# UNIVERSITY OF SWAZILAND

## FINAL EXAMINATION PAPER 2007

TITLE OF PAPER:

QUANTITATIVE METHODS IN DEMOGRAPHY

COURSE CODE : DEM 206

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ANY THREE (3) QUESTIONS.

PLEASE DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN **GRANTED BY THE INVIGILATOR** 

## QUESTION 1 (3+3+3+3+3+3+3+2 marks)

Here is a grouped frequency distribution of ideal family sizes (the number of children desired) reported by respondents in a demographic survey:

Ideal Number	Frequency
0	16
1	26
2	752
3	353
4	196
5	34
6	14
7	8

Compute the following measures: mean, median, mode, standard deviation, coefficient of skewness and coefficient of variation. Interpret your results.

#### QUESTION 2 (8+12 marks)

a. Calculate the four-quarterly moving average trend of the following time series (of births in a large hospital).

		Qt.	iariers		
Year	1	2	3	4	
1999	500	450	350	550	
2000	350	350	200	350	
2001	250	200	150	250	

b. Calculate the de-seasonalized values for each quarter. Comment on the seasonal influences per quarter.

# QUESTION 3 (14+6 marks)

In a group of people on holiday it is established that there are:

- 10 males under the age of 21
- 8 females under the age of 21
- 6 males aged between 21 and 30
- 5 females aged between 21 and 30
- 7 males over the age of 30
- a. Calculate the probability that, if one person is selected at random from the group this person will be:

- i. A male under the age of 30;
- ii. A female;
- iii. A female over the age of 30;
- iv. A male over the age of 21;
- v. A person not older than 21;
- vi. A male given that this person is over 30;
- vii. A female or between 21 and 30 years
- b. Sixty percent of the population of a town read either magazine A or magazine B, and 10 percent read both. If 50% read magazine A, what is the probability that one person, selected at random, reads magazine B?

### QUESTION 4 (8+6+6 marks)

- a. A form of malnutrition occurs in 10% of all persons. Determine the probabilities for the following malnutrition outcomes for 5 randomly chosen persons:
  - i. All have it;
  - ii. At least two have it; and
  - iii. Between 2 and 4, inclusive, have it.
- b. Patients are known to arrive at a certain private clinic on a random basis, with an average of two customers per hour arriving at the facility.
  - i. What is the probability that more than 3 patients will require attention during a particular hour?
  - ii. What is the probability that fewer than 4 patients will require attention during a 4 hour period in the morning on a particular day?
- c. An IQ scale has approximately a normal distribution with a mean of 100 and a standard deviation of 16.
  - i. What proportion of people have an IQ of at most 115?
  - ii. What proportion of people have an IQ of between 94 and 96?

### QUESTION 5 (7+6+7 marks)

a. Unemployment at present in a certain area is said to be currently standing at not less than 15% of the economically active population. A random sample of 300 households in the area established that 34 of these households had at least

- one unemployed job seeker. Is this claim about the percentage of unemployed job-seekers correct? Test at the 1% level of significance.
- b. For a random sample of 150 households in a large metropolitan area the number of households in which at least one adult is currently unemployed and seeking a full-time job is 12. Using a 95% confidence interval, estimate the proportion of households in the area in which at least one adult is unemployed.
- c. A coin which is tossed 35 times comes up heads 20 times. Can we conclude at significance level 0.01 that the coin is not fair?

Table 4. Normal curve areas
Standard normal probability in right-hand tail
(for negative values of z areas are found by symmetry)

Z         DO         O1         DZ         O3         O4         O5         O6         O7         O8         O9           0.0         5000         4960         4920         4880         4840         4801         4761         4721         4681         4641           0.1         4602         4564         4324         4404         4364         4323         4286         4247           0.2         2,207         468         4129         4090         3972         3336         3902         3594         3557         3520         3483           0.4         3446         3409         3372         3336         3900         3264         3228         3192         3156         3121           0.5         2443         2490         3378         3396         3900         3264         3228         3192         3156         3121           0.7         2420         2389         2358         2377         2346         2211         2483         2481           0.7         2420         2381         2358         2327         2241         2926         2266         2324         2483         2481         2480         2483         2481 </th <th></th> <th></th> <th></th> <th></th> <th>Seco</th> <th>Second decimal place of z</th> <th>al place</th> <th>of z</th> <th></th> <th></th> <th></th>					Seco	Second decimal place of z	al place	of z			
5000         4960         4920         4880         4801         4761         4721         4681           4602         4562         4562         4522         4483         4443         4404         4364         4364         3432         4286           4,007         4188         4129         4090         4052         4013         3974         3935         3897           3221         3783         3745         3709         3663         3900         3264         3228         3192         3156           3085         3005         3015         2981         2946         2912         2877         2843         2810           2743         2799         2676         2643         2611         2778         2546         2214         2483           2440         2389         2358         2327         2296         2266         2236         2236         2177           2119         2090         2061         2033         2005         1977         1949         1922         1894           1841         1181         1176         1173         1171         1685         1660         1635           1135         1131         111	M	8	.01	23	.03	<b>Ģ</b>	.05	.06	.07	.08	.09
.4602 .4562 .4522 .4483 .4443 .4404 .4364 .4325 .4286 .4207 .4168 .4129 .4090 .4052 .4013 .3974 .3936 .3937 .3936 .3946 .3428 .3446 .3409 .3712 .3336 .3300 .3264 .3228 .3192 .3156 .3085 .3059 .2676 .2643 .2611 .2578 .2546 .2514 .2483 .2420 .2389 .2358 .2327 .2296 .2266 .2236 .2277 .2119 .2090 .2061 .2033 .2005 .1977 .1949 .1972 .1894 .1841 .1814 .1788 .1762 .1736 .1711 .1685 .1660 .1635 .1587 .1562 .1539 .1515 .1492 .1469 .1466 .1423 .1401 .1357 .1335 .1314 .1292 .1271 .1251 .1230 .1210 .1190 .1151 .1131 .1112 .1093 .1075 .1056 .1038 .1020 .0838 .0951 .0934 .0918 .0901 .0885 .0869 .0853 .0843 .0931 .0934 .0918 .0901 .0885 .0869 .0853 .0838 .0793 .0778 .0764 .0749 .0735 .0722 .0708 .0694 .0046 .0436 .0437 .0431 .0409 .0401 .0392 .0383 .0838 .0179 .0174 .0170 .0166 .0162 .0138 .0154 .0159 .0188 .0179 .0174 .0170 .0166 .0162 .0138 .0154 .0150 .0048 .0066 .0062 .0062 .0069 .0078 .0078 .0075 .0071 .0069 .0068 .0066 .0069 .0078 .0075 .0075 .0071 .0069 .0068 .0066 .0069 .0078 .0075 .0073 .0071 .0069 .0068 .0066 .0069	0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
	0.1	.4602	.4562	.4522	.4483	,4443	4404	.4364	.4325	.4286	.4247
3821         3783         3745         3707         3669         3632         3394         3357         3520           3446         3409         3372         3336         3300         3264         3228         3192         3156           3085         3050         3015         2981         2946         2912         2877         2843         2810           2743         2709         2676         2643         2611         2578         2546         2514         2483           2420         2389         2358         2327         2296         2266         2236         2206         2177           2119         2090         2061         2033         2005         1977         1949         1972         1483           1841         1.814         1.788         1.762         1.736         1.711         1.685         1660         2177           2119         1.131         1.112         1.093         1.075         1.056         1.633         1.201         1.190           1.157         1.131         1.112         1.093         1.071         1.056         1.635         1.469         1.401         1.493         1.051         1.038         <	0.2	.,4207	.4168	.4129	.4090	4052	.4013	3974	.3936	.3897	,3859
3446 3409 3372 3336 3300 3264 3228 3192 3156 33085 3050 3015 2981 2946 2912 2877 2843 2810 2743 2709 2676 2643 2611 2578 2546 2514 2483 2420 2389 2358 2327 2296 2266 2236 2206 2177 2119 2090 2061 2033 2005 1977 1949 1922 1894 1841 .1814 .1788 .1762 .1736 .1711 .1685 .1660 .1635 1.1587 .1562 .1539 .1515 .1492 .1469 .1446 .1423 .1401 1.1377 .1335 .1314 .1292 .1271 .1251 .1230 .1230 .1190 1.1571 .1335 .1314 .1292 .1271 .1251 .1238 .1020 .1033 0968 .0951 .0934 .0918 .0901 .0885 .0869 .0833 .0838 0.0808 .0793 .0778 .0764 .0749 .0735 .0722 .0708 .0694 0.0648 .0655 .0643 .0630 .0618 .0606 .0594 .0582 .0571 0.0548 .0537 .0526 .0516 .0505 .0495 .0485 .0475 .0465 0.0446 .0436 .0427 .0418 .0409 .0401 .0392 .0384 .0375 0.0359 .0352 .0344 .0336 .0329 .0322 .0314 .0307 .0301 0.0287 .0281 .0274 .0268 .0262 .0256 .0250 .0244 .0239 0.0228 .0222 .0217 .0212 .0207 .0202 .0197 .0192 .0188 0.0179 .0174 .0170 .0166 .0162 .0158 .0154 .0150 .0146 0.0139 .0136 .0132 .0129 .0125 .0125 .0125 .0113 0.0162 .0060 .0039 .0037 .0055 .0054 .0059 .0068 .0066 0.0062 .0060 .0078 .0075 .0073 .0071 .0069 .0068 .0066 0.0023 .0034 .0033 .0032 .0031 .0040 .0039 .0087 0.0013 .0018 .0017 .0017 .0016 .0016 .0015 .0015 .0014 0.00131 7 0.000 0031 7 0.000 000 287	<b>E</b> .0	.3821	.3783	.3745	.3707	.3669	.3632	3594	.3557	.3520	.3483
3985         3950         3915         2981         2946         2912         2877         2843         2810           2743         2709         2276         2243         2611         2578         2546         2514         2483           2420         2389         2358         2327         2296         2266         2236         2206         2177           2119         2090         2061         2033         2005         1977         1949         1922         1894           11841         .1814         .1788         .1762         .1736         .1711         .1685         .1660         .1635           1.151         .1313         .1112         .1093         .1075         .1056         .1038         .1020         .1003           .0588         .0951         .0934         .0918         .0901         .0885         .0869         .0823         .0838           .0808         .0793         .0778         .0764         .0749         .0735         .0727         .0038           .0848         .0655         .0643         .0630         .0618         .0666         .0594         .0582         .0871           .0544         .0336         .0	0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	3192	.3156	.3121
2743 2709 2676 2643 2611 2578 2546 2514 2483 2420 2389 2358 2327 2296 2266 2236 2236 2206 2177 2119 2090 2061 2033 2005 1977 1949 1922 1894 1841 1841 1814 1762 1762 1776 1771 1685 1660 1635 1.157 1.355 1.334 1.292 1.175 1.056 1.034 1.129 1.137 1.1335 1.1112 1.093 1.075 1.056 1.038 1.020 1.103 1.0885 0.0694 0.0918 0.0918 0.0918 0.0901 0.0885 0.0893 0.0833 0.0688 0.0793 0.0778 0.0764 0.0749 0.0735 0.0722 0.0835 0.0838 0.0031 0.0526 0.0534 0.0835 0.0838 0.0931 0.0237 0.0418 0.0409 0.0401 0.0922 0.0344 0.035 0.0484 0.0436 0.0427 0.0418 0.0409 0.0401 0.0922 0.0344 0.0375 0.0287 0.0281 0.0274 0.0268 0.0262 0.0250 0.0244 0.0239 0.0287 0.0281 0.0718 0.0718 0.0718 0.0719 0.0144 0.0102 0.099 0.096 0.094 0.0919 0.088 0.0666 0.039 0.039 0.039 0.039 0.039 0.039 0.039 0.0039	2.0	.3085	.3050	.3015	.2981	.2946	2912	2877	2843	.2810	.2776
2420         2389         2358         2327         2296         2266         2236         2236         2171           2119         2090         2061         2033         2005         1977         1949         1922         1894           1841         1814         1788         1762         1736         1711         1685         1660         1635           1.1587         1.562         1.539         1.515         1.492         1.427         1.469         1.446         1.423         1.401           1.357         1.335         1.314         1.292         1.271         1.251         1.230         1.210         .1190           1.151         1.131         1.112         1.093         1.075         1.056         1.038         1.020         1.003           .0968         .0951         .0934         .0918         .0901         .0885         .0869         .0833         .0838           .0868         .0951         .0934         .0918         .0901         .0885         .0869         .0833         .0838           .0668         .0643         .0630         .0618         .0666         .0594         .0582         .0572         .0455	9,0	.2743	.2709	2676	.2643	.2611	2578	.2546	.2514	.2483	.2451
2119         2090         2061         2033         2005         1977         1949         1922         1894           1841         1814         1788         1762         1736         1711         1685         1660         1635           1.1587         1.562         1.1539         1.1515         1.492         1.469         1.446         1.423         1.401           1.357         1.335         1.314         1.292         1.271         1.251         1.230         .1210         .1190           1.151         1.1131         1.112         .1093         .1075         .1056         .1038         .1020         .1003           .0968         .0951         .0934         .0918         .0901         .0885         .0869         .0833         .0838           .0868         .0655         .0643         .0630         .0618         .0606         .0594         .0582         .0839           .0446         .0436         .0427         .0418         .0409         .0401         .0392         .0384         .0375           .0287         .0281         .0274         .0268         .0262         .0256         .0250         .0244         .0375           .03	0.7	.2420	.2389	2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
1.1841 1.1814 1.1788 1.1762 1.1736 1.1711 1.1685 1.1660 1.1535 1.1587 1.1562 1.1539 1.1515 1.1492 1.1469 1.1446 1.1423 1.1401 1.1357 1.1335 1.1314 1.1292 1.1271 1.1251 1.1230 1.1210 1.1190 1.1151 1.1131 1.1112 1.093 1.075 1.056 1.038 1.0220 1.0033 1.0968 0.0951 0.0934 0.0918 0.0901 0.0885 0.0869 0.0833 0.0838 0.0698 0.0655 0.0643 0.0630 0.0618 0.0606 0.0594 0.0582 0.0571 0.0548 0.0537 0.0526 0.0516 0.0505 0.0495 0.0485 0.0475 0.0465 0.0446 0.0436 0.0427 0.0418 0.0409 0.0401 0.0392 0.0384 0.0375 0.0287 0.0281 0.0274 0.0268 0.0262 0.0256 0.0250 0.0244 0.0395 0.0282 0.0217 0.0116 0.0162 0.0158 0.0154 0.0150 0.0146 0.0139 0.0136 0.0132 0.0129 0.0125 0.0125 0.0125 0.0146 0.0062 0.0060 0.0078 0.0073 0.0071 0.0069 0.0068 0.0066 0.0062 0.0064 0.0039 0.0039 0.0038 0.0037 0.0035 0.034 0.0033 0.0037 0.0013	0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1972	.1894	.1867
1.1587 1.1562 1.1539 1.1515 1.1492 1.1469 1.1446 1.1423 1.1401 1.1357 1.1335 1.1314 1.1292 1.1271 1.1251 1.1230 1.1210 1.1190 1.1151 1.1131 1.1112 1.093 1.075 1.056 1.038 1.0220 1.0033	0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
.1357 .1335 .1314 .1292 .1271 .1251 .1230 .1210 .1190 .1151 .1131 .1112 .1093 .1075 .1056 .1038 .1020 .1003	0.1	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
.1151 .1131 .1112 .1093 .1075 .1056 .1038 .1020 .1003 .0968 .0951 .0934 .0918 .0901 .0885 .0869 .0833 .0838 .0808 .0793 .0778 .0764 .0749 .0735 .0722 .0708 .0694 .0668 .0655 .0643 .0630 .0618 .0606 .0594 .0592 .0571 .0548 .0537 .0526 .0516 .0505 .0495 .0485 .0475 .0465 .0436 .0437 .0418 .0409 .0401 .0392 .0384 .0375 .0399 .0352 .0344 .0336 .0329 .0322 .0314 .0307 .0301 .0287 .0281 .0274 .0268 .0262 .0256 .0250 .0244 .0239 .0228 .0222 .0217 .0212 .0207 .0202 .0197 .0192 .0188 .0179 .0174 .0170 .0166 .0162 .0158 .0154 .0150 .0146 .0113 .0107 .0104 .0102 .0099 .0096 .0094 .0091 .0089 .0087 .0082 .0080 .0078 .0075 .0073 .0071 .0069 .0068 .0066 .0062 .0060 .0078 .0073 .0071 .0069 .0068 .0066 .0062 .0060 .0039 .0039 .0039 .0039 .0039 .0039 .0039 .0039 .0039 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0037 .0011 .00113 .0013 .0017 .0017 .0016 .0016 .0015 .0014 .0010 .0014 .0000 .0000 .0078 .0017 .0016 .0016 .0015 .0014 .0014 .0000	:	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
.0968         .0951         .0934         .0918         .0901         .0885         .0869         .0833         .0838           .0808         .0793         .0778         .0764         .0749         .0735         .0722         .0708         .0694           .0668         .0655         .0643         .0630         .0618         .0606         .0594         .0582         .0571           .0548         .0537         .0526         .0516         .0505         .0495         .0485         .0475         .0465           .0446         .0436         .0427         .0418         .0409         .0401         .0392         .0384         .0375           .0339         .0352         .0344         .0336         .0329         .0322         .0314         .0307         .0301           .0287         .0281         .0271         .0212         .0227         .0226         .0250         .0244         .0335           .0228         .0222         .0217         .0212         .0227         .0227         .0197         .0192         .034           .0119         .0134         .0170         .0166         .0162         .0158         .0154         .0130         .0116	1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
.0808 .0793 .0778 .0764 .0749 .0735 .0727 .0708 .0694 .0668 .0655 .0643 .0630 .0618 .0606 .0594 .0582 .0571 .0548 .0537 .0526 .0516 .0505 .0495 .0485 .0475 .0465 .0446 .0436 .0427 .0418 .0409 .0401 .0392 .0384 .0375 .0359 .0352 .0344 .0336 .0329 .0322 .0314 .0397 .0301 .0287 .0281 .0274 .0268 .0262 .0256 .0250 .0244 .0239 .0228 .0222 .0217 .0212 .0227 .0202 .0197 .0192 .0188 .0179 .0174 .0170 .0166 .0162 .0158 .0154 .0150 .0146 .0139 .0136 .0132 .0129 .0125 .0122 .0119 .0116 .0113 .0107 .0104 .0102 .0099 .0096 .0094 .0091 .0089 .0087 .0082 .0080 .0078 .0073 .0073 .0071 .0069 .0068 .0066 .0062 .0064 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0027 .0021 .0021 .0020 .0018 .0017 .0017 .0016 .0016 .0015 .0014 .0013 .000 .0034 .0033 .0037 .0016 .0016 .0015 .0014 .0010 .0019 .0018 .0017 .0017 .0016 .0016 .0015 .0014 .0010 .000 .0034 .0003 40 .000 .000 .000 .00	1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	<b>8E80</b> .	.0823
.0668	1.4	8080	.0793	.0778	.0764	.0749	.0735	.0722	.0708	.0694	.0681
.0548 .0537 .0526 .0516 .0505 .0495 .0485 .0475 .0465 .0446 .0436 .0437 .0418 .0409 .0401 .0392 .0384 .0375 .0389 .0352 .0384 .0336 .0329 .0322 .0314 .0307 .0301 .0287 .0281 .0274 .0268 .0262 .0256 .0250 .0244 .0239 .0228 .0222 .0217 .0212 .0207 .0202 .0197 .0192 .0188 .0179 .0174 .0170 .0166 .0162 .0158 .0154 .0150 .0146 .0113 .0197 .0104 .0102 .0099 .0096 .0094 .0091 .0089 .0087 .0082 .0080 .0078 .0075 .0073 .0071 .0069 .0068 .0066 .0062 .0064 .0015 .0015 .0014 .0015 .0049 .0068 .0066 .0065 .0064 .0033 .0037 .0031 .0039 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0027 .00135 .0018 .0017 .0017 .0016 .0016 .0015 .0014 .0013 .000 .0034 .0007 .0017 .0016 .0016 .0015 .0014 .0013 .000 .0034 .0003 40 .000 .000 .000 .00	1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
.0446	1.6	.0548	.0537	.0526	.0516	.0505	0495	.0485	.0475	.0465	.0455
.0359         .0352         .0344         .0336         .0329         .0322         .0314         .0307         .0301           .0287         .0281         .0274         .0268         .0262         .0226         .0250         .0244         .0239           .0228         .0222         .0217         .0212         .0227         .0202         .0197         .0192         .0188           .0179         .0136         .0132         .0129         .0125         .0123         .0158         .0154         .0150         .0146           .0139         .0136         .0132         .0129         .0125         .0122         .0119         .0116         .0113           .0107         .0104         .0102         .0099         .0096         .0094         .0091         .0089         .0087           .0062         .0060         .0078         .0075         .0073         .0071         .0069         .0068         .0066           .0062         .0060         .0059         .0057         .0055         .0054         .0052         .0051         .0049           .0047         .0045         .0044         .0043         .0041         .0040         .0039         .0038         .0037 <td>1.7</td> <td>.0446</td> <td>.0436</td> <td>.0427</td> <td>.0418</td> <td>.0409</td> <td>.0401</td> <td>.0392</td> <td>.0384</td> <td>.0375</td> <td>.0367</td>	1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
.0287         .0281         .0274         .0268         .0262         .0236         .0236         .0230         .0244         .0239           .07228         .0722         .0217         .0212         .0227         .0207         .0197         .0197         .0198         .0146         .0152         .0158         .0154         .0150         .0146         .0132         .0129         .0125         .0122         .0119         .0116         .0113         .0117         .0104         .0107         .0099         .0096         .0094         .0091         .0089         .0087           .0082         .0080         .0078         .0073         .0073         .0071         .0069         .0068         .0066           .0062         .0060         .0059         .0057         .0055         .0054         .0052         .0051         .0049           .0047         .0045         .0044         .0043         .0041         .0040         .0039         .0038         .0037           .0024         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023         .0023	1.8	.0359	.0352	0344	.0336	.0329	0322	.0314	.0307	.0301	.0294
.022.8         .022.2         .0217         .0212         .0207         .0202         .0197         .0192         .0188           .0179         .0174         .0170         .0166         .0162         .0158         .0154         .0150         .0146           .0139         .0136         .0132         .0129         .0125         .0122         .0119         .0116         .0113           .0107         .0104         .0102         .0099         .0096         .0094         .0091         .0089         .0087           .0082         .0080         .0078         .0073         .0073         .0071         .0069         .0068         .0066           .0062         .0060         .0059         .0057         .0055         .0054         .0052         .0051         .0049           .0047         .0045         .0044         .0043         .0041         .0040         .0039         .0038         .0037           .0026         .0025         .0024         .0023         .0021         .0029         .0028         .0027           .0026         .0025         .0024         .0023         .0023         .0022         .0021         .0021         .0020           .0013	1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
.0179 .0174 .0170 .0166 .0162 .0158 .0154 .0150 .0146 .0139 .0136 .0132 .0129 .0125 .0122 .0119 .0116 .0113 .0107 .0104 .0102 .0099 .0096 .0094 .0091 .0089 .0087 .0082 .0080 .0078 .0075 .0073 .0071 .0069 .0068 .0066 .0062 .0066 .0059 .0057 .0055 .0054 .0052 .0051 .0049 .0047 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0027 .0026 .0025 .0024 .0023 .0031 .0030 .0029 .0028 .0027 .0019 .0018 .0017 .0016 .0016 .0016 .0015 .0014 .000 .0031 7 .000 .0034 .000 .000 .000 .000 .000 .00	2.0	.0228	.0222	.0217	.0212	.0207	0202	.0197	.0192	.0188	.0183
.0139 .0136 .0132 .0129 .0125 .0127 .0119 .0116 .0113 .0107 .0104 .0102 .0099 .0096 .0094 .0091 .0089 .0087 .0082 .0080 .0078 .0073 .0073 .0071 .0069 .0068 .0066 .0062 .0060 .0059 .0057 .0055 .0054 .0052 .0051 .0049 .0047 .0045 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0027 .0026 .0025 .0024 .0023 .0023 .0023 .0021 .0020 .0021 .0021 .0020 .00135 .0018 .0017 .0016 .0016 .0015 .0015 .0014 .000 .003 40 .000 .003 40	2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
.0107 .0104 .0102 .0099 .0096 .0094 .0091 .0089 .0087 .0082 .0080 .0078 .0073 .0073 .0071 .0069 .0068 .0066 .0062 .0060 .0059 .0057 .0055 .0054 .0052 .0051 .0049 .0047 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0033 .0031 .0040 .0039 .0038 .0037 .0056 .0056 .0024 .0033 .0031 .0030 .0029 .0028 .0027 .0026 .0025 .0024 .0023 .0023 .0023 .0022 .0021 .0021 .0020 .00135 .0018 .0017 .0016 .0016 .0016 .0015 .0014 .000 .003 40 .000 .003 40	2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
.0082 .0080 .0078 .0073 .0071 .0069 .0068 .0066 .0062 .0062 .0060 .0059 .0057 .0055 .0054 .0052 .0051 .0049 .0047 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0040 .0039 .0028 .0037 .0026 .0025 .0024 .0023 .0023 .0022 .0021 .0021 .0020 .0019 .0018 .0017 .0017 .0016 .0016 .0015 .0015 .0014 .00135 .000 .0034 .0017 .0017 .0016 .0016 .0015 .0015 .0014 .000 .0034 0 .000 .0034 0 .000 .000 .0	2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
.0062 .0060 .0059 .0057 .0055 .0054 .0052 .0051 .0049 .0047 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0040 .0039 .0038 .0037 .0026 .0025 .0024 .0023 .0023 .0023 .0022 .0021 .0021 .0020 .0019 .0018 .0017 .0016 .0016 .0015 .0015 .0014 .00133 .000 .0034 .0017 .0017 .0016 .0016 .0015 .0015 .0014 .000 .0034 0 .000 .0034 0 .000 .00340 .000 .00	2.4	,0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
.0047 .0045 .0044 .0043 .0041 .0040 .0039 .0038 .0037 .0035 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0027 .0026 .0025 .0024 .0023 .0023 .0023 .0022 .0021 .0021 .0020 .0019 .0018 .0017 .0016 .0016 .0016 .0015 .0015 .0014 .00135 .000 .0034 .000 .0034 .000 .0034 .000 .0034 .000 .000	2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
.0035 .0034 .0033 .0032 .0031 .0030 .0029 .0028 .0027 .0026 .0025 .0024 .0023 .0023 .0022 .0021 .0021 .0020 .0019 .0018 .0017 .0017 .0016 .0016 .0015 .0015 .0014 .00135 .000 .031 7 .000 .003 40 .000 .000 .001 .001	2.6	.0047	.0045	0044	.0043	.0041	.0040	.0039	8E00.	.0037	.0036
.0026 .0025 .0024 .0023 .0022 .0021 .0021 .0020 .0019 .0018 .0017 .0017 .0016 .0016 .0015 .0015 .0014 .0013 .00033 .000 .0031 7 .000 .003 40 .000 .000 .000 .287	2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
.0019 .0018 .0017 .0017 .0016 .0016 .0015 .0014 .0013 .0014 .00135 .0014 .00135 .000233 .000 031 7 .000 003 40 .000 000 287	2.8	.0026	.0025	.0024	.0023	,0023	.0022	.0021	.0021	.0020	.0019
	2.9	,0019	.0018	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014
	3.0	.00135									
	3	.000 233	_								
	4.0	.000 031	. 7								
	2.	.000 000	40								
	5.0	.000 000	) 287								

From R. B. Walpole, Introduction to Statistics (New York: Macmillan, 1968).

Percentage points of the X-distribution

023         X <sub>0,010</sub> X <sub>0,003</sub> 22389         6,63490         7,87944           17776         9,21034         10,5966           44840         11,3449         12,8381           4494         16,8119         18,5476           4494         16,8119         18,5476           4494         16,8119         18,5476           4494         16,8119         18,5476           4494         16,8119         18,5476           4494         16,8119         18,5476           4494         16,8119         18,5476           4495         14,4660         23,5893           20,0902         21,1882         20,2777           346         20,0902         25,1882           200         24,7250         26,7569           367         26,2170         28,2995           3831         23,2803         29,8194           390         29,1413         31,3193           31,3193         32,21413         31,3193           32,007         32,4087         32,7185           34,43         31,9999         34,2672           31,4098         38,3193         31,3193           31,4098<	Table 6. (American)	men review teaper	tage points	To the second	1-distribution	Ş
5554         3.84146         5.02389         6.63490         7.87944           5517         5.9147         7.37776         92.1034         10.5966           1139         7.81473         9.34840         11.349         10.5966           11344         9.48773         11.1433         13.2767         14.8607           1633         11.0705         12.8325         15.0863         16.7496           144601         16.0128         18.4753         20.2777           16         12.5916         14.4494         16.8119         18.5776           16.0128         18.4753         20.2777         20.4831         23.0993         25.1882           19.6751         17.5346         20.0902         24.7250         28.2995           94         21.0261         22.3367         26.2170         28.2995           94         21.0261         24.7356         27.5883         29.8194           42         23.6848         26.1190         29.1413         31.3193           42         23.6822         27.4884         30.5779         32.8013           71         24.8938         27.4884         30.5779         32.8013           71         28.8933         31.5264 </th <th><math>\chi^{2}_{0.100}</math></th> <th>X<sub>0.050</sub></th> <th>X0.025</th> <th>X<sub>0.010</sub></th> <th>X<sub>0.005</sub></th> <th>Jp</th>	$\chi^{2}_{0.100}$	X <sub>0.050</sub>	X0.025	X <sub>0.010</sub>	X <sub>0.005</sub>	Jp
5517         5.9147         7.37776         9.21034         10.5966           1139         7.81473         9.34840         11.3449         12.8381           19944         9.48773         11.1433         13.2767         14.8602           1633         11.0705         12.8325         15.0863         16.7496           446         12.5916         14.4494         16.8119         18.5476           70         14.0671         16.0128         18.4753         20.2777           16         15.5073         17.346         20.0902         21.9550           37         16.9190         19.07228         21.6660         23.5893           71         18.3070         20.4831         23.2093         25.1882           94         21.0261         23.3367         26.2170         28.2995           94         21.6848         26.1190         29.1413         31.3193           18         26.2962         21.4884         30.5779         32.8013           18         26.2962         21.4884         30.5779         32.8013           18         26.2962         21.4844         30.5799         34.2672           21.8453         31.5934         31.5662	2.70554	3.84146	5.02389	6.63490	7.87944	
1139         7.81473         9.34840         11.3449         12.8381           9944         9.48773         11.1433         13.2767         14.8602           1635         11.0705         12.8325         15.0863         16.7496           146         12.5916         14.4494         16.8119         18.5476           14.0671         16.0128         18.4733         20.2777           116         15.5073         17.5346         20.0902         21.9550           27         16.9190         19.0228         21.0660         23.5893           27         16.9190         20.2361         24.7250         24.7250         25.1882           29         21.0261         21.3367         26.2170         28.2995           94         21.0261         21.3367         26.2170         28.2995           94         22.3621         24.7356         27.6883         29.8194           42         23.6488         26.1190         29.1413         31.3193           72         24.9586         27.4884         30.5779         32.8013           72         24.9586         27.4884         30.5779         32.8013           72         24.9587         31.3193	4.60517	5.99147	7.37776	9.21034	10.5966	
944 9.48773 11.1433 13.2767 14.8602 16635 11.0705 12.8325 15.0863 16.7496 146 12.5916 14.4494 16.8119 18.5476 170 14.0671 16.0128 18.4753 20.2777 166 15.5073 17.5346 20.9902 21.9550 19.6751 19.07228 21.6660 23.5893 171 18.3070 20.4831 23.2093 25.1882 19 22.3621 24.7356 27.6883 29.8194 42 23.6848 26.1190 29.1413 31.3193 172 24.9958 27.4884 30.5779 32.8013 18 26.2962 28.8454 31.9999 34.2672 18 27.5871 30.1910 33.4087 35.7185 18 26.2962 28.8454 31.9999 34.2672 19 27.3871 30.1910 33.4087 35.7185 19 27.3871 30.1910 33.4087 35.7185 19 33.4789 31.5264 34.8053 37.1564 19 33.6705 35.4789 38.9321 44.4010 20 31.4104 34.6966 37.5662 39.9968 21 33.9244 40.6465 44.3141 46.9278 29 33.1725 38.0757 41.6384 44.1813 29 33.1852 41.9232 45.6417 48.2899 10 43.7729 46.6979 49.5879 52.3356 10 43.7729 46.6979 50.8972 51.6520 32.6720 10 43.7729 46.9792 50.8972 53.6720 10 67.5048 71.4202 76.1539 79.4900 10 79.0819 83.2971 100.425 104.215 77 11 90.5312 95.0231 100.425 104.215 77 11 10.16321 88 113.145 118.136 124.116 128.299 9	6.25139	7.81473	9.34840	11.3449	12.8381	
6635         11.0705         12.8325         15.0863         16.7496           446         12.5916         14.4494         16.8119         18.5476           70         14.0671         16.0128         18.4733         20.2777           116         15.5073         17.5346         20.0902         21.9550           116         15.5073         17.5346         20.0902         21.9550           11         18.3070         20.4831         23.093         25.1882           20         19.6751         21.9200         24.7250         26.7569           94         21.0261         23.3367         26.1170         28.2995           19         22.3621         24.7356         27.4883         29.8193           21         22.4958         27.4884         30.5779         32.8013           11         23.2962         28.8434         30.5779         32.8013           22.5871         20.1910         33.4087         35.7185           23.48693         31.5264         34.8053         37.1564           24.8693         31.5264         34.8053         37.1564           25.28771         30.1910         33.4087         32.3822           27.5877	7.77944	9.48773	11.1433	13.2767	14.8602	
446         12.5916         14.4494         16.8119         18.5476           70         14.0671         16.0128         18.4753         20.2777           116         15.5073         17.5346         20.0902         21.9550           27         16.9190         19.0228         21.6660         23.5893           27         16.9197         20.4831         23.2093         25.1882           20         19.6751         21.9200         24.7250         26.7369           24         21.0261         23.367         26.1170         28.2995           19         22.36848         26.1190         29.4113         31.3193           19         22.36871         20.1910         39.4087         32.8012           19         22.36871         30.1909         34.2672           21.88693         31.5844         30.5779         32.8012           22.5871         30.1908         38.71264         31.9999           23.4133         31.354         31.9999         34.2672           24.28693         31.5264         31.9083         37.1564           30.1413         34.1696         37.5662         39.9968           31.4104         34.1696         37.5662	9.23635	11.0705	12.8325	15.0863	16.7496	
70         14.0671         16.0128         18.4753         20.2777           116         15.5073         17.5346         20.0902         21.9550           37         16.9190         19.0728         21.6660         23.5893           71         18.3070         20.4831         23.2093         25.1882           50         19.6751         21.9200         24.7250         26.7569           94         21.0261         23.367         26.2170         28.2995           19         22.36848         26.1190         29.1413         31.3193           118         26.2962         28.8454         30.9779         32.8013           118         26.2962         28.8454         30.9799         34.2672           27.5871         30.1910         33.4087         35.7185           94         28.8693         31.2564         34.8053         37.1564           95         31.4104         34.1696         37.5662         39.9968         38.5822           20         31.4104         34.1696         37.5662         39.9968         38.2822           21         32.5705         35.4789         38.9321         41.4010         39.9968           51 <td< td=""><td>10.6446</td><td>12.5916</td><td>14.4494</td><td>16.8119</td><td>18.5476</td><td></td></td<>	10.6446	12.5916	14.4494	16.8119	18.5476	
116         15.5073         17.5346         20.0902         21.9550           37         16.9190         19.0728         21.6660         23.5893           37         16.9190         19.0728         21.6660         23.5893           71         18.3070         20.4831         23.2093         25.1882           50         19.6751         21.9200         24.7250         26.7569           94         21.0261         23.367         26.2170         28.2995           19         22.3621         24.7356         27.6883         29.8194           42         23.6848         26.1190         29.1413         31.3193           72         24.9958         27.4884         30.5779         32.8013           31.3264         31.9999         34.2672         32.8023           31.3264         31.9908         38.5822         31.564           31.4104         34.1696         37.5662         39.9968         38.5822           31         32.6705         35.4789         38.9321         41.4010         34.1696         39.9968         38.5822           31         32.64151         39.3641         42.9798         42.7956         39.9968         42.7956         39.996	12.0170	14.0671	16.0128	18.4753	20.2777	
37         16.9190         19.0728         21.6660         23.5893           71         18.3070         20.4831         23.2093         25.1887           71         18.3070         20.4831         23.2093         25.1887           50         19.6751         21.9200         24.7250         26.7569           94         21.0261         23.367         26.2170         28.2995           19         22.3621         24.7356         27.6883         29.8194           42         23.6848         26.1190         29.1413         31.3193           72         24.9958         27.4884         30.5779         32.8013           73         24.8663         31.5264         34.8053         37.1564           30.1435         32.8523         36.1908         38.5822           20         31.4104         34.1696         37.5662         39.9968           31         32.6705         35.4789         38.9321         41.4010           31         32.5724         36.7807         40.2894         42.7956           31         33.9244         36.7807         41.5384         44.1813         2           34         41.9232         45.6417         48.2899 </td <td>13.3616</td> <td>15.5073</td> <td>17.5346</td> <td>20.0902</td> <td>21.9550</td> <td><b>~</b> .</td>	13.3616	15.5073	17.5346	20.0902	21.9550	<b>~</b> .
71         18.3070         20.4831         23.2093         25.1882           50         19.6751         21.9200         24.7250         26.7569           94         21.0261         23.367         26.2170         28.2995           19         22.3621         24.7356         27.6883         29.8194           42         23.6848         26.1190         29.1413         31.3193           77         24.9958         27.4884         30.5779         32.8013           72         24.9958         27.4884         30.5779         32.8013           73         26.2962         28.8454         31.9999         34.2672           29         31.5264         31.9999         34.2672           30.14104         31.5264         34.8053         37.1564           31.4104         34.1696         37.5662         39.9968           32.5705         35.4789         38.9321         41.4010           31         35.7185         38.9321         41.4010           31         35.7187         40.2894         42.7956           31         35.7185         38.9321         41.4010           32         36.4151         39.3641         42.9798         45.	14.6837	16.9190	19.0228	21.6660	23.5893	١٥.
50         19.6751         21.9200         24.7250         26.7569           94         21.0261         23.367         26.2170         28.2995           94         21.0261         23.367         26.2170         28.2995           19         22.3621         24.7356         27.6883         29.8194           42         23.6848         26.1190         29.1413         31.3193           77         24.9958         27.4884         30.5779         32.8013           94         28.8693         31.5264         34.803         37.1564           94         28.8693         31.5264         34.803         37.1564           94         28.7005         32.4789         38.9321         41.4010           31.4104         34.1696         37.5662         39.9968         38.5822           30         31.5244         36.7807         40.2894         42.7956           31.39244         36.7807         40.2894         42.7956           33.4151         39.3641         42.9798         45.5885           39.3641         42.9798         45.5885         2           40.1133         43.1944         46.9630         49.6449         2           41<	15.9871	18.3070	20.4831	23.2093	25.1882	=
94 21.0261 23.367 26.2170 28.2995 19 22.3621 24.7356 27.6883 29.8194 42 23.6848 26.1190 29.1413 31.3193 72 24.9958 27.4884 30.5779 32.8013 18 26.2962 28.8454 31.9999 34.2672 90 27.5871 30.1910 33.4087 35.7185 94 28.8693 31.5264 34.8053 37.1564 95 30.1435 32.8523 36.1908 38.5822 10 31.4104 34.1696 39.3921 41.4010 21 32.6705 35.4789 38.9321 41.4010 23 33.9244 36.7807 40.2894 42.7956 23 35.1725 38.0757 41.6384 44.1813 23 36.4151 39.3641 42.9798 45.5885 24 31.372 40.6465 44.2141 46.9278 25 36.4151 39.3641 46.9630 49.6449 26 43.7729 46.5792 50.8922 53.6720 27 40.1337 44.4607 48.2782 50.9933 28 42.5569 45.7222 49.5879 52.3356 29 43.7729 46.5792 50.8922 53.6720 20 43.7729 46.5792 50.8922 53.6720 20 79.0819 83.2976 88.3794 91.9517 6 21 101.879 106.629 112.329 116.321 8 21 101.879 106.629 112.329 116.321 8 21 101.879 106.629 112.329 116.321 8	17.2750	19.6751	21.9200	24.7250	26.7569	<u> </u>
19         22.3621         24.7356         27.6883         29.8194           42         23.6848         26.1190         29.1413         31.3193           77         24.9958         27.4884         30.5779         32.8013           78         26.2962         28.8434         31.9999         34.2672           90         27.5871         30.1910         33.4087         35.7185           94         28.8693         31.5264         34.8053         37.1564         1           96         31.4104         34.1696         37.5662         39.9968         2           20         31.4104         34.1696         37.5662         39.9968         2           21         32.6705         35.4789         38.9321         41.4010         3           22         31.39244         36.7807         40.2894         42.7956         2           23         35.1725         38.0757         41.6384         44.1813         2           33         36.4151         39.3641         42.9798         45.5855         2           34         39.4465         44.3141         46.9278         2           34         48.2923         45.6417         48.2899	18.5494	21.0261	23.3367	26.2170	28.2995	5
42 23.6848 26.1190 29.1413 31.3193 72 24.9958 27.4884 30.5779 32.8013 18 26.2962 28.8454 31.9999 34.2672 90 27.5871 30.1910 33.4087 35.7185 94 28.8693 31.5264 34.8053 37.1564 30.1435 32.8523 36.1908 38.5822 20 31.4104 34.1696 37.5662 39.9968 51 32.6705 35.4789 38.9321 41.4010 33.9244 36.7807 40.2894 42.7956 33.9244 36.7807 40.2894 42.7956 33.9244 36.7807 40.2894 42.7956 23 36.4151 39.3641 42.9798 45.5855 2 36 37.6525 40.6465 44.3141 46.9278 42.8899 24 40.1133 43.1944 46.9630 49.6449 2 24 40.1133 43.1944 46.9630 49.6449 2 25 42.5569 45.7222 49.5879 52.3356 2 26 43.7729 46.9792 50.8922 53.6720 3 26 43.7729 46.9792 50.8922 53.6720 3 27 67.5048 71.4202 76.1539 79.4900 5 28 101.879 106.629 112.329 116.321 8 113.145 118.136 124.116 128.299 9 10 124.342 129.561 135.807 140.169 10	19.8119	22.3621	24.7356	27.6883	29.8194	=======================================
72         24.9958         27.4884         30.5779         32.8013           18         26.2962         28.8454         31.9999         34.2672           90         27.5871         30.1910         33.4087         35.7185           94         28.8693         31.5264         34.8033         37.1564           36         30.1435         32.8523         36.1908         38.5822           20         31.4104         34.1696         37.5662         39.9968           31         32.6705         35.4789         38.9321         41.4010           31         33.9244         36.7807         40.2884         42.7956           33         35.1725         38.0757         41.6384         44.1813           39         36.4151         39.3641         42.9798         45.5585           31         37.6525         40.6465         44.3141         46.9278         45.5417           40.133         43.1944         46.9630         49.6449         44.2899           41         38.8852         41.9232         45.6417         48.2899         45.2585           40         40.133         43.1944         46.9630         49.6449         44.27956 <t< td=""><td>21.0642</td><td>23.6848</td><td>26.1190</td><td>29.1413</td><td>31.3193</td><td>7</td></t<>	21.0642	23.6848	26.1190	29.1413	31.3193	7
18         26.2962         28.8454         31.9999         34.2672           90         27.5871         30.1910         33.4087         35.7185           94         28.6693         31.5264         34.8033         37.1564           94         28.6693         31.5264         34.8033         37.1564           96         30.1435         32.8723         36.1908         38.5822           20         31.4104         34.1696         37.5662         39.9968         39.9968           31         32.6705         35.4789         38.9321         41.4010         39.9641           31         33.9244         36.7807         40.2884         42.7956         42.7956           33         35.4151         39.3641         42.9798         45.5885         32.3724           36         37.6525         40.6465         44.3141         46.9278         45.6417         48.2899         42.2899         42.4899         44.2899         44.2899         44.2899         44.2899         44.2928         44.2899         44.2899         44.2928         44.2899         44.2899         44.2928         44.2899         44.2928         44.2928         44.2899         44.2899         44.2928         44.2899         44	22.3072	24.9958	27.4884	30.5779	32.8013	<b>.</b>
90 27.5871 30.1910 33.4087 35.7185 94 28.8693 31.5264 34.8053 37.1564 96 30.1435 32.8523 36.1908 38.5822 20 31.4104 34.1696 37.5662 39.9968 91 32.6705 35.4789 38.9321 41.4010 33.9244 36.7807 40.2894 42.7956 33.9244 36.7857 41.6384 44.1813 33.9244 36.7857 41.6384 44.1813 33.9244 36.7857 42.5798 45.5585 23 36.4151 39.3641 42.9798 45.5585 24 38.8852 41.9232 45.6417 48.2899 24 40.1133 43.1944 46.9630 49.6449 25 40.1337 44.4607 48.2782 50.9933 25 42.5569 45.7222 49.5879 52.3356 26 43.7729 46.9792 50.8922 53.6720 26 43.7729 46.9792 50.8922 53.6720 27 67.5048 71.4202 76.1539 79.4900 28 67.5048 71.4202 76.1539 79.4900 29 79.0819 83.2976 88.3794 91.9517 67.9512 106.629 112.329 116.321 8113.145 118.136 124.116 128.299 91	23.5418	26.2962	28.8454	31.9999	34.2672	5
94     28.8693     31.5264     34.8053     37.1564       36     30.1435     32.8523     36.1908     38.5822       20     31.4104     34.1696     37.5662     39.9968       51     32.6705     35.4789     38.9321     41.4010       33     33.9244     36.7807     40.2894     42.7956       39     34.151     39.3641     42.9798     45.5885       36     37.6525     40.6465     44.3141     46.9278       31     38.8852     41.9232     45.6417     48.2899       32     40.1133     43.1944     46.9630     49.6449       39     41.3372     44.4607     48.2782     50.9933       35     42.5569     45.7222     49.5879     52.3356       30     43.7729     46.9792     50.8922     53.6720       30     43.7729     46.9792     50.8922     53.6720       31     67.5048     71.4202     76.1539     79.4900       31     90.5312     95.0231     100.425     104.215       32     101.879     106.629     112.329     116.321     8       34     112.432     129.561     135.807     140.169     10	24.7690	27.5871	30.1910	33.4087	35.7185	17
36         30.1435         32.8523         36.1908         38.5822           20         31.4104         34.1696         . 37.5662         39.9968           51         32.6705         35.4789         38.9321         41.4010           33         33.9244         36.7807         40.2894         42.7956           39         35.1725         38.0757         41.6384         44.1813           39         36.4151         39.3641         42.9798         45.5585           66         37.6525         40.6465         44.3141         46.9278           31         38.8852         41.9232         45.6417         48.2899           31         38.8852         41.9232         45.6417         48.2899           31         38.8852         41.9232         45.6417         48.2899           32         40.1133         43.1944         46.9630         49.6449           41.3372         44.4607         48.2782         50.9933           35         42.5569         45.7222         49.5879         52.3356           30         43.7729         46.9792         50.8922         53.6720           31         67.5048         71.4202         76.1539	25.9894	28.8693	31.5264	34.8053	37.1564	18
20     31,4104     34,1696     .37,5662     39,9968       51     32,6705     35,4789     38,9321     41,4010       33     33,9244     36,7807     40,2894     42,7956       39     35,1725     38,0757     41,6384     44,1813       39     36,4151     39,3641     42,9798     45,5885       16     37,6525     40,6465     44,3141     46,9278       13     38,8852     41,9232     45,6417     48,2899       12     40,1133     43,1944     46,9630     49,6449       12     40,1133     43,7222     49,5879     52,3356       15     42,5569     45,7222     49,5879     52,3356       15     43,7729     46,9792     50,8922     53,6720       10     55,7585     59,3417     63,6907     66,7659       11     67,5048     71,4202     76,1539     79,4900       10     79,0819     83,2976     88,3794     ,91,9517       1     90,5312     95,0231     100,425     104,215       1     90,5312     106,629     112,329     116,321       1     101,879     106,629     112,316     128,299       1     124,342     129,561     135,807     <	27.2036	30.1435	32,8523	36,1908	38.5822	19
51     32.6705     35.4789     38.9321     41.4010       33     33.9244     36.7807     40.2894     42.7956       39     35.1725     38.0757     41.6384     44.1813       59     35.1725     39.3641     42.9798     45.5885       16     37.6525     40.6465     44.3141     46.9278       11     38.8852     41.9232     45.6417     48.2899       12     40.1133     43.1944     46.9630     49.6449       12     40.1133     43.1944     46.9630     49.6449       12     41.3372     44.4607     48.2782     50.9933       15     42.569     45.7222     49.5879     52.3356       16     43.7729     46.9792     50.8922     53.6720       10     55.7585     59.3417     63.6907     66.7659       11     67.5048     71.4202     76.1539     79.4900       10     79.0819     83.2976     88.3794     91.9517       1     90.5312     95.0231     100.425     104.215       1     101.879     106.629     112.329     116.321       113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     10	28.4120	31.4104	34.1696	. 37.5662	39.9968	20
33 33.9244 36.7807 40.2894 42.7956  43 35.1725 38.0757 41.6384 44.1813  43 36.4151 39.3641 42.9798 45.585  16 37.6525 40.6465 44.3141 46.9278  18 38.8852 41.9232 45.6417 48.2899  12 40.1133 43.1944 46.9630 49.6449  41.3372 44.4607 48.2782 50.9933  15 42.5569 45.7222 49.5879 52.3356  26 43.7729 46.9792 50.8972 53.6720  27 57.5048 71.4202 76.1539 79.4900  28 79.0819 83.2976 88.3794 91.9517  1 90.5312 95.0231 100.425 104.215  113.145 118.136 124.116 128.299  114.4342 129.561 135.807 140.169 11	29.6151	32.6705	35.4789	38.9321	41,4010	21
59     35.1725     38.0757     41.6384     44.1813       53     36.4151     39.3641     42.9798     45.585       16     37.6525     40.6465     44.3141     46.9278       81     38.8852     41.9232     45.6417     48.2899       91     40.1133     43.1944     46.9630     49.6449       99     41.3372     44.4607     48.2782     50.9933       95     42.5569     45.7222     49.5879     52.3356       90     43.7729     46.9792     50.8922     53.6720       90     55.7585     59.3417     63.6907     66.7659       91     67.5048     71.4202     76.1539     79.4900       90     79.0819     83.2976     88.3794     .91.9517       11     90.5312     95.0231     100.425     104.215       12     101.879     106.629     112.329     116.321       113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	30.8133	33.9244	36.7807	40.2894	42,7956	22
33 36.4151 39.3641 42.9798 45.585  66 37.6525 40.6465 44.3141 46.9278  81 38.8852 41.9222 45.6417 48.2899  82 40.1133 43.1944 46.9630 49.6449  83 43.372 44.4607 48.2782 50.9933  85 42.5569 45.7222 49.5879 52.3356  80 43.7729 46.9792 50.8922 53.6720  80 55.7585 59.3417 63.6907 66.7659  80 79.0819 83.2976 88.3794 91.9517  1 90.5312 95.0231 100.425 104.215  113.145 118.136 124.116 128.299  1124.342 129.561 135.807 140.169 1	32.0069	35.1725	38.0757	41.6384	44.1813	22
66     37.6525     40.6465     44.3141     46.9278       31     38.8852     41.9232     45.6417     48.2899       32     40.1133     43.1944     46.9630     49.6449       40.13372     44.4607     48.2782     50.9933       42.5569     45.7222     49.5879     52.3356       50     43.7729     46.9792     50.8922     53.6720       50     55.7585     59.3417     63.6907     66.7659       71     67.5048     71.4202     76.1539     79.4900       79     79.0819     83.2976     88.3794     .91.9517       11     90.5312     95.0231     100.425     104.215       22     101.879     106.629     112.329     116.321       113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	33.1963	36,4151	39,3641	42.9798	45.5585	24
11     38.8852     41.9232     45.6417     48.2899       12     40.1133     43.1944     46.9630     49.6449       19     41.3372     44.4607     48.2782     50.9933       15     42.5569     45.7222     49.5879     52.3356       20     43.7729     46.9792     50.8922     53.6720       20     55.7585     59.3417     63.6907     66.7659       21     67.5048     71.4202     76.1539     79.4900       20     79.0819     83.2976     88.3794     91.9517       21     90.5312     95.0231     100.425     104.215       22     101.879     106.629     112.329     116.321       23     113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	34.3816	37.6525	40.6465	443141	46.9278	23
12     40.1133     43.1944     46.9630     49.6449       19     41.3372     44.4607     48.2782     50.9933       15     42.5669     45.7222     49.5879     52.3356       20     43.7729     46.9792     50.8922     53.6720       20     55.7585     59.3417     63.6907     66.7659       21     67.5048     71.4202     76.1539     79.4900       20     79.0819     83.2976     88.3794     .91.9517       21     90.5312     95.0231     100.425     104.215       22     101.879     106.629     112.329     116.321       23     113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	35.5631	38,8852	41.9232	45.6417	48.2899	26
89     41.3372     44.4607     48.2782     50.9933       15     42.5569     45.7222     49.5879     52.3356       20     43.7729     46.9792     50.8922     53.6720       20     55.7585     59.3417     63.6907     66.7659       21     67.5048     71.4202     76.1539     79.4900       20     79.0819     83.2976     88.3794     .91.9517       21     90.5312     95.0231     100.425     104.215       22     101.879     106.629     112.329     116.321       23     113.145     118.136     124.116     128.299       1124.342     129.561     135.807     140.169     1	36.7412	40.1133	43.1944	46.9630	49.6449	27
55         42.5569         45.7222         49.5879         52.3356           50         43.7729         46.9792         50.8922         53.6720           50         43.7729         46.9792         50.8922         53.6720           60         55.7585         59.4417         63.6907         66.7659           71         67.5048         71.4202         76.1539         79.4900           70         79.0819         83.2976         88.3794         .91.9517           71         90.5312         95.0231         100.425         104.215           72         101.879         106.629         112.329         116.321           113.145         118.136         124.116         128.299           124.342         129.561         135.807         140.169         1	37.9159	41.3372	44.4607	48.2782	50.9933	28
50     43.7729     46.9792     50.8922     53.6720       60     55.7585     59.3417     63.6907     66.7659       71     67.5048     71.4202     76.1539     79.4900       70     79.0819     83.2976     88.3794     .91.9517       71     90.5312     95.0231     100.425     104.215       72     101.879     106.629     112.329     116.321       113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	39.0875	42.5569	45.7222	49.5879	52.3356	29
00     55.7585     59.3417     63.6907     66.7659       11     67.5048     71.4202     76.1539     79.4900       10     79.0819     83.2976     88.3794     91.9517       11     90.5312     95.0231     100.425     104.215       12     101.879     106.629     112.329     116.321       113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	40.2560	43.7729	46.9792	50.8922	53.6720	30
11     67.5048     71.4202     76.1539     79.4900       10     79.0819     83.2976     88.3794     91.9517       11     90.5312     95.0231     100.425     104.215       12     101.879     106.629     112.329     116.321       113.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	51.8050	55.7585	59.3417	63.6907	66.7659	6
70     79.0819     83.2976     88.3794     .91.9517       1     90.5312     95.0231     100.425     104.215       12     101.879     106.629     112.329     116.321       13.145     118.136     124.116     128.299       124.342     129.561     135.807     140.169     1	63.1671	67.5048	71.4202	76.1539	79.4900	8
1 90.5312 95.0231 100.425 104.215 12 101.879 106.629 112.329 116.321 113.145 118.136 124.116 128.299 124.342 129.561 135.807 140.169 1	74.3970	79.0819	83.2976	88.3794	.91.9517	69
72 101.879 106.629 112.329 116.321 113.145 118.136 124.116 128.299 124.342 129.561 135.807 140.169 1	85.5271	90.5312	95.0231	100.425	104,215	70
113.145 118.136 124.116 128.299 1 124.342 129.561 135.807 140.169 1	96.5782	101.879	106.629	112 329	116.321	80
124.342 129.561 135.807 140.169	107.565	113.145	118.136	124.116	128.299	90
	18.498	124,342	129.561	135.807	140,169	100

From "Tables of the Percentage Points of the  $\chi^2$ -Distribution." Biometrika, Vol. 32 (1941), pp. 188–189, by Catherina M. Thompson, Reproduced by penulusion of Professor B. S. Pearson.