

國立中央大學八十六學年度碩士班研究生入學試題卷

所別: 土木工程研究所 己組 科目: 統計學 共 / 頁 第 / 頁

Note: 1) Simple answers without calculation procedures or explanations do not get any score.
 2) The statistical table you may use in this exam is located at the bottom of this page.

Problem 1 (10%): Suppose that a random variable X can take each of the five values -2, 0, 1, 3, 4 with equal probability. What is the standard deviation of $Y = 4X - 5$.

Problem 2 (10%): Let X and Y be discrete random variables with joint distribution

$$f(x, y) = \begin{cases} (xy)/18, & x = 1, 2, 3, y = 1, 2 \\ 0, & \text{elsewhere} \end{cases}$$

Find the probability distribution of the random variable $Z = XY$.

Problem 3 (20%): A test was given to 55 girls and 70 boys. The girls made an average grade of 76 with a standard deviation of 6, while the boys made an average grade of 80 with a standard deviation of 8. Find a 96% confidence interval for the difference $\mu_1 - \mu_2$, where μ_1 is the mean score of all boys and μ_2 is the mean score of all girls who might take this test.

Problem 4 (20%): A manufacturer of sports equipment has developed a new fishing line that he claims has a mean breaking strength of 8 kilograms with a standard deviation of 0.5 kilogram. Test the hypothesis that $\mu = 8$ kilograms against the alternative that $\mu \neq 8$ kilograms if a random sample of 50 lines is tested and found to have a mean breaking strength of 7.8 kilograms. Use a 0.01 level of significance.

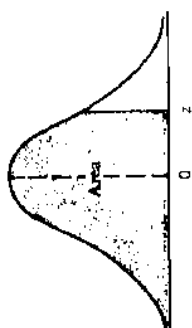
Problem 5 (20%): The pressure P of a gas corresponding to various volumes V was recorded as follows:

V(cm ³)	50	60	70	90	100
P(kg/cm ³)	64.7	51.3	40.5	25.9	7.8

The ideal gas law is given by the equation $PV^\gamma = C$, where γ and C are constants. Use the least square method to estimate γ and C from the given data.

Problem 6 (20%): Suppose that an examination contains 99 questions arranged in a sequence from the easiest to the most difficult. Suppose that the probability that a particular student will answer the first question correctly is 0.99; the probability that he will answer the second question correctly is 0.98; and, in general, the probability that he will answer the i 'th question correctly is $1 - (i/100)$ for $i = 1, \dots, 99$. It is assumed that all questions will be answered independently and that the student must answer at least 60 questions correctly to pass the examination. What is the probability that the student will pass the examination?

Table 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
-3.4	0.0001	0.0003	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0019
-3.3	0.0004	0.0006	0.0008	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022
-3.2	0.0005	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0023
-3.1	0.0006	0.0008	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022	0.0024
-3.0	0.0007	0.0009	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0023	0.0025
-2.9	0.0008	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022	0.0024	0.0026
-2.8	0.0009	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027
-2.7	0.0010	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028
-2.6	0.0011	0.0013	0.0015	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027	0.0029
-2.5	0.0012	0.0014	0.0016	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030
-2.4	0.0013	0.0015	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027	0.0029	0.0031
-2.3	0.0014	0.0016	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032
-2.2	0.0015	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027	0.0029	0.0031	0.0033
-2.1	0.0016	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032	0.0034
-2.0	0.0017	0.0019	0.0021	0.0023	0.0025	0.0027	0.0029	0.0031	0.0033	0.0035
-1.9	0.0018	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032	0.0034	0.0036
-1.8	0.0019	0.0021	0.0023	0.0025	0.0027	0.0029	0.0031	0.0033	0.0035	0.0037
-1.7	0.0020	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032	0.0034	0.0036	0.0038
-1.6	0.0021	0.0023	0.0025	0.0027	0.0029	0.0031	0.0033	0.0035	0.0037	0.0039
-1.5	0.0022	0.0024	0.0026	0.0028	0.0030	0.0032	0.0034	0.0036	0.0038	0.0040
-1.4	0.0023	0.0025	0.0027	0.0029	0.0031	0.0033	0.0035	0.0037	0.0039	0.0041
-1.3	0.0024	0.0026	0.0028	0.0030	0.0032	0.0034	0.0036	0.0038	0.0040	0.0042
-1.2	0.0025	0.0027	0.0029	0.0031	0.0033	0.0035	0.0037	0.0039	0.0041	0.0043
-1.1	0.0026	0.0028	0.0030	0.0032	0.0034	0.0036	0.0038	0.0040	0.0042	0.0044
-1.0	0.0027	0.0029	0.0031	0.0033	0.0035	0.0037	0.0039	0.0041	0.0043	0.0045
-0.9	0.0028	0.0030	0.0032	0.0034	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046
-0.8	0.0029	0.0031	0.0033	0.0035	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047
-0.7	0.0030	0.0032	0.0034	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048
-0.6	0.0031	0.0033	0.0035	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049
-0.5	0.0032	0.0034	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050
-0.4	0.0033	0.0035	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051
-0.3	0.0034	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050	0.0052
-0.2	0.0035	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053
-0.1	0.0036	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054
0.0	0.0037	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055
0.1	0.0038	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054	0.0056
0.2	0.0039	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057
0.3	0.0040	0.0042	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054	0.0056	0.0058
0.4	0.0041	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057	0.0059
0.5	0.0042	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054	0.0056	0.0058	0.0060
0.6	0.0043	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057	0.0059	0.0061
0.7	0.0044	0.0046	0.0048	0.0050	0.0052	0.0054	0.0056	0.0058	0.0060	0.0062
0.8	0.0045	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057	0.0059	0.0061	0.0063
0.9	0.0046	0.0048	0.0050	0.0052	0.0054	0.0056	0.0058	0.0060	0.0062	0.0064
1.0	0.0047	0.0049	0.0051	0.0053	0.0055	0.0057	0.0059	0.0061	0.0063	0.0065
1.1	0.0048	0.0050	0.0052	0.0054	0.0056	0.0058	0.0060	0.0062	0.0064	0.0066
1.2	0.0049	0.0051	0.0053	0.0055	0.0057	0.0059	0.0061	0.0063	0.0065	0.0067
1.3	0.0050	0.0052	0.0054	0.0056	0.0058	0.0060	0.0062	0.0064	0.0066	0.0068
1.4	0.0051	0.0053	0.0055	0.0057	0.0059	0.0061	0.0063	0.0065	0.0067	0.0069
1.5	0.0052	0.0054	0.0056	0.0058	0.0060	0.0062	0.0064	0.0066	0.0068	0.0070
1.6	0.0053	0.0055	0.0057	0.0059	0.0061	0.0063	0.0065	0.0067	0.0069	0.0071
1.7	0.0054	0.0056	0.0058	0.0060	0.0062	0.0064	0.0066	0.0068	0.0070	0.0072
1.8	0.0055	0.0057	0.0059	0.0061	0.0063	0.0065	0.0067	0.0069	0.0071	0.0073
1.9	0.0056	0.0058	0.0060	0.0062	0.0064	0.0066	0.0068	0.0070	0.0072	0.0074
2.0	0.0057	0.0059	0.0061	0.0063	0.0065	0.0067	0.0069	0.0071	0.0073	0.0075
2.1	0.0058	0.0060	0.0062	0.0064	0.0066	0.0068	0.0070	0.0072	0.0074	0.0076
2.2	0.0059	0.0061	0.0063	0.0065	0.0067	0.0069	0.0071	0.0073	0.0075	0.0077
2.3	0.0060	0.0062	0.0064	0.0066	0.0068	0.0070	0.0072	0.0074	0.0076	0.0078
2.4	0.0061	0.0063	0.0065	0.0067	0.0069	0.0071	0.0073	0.0075	0.0077	0.0079
2.5	0.0062	0.0064	0.0066	0.0068	0.0070	0.0072	0.0074	0.0076	0.0078	0.0080
2.6	0.0063	0.0065	0.0067	0.0069	0.0071	0.0073	0.0075	0.0077	0.0079	0.0081
2.7	0.0064	0.0066	0.0068	0.0070	0.0072	0.0074	0.0076	0.0078	0.0080	0.0082
2.8	0.0065	0.0067	0.0069	0.0071	0.0073	0.0075	0.0077	0.0079	0.0081	0.0083
2.9	0.0066	0.0068	0.0070	0.0072	0.0074	0.0076	0.0078	0.0080	0.0082	0.0084
3.0	0.0067	0.0069	0.0071	0.0073	0.0075	0.0077	0.0079	0.0081	0.0083	0.0085
3.1	0.0068	0.0070	0.0072	0.0074	0.0076	0.0078	0.0080	0.0082	0.0084	0.0086
3.2	0.0069	0.0071	0.0073	0.0075	0.0077	0.0079	0.0081	0.0083	0.0085	0.0087
3.3	0.0070	0.0072	0.0074	0.0076	0.0078	0.0080	0.0082	0.0084	0.0086	0.0088
3.4	0.0071	0.0073	0.0075	0.0077	0.0079	0.0081	0.0083	0.0085	0.0087	0.0089