UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semasa Cuti Panjang
Sidang Akademik 2009/2010

Jun 2010

MAT 161 – Elementary Statistics
[Statistik Permulaan]

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of THIRTEEN pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi TIGA BELAS muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **all ten** [10] questions.

*[**Arahan:** Jawab **semua sepuluh** [10] soalan.]*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

1. The speeds of 50 randomly selected cars that passed through a road in a town were monitored by radar and recorded as in the following table:

Speed of car, X (miles/hour)	Frequency, f_i
18 - 24	10
24 - 30	22
30 - 36	8
36 - 42	5
42 - 48	3
48 - 54	2

(i) Calculate the mean speed and its standard deviation.
(ii) Cars that exceed the limit of 40 miles/hour will be remanded by the police. What percentage of the cars that passed through the road will be remanded by the police?
(iii) Use Chebyshev's Theorem to obtain an interval of the speeds of at least 75% of cars that passed through the road.

[15 marks]

2. A box contains three white marbles, three red marbles and a blue marble. Three marbles were randomly taken out of the box, without replacement. Let X represents the number of red marbles that were taken out.
(i) Write the probability distribution of X.
(ii) Find the probability that one white, one red and one blue marble were selected.
(iii) Find the probability that at least one red marble was taken out.

[15 marks]

3. The probability density function of a continuous variable X is given by

$$f(x)=\begin{cases}\dfrac{x+1}{6}, & 1<x<3\\ 0, & otherwise,\end{cases}$$

(i) Find E(X) and Var(X).
(ii) The median for a continuous probability distribution is a value m that divides the distribution into two equal areas, i.e.

$$\int_{-\infty}^{m} f(x)\,dx = \int_{m}^{\infty} f(x)\,dx = 0.5.$$

Find the median of $f(x)$.

[15 marks]

1. *Kelajuan 50 buah kereta yang dipilih secara rawak yang melalui sebatang jalan dalam sebuah bandar dipantau dengan alat radar dan direkodkan seperti dalam jadual yang berikut:*

Kelajuan kereta, X (km/jam)	*Kekerapan,* f_i
18 - 24	*10*
24 - 30	*22*
30 - 36	*8*
36 - 42	*5*
42 - 48	*3*
48 - 54	*2*

   (i) Hitung purata kelajuan kereta yang melalui jalan tersebut dan sisihan piawainya.
   (ii) Kereta yang melebihi had 40 km/jam akan ditahan oleh polis. Berapakah peratusan kereta yang melalui jalan tersebut akan ditahan oleh polis?
   (iii) Gunakan Teorem Chebyshey untuk mendapatkan suatu selang kelajuan bagi sekurang-kurangnya 75% daripada kereta-kereta yang melalui jalan tersebut

[15 markah]

2. *Sebuah kotak mengandungi tiga biji guli putih, tiga biji guli merah dan sebiji guli biru. Tiga biji guli dikeluarkan secara rawak daripada kotak tersebut, tanpa pengembalian. Andaikan X mewakili bilangan guli merah yang dikeluarkan.*
   (i) Tuliskan taburan kebarangkalian bagi X.
   (ii) Dapatkan kebarangkalian bahawa sebiji guli putih, sebiji guli merah dan sebiji guli biru terpilih.
   (iii) Dapatkan kebarangkalian bahawa sekurang-kurangnya sebiji guli merah dikeluarkan.

[15 markah]

3. *Taburan kebarangkalian pembolehubah selanjar X diberikan oleh*

$$f(x)=\begin{cases}\dfrac{x+1}{6}, & 1<x<3\\ 0, & \text{di tempat lain,}\end{cases}$$

   (i) Dapatkan E(X) dan Var(X).
   (ii) Median bagi taburan kebarangkalian selanjar ialah suatu nilai m yang membahagikan taburan tersebut kepada dua bahagian yang sama besar iaitu

$$\int_{-\infty}^{m} f(x)dx=\int_{m}^{\infty} f(x)dx=0.5.$$

Dapatkan median f(x).

[15 markah]

4. A process for making glass plates produces small bubbles (defects) scattered at random in the glass, at an average rate of four small bubbles per $10m^2$. Consider glass pieces with dimensions 2.5m x 2.0m.

   (i) Determine the probability that a piece of glass contains at least one small bubble.
   (ii) Calculate the probability that five glass pieces chosen at random are all free of bubbles.
   (iii) Suppose ten glass pieces were randomly chosen. What is the probability that five of the pieces contain at least one small bubble each?

   [15 marks]

5. Two companies, *A* and *B*, drill wells in a rural area. Company *A* charges a flat fee of RM3500 to drill a well, regardless of its depth. Company *B* charges a basic fee of RM1000 plus RM12 per foot to drill a well. The depths of wells in this area have a normal distribution with a mean of 250 feet and a standard deviation of 40 feet.

   (i) What is the probability that Company *B* would charge more than Company *A* to drill a well?
   (ii) Find the expected amount charged by Company *B* to drill a well in the area.

   [10 marks]

6. It is claimed that the performance of the first year undergraduate students in Statistics in one university can be studied in their ratios of grades. The ratios of distributions to grade A, B and C are 3:5:2 respectively. A total of 100 students are surveyed and the survey reveals the following result:

Grade A	Grade B	Grade C
34	54	12

   (i) If the null hypothesis (3:5:2) is true, what are the expected number of students that score A, B and C respectively in Statistics?
   (ii) Complete the hypothesis test using the 0.01 significance level.

   [15 marks]

4. *Suatu proses pembuatan kepingan kaca menghasilkan gelembung-gelembung kecil (kecacatan) yang tertabur secara rawak pada kaca dengan purata empat gelembung kecil pada setiap $10m^2$. Pertimbangkan kepingan-kepingan kaca dengan dimensi 2.5m x 2.0m.*

   (i) Tentukan kebarangkalian bahawa sekeping kaca mengandungi sekurang kurangnya satu gelembung kecil.
   (ii) Hitung kebarangkalian bahawa lima kepingan kaca yang dipilih secara rawak semuanya bebas daripada gelembung-gelembung kecil.
   (iii) Andaikan sepuluh kepingan kaca dipilih secara rawak. Apakah kebarangkalian bahawa lima daripadanya mengandungi sekurang-kurangnya satu gelembung kecil?

   [15 markah]

5. *Dua buah syarikat, A dan B, menggali perigi di sebuah kawasan pedalaman. Syarikat A mengenakan bayaran pukal sebanyak RM3500 untuk menggali perigi tanpa mengambil kira kedalamannya. Syarikat B mengenakan bayaran asas sebanyak RM1000 campur RM12 bagi setiap kaki kedalaman perigi yang digali. Kedalaman perigi di kawasan tersebut tertabur secara normal dengan min 250 kaki dan sisihan piawai 40 kaki.*

   (i) Apakah kebarangkalian bahawa Syarikat B akan mengenakan bayaran yang lebih tinggi daripada Syarikat A untuk menggali sebuah perigi?
   (ii) Dapatkan bayaran yang dijangka dikenakan oleh Syarikat B untuk menggali sebuah perigi di kawasan tersebut.

   [10 markah]

6. *Terdapat dakwaan yang menyatakan bahawa prestasi pelajar ijazah tahun pertama dalam statistic boleh dikaji dari nisbah gred mereka. Taburan untuk gred A, B dan C adalah dalam nisbah 3:5:2. Seramai 100 mahasiswa ditinjau dan hasil tinjauan adalah seperti yang berikut.*

Grade A	*Grade B*	*Grade C*
34	*54*	*12*

   (i) Jika hipotesis nol (3:5:2) adalah benar, berapakah bilangan pelajar yang mendapat gred A, B dan C?
   (ii) Lengkapkan pengujian hipotesis dengan menggunakan aras keertian 0.01.

   [15 markah]

7. The diameters of apples from an orchard are normally distributed with a mean of 2.63 inches and a standard deviation of 0.25 inch.
   (i) What percentage of the apples from this orchard have diameters less than 2.25 inches?
   (ii) A random sample of 100 apples is gathered, and the mean diameter obtained is $\bar{x} = 2.56$ inches. What is the probability that the sample mean will be greater than 2.56 inches?
   (iii) Why is the formula for z-score used in part (ii) different from that used in part (i)?

[15 marks]

8. Supermarket A requires that all apples from orchards must meet the store's specifications of a mean diameter of 7.0cm and a standard deviation of no more than 0.2cm. Supermarket A sends a buyer to a potential fruit supplier and selects a random sample of 50 apples from the supplier's orchard. The diameter of each apple is measured and the mean is reported to be 6.95cm with a standard deviation of 0.24cm.
   (i) Show if the sample sufficiently meets the specification with regard to the mean diameter. Use a significance level of 0.05.
   (ii) Is there any sufficient evidence that the apples do not meet the specification with regard to the standard deviation? Conduct a hypothesis test at the 0.05 significance level.
   (iii) Compare the results of (i) and (ii). Should supermarket A take the apples from the fruit supplier?

[20 marks]

9. The table below shows the average daily temperature (in Degree Celsius) of 10 days in September for two cities, city A and city B. The samples are assumed to be normally distributed.

City A	14.0	12.5	11.5	12.2	12.4	12.3	11.8	11.9	13.7	13.2
City B	12.0	12.5	11.6	13.3	13.0	13.0	12.1	12.8	12.2	12.6

City A : $\bar{x} = 12.55$ $s^2 = 0.6827$ $s = 0.826$
City B : $\bar{x} = 12.51$ $s^2 = 0.2832$ $s = 0.532$

   (i) Conduct a t-test to show if the average temperature between city A and B are different.
   (ii) Combine both samples to a single list and arrange the data in ascending sequence. Determine the median and number of runs above and below the median.
   (iii) Use the runs test at 5% level of significance to test these data for randomness about the median.

[20 marks]

7. *Diameter epal dari sebuah dusun tertabur secara normal dengan min 2.63 inci dan sisihan piawai 0.25 inci.*
   (i) Apakah peratusan epal dari dusun ini yang mempunyai diameter kurang daripada 2.25 inci?
   (ii) Satu sampel rawak sebanyak 100 epal dikumpul dan sampel tersebut mempunyai min $\bar{x} = 2.56$ *inci. Apakah kebarangkalian bahawa min sampel melebihi 2.56 inci?*
   (iii) Kenapakah formula z-score yang digunakan di bahagian (ii) berbeza daripda formula yang digunakan dalam bahagian (i)?

   [15 markah]

8. *Pasaraya A mensyaratkan bahawa semua epal dari pembekal buah-buahan harus memenuhi spesifikasi dengan min diameter 7.0 cm dan sisihan piawai tidak melebihi 0.2 cm. Pasaraya A menghantar seorang pembeli kepada seorang bakal pembekal buah-buahan dan memilih suatu sampel rawak 50 biji epal dari dusunnya. Diameter epal diukur dan min dilaporkan 6.95cm dengan sisihan piawai 0.24cm.*
   (i) Tunjukkan sama ada sampel tersebut memenuhi spesifikasi dengan secukupnya dari segi min diameter. Gunakan aras keertian 0.05.
   (ii) Adakah terdapat bukti yang menunjukkan bahawa epal-epal tersebut tidak memenuhi spesifikasi dari segi sisishan piawai? Lakukan ujian hipotesis pada aras keertian 0.05.
   (iii) Bandingkan keputusan (i) dan (ii). Haruskah pasaraya A mengambil epal daripada pembekal buah-buahan tersebut?

   [20 markah]

9. *Jadual di bawah menunjukkan purata suhu harian (dalam darjah celsius) selama 10 hari dalam bulan September untuk dua bandar, A dan B. Sampel tersebut diandaikan tertabur secara normal.*

Bandar A	*14.0*	*12.5*	*11.5*	*12.2*	*12.4*	*12.3*	*11.8*	*11.9*	*13.7*	*13.2*
Bandar B	*12.0*	*12.5*	*11.6*	*13.3*	*13.0*	*13.0*	*12.1*	*12.8*	*12.2*	*12.6*

Bandar A : $\bar{x} = 12.55 \quad s^2 = 0.6827 \quad s = 0.826$
Bandar B : $\bar{x} = 12.51 \quad s^2 = 0.2832 \quad s = 0.532$

   (i) Lakukan ujian-t untuk menunjukkan sama ada purata suhu di bandar A dan bandar B berlainan.
   (ii) Gabungkan kedua-dua sampel tersebut menjadi satu senarai dan aturkan data dalam susunan menaik. Tentukan median dan nombor 'runs' di atas dan di bawah median.
   (iii) Gunakan ujian 'runs' pada aras keertian 5% untuk mengguji kerawakan data terhadap median.

   [20 markah]

10. It is claimed that the participation rate of Statistics course for the first year undergraduate students in university B is higher than the participation rate of university A. In order to investigate how true this statement holds, two independent samples are taken randomly. The results are summarized in the following table.

Universities	n	No. of students participate in Statistics
A	100	48
B	100	54

(i) Construct the 95% confidence interval for the difference between the proportions of the two samples.

(ii) Conduct a hypothesis test to determine if the participation ratios of two universities in Statistics are the same. Use the significance level $\alpha = 0.05$.

[10 marks]

10. *Terdapat dakwaan bahawa kadar penyertaan kursus Statistik untuk pelajar ijazah tahun pertama di Universiti B lebih tinggi daripada kadar penyertaan di Universiti A. Untuk menyiasat kebenaran dakwaan ini, dua sampel tak bersandar diambil secara rawak. Hasilnya diringkaskan dalam jadual berikut.*

Universiti	*n*	*Bil. pelajar yang menyertai kursus Statistik*
A	*100*	*48*
B	*100*	*54*

(i) Bentukkan 95% selang keyakinan untuk perbezaan nisbah antara kedua-dua sampel tersebut.

(ii) Lakukan ujian hipotesis untuk menentukan sama ada nisbah penyertaan dalam kursus Statistik untuk kedua-dua universiti adalah sama. Gunakan aras keertian $\alpha = 0.05$.

[10 markah]

APPENDIX/FORMULA

$\bar{x} = \frac{\sum xf}{\sum f}$ $s^2 = \frac{\sum (x^2 f) - \frac{(\sum xf)^2}{\sum f}}{\sum f - 1}$	$S_p^{\,2} = \frac{(n_x - 1)s_x^{\,2} + (n_y - 1)s_y^{\,2}}{n_x + n_y - 2}$ $\bar{p} = \frac{X + Y}{n_x + n_y}$
Confidence Intervals: $\overline{X} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$ $\overline{X} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$ $\hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ $\frac{(n-1)s^2}{\chi^2_{\alpha/2}}$ *to* $\frac{(n-1)s^2}{\chi^2_{1-\alpha/2}}$	$(\bar{X} - \bar{Y}) \pm z_{\alpha/2}\sqrt{\frac{\sigma_x^{\,2}}{n_x} + \frac{\sigma_y^{\,2}}{n_y}}$ $(\bar{X} - \bar{Y}) \pm z_{\alpha/2}\sqrt{\frac{s_x^{\,2}}{n_x} + \frac{s_y^{\,2}}{n_y}}$ $(\bar{X} - \bar{Y}) \pm t_{\alpha/2}\sqrt{S_p^{\,2}\left(\frac{1}{n_x} + \frac{1}{n_y}\right)}$ $(\hat{p}_x - \hat{p}_y) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_x(1-\hat{p}_x)}{n_x} + \frac{\hat{p}_y(1-\hat{p}_y)}{n_y}}$
Test Statistics: $Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}}$ $T = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}}$	$T = \frac{\bar{d} - \mu_d}{\frac{s_d}{\sqrt{n_d}}}$ $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$

Test Statistics:

$$Z = \frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}}}$$

$$Z = \frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{\frac{s_x^2}{n_x} + \frac{s_y^2}{n_y}}}$$

$$T = \frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{S_p^2\left(\frac{1}{n_x} + \frac{1}{n_y}\right)}}$$

$$Z = \frac{(\hat{p}_x - \hat{p}_y) - (p_x - p_y)}{\sqrt{\frac{p_x(1-p_x)}{n_x} + \frac{p_y(1-p_y)}{n_y}}}$$

$$Z = \frac{(\hat{p}_x - \hat{p}_y) - (p_x - p_y)}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_x} + \frac{1}{n_y}\right)}}$$

$$F = \frac{s_1^2}{s_2^2}$$

$$\chi^2 = \sum \frac{O - E}{E}, \quad E = np$$

Nonparametric Statistics:

Wilcoxon Signed-rank: $W = \sum R^+$, $W = \sum R^-$

$$Z = \frac{T - \mu_W}{\sigma_W}, \quad \mu_W = \frac{n(n+1)}{4}, \quad \sigma_W = \sqrt{\frac{n(n+1)(2n+1)}{24}}$$

Wilcoxon Rank Sum Test: $U = R - \frac{n(n+1)}{2}$

$$Z = \frac{T - \mu_T}{\sigma_T},$$

$$\mu_T = \frac{n_1(n_1 + n_2 + 1)}{2}, \quad \sigma_T = \sqrt{\frac{n_1 n_2 (n+1)(n_1 + n_2 + 1)}{12}}$$

Formulae

(1) Mann-Whitney U Test:

Mann-Whitney U test-statistic:

$$U_a = n_a \cdot n_b \cdot \frac{n_b \quad n_b + 1}{2} - R_b$$

$$U_b = n_a \cdot n_b \cdot \frac{n_a \quad n_a + 1}{2} - R_a$$

U^* is the test statistic , i.e. the smaller of U_a and U_b

Normal approximation:

Mean: $\mu_u = \frac{n_a \cdot n_b}{2}$

Standard deviation: $\sigma_u = \sqrt{\frac{n_a \cdot n_b \quad n_a + n_b + 1}{12}}$

Test-statistic: $z^* = \frac{U^* \cdot \mu_u}{\sigma_u}$

(2) Application of Chi-square:

Chi-square statistic: $\chi^{2*} = \sum \left[\frac{O - E}{E}^2 \right]$

(3) Inferences about variance

Test-statistic: $\chi^{2*} = \frac{n - 1 \; s^2}{\sigma^2}$

(4) Inferences about mean (σ known):

Test statistic: $t^* = \frac{\bar{x} - \mu}{s/\sqrt{n}}$

Calculated test-statistic for $H_0 : \mu_1 - \mu_2 = 0$

$$t^* = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Calculated test-statistic for $H_0 : p_1 - p_2 = 0$

$z^* = \frac{p_1^{'} - p_2^{'}}{\sqrt{p_p^{'} q_p^{'}} \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}$ where $p_p^{'} = \frac{x_1 + x_2}{n_1 + n_2}$ and $q_p^{'} = 1 - p_p^{'}$

APPENDIX

STANDARD NORMAL TABLE
(Area between mean and z-score)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2703	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

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