1.833	2.262	2.821	3.250	59	0.848	1.296	1.671	2.001	2.391	2.662
10	0.879	1.372	1.812	2.228	2.764	3.169	60	0.848	1.296	1.671	2.000	2.390	2.660
11	0.876	1.363	1.796	2.201	2.718	3.106	61	0.848	1.296	1.670	2.000	2.389	2.659
12	0.873	1.356	1.782	2.179	2.681	3.055	62	0.847	1.295	1.670	1.999	2.388	2.657
13	0.870	1.350	1.771	2.160	2.650	3.012	63	0.847	1.295	1.669	1.998	2.387	2.656
14	0.868	1.345	1.761	2.145	2.624	2.977	64	0.847	1.295	1.669	1.998	2.386	2.655
15	0.866	1.341	1.753	2.131	2.602	2.947	65	0.847	1.295	1.669	1.997	2.385	2.654
16	0.865	1.337	1.746	2.120	2.583	2.921	66	0.847	1.295	1.668	1.997	2.384	2.652
17	0.863	1.333	1.740	2.110	2.567	2.898	67	0.847	1.294	1.668	1.996	2.383	2.651
18	0.862	1.330	1.734	2.101	2.552	2.878	68	0.847	1.294	1.668	1.995	2.382	2.650
19	0.861	1.328	1.729	2.093	2.539	2.861	69	0.847	1.294	1.667	1.995	2.382	2.649
20	0.860	1.325	1.725	2.086	2.528	2.845	70	0.847	1.294	1.667	1.994	2.381	2.648
21	0.859	1.323	1.721	2.080	2.518	2.831	71	0.847	1.294	1.667	1.994	2.380	2.647
22	0.858	1.321	1.717	2.074	2.508	2.819	72	0.847	1.293	1.666	1.993	2.379	2.646
23	0.858	1.319	1.714	2.069	2.500	2.807	73	0.847	1.293	1.666	1.993	2.379	2.645
24	0.857	1.318	1.711	2.064	2.492	2.797	74	0.847	1.293	1.666	1.993	2.378	2.644
25	0.856	1.316	1.708	2.060	2.485	2.787	75	0.846	1.293	1.665	1.992	2.377	2.643
26	0.856	1.315	1.706	2.056	2.479	2.779	76	0.846	1.293	1.665	1.992	2.376	2.642
27	0.855	1.314	1.703	2.052	2.473	2.771	77	0.846	1.293	1.665	1.991	2.376	2.641
28	0.855	1.313	1.701	2.048	2.467	2.763	78	0.846	1.292	1.665	1.991	2.375	2.640
29	0.854	1.311	1.699	2.045	2.462	2.756	79	0.846	1.292	1.664	1.990	2.374	2.640
30	0.854	1.310	1.697	2.042	2.457	2.750	80	0.846	1.292	1.664	1.990	2.374	2.639
31	0.853	1.309	1.696	2.040	2.453	2.744	81	0.846	1.292	1.664	1.990	2.373	2.638
32	0.853	1.309	1.694	2.037	2.449	2.738	82	0.846	1.292	1.664	1.989	2.373	2.637
33	0.853	1.308	1.692	2.035	2.445	2.733	83	0.846	1.292	1.663	1.989	2.372	2.636
34	0.852	1.307	1.691	2.032	2.441	2.728	84	0.846	1.292	1.663	1.989	2.372	2.636
35	0.852	1.306	1.690	2.030	2.438	2.724	85	0.846	1.292	1.663	1.988	2.371	2.635
36	0.852	1.306	1.688	2.028	2.434	2.719	86	0.846	1.291	1.663	1.988	2.370	2.634
37	0.851	1.305	1.687	2.026	2.431	2.715	87	0.846	1.291	1.663	1.988	2.370	2.634
38	0.851	1.304	1.686	2.024	2.429	2.712	88	0.846	1.291	1.662	1.987	2.369	2.633
39	0.851	1.304	1.685	2.023	2.426	2.708	89	0.846	1.291	1.662	1.987	2.369	2.632
40	0.851	1.303	1.684	2.021	2.423	2.704	90	0.846	1.291	1.662	1.987	2.368	2.632
41	0.850	1.303	1.683	2.020	2.421	2.701	91	0.846	1.291	1.662	1.986	2.368	2.631
42	0.850	1.302	1.682	2.018	2.418	2.698	92	0.846	1.291	1.662	1.986	2.368	2.630
43	0.850	1.302	1.681	2.017	2.416	2.695	93	0.846	1.291	1.661	1.986	2.367	2.630
44	0.850	1.301	1.680	2.015	2.414	2.692	94	0.845	1.291	1.661	1.986	2.367	2.629
45	0.850	1.301	1.679	2.014	2.412	2.690	95	0.845	1.291	1.661	1.985	2.366	2.629
46	0.850	1.300	1.679	2.013	2.410	2.687	96	0.845	1.290	1.661	1.985	2.366	2.628
47	0.849	1.300	1.678	2.012	2.408	2.685	97	0.845	1.290	1.661	1.985	2.365	2.627
48	0.849	1.299	1.677	2.011	2.407	2.682	98	0.845	1.290	1.661	1.984	2.365	2.627
49	0.849	1.299	1.677	2.010	2.405	2.680	99	0.845	1.290	1.660	1.984	2.365	2.626
50	0.849	1.299	1.676	2.009	2.403	2.678	100	0.845	1.290	1.660	1.984	2.364	2.626

