

UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Kedua
Sidang Akademik 2002/2003

Februari/Mac 2003

RPG 131E – Applied Quantitative Methods
Kaedah Kuantitatif Gunaan

Masa: 3 jam

Please check that the examination paper contains **THIRTEEN** printed papers before the commencement of the examination.

Sila pastikan bahawa kertas peperiksaan ini mengandungi TIGABELAS muka surat yang tercetak sebelum anda memulakan peperiksaan ini.

Students are allowed to answer all questions in English OR in Bahasa Malaysia OR in both languages.

Pelajar dibenarkan menjawab semua soalan dalam Bahasa Inggeris ATAU Bahasa Malaysia ATAU kombinasi kedua-duanya.

Answer **THREE** questions from **Section A** and **ONE** question from **Section B**.

Jawab TIGA soalan dari Bahagian A dan SATU soalan dari Bahagian B.

Section A

Bahagian A

1. One hundred and sixty HBP students measured their weight in a recent health survey. The results indicate a normal distribution with a standard deviation of 2.5. Out of the 160 students, 100 students are male and the rest are females. The average weight for the male is 61.3 kg and the average weight for the female is 49.5 kg.

Seratus enam puluh orang pelajar PBP telah mengukur berat badan mereka di sebuah kajian survei baru-baru ini. Hasil kajian menunjukkan taburan normal dengan nilai sisihan piawai sebanyak 2.5. Dari jumlah keseluruhan 160 orang pelajar, 100 orang pelajar adalah lelaki dan selebihnya adalah perempuan. Berat purata bagi pelajar lelaki adalah 61.3 kg dan berat purata pelajar perempuan adalah 49.5 kg.

- (a) What is the range of weight for each of the following case:
Apakah julat berat bagi setiap kes berikut:

- 68.26 % of the total case (male)
68.26% dari jumlah kes (lelaki)
- 95.44 % of the total case (female)
95.44% dari jumlah kes (perempuan)
- 99.70 % of the total case (male)
99.70% dari jumlah kes (lelaki)

(15 marks/markah)

...2/-

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(b) Describe the meaning of the following words:
Huraikan istilah-istilah berikut:

- variables
pembolehubah
- line of best fit
'line of best fit'
- normal distribution
taburan normal
- independent variable
'independent variable'
- dependent variable
'dependent variable'
- bell-shaped curve
'bell-shaped curve'
- cause and effect
sebab dan kesan
- regression
regresi
- intercept
pemalar
- ratio variables
pemboleh ubah ratio

(10 marks/markah)

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2. Syarikat Sewaan Alat provides contractors with tools such as concrete saws. When equipment is broken during a rental, it must be taken out of service for repairs. Often this can be done quickly but sometimes there are delays while parts are ordered. The records of downtime for last year are:

Syarikat Sewaan Alat membekalkan kontraktor dengan alatan seperti gergaji konkrit. Apabila alatan rosak dalam tempoh penyewaan, ia perlu dihantar untuk diperbaiki. Selalunya kerja pembaikan boleh dijalankan dengan segera tetapi adakala timbul kelewatan kerana menunggu pesanan "spare-parts". Rekod untuk masa pembaikan bagi tahun lepas adalah seperti di bawah:

Equipment Group <i>Kumpulan Alatan</i>	Days of out service <i>Tempoh Pembaikan (hari)</i>	Equipment Group <i>Kumpulan Alatan</i>	Days out of service <i>Tempoh Pembaikan (hari)</i>
1	2	8	8
2	19	9	29
3	14	10	6
4	21	11	0
5	5	12	4
6	7	13	4
7	11	14	10

- (a) What is last year's mean downtime for the equipments?
Apakah min tempoh pembaikan bagi alatan untuk tahun lepas?
(5 marks/markah)
- (b) What is the median?
Apakah median tempoh pembaikan?
(5 marks/markah)
- (c) What is the mode?
Apakah mod tempoh pembaikan?
(5 marks/markah)
- (d) Find the standard deviation of the data. (The entire population is included in the data.)
Cari sisihan piawai bagi data yang diberikan (Jadual di atas menunjukkan data keseluruhan populasi)
(10 marks/markah)

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3. (a) The management of an oil company must decide whether to continue drilling at a certain site. The management must decide based on the possible outcomes as follows:

If they continue drilling and there is oil, this will be worth RM2,000,000 to their company.

If they continue to drill and there is no oil, this will result in a loss of RM1,200,000.

If they stop drilling and there is oil (for their competitor to use), this will cause a loss of RM800,000 to the company.

If they stop drilling and there is no oil, this will be worth RM200,000 to their company because funds allocated to the operation will be saved for other use.

Pihak pengurusan sebuah syarikat minyak perlu membuat keputusan sama ada akan meneruskan operasi penggerudian di sesebuah tapak. Pihak pengurusan perlu membuat keputusan berasaskan kemungkinan berikut:

Jika meneruskan penggerudian dan terdapat minyak, syarikat akan mendapat keuntungan RM2,000,000.

Jika meneruskan penggerudian dan tidak terdapat minyak, ini akan mengakibatkan kerugian RM1,200,000.

Jika berhenti menggerudi dan terdapat minyak (untuk kegunaan pesaing), maka syarikat akan mengalami kerugian RM800,000.

Jika berhenti menggerudi dan tidak terdapat minyak, syarikat akan mendapat habuan RM200,000 kerana peruntukan bagi penggerudian dapat disalurkan untuk tujuan yang lain.

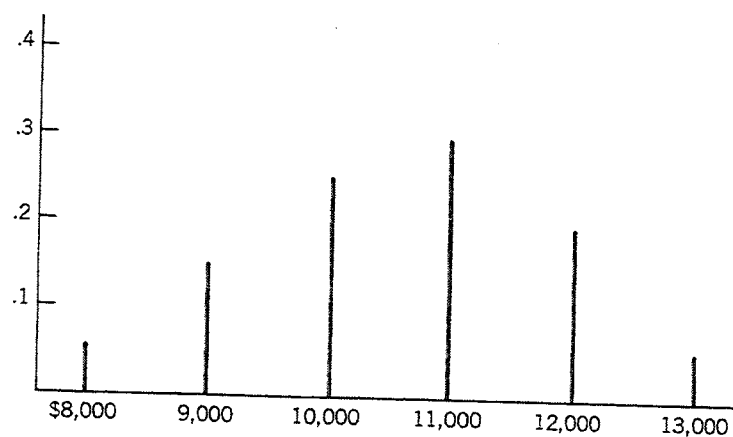
Answer the following questions based on the situation above:

Jawab soalan berikut berdasarkan keadaan di atas:

- i. Construct a payoff table.
Sediakan sebuah jadual pembayaran.
(4 marks/markah)
- ii. Draw the decision tree.
Sediakan sebuah rajah ranting keputusan.
(4 marks/markah)
- iii. Calculate the expected monetary value for each decision node. Assume an equal probability 0.5 : 0.5 in each decision.
Kirakan 'expected monetary value' bagi setiap ranting keputusan. Andaikan nilai kebarangkalian yang sama 0.5:0.5 bagi setiap keputusan.
(5 marks/markah)

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- iv. Which decision should the oil company make if they wanted to MAXIMIN profits? Explain the basis for decision.
Keputusan yang manakah perlu dibuat oleh syarikat minyak untuk mendapatkan keuntungan MAXIMIN?. Terangkan keputusan anda.
- (2 marks/markah)
- v. What decision should the oil company make if they wanted to MAXIMAX profits? Explain the basis for the decision.
Keputusan yang manakah perlu dibuat oleh syarikat minyak untuk mendapatkan keuntungan MAXIMAX?. Terangkan keputusan anda.
- (2 marks/markah)
- (b) Based on the following graph of probability distribution:
Berdasarkan graf taburan kebarangkalian berikut:
- i. Construct a table of probability distribution.
Sediakan sebuah jadual taburan kebarangkalian.
- (4 marks/markah)
- ii. Find the expected value of the random variable.
Kirakan 'expected value' bagi pembolehubah rawak.
- (4 marks/markah)



Section B
Seksyen B

4. (a) A group of 20 workers worked on building houses in Sungai Ara, Penang. The table below indicates the number of days they spend on construction and the number of houses completed.
Sekumpulan 20 orang buruh bekerja membina rumah di Sungai Ara, Pulau Pinang. Jadual di bawah menunjukkan jumlah hari mereka bekerja dan jumlah rumah yang siap dibina.

Number of houses completed <i>Jumlah rumah yang siap</i>	Number of days spent on construction <i>Jumlah hari yang diguna untuk pembinaan</i>
40	5
45	6
47	7
49	9
52	13
54	14
57	15

- What is the value of the “intercept”?
Berapakah nilai pemalar?
- What is the value of the “regression coefficient”?
Berapakah nilai koefisien regresi?
- How many houses would they have completed if they spend 20 days working?
Berapakah jumlah rumah yang dapat disiapkan jika jumlah hari pembinaan adalah 20?
- What is the advantage of regression over correlation?
Apakah kelebihan regresi berbanding korelasi?

(10 marks/markah)

- b) Six students were involved in English and Spanish literature tests. The results are displayed below:

Enam orang pelajar terlibat dalam ujian Bahasa Inggeris dan Sepanyol seperti yang dipaparkan di jadual berikut:

	Ricky Martin	Boy George	Witney Houston	Pink	Ronaldo	Sting
English	3	5	7	8	9	6
Spanish	4	7	8	9	10	6

- What is the correlation value?
Berapakah nilai korelasi?
- What is the scale of the variable "English"?
Apakah skala bagi pembolehubah 'Bahasa Inggeris'?
- How would you describe the relationship between both variables?
Apakah kesimpulan mengenai perhubungan di antara 2 pembolehubah tersebut?
- Is there any dependent variable among the two?
Adakah terdapat sebarang pembolehubah 'dependent' di antara keduanya?

(15 marks/markah)

- 5 (a) For the following situations, describe which measure of central tendency is appropriate and why.

Nyatakan jenis pengukuran kecenderungan memusat yang sesuai digunakan untuk setiap situasi yang tercatat di bawah serta berikan sebabnya.

- A survey on the types of house favoured by residents in the State of Penang: bungalow, semi-detached, terrace, condominiums and apartments.
Satu kaji selidik mengenai jenis-jenis rumah yang digemari oleh penduduk di Negeri Pulau Pinang: banglo, rumah berkembar, rumah teres, kondominium dan apartmen.

(5 marks/markah)

- In a study of Architect's income in a city, the following income categories were established: RM0-RM3,000, RM3,001-RM6,000, RM6,001-RM9,000, RM9,001-RM12,000 and RM12,001 and more.

Dalam satu kajian mengenai pendapatan Arkitek di sebuah bandaraya, kategori pendapatan yang berikut telah dikenalpasti: RM0 – RM3,000, RM3001-RM6,000, RM6,001-RM9,000, RM9001-RM12,000 dan RM12,001 ke atas.

(5 marks/markah)

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- Several readings were taken on the deflection of a pile and most of the readings were in the range of 0.03-0.05mm. A few were above this and a few were below.

Beberapa bacaan mengenai defleksi satu cerucuk telah diambil dan kebanyakan bacaan tersebut adalah dalam julat 0.03 – 0.05 mm. Beberapa bacaan terletak di atas julat ini dan beberapa bacaan terletak di bawah julat ini.

(5 marks/markah)

- (b) Here are the data on the heights of female and male workers in a construction site. Find .

Berikut adalah data mengenai ketinggian pekerja wanita dan lelaki di dalam satu tapak pembinaan. Carikan .

Females Wanita		Males Lelaki	
Height (in.) Ketinggian	f	Height (in.) Ketinggian	f
72	1	77	1
70	1	76	1
69	2	75	1
68	1	74	1
67	4	73	4
66	5	72	5
65	10	71	7
64	9	70	6
63	7	69	8
62	5	68	7
61	3	67	2
60	1	66	2
59	1	65	3
		64	1
		62	1

(10 marks/markah)

6. (a) Explain briefly the difference between descriptive statistics and inferential statistics.

Terangkan dengan ringkas perbezaan di antara statistik deskriptif dengan statistik inferential.

(4 marks/markah)

- (b) Indicate the significance levels in the following cases:
Nyatakan tahap keyakinan bagi setiap kes berikut:

Case (1)

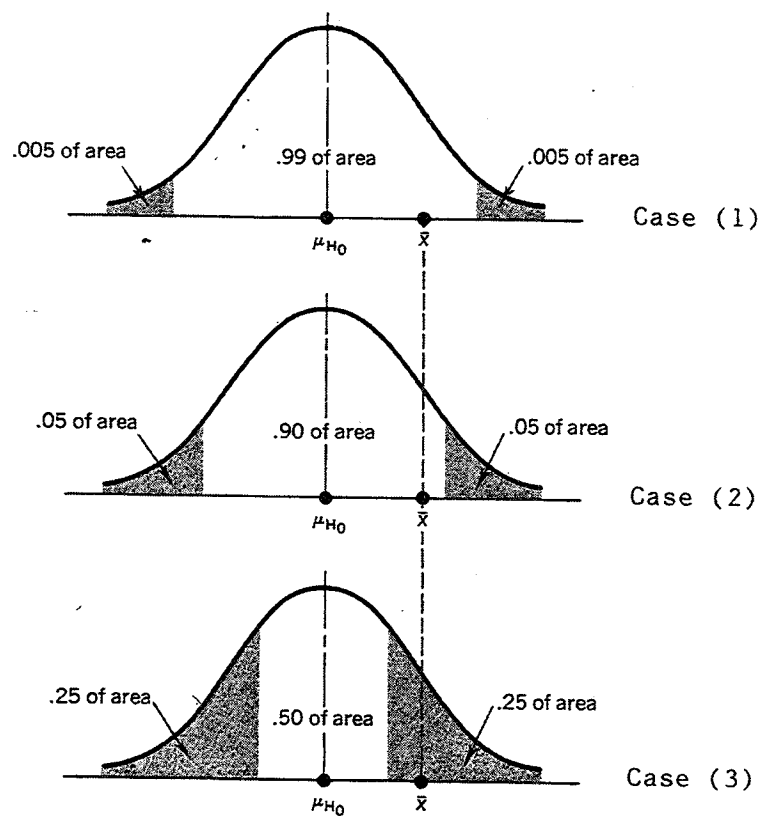
Case (2)

Case (3)

Kes (1)

Kes (2)

Kes (3)



(3 marks/markah)

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- (c) Conduct a hypothesis testing based on the following situation. Assume a normal distribution.

Jalankan ujian hipotesis terhadap keadaan berikut. Andaikan taburan normal.

Government statistical records have shown that the price of low-cost housing in the City of Townsville in 1993 was RM24,500 per unit with a standard deviation of RM2,500. However in 2003, housing developers in the City of Townsville wanted to increase the price of low-cost housing to RM30,000 per unit due to the inflation factor and other increased costs.

Maklumat statistik Kerajaan menunjukkan harga rumah kos rendah di Bandar Townsville pada 1993 ialah RM24,500 setiap unit dengan sisihan piawai RM2,500. Namun pada tahun 2003, pemaju perumahan di Bandar Townsville menuntut untuk menaikkan harga rumah kos rendah kepada RM30,000 setiap unit atas alasan faktor inflasi dan kenaikan kos yang lain.

The housing developers have shown the following information to support their claims.

Pemaju perumahan telah menyediakan maklumat berikut untuk menyokong tuntutan mereka:

	Site A <i>Tapak A</i>	Site B <i>Tapak B</i>	Site C <i>Tapak C</i>	Site D <i>Tapak D</i>	Site E <i>Tapak E</i>	Site F <i>Tapak F</i>
Price of Low-Cost Housing in 2003 (RM per unit) <i>Harga Rumah Kos Rendah Pada 2003 (RM per unit)</i>	27,800	26,400	29,500	27,700	26,900	28,600
Number of low – cost housing units built <i>Bilangan unit rumah kos rendah yang dibina</i>	100	250	200	100	200	150

The question is : Should the government approve the applications by the housing developers to increase the price of low-cost housing?

Persoalannya: Patutkah Kerajaan meluluskan permohonan pemaju perumahan untuk menaikkan harga rumah kos rendah?

- i. State the null hypothesis and the alternative hypothesis.
Nyatakan hipotesis null dan hipotesis alternatif.

(3 marks/markah)

- ii. Test your hypothesis at 95% confidence level. Show all calculations clearly. State your reasons and assumptions.
Uji hipotesis anda pada tahap keyakinan 95%. Tunjukkan semua pengiraan dengan jelas. Nyatakan sebab-sebab dan andaian anda.

(9 marks/markah)

- iii. Re-test your hypothesis at 99% confidence level. Show all calculations clearly. Is there a difference in the result? State your reasons and assumptions.
Uji hipotesis anda sekali lagi pada tahap keyakinan 99%. Tunjukkan semua pengiraan dengan jelas. Adakah terdapat perbezaan daripada keputusan dalam (ii) di atas? Nyatakan sebab-sebab dan andaian anda.

(5 marks/markah)

- iv. Based on your analysis, should the housing price increase be approved?
Berdasarkan analisis ini, patutkah kenaikan harga rumah kos rendah diluluskan?

(1 mark/markah)

FORMULA:

$$r = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{[N \sum x^2 - (\sum x)^2][N \sum y^2 - (\sum y)^2]}}$$

$$y = a + bx$$

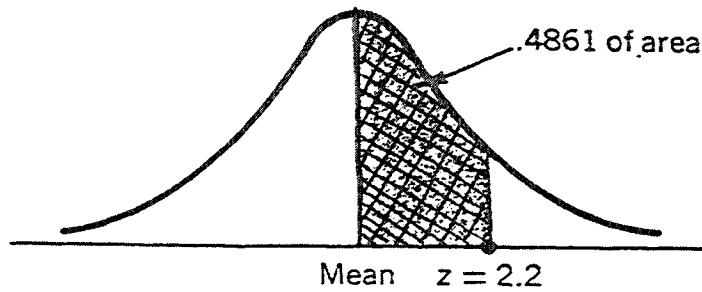
$$a = \frac{\sum y}{N} - b \frac{\sum x}{N}$$

$$b = \frac{N \sum xy - (\sum x)(\sum y)}{N \sum x^2 - (\sum x)^2}$$

APPENDIX TABLE 1

THE STANDARD NORMAL (Z) DISTRIBUTION Areas under the Standard Normal Probability Distribution between the Mean and Positive Values of z*

$$Z = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{N}}}$$



EXAMPLE: To find the area under the curve between the mean and a point 2.2 standard deviations to the right of the mean, look up the value opposite 2.2 in the table; .4861 of the area under the curve lies between the mean and a z value of 2.2.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.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	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990