PAPER CODE	EXAMINER	DEPARTMENT	TEL
ECO111	Tiago Freire	IBSS	0450

1st SEMESTER 2013/14 Final Examination

BA ACCOUNTANCY – Year 2

BA BUSINESS ADMINISTRATION – Year 2

QUANTITATIVE METHODS

TIME ALLOWED: 2 hours

INSTRUCTIONS TO CANDIDATES

1、 **This is a closed-book examination, which is to be written without books, tapes, or notes.**

2、 **Total marks available are 100, divided in Section A (40 marks) and B (60 marks). Answer all questions.**

3、 **In section A, 4 marks will be awarded for each correct answer and 0 marks for each wrong answer provided. There is NO penalty for providing a wrong answer.**

4、 **In section B, a total of 60 marks are available. The number of marks awarded for each question is given in [] after each question.**

5、 **Statistical distribution tables are provided on pages 10 to 14 of this question paper.**

6、 **Answer should be written in the answer sheet(s) and/or booklet(s) provided. Only English solutions are accepted.**

7、 **The university approved calculator - Casio FS82ES/83ES can be used.**

8、 **All materials must be returned to the exam supervisor upon completion of the exam. Failure to do so will be deemed academic misconduct and will be dealt with accordingly**.

SECTION A (Multiple Choice Questions)

Choose the one alternative that best completes the statement or answers the question. (4 marks per question, Total marks 40)

A1. A monopolist has the following demand function:

$$p = 20 - 0.5q$$

And her cost function is:

$$C = 0.04q^3 - 1.94q^2 + 32.96q\text{-}1.44$$

Where C is total cost, q is quantity and p is price. What is the monopolist's profit?

[4 marks]

a. 1.44
b. 6
c. 18
d. 17

A2. How much must I invest at a rate of 6% payable annually to obtain £5,000 after 4 years? **[4 marks]**

a. £2,855.34
b. £3,960.47
c. £4,706.67
d. £5,000

A3. A property investment company has the opportunity to buy an office building now for £300,000. It will cost £100,000 to refurbish it, which will be payable at the end of year 1. The company expects to be able to sell it for £500,000 in 3 years' time. What is the net present value of the project, assuming a discount rate of 6%?

a. £35,210.60
b. £19,890.50
c. £25,470.02
d. £50,000

A4. The number of passengers on a bus route was recorded over a period of time, to give the following data:

Table 1 – Data to accompany question A4.

Number of Passengers	*Frequency*
$0 \leq n < 10$	3
$10 \leq n < 20$	7
$20 \leq n < 30$	12
$30 \leq n < 40$	13
$40 \leq n < 50$	29
$50 \leq n < 60$	27

What is the inter-quartile range (to the nearest integer)? **[4 marks]**

a. 31
b. 18
c. 28
d. 21

A5. Data in the 30 largest bond funds provided one-year and five-year percentage returns for the period ending the 31st of March, 2000 (The Wall Street Journal, 10th of April, 2000). Suppose we consider a one-year return in excess of 2% to be high and a five-year return in excess of 44% to be high. One-half of the funds had a one-year return in excess of 2%, 12 of the funds had a five-year return in excess of 44%, and six of the funds had both a one-year return in excess of 2% and a five year return in excess of 44%.

What is the probability that a fund had neither a high one-year return nor a high five-year return? **[4 marks]**

a. 0.3
b. 0.7
c. 0.1
d. 0.9

A6. There is a 90% probability that each of 10 jury members casts a vote of not guilty. What is the probability that 7 or less members vote not guilty? Assume that each jury member's vote is independent of the others. **[4 marks]**

a. 0.0001
b. 0.0702
c. 0.0815
d. 0.0043

A7. Annually the U.S. Census Bureau provides estimates of a variety of demographic characteristics of the U.S. population. In terms of categorizing people by race, the bureau divides the population into those of "Hispanic" origin and those not. Within these two categories, a person can be associated with one of several races. For 2007, the bureau gives the following estimates:

Table 2 – Data to accompany question A6.

	Hispanic	*Not Hispanic*
Asian	0.001	0.043
Black	0.006	0.123
White	0.139	0.660
Other	0.005	0.023

What is the probability that a person is white, given that that you know that the person is of Hispanic origin? **[4 marks]**

a. 0.123
b. 0.660
c. 0.920
d. 0.174

A8. According to a survey, salaries of dentists have an average of £48,000 with a standard deviation of £3,500. If the salary of a dentist is normally distributed what salary is such that 20% of dentists have a higher salary? **[4 marks]**

a. £60,566
b. £52,552
c. £48,213
d. £50,946

A9. Management claim that the bonuses paid to workers at a plant average £1,000. A random sample of 100 workers gives an average bonus of only £975 and a standard deviation of £100. Are workers on average being paid £1000 in bonuses? What is the value of the statistical test that can answer this question? Assume a 5% significance level.

[4 marks]

a. Yes, workers are on average being paid £1000 in bonuses. The statistical test has a value of -2.5
b. No, workers are on average not being paid £1000 in bonuses. The statistical test has a value of -2.5
c. Yes, workers are on average being paid £1000 in bonuses. The statistical test has a value of -0.25
d. No, workers are on average not being paid £1000 in bonuses. The statistical test has a value of -0.25

A10. In hypothesis testing, for a given level of significance, alpha, you can decrease the chance of Type II error by: **[4 marks]**

a. Increasing the sample size
b. Decreasing the sample size
c. Increasing the skewness
d. Decreasing the skewness

SECTION B (Short Answer Questions, total marks 60)

B11. Suppose ideally, a worker seeking a new job in a particular industry should acquire information about wage rates offered by all firms in the industry. However, this information search could be time consuming and costly. In particular, the longer an unemployed worker searches for a higher wage, the greater will be the loss in income. Therefore, workers may not find it worthwhile to search until they find the highest available wage rate. The result is that managers may not have to pay top dollar to attract workers. These factors help explain the existing disparity in wage rates among firms. Suppose the distribution of wage rates nationwide that would be offered to a particular skilled worker can be approximated by a normal distribution with μ = \$10.50 per hour and σ = \$1.25 per hour. Suppose the worker were to undertake a nationwide job search.

a. What proportion of the wage rates that would be offered to the worker would be greater than \$12.00 per hour? **[6 marks]**

b. If the worker randomly selects one of the many jobs offers received, what is the probability that the wage rate will be between \$11.00 and \$12.00? **[4 marks]**

c. If the worker randomly selects one of the many jobs offers received, what is the probability that the wage rate will be between \$9.5 and \$12.00? **[4 marks]**

d. If the worker tries to avoid being in the 25% of the lowest paid category, what is the minimum wage rate that he will accept? **[6 marks]**

B12. A home products firm has developed a new solar energy heater and now must decide whether to market it. The success of the product, as measured by its profit contribution, depends on the proportion of households in the target market that will purchase it. If the demand is high (that is if there is a favorable market for the heater), the firm could realize a profit of $900,000. If the market is not favorable, the firm could lose $500,000. Of course, the firm doesn't have to market the heater, in which case there is no cost. Based on experience, the marketing manager believes that the probability of a favorable market is 0.55 and the probability of an unfavorable market is 0.45.

The firm may hire Home Product Promotions Inc. (HPP), a marketing research firm, to conduct a study of the market, at a fee of $5,000. Past studies by HPP show the following conditional probabilities:

Probability of favorable study given a favorable market = 0.80
Probability of unfavorable study given an unfavorable market = 0.90

a. List the conditional probabilities and compute the joint probabilities. What are the probabilities of the different predictions by HPP (keep 3 decimal digits)? **[2 marks]**

b. Compute the posterior or revised probabilities using the information given above. **[3 marks]**

c. Draw a decision tree. **[3 marks]**

d. Should the firm hire HPP to conduct the market research or not? Explain your reasoning. **[4 marks]**

e. How does the sampling method used in the market study affect your answer in the previous question? **[8 marks]**

B13. The number of staff working in a pub during an evening shift and the number of abusive customers encountered that evening for 5 consecutive Monday evenings are recorded in the table bellow.

Table 3 – Data to accompany question B13.

Number of staff	*Abusive customers*
3	10
4	11
2	13
6	15
2	10

a. Plot a scatter diagram of the data. What does it suggest? **[5 marks]**

b. Calculate the linear regression equation that best fits the data. **[5 marks]**

c. Comment on how useful the number of staff is in explaining the number of abusive customers. What can you say about causality? **[10 marks]**

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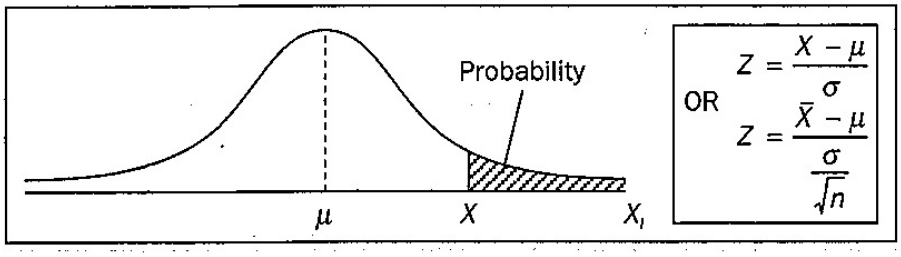
Probabilities for the Normal distribution



Z Score	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0562	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0072	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010

Cumulative Binomial probabilities

			$p = 0.01$	0.05	0.10	0.20	0.30	0.40	0.45	0.50
$n = 5$	$r =$	0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
		1	0.0490	0.2262	0.4095	0.6723	0.8319	0.9222	0.9497	0.9688
		2	0.0010	0.0226	0.0815	0.2627	0.4718	0.6630	0.7438	0.8125
		3		0.0012	0.0086	0.0579	0.1631	0.3174	0.4069	0.5000
		4			0.0005	0.0067	0.0308	0.0870	0.1312	0.1875
		5				0.0003	0.0024	0.0102	0.0185	0.0313
$n = 10$	$r =$	0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
		1	0.0956	0.4013	0.6513	0.8926	0.9718	0.9940	0.9975	0.9990
		2	0.0043	0.0861	0.2639	0.6242	0.8507	0.9536	0.9767	0.9893
		3	0.0001	0.0115	0.0702	0.3222	0.6172	0.8327	0.9004	0.9453
		4		0.0010	0.0128	0.1209	0.3504	0.6177	0.7430	0.8281
		5		0.0001	0.0016	0.0328	0.1503	0.3669	0.4956	0.6230
		6			0.0001	0.0064	0.0473	0.1662	0.2616	0.3770
		7				0.0009	0.0106	0.0548	0.1020	0.1719
		8				0.0001	0.0016	0.0123	0.0274	0.0547
		9					0.0001	0.0017	0.0045	0.0107
		10						0.0001	0.0003	0.0010

where
p is the probability of a characteristic (e.g. a defective item),
n is the sample size and
r is the number with that characteristic.
Note: All probabilities are for 'r or more successes'. Only selected values for n and r are shown in this table.

Cumulative Poisson probabilities

		$\mu = 1.0$	2.0	3.0	4.0	5.0	6.0	7.0
$r =$	0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	0.6321	0.8647	0.9502	0.9817	0.9933	0.9975	0.9991
	2	0.2642	0.5940	0.8009	0.9084	0.9596	0.9826	0.9927
	3	0.0803	0.3233	0.5768	0.7619	0.8753	0.9380	0.9704
	4	0.0190	0.1429	0.3528	0.5665	0.7350	0.8488	0.9182
	5	0.0037	0.0527	0.1847	0.3712	0.5595	0.7149	0.8270
	6	0.0006	0.0166	0.0839	0.2149	0.3840	0.5543	0.6993
	7	0.0001	0.0011	0.0335	0.1107	0.2378	0.3937	0.5503
	8		0.0002	0.0119	0.0511	0.1334	0.2560	0.4013
	9			0.0038	0.0214	0.0681	0.1528	0.2709
	10			0.0011	0.0081	0.0318	0.0839	0.1695
	11			0.0003	0.0028	0.0137	0.0426	0.0985
	12			0.0001	0.0009	0.0055	0.0201	0.0534
	13				0.0003	0.0020	0.0088	0.0270
	14				0.0001	0.0007	0.0036	0.0128
	15					0.0002	0.0014	0.0057
	16					0.0001	0.0005	0.0024
	17						0.0002	0.0010
	18						0.0001	0.0004
	19							0.0001

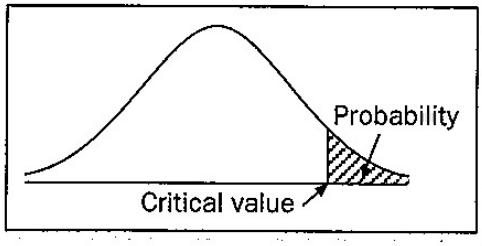
where

$\mu(=np)$ is the average number of times a characteristic occurs and

r is the number of occurrences.

Note: All probabilities are for 'r or more successes'.

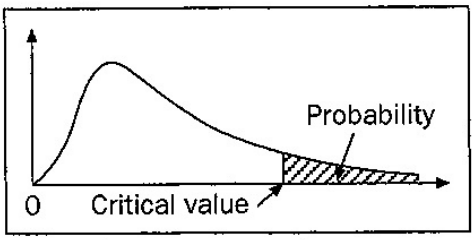
Student *t* Critical values



Probability		*0.10*	*0.05*	*0.025*	*0.01*	*0.005*
v =	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

where *v* is the number of degrees of freedom.

χ^2 Critical values



v \ Probability	0.250	0.100	0.050	0.025	0.010	0.005	0.001
1	1.32	2.71	3.84	5.02	6.63	7.88	10.8
2	2.77	4.61	5.99	7.38	9.21	10.6	13.8
3	4.11	6.25	7.81	9.35	11.3	12.8	16.3
4	5.39	7.78	9.49	11.1	13.3	14.9	18.5
5	6.63	9.24	11.1	12.8	15.1	16.7	20.5
6	7.84	10.6	12.6	14.4	16.8	18.5	22.5
7	9.04	12.0	14.1	16.0	18.5	20.3	24.3
8	10.2	13.4	15.5	17.5	20.3	22.0	26.1
9	11.4	14.7	16.9	19.0	21.7	23.6	27.9
10	12.5	16.0	18.3	20.5	23.2	25.2	29.6
11	13.7	17.3	19.7	21.9	24.7	26.8	31.3
12	14.8	18.5	21.0	23.3	26.2	28.3	32.9
13	16.0	19.8	22.4	24.7	27.7	29.8	34.5
14	17.1	21.1	23.7	26.1	29.1	31.3	36.1
15	18.2	22.3	25.0	27.5	30.6	32.8	37.7
16	19.4	23.5	26.3	28.8	32.0	34.3	39.3
17	20.5	24.8	27.6	30.2	33.4	35.7	40.8
18	21.6	26.0	28.9	31.5	34.8	37.2	42.3
19	22.7	27.2	30.1	32.9	36.2	38.6	43.8
20	23.8	28.4	31.4	34.2	37.6	40.0	45.3
21	24.9	29.6	32.7	35.5	38.9	41.4	46.8
22	26.0	30.8	33.9	36.8	40.3	42.8	48.3
23	27.1	32.0	35.2	38.1	41.6	44.2	49.7
24	28.2	33.2	36.4	39.4	43.0	45.6	51.2
25	29.3	34.4	37.7	40.6	44.3	46.9	52.6
26	30.4	35.6	38.9	41.9	45.6	48.3	54.1
27	31.5	36.7	40.1	43.2	47.0	49.6	55.5
28	32.6	37.9	41.3	44.5	48.3	51.0	56.9
29	33.7	39.1	42.6	45.7	49.6	52.3	58.3
30	34.8	40.3	43.8	47.0	50.9	53.7	59.7
40	45.6	51.8	55.8	59.3	63.7	66.8	73.4
50	56.3	63.2	67.5	71.4	76.2	79.5	86.7
60	67.0	74.4	79.1	83.3	88.4	92.0	99.6
70	77.6	85.5	90.5	95.0	100	104	112
80	88.1	96.6	102	107	112	116	125
90	98.6	108	113	118	124	128	137
100	109	118	124	130	136	140	149

where v is the number of degrees of freedom.