1. A paper towel company is attempting to prove that its paper towel has the better quality in absorbing water than two of its principal competitors. Its research department tests five papers of each company, getting the following results (in ounces per paper). (10)

   Brand A: 6, 6, 4, 3, 7

   Brand B: 6, 5, 5, 6, 5

   Brand C: 4, 4, 5, 5, 8

   (a) Use the sample mean, median, and midrange (i.e., the mean of the smallest and largest values of a sample) to conclude the result.

   (b) Following (a), if the company is brand A, which way would it prefer to use? What happens if the company is brand B? Or brand C?

   (c) From a scientific viewpoint, is it appropriate to use the way described in b, that is, test several sample statistics first and then choose the one that is most favorable, to make an inference? Why or Why not?

2. Taipei Company purchases a certain part from three suppliers A, B and C. Supplier A supplies 50% of the parts, B 30%, and C 20%. The quality of parts is known to vary among suppliers, with A, B, and C parts having 0.2%, 1%, and 2% defective rates, respectively. The parts are used in one of the company's major products. (15)

   (a) What is the probability that the company's major product is assembled with a defective part?

   (b) When a defective part is found, which supplier is the likely source?

   (c) Supplier A supplies most parts to Taipei Company. Are the events "supplier of A" and "defect" independent? Why or why not?

   (d) Based on the above analysis, what would you recommend the company in choosing the suppliers?

3. YY University conducted a study to investigate differences between the scores of males and females on a national aptitude test. The test gave each tester two scores: one for English and one for mathematics. The study identified a random sample of 36 females and 49 males who had achieved the same high score on the mathematics portion of the test. That is, the two groups of females and males were viewed as having similar abilities in mathematics. The English scores for the two samples are summarized as follows. (15)

Females	Male
$\bar{X}_1$=40	$\bar{X}_2$=35
S_1=9	S_2=10

   (a) Do the data support the conclusion that given a population of females and a population of males with similar mathematical abilities, the females and males will have a significantly different English ability at α=0.10 level? Write out your null hypothesis.

   (b) Will you have the same conclusion if confidence interval method is used to make the test in (a)? Just explain. No computation.

   (c) Following (b), what happens to the width of the interval estimate if the confidence level is increased? Just explain. No computation.

   (d) Following (b), what should you do if you want to increase the precision of the interval while maintain the same confidence level? Just explain. No computation.

(背面仍有題目,請繼續作答)

4. The Tainan Milktea Company is considering reformulating its milk-tea product. The milk-tea currently has 30% of the total market. Therefore, the company assumes that the proportion of all persons in the market who will favor the reformulated product will be 0.3. However, the final decision for reformulating will be based on the results of a sample taste test involving 100 randomly chosen persons representing the entire market. If more than 25% of the sample likes the new formulation, the milk-tea will be reformulated and marketed. (20)

(a) Without having the sample taste test, is the assumption that the proportion of all persons in the market who will favor the reformulated product will be 0.3 right? Why or Why not?

(b) Suppose that the new milk-tea tastes so bad that only 15% of the population likes it. Find the probability that the new formulation will be adopted after having the sample taste test.

(c) Suppose that the new milk-tea is so delicious that the market share would immediately jump to 40% if it is reformulated. Find the probability that it doesn't get adopted after having the sample taste test.

(d) If 30 people in the sample taste test like the new product. Do you suggest the company to reformulate the product? Write out the null and alternative hypotheses. Test at 0.05 significance level.

(e) What are the two tailed 90% confidence intervals in (d)?

5. Beauty Company has three products. Based on the selling data of previous 30 weeks, the company estimates the profit of product A is 1%, product B 2%, product C 3%. The variances of the profits are product A 0.0004, product B 0.0009 and product C 0.0016, respectively. The company also notices the correlation between product A and B is 0.3, but no correlations between B and C, and between A and C. Beauty Company has received $40 orders of product A, $50 of product B and $100 of product C for the coming week. (20)

(a) What is the profit that Beauty can expect for sales of the three products in the coming week?

(b) What is the profit variance that Beauty would expect for sales of the three products in the coming week?

(c) Will Beauty Company get a negative return for sales of the three products in the coming week? Why?

(d) Based on answer (c), what is the risk of Beauty in making profit through selling of the three products?

(e) Based on answer (b), can we ignore the correlations among the three products? Why or Why not?

6. A financial analyst obtained the following rates of return after exercising three stock-trading rules during four series of simulated trades. (20)

	Trading Rule		
Series	(1) Buy and hold	(2) Sell on good news	(3) Buy on bad news
1	8%	1%	-5%
2	-2	12	8
3	4	8	10
4	6	15	7

(a) Write out the hypothesis and the critical value of the test statistics. Use α=0.05.

(b) Compute the sample means.

(c) Compute the model sum of square.

(d) Compute the error sum of square.

(e) Compute the mean sum of square.

(f) Construct the ANOVA table.

(g) What is R^2?

(h) At α=0.05 significance level, should the analyst accept or reject the null hypothesis in (a)?

Standard Normal Distribution:

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

χ^2 - distribution:

degrees freedom	Area in Upper Tail									
	.995	.99	.975	.95	.90	.10	.05	.025	.01	.005
1	$392,704 \times 10^{-10}$	$157,088 \times 10^{-9}$	$982,069 \times 10^{-9}$	$393,214 \times 10^{-8}$	.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	7.63273	8.90655	10.1170	11.6509	27.2036	30.1435	32.8523	36.1908	38.5822

F - distribution

Denominator degree of freedom

	Numerator Degrees of Freedom (Nominator)																	
	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
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