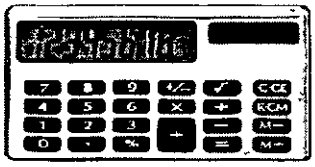
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

IOP2601

May/June 2013
Mei/Junie 2013

ORGANISATIONAL RESEARCH METHODOLOGY
ORGANISASIE NAVORSINGSMETODOLOGIE

Duration 2 Hours
Tydsduur 2 Uur

70 Marks
70 Punte

EXAMINERS / EKSAMINATORE

FIRST / EERSTE	MS/ME NN BEKWA	PROF SC VAN DER WESTHUIZEN
SECOND / TWEEDE	PROF FVN CILLIERS	

Use of a non-programmable pocket calculator is permissible
Gebruik van 'n nie-programmeerbare sakrekenaar is toelaatbaar

Closed book examination
Toeboekeksamen

This paper consists of 22 pages.
Hierdie vraestel bestaan 22 bladsye

ENGLISH QUESTIONS START ON PAGE 11
AFRIKAANSE VRAE BEGIN OP BLADSY 17.

ANSWER ALL THE QUESTIONS
BEANTWOORD AL DIE VRAE.

LIST OF FORMULAS / LYS VAN FORMULES

$$\text{midpoint of class interval} = \text{RLL} + \frac{(\text{RUL} - \text{RLL})}{2}$$

$$\text{percentile rank} = \%\text{ below} + \frac{\text{score} - \text{RLL}}{\text{class int width}}(\text{interval }\%)$$

$$\text{score of } p = \text{RLL} + \frac{\text{PR} - \%\text{ below}}{\text{interval }\%}(\text{interval width})$$

$$\text{middelpunt van klasinterval} = \text{WOG} + \frac{(\text{WBG} - \text{WOG})}{2}$$

$$\text{persentielrang} = \%\text{ onder} + \frac{\text{telling} - \text{WOG}}{\text{klasintervalwydte}}(\text{interval }\%)$$

$$\text{telling van } p = \text{WOG} + \frac{\text{PR} - \%\text{ onder}}{\text{interval }\%}(\text{intervalwydte})$$

Mo = Most frequently occurring score

$$\text{Median location} = \frac{N+1}{2}$$

$$\bar{X} = \frac{\Sigma X}{N} \qquad \bar{Y} = \frac{\Sigma Y}{N}$$

Range = highest score minus lowest score

$$s_X^2 = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N-1} \qquad s_X = \sqrt{s_X^2}$$

$$s_Y^2 = \frac{\Sigma Y^2 - \frac{(\Sigma Y)^2}{N}}{N-1} \qquad s_Y = \sqrt{s_Y^2}$$

$$r = \frac{N\Sigma XY - \Sigma X\Sigma Y}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

$$b = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2} \qquad a = \bar{Y} - b\bar{X}$$

$$\hat{Y} = bX + a$$

$$z = \frac{X - \mu}{\sigma}$$

$$t = \frac{\bar{D} - 0}{\frac{s_D}{\sqrt{N}}}$$

$$df = N - 1$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}}}$$

$$df = N_1 + N_2 - 2$$

$$s_P^2 = \frac{(N_1 - 1)\, s_1^2 + (N_2 - 1)\, s_2^2}{N_1 + N_2 - 2}$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_P^2}{N_1} + \frac{s_P^2}{N_2}}}$$

$$SS_{total} = \Sigma X^2 - \frac{(\Sigma X)^2}{N}$$

$$df_{total} = N - 1$$

$$SS_{group} = n\Sigma(\bar{X}_j - \bar{X})^2$$

$$df_{group} = k - 1$$

$$SS_{error} = SS_{total} - SS_{group}$$

$$df_{error} = k(n - 1)$$

$$MS_{group} = SS_{group} \; / \; df_{group}$$

$$MS_{error} = SS_{error} \; / \; df_{error}$$

$$F = \frac{MS_{group}}{MS_{error}}$$

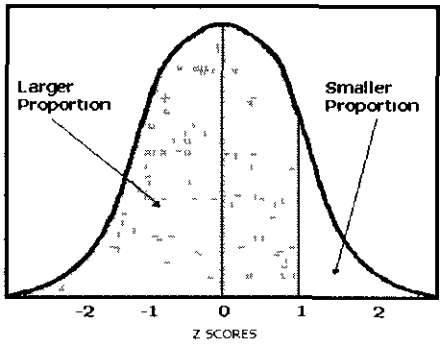
$$\chi^2 = \Sigma \frac{(O - E)^2}{E}$$

$$E_{ij} = \frac{R_i C_j}{N}$$

$$df = k - 1$$

$$df = (R - 1)(C - 1)$$

LIST OF TABLES / LYS VAN TABELLE



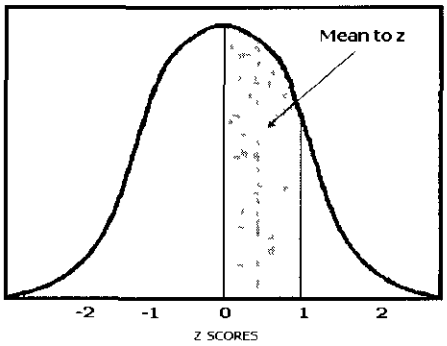


Table A1.1 *z*-table – the standard normal distribution

z	Smaller *p*	Larger *p*	Mean to z	z	Smaller *p*	Larger *p*	Mean to z	z	Smaller *p*	Larger *p*	Mean to z
0	0 50000	0 50000	0 00000	0.65	0 25785	0 74215	0 24215	1.3	0 09680	0 90320	0 40320
0.01	0 49601	0 50399	0 00399	0.66	0 25463	0 74537	0 24537	1.31	0 09510	0 90490	0 40490
0.02	0 49202	0 50798	0 00798	0.67	0 25143	0 74857	0 24857	1.32	0 09342	0 90658	0 40658
0.03	0 48803	0 51197	0 01197	0.68	0 24825	0 75175	0 25175	1.33	0 09176	0 90824	0 40824
0.04	0 48405	0 51595	0 01595	0.69	0 24510	0 75490	0 25490	1.34	0 09012	0 90988	0 40988
0.05	0 48006	0 51994	0 01994	0.7	0 24196	0 75804	0 25804	1.35	0 08851	0 91149	0 41149
0.06	0 47608	0 52392	0 02392	0.71	0 23885	0 76115	0 26115	1.36	0 08692	0 91308	0 41308
0.07	0 47210	0 52790	0 02790	0.72	0 23576	0 76424	0 26424	1.37	0 08534	0 91466	0 41466
0.08	0 46812	0 53188	0 03188	0.73	0 23270	0 76730	0 26730	1.38	0 08379	0 91621	0 41621
0.09	0 46414	0 53586	0 03586	0.74	0 22965	0 77035	0 27035	1.39	0 08226	0 91774	0 41774
0.1	0 46017	0 53983	0 03983	0.75	0 22663	0 77337	0 27337	1.4	0 08076	0 91924	0 41924
0.11	0 45620	0 54380	0 04380	0.76	0 22363	0 77637	0 27637	1.41	0 07927	0 92073	0 42073
0.12	0 45224	0 54776	0 04776	0.77	0 22065	0 77935	0 27935	1.42	0 07780	0 92220	0 42220
0.13	0 44828	0 55172	0 05172	0.78	0 21770	0 78230	0 28230	1.43	0 07636	0 92364	0 42364
0.14	0 44433	0 55567	0 05567	0.79	0 21476	0 78524	0 28524	1.44	0 07493	0 92507	0 42507
0.15	0 44038	0 55962	0 05962	0.8	0 21186	0 78814	0 28814	1.45	0 07353	0 92647	0 42647
0.16	0 43644	0 56356	0 06356	0.81	0 20897	0 79103	0 29103	1.46	0 07215	0 92785	0 42785
0.17	0 43251	0 56749	0 06749	0.82	0 20611	0 79289	0 29289	1.47	0 07078	0 92922	0 42922
0.18	0 42858	0 57142	0 07142	0.83	0 20327	0 79673	0 29673	1.48	0 06944	0 93056	0 43056
0.19	0 42465	0 57535	0 07535	0.84	0 20045	0 79955	0 29955	1.49	0 06811	0 93189	0 43189
0.2	0 42074	0 57926	0 07926	0.85	0 19766	0 80234	0 30234	1.5	0 06681	0 93319	0 43319
0.21	0 41683	0 58317	0 08317	0.86	0 19489	0 80511	0 30511	1.51	0 06552	0 93448	0 43448
0.22	0 41294	0 58706	0 08706	0.87	0 19215	0 80785	0 30785	1.52	0 06426	0 93574	0 43574
0.23	0 40905	0 59095	0 09095	0.88	0 18943	0 81057	0 31057	1.53	0 06301	0 93699	0 43699
0.24	0 40517	0 59483	0 09483	0.89	0 18673	0 81327	0 31327	1.54	0 06178	0 93822	0 43822
0.25	0 40129	0 59871	0 09871	0.9	0 18406	0 81594	0 31594	1.55	0 06057	0 93943	0 43943
0.26	0 39743	0 60257	0 10257	0.91	0 18141	0 81859	0 31859	1.56	0 05938	0 94062	0 44062
0.27	0 39358	0 60642	0 10642	0.92	0 17879	0 82121	0 32121	1.57	0 05821	0 94179	0 44179
0.28	0 38974	0 61026	0 11026	0.93	0 17619	0 82381	0 32381	1.58	0 05705	0 94295	0 44295
0.29	0 38591	0 61409	0 11409	0.94	0 17361	0 82639	0 32639	1.59	0 55920	0 94408	0 44408
0.3	0 38209	0 61791	0 11791	0.95	0 17106	0 82894	0 32894	1.6	0 05480	0 94520	0 44520
0.31	0 37828	0 62172	0 12172	0.96	0 16853	0 83147	0 33147	1.61	0 05370	0 94630	0 44630
0.32	0 37448	0 62552	0 12552	0.97	0 16602	0 83398	0 33398	1.62	0 05262	0 94738	0 44738
0.33	0 37070	0 62930	0 12930	0.98	0 16354	0 83646	0 33646	1.63	0 05155	0 94845	0 44845
0.34	0 36693	0 63307	0 13307	0.99	0 16109	0 83891	0 33891	1.64	0 05050	0 94950	0 44950
0.35	0 36317	0 63683	0 13683	1	0 15866	0 84134	0 34134	1.65	0 04947	0 95053	0 45053
0.36	0 35942	0 64058	0 14058	1.01	0 15625	0 84375	0 34375	1.66	0 04846	0 95154	0 45154
0.37	0 35569	0 64431	0 14431	1.02	0 15386	0 84614	0 34614	1.67	0 04746	0 95254	0 45254
0.38	0 35197	0 64803	0 14803	1.03	0 15151	0 84849	0 34849	1.68	0 04648	0 95352	0 45352
0.39	0 34827	0 65173	0 15173	1.04	0 14917	0 85083	0 35083	1.69	0 04551	0 95449	0 45449
0.4	0 34458	0 65542	0 15542	1.05	0 14686	0 85314	0 35314	1.7	0 04457	0 95543	0 45543
0.41	0 34090	0 65910	0 15910	1.06	0 14457	0 85543	0 35543	1 71	0 04363	0 95637	0 45637
0.42	0 33724	0 66276	0 16276	1.07	0 14231	0 85769	0 35769	1.72	0 04272	0 95728	0 45728
0.43	0 33360	0 66640	0 16640	1.08	0 14007	0 85993	0 35993	1.73	0 04182	0 95818	0 45818
0.44	0 32991	0 67003	0 17003	1.09	0 13786	0 86214	0 36214	1.74	0 04093	0 95907	0 45907
0.45	0 32636	0 67364	0 17364	1.1	0 13567	0 86433	0 36433	1.75	0 04006	0 95994	0 45994
0.46	0 32276	0 67724	0 17724	1.11	0 13350	0 86650	0 36650	1.76	0 03920	0 96080	0 46080
0.47	0 31918	0 68082	0 18082	1.12	0 13136	0 86864	0 36864	1.77	0 03836	0 96164	0 46164
0.48	0 31561	0 68439	0 18439	1.13	0 12924	0 87076	0 37076	1.78	0 03754	0 96246	0 46246
0.49	0 31207	0 68793	0 18793	1.14	0 12714	0 87286	0 37286	1.79	0 03673	0 96327	0 46327
0.5	0 30854	0 69146	0 19146	1.15	0 12507	0 87493	0 37493	1.8	0 03593	0 96407	0 46407
0.51	0 30503	0 69497	0 19497	1.16	0 12302	0 87698	0 37698	1.81	0 03515	0 96485	0 46485
0.52	0 30153	0 69847	0 19847	1.17	0 12100	0 87900	0 37900	1.82	0 03438	0 96562	0 46562
0.53	0 29806	0 70194	0 20194	1.18	0 11900	0 88100	0 38100	1.83	0 03362	0 96638	0 46638
0.54	0 29460	0 70540	0 20540	1.19	0 11702	0 88289	0 38289	1.84	0 03288	0 96712	0 46712
0.55	0 29116	0 70884	0 20884	1.2	0 11507	0 88493	0 38493	1.85	0 03216	0 96784	0 46784
0.56	0 28774	0 71226	0 21226	1.21	0 11314	0 88686	0 38686	1.86	0 03144	0 96856	0 46856
0.57	0 28434	0 71566	0 21566	1.22	0 11123	0 88877	0 38877	1.87	0 03074	0 96926	0 46926
0.58	0 28096	0 71904	0 21904	1.23	0 10935	0 89065	0 39065	1.88	0 03005	0 96995	0 46995
0.59	0 27760	0 72240	0 22240	1.24	0 10416	0 89251	0 39251	1.89	0 02938	0 97062	0 47062
0.6	0 27425	0 72575	0 22575	1.25	0 10565	0 89435	0 39435	1.9	0 02872	0 97128	0 47128
0.61	0 27093	0 72907	0 22907	1.26	0 10383	0 89617	0 39617	1.91	0 02807	0 97193	0 47193
0.62	0 26763	0 73237	0 23237	1.27	0 10204	0 89796	0 39796	1.92	0 02743	0 97257	0 47257
0.63	0 26435	0 73565	0 23565	1.28	0 10027	0 89973	0 39973	1.93	0 02680	0 97320	0 47320
0.64	0 26109	0 73891	0 23891	1.29	0 09853	0 90147	0 40147	1.94	0 02619	0 97381	0 47381

Table A1.1 *z*-table – the standard normal distribution – *continued*

z	Smaller *p*	Larger *p*	Mean to *z*	z	Smaller *p*	Larger *p*	Mean to *z*	z	Smaller *p*	Larger *p*	Mean to *z*
1 95	0 02559	0 97441	0 47441	2.6	0 00466	0 99534	0 49534	3.3	0 00048	0 99952	0 49952
1.96	0 02500	0 97500	0 47500	2.61	0 00453	0 99547	0 49547	3.4	0 00034	0 99966	0 49966
1.97	0 02442	0 97558	0 47558	2.62	0 00440	0 99560	0 49560	3.5	0 00023	0 99977	0 49977
1 98	0 02385	0 97615	0 47615	2.63	0 00427	0 99573	0 49573	3.6	0 00016	0 99984	0 49984
1 99	0 02330	0 97670	0 47670	2.64	0 00415	0 99585	0 49585	3.7	0 00011	0 99989	0 49989
2	0 02275	0 97725	0 47725	2.65	0 00402	0 99598	0 49598	3.8	0 00007	0 99993	0 49993
2.01	0 02222	0 97778	0 47778	2.66	0 00391	0 99609	0 49609	3.9	0 00005	0 99995	0 49995
2.02	0 02169	0 97831	0 47831	2.67	0 00379	0 99621	0 49621	4	0 00003	0 99997	0 49997
2.03	0 02118	0 97882	0 47882	2.68	0 00368	0 99632	0 49632	4.1	0 00002	0 99998	0 49998
2.04	0 02068	0 97932	0 47932	2.69	0 00357	0 99643	0 49643	4.2	0 00001	0 99999	0 49999
2 05	0 02018	0 97982	0 47982	2.7	0 00347	0 99653	0 49653				
2.06	0 01970	0 98030	0 48030	2.71	0 00336	0 99664	0 49664				
2.07	0 01923	0 98077	0 48077	2.72	0 00324	0 99674	0 49674				
2 08	0 01876	0 98124	0 48124	2.73	0 00317	0 99683	0 49683				
2.09	0 01831	0 98169	0 48169	2.74	0 00307	0 99693	0 49693				
2.1	0 01786	0 98214	0 48214	2.75	0 00298	0 99702	0 49702				
2.11	0 01743	0 98251	0 48251	2.76	0 00289	0 99711	0 49711				
2.12	0 01700	0 98300	0 48300	2.77	0 00280	0 99720	0 49720				
2 13	0 06590	0 98341	0 48341	2.78	0 00272	0 99728	0 49728				
2.14	0 01618	0 98382	0 48382	2.79	0 00264	0 99736	0 49736				
2.15	0 01780	0 98422	0 48422	2.8	0 00256	0 99744	0 49744				
2.16	0 01539	0 98461	0 48461	2.81	0 00248	0 99752	0 49752				
2.17	0 01500	0 98500	0 48500	2.82	0 00240	0 99760	0 49760				
2.18	0 01463	0 98537	0 48537	2.83	0 00233	0 99767	0 49767				
2.19	0 01426	0 98574	0 48574	2.84	0 00226	0 99774	0 49774				
2.2	0 01390	0 98610	0 48610	2.85	0 00219	0 99781	0 49781				
2.21	0 01355	0 98645	0 48645	2.86	0 00212	0 99788	0 49788				
2.22	0 01321	0 98679	0 48679	2.87	0 00205	0 99795	0 49795				
2.23	0 01287	0 98713	0 48713	2.88	0 00199	0 99801	0 49801				
2.24	0 01255	0 98745	0 48745	2.89	0 00193	0 99807	0 49807				
2.25	0 01222	0 98778	0 48778	2.9	0 00187	0 99813	0 49813				
2.26	0 01191	0 98809	0 48809	2.91	0 00181	0 99819	0 49819				
2.27	0 01160	0 98840	0 48840	2.92	0 00175	0 99825	0 49825				
2.28	0 01130	0 98870	0 48870	2.93	0 00169	0 99831	0 49831				
2.29	0 01101	0 98899	0 48899	2.94	0 00164	0 99836	0 49836				
2.3	0 01072	0 98928	0 48928	2.95	0 00159	0 99841	0 49841				
2.31	0 01044	0 98956	0 48956	2.96	0 00154	0 99846	0 49846				
2.32	0 01017	0 98983	0 48983	2.97	0 00149	0 99851	0 49851				
2.33	0 00990	0 99010	0 49010	2.98	0 00144	0 99856	0 49856				
2.34	0 00964	0 99036	0 49036	2.99	0 00139	0 99861	0 49861				
2.35	0 00939	0 99061	0 49061	3	0 00135	0 99865	0 49865				
2.36	0 00914	0 99086	0 49086	3.01	0 00131	0 99869	0 49869				
2.37	0 00889	0 99111	0 49111	3.02	0 00126	0 99874	0 49874				
2.38	0 00866	0 99134	0 49134	3.03	0 00122	0 99878	0 49878				
2.39	0 00842	0 99158	0 49158	3.04	0 00118	0 99882	0 49882				
2.4	0 00820	0 99180	0 49180	3.05	0 00114	0 99886	0 49886				
2.41	0 00798	0 99202	0 49202	3.06	0 00111	0 99889	0 49889				
2 42	0 00776	0 99224	0 49224	3.07	0 00107	0 99893	0 49893				
2.43	0 00755	0 99245	0 49245	3.08	0 00104	0 99896	0 49896				
2.44	0 00734	0 99266	0 49266	3.09	0 00100	0 99900	0 49900				
2 45	0 00714	0 99286	0 49286	3.1	0 00097	0 99903	0 49903				
2.46	0 00695	0 99305	0 49305	3.11	0 00094	0 99906	0 49906				
2 47	0 00676	0 99324	0 49324	3.12	0 00090	0 99910	0 49910				
2 48	0 00657	0 99343	0 49343	3.13	0 00087	0 99913	0 49913				
2.49	0 00639	0 99361	0 49361	3.14	0 00084	0 99916	0 49916				
2.5	0 00621	0 99379	0 49379	3.15	0 00082	0 99918	0 49918				
2.51	0 00604	0 99396	0 49396	3 16	0 00079	0 99921	0 49921				
2.52	0 00587	0 99413	0 49413	3.17	0 00076	0 99924	0 49924				
2.53	0 00570	0 99430	0 49430	3.18	0 00074	0 99926	0 49926				
2 54	0 00554	0 99446	0 49446	3.19	0 00071	0 99929	0 49929				
2.55	0 00539	0 99461	0 49461	3.2	0 00069	0 99931	0 49931				
2.56	0 00523	0 99477	0 49477	3.21	0 00066	0 99934	0 49934				
2.57	0 00508	0 99492	0 49492	3.22	0 00064	0 99936	0 49936				
2.58	0 00494	0 99506	0 49506	3.23	0 00062	0 99938	0 49938				
2.59	0 00480	0 99520	0 49520	3.24	0 00060	0 99940	0 49940				

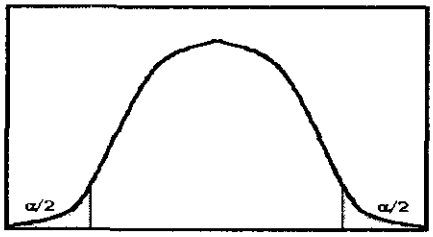
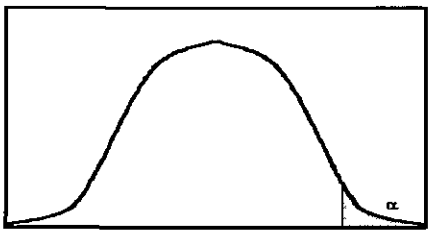


Table A1.2: *t*-table – values of the *t* distribution for varying degrees of freedom (*df*) and α



α for two-tailed test	0.001	0.01	0.02	0.05	0.1	0.2	0.3
α for one-tailed test	0.0005	0.005	0.01	0 025	0.05	0.1	0.15
DEGREES OF FREEDOM (df)							
1	636 5776	63 6559	31 8210	12 7062	6 3137	3 0777	1 9626
2	31 5998	9 9250	6 9645	4 3027	2 9200	1 8856	1 3862
3	12 9244	5 8408	4 5407	3 1824	2 3534	1 6377	1 2498
4	8 6101	4 6041	3 7469	2 7765	2 1318	1 5332	1 1896
5	6 8685	4 0321	3 3649	2 5706	2 0150	1 4759	1 1558
6	5 9587	3 7074	3 1427	2 4469	1 9432	1 4398	1 1342
7	5 4081	3 4995	2 9979	2 3646	1 8946	1 4149	1 1192
8	5 0414	3 3554	2 8965	2 3060	1 8595	1 3968	1 1081
9	4 7809	3 2498	2 8214	2 2622	1 8331	1 3830	1 0997
10	4 5868	3 1693	2 7638	2 2281	1 8125	1 3722	1 0931
11	4 4369	3 1058	2 7181	2 2010	1 7959	1 3634	1 0877
12	4 3178	3 0545	2 6810	2 1788	1 7823	1 3562	1 0832
13	4 2209	3 0123	2 6503	2 1604	1 7709	1 3502	1 0795
14	4 1403	2 9768	2 6245	2 1448	1 7613	1 3450	1 0763
15	4 0728	2 9467	2 6025	2 1315	1 7531	1 3406	1 0735
16	4 0149	2 9208	2 5835	2 1199	1 7459	1 3368	1 0711
17	3 9651	2 8982	2 5669	2 1098	1 7396	1 3334	1 0690
18	3 9217	2 8784	2 5524	2 1009	1 7341	1 3304	1 0672
19	3 8833	2 8609	2 5395	2 0930	1 7291	1 3277	1 0655
20	3 8496	2 8453	2 5280	2 0860	1 7247	1 3253	1 0640
21	3 8193	2 8314	2 5176	2 0796	1 7207	1 3232	1 0627
22	3 7922	2 8188	2 5083	2 0739	1 7171	1 3212	1 0614
23	3 7676	2 8073	2 4999	2 0687	1 7139	1 3195	1 0603
24	3 7454	2 7970	2 4922	2 0639	1 7109	1 3178	1 0593
25	3 7251	2 7874	2 4851	2 0595	1 7081	1 3163	1 0584
26	3 7067	2 7787	2 4786	2 0555	1 7056	1 3150	1 0575
27	3 6895	2 7707	2 4727	2 0518	1 7033	1 3137	1 0567
28	3 6739	2 7633	2 4671	2 0484	1 7011	1 3125	1 0560
29	3 6595	2 7564	2 4620	2 0452	1 6991	1 3114	1 0553
30	3 6460	2 7500	2 4573	2 0423	1 6973	1 3104	1 0547
31	3 6335	2 7440	2 4528	2 0395	1 6955	1 3095	1 0541
32	3 6218	2 7385	2 4487	2 0369	1 6939	1 3086	1 0535
33	3 6109	2 7333	2 4448	2 0345	1 6924	1 3077	1 0530
34	3 6007	2 7284	2 4411	2 0322	1 6909	1 3070	1 0525
35	3 5911	2 7238	2 4377	2 0301	1 6896	1 3062	1 0520
36	3 5821	2 7195	2 4345	2 0281	1 6883	1 3055	1 0516
37	3 5737	2 7154	2 4314	2 0262	1 6871	1 3049	1 0512
38	3 5657	2 7116	2 4286	2 0244	1 6860	1 3042	1 0508
39	3 5581	2 7079	2 4258	2 0227	1 6849	1 3036	1 0504
40	3 5510	2 7045	2 4233	2 0211	1 6839	1 3031	1 0500
45	3 5203	2 6896	2 4121	2 0141	1 6794	1 3007	1 0485
50	3 4960	2 6778	2 4033	2 0086	1 6759	1 2987	1 0473
55	3 4765	2 6682	2 3961	2 0040	1 6730	1 2971	1 0463
60	3 4602	2 6603	2 3901	2 0003	1 6706	1 2958	1 0455
100	3 3905	2 6259	2 3642	1 9840	1 6602	1 2901	1 0418
1000	3 3002	2 5807	2 3301	1 9623	1 6464	1 2824	1 0370

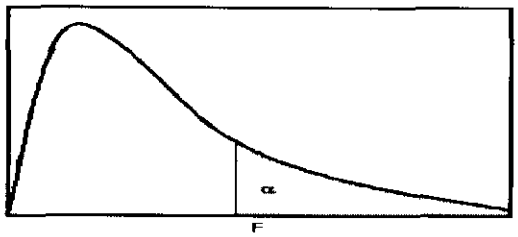


Table A1.4: Table of the F-distribution: $\alpha = 0\ 05$

Numerator degrees of freedom (df)

Denominator degrees of freedom (df)

	1	2	3	4	5	6	7	8	9	10	15	20	25	30	40	50	100
1	161 45	199 50	215 71	224 58	230 16	233 99	236 77	238 88	240 54	241 88	245 95	248 01	249 26	250 10	251 14	251 77	253 04
2	18 51	19 00	19 16	19 25	19 30	19 33	19 35	19 37	19 38	19 40	19 43	19 45	19 46	19 46	19 47	19 48	19 49
3	10 13	9 55	9 28	9 12	9 01	8 94	8 89	8 85	8 81	8 79	8 70	8 66	8 63	8 62	8 59	8 58	8 55
4	7 71	6 94	6 59	6 39	6 26	6 16	6 09	6 04	6 00	5 96	5 86	5 80	5 77	5 75	5 72	5 70	5 66
5	6 61	5 79	5 41	5 19	5 05	4 95	4 88	4 82	4 77	4 74	4 62	4 56	4 52	4 50	4 46	4 44	4 41
6	5 99	5 14	4 76	4 53	4 39	4 28	4 21	4 15	4 10	4 06	3 94	3 87	3 83	3 81	3 77	3 75	3 71
7	5 59	4 74	4 35	4 12	3 97	3 87	3 79	3 73	3 68	3 64	3 51	3 44	3 40	3 38	3 34	3 32	3 27
8	5 32	4 46	4 07	3 84	3 69	3 58	3 50	3 44	3 39	3 35	3 22	3 15	3 11	3 08	3 04	3 02	2 97
9	5 12	4 26	3 86	3 63	3 48	3 37	3 29	3 23	3 18	3 14	3 01	2 94	2 89	2 86	2 83	2 80	2 76
10	4 96	4 10	3 71	3 48	3 33	3 22	3 14	3 07	3 02	2 98	2 85	2 77	2 73	2 70	2 66	2 64	2 59
11	4 84	3 98	3 59	3 36	3 20	3 09	3 01	2 95	2 90	2 85	2 72	2 65	2 60	2 57	2 53	2 51	2 46
12	4 75	3 89	3 49	3 26	3 11	3 00	2 91	2 85	2 80	2 75	2 62	2 54	2 50	2 47	2 43	2 40	2 35
13	4 67	3 81	3 41	3 18	3 03	2 92	2 83	2 77	2 71	2 67	2 53	2 46	2 41	2 38	2 34	2 31	2 26
14	4 60	3 74	3 34	3 11	2 96	2 85	2 76	2 70	2 65	2 60	2 46	2 39	2 34	2 31	2 27	2 24	2 19
15	4 54	3 68	3 29	3 06	2 90	2 79	2 71	2 64	2 59	2 54	2 40	2 33	2 28	2 25	2 20	2 18	2 12
16	4 49	3 63	3 24	3 01	2 85	2 74	2 66	2 59	2 54	2 49	2 35	2 28	2 23	2 19	2 15	2 12	2 07
17	4 45	3 59	3 20	2 96	2 81	2 70	2 61	2 55	2 49	2 45	2 31	2 23	2 18	2 15	2 10	2 08	2 02
18	4 41	3 55	3 16	2 93	2 77	2 66	2 58	2 51	2 46	2 41	2 27	2 19	2 14	2 11	2 06	2 04	1 98
19	4 38	3 52	3 13	2 90	2 74	2 63	2 54	2 48	2 42	2 38	2 23	2 16	2 11	2 07	2 03	2 00	1 94
20	4 35	3 49	3 10	2 87	2 71	2 60	2 51	2 45	2 39	2 35	2 20	2 12	2 07	2 04	1 99	1 97	1 91
21	4 32	3 47	3 07	2 84	2 68	2 57	2 49	2 42	2 37	2 32	2 18	2 10	2 05	2 01	1 96	1 94	1 88
22	4 30	3 44	3 05	2 82	2 66	2 55	2 46	2 40	2 34	2 30	2 15	2 07	2 02	1 98	1 94	1 91	1 85
23	4 28	3 42	3 03	2 80	2 64	2 53	2 44	2 37	2 32	2 27	2 13	2 05	2 00	1 96	1 91	1 88	1 82
24	4 26	3 40	3 01	2 78	2 62	2 51	2 42	2 36	2 30	2 25	2 11	2 03	1 97	1 94	1 89	1 86	1 80
25	4 24	3 39	2 99	2 76	2 60	2 49	2 40	2 34	2 28	2 24	2 09	2 01	1 96	1 92	1 87	1 84	1 78
26	4 23	3 37	2 98	2 74	2 59	2 47	2 39	2 32	2 27	2 22	2 07	1 99	1 94	1 90	1 85	1 82	1 76
27	4 21	3 35	2 96	2 73	2 57	2 46	2 37	2 31	2 25	2 20	2 06	1 97	1 92	1 88	1 84	1 81	1 74
28	4 20	3 34	2 95	2 71	2 56	2 45	2 36	2 29	2 24	2 19	2 04	1 96	1 91	1 87	1 82	1 79	1 73
29	4 18	3 33	2 93	2 70	2 55	2 43	2 35	2 28	2 22	2 18	2 03	1 94	1 89	1 85	1 81	1 77	1 71
30	4 17	3 32	2 92	2 69	2 53	2 42	2 33	2 27	2 21	2 16	2 01	1 93	1 88	1 84	1 79	1 76	1 70
35	4 12	3 27	2 87	2 64	2 49	2 37	2 29	2 22	2 16	2 11	1 96	1 88	1 82	1 79	1 74	1 70	1 63
40	4 08	3 23	2 84	2 61	2 45	2 34	2 25	2 18	2 12	2 08	1 92	1 84	1 78	1 74	1 69	1 66	1 59
45	4 06	3 20	2 81	2 58	2 42	2 31	2 22	2 15	2 10	2 05	1 89	1 81	1 75	1 71	1 66	1 63	1 55
50	4 03	3 18	2 79	2 56	2 40	2 29	2 20	2 13	2 07	2 03	1 87	1 78	1 73	1 69	1 63	1 60	1 52
60	4 00	3 15	2 76	2 53	2 37	2 25	2 17	2 10	2 04	1 99	1 84	1 75	1 69	1 65	1 59	1 56	1 48
70	3 98	3 13	2 74	2 50	2 35	2 23	2 14	2 07	2 02	1 97	1 81	1 72	1 66	1 62	1 57	1 53	1 45
80	3 96	3 11	2 72	2 49	2 33	2 21	2 13	2 06	2 00	1 95	1 79	1 70	1 64	1 60	1 54	1 51	1 43
90	3 95	3 10	2 71	2 47	2 32	2 20	2 11	2 04	1 99	1 94	1 78	1 69	1 63	1 59	1 53	1 49	1 41
100	3 94	3 09	2 70	2 46	2 31	2 19	2 10	2 03	1 97	1 93	1 77	1 68	1 62	1 57	1 52	1 47	1 39
200	3 89	3 04	2 65	2 42	2 26	2 14	2 06	1 98	1 93	1 88	1 72	1 62	1 56	1 52	1 46	1 41	1 32
300	3 87	3 03	2 63	2 40	2 24	2 13	2 04	1 97	1 91	1 86	1 70	1 61	1 54	1 50	1 43	1 39	1 30
400	3 86	3 02	2 63	2 39	2 24	2 12	2 03	1 96	1 90	1 85	1 69	1 60	1 53	1 49	1 42	1 38	1 28
500	3 86	3 01	2 62	2 39	2 23	2 12	2 03	1 96	1 90	1 85	1 69	1 59	1 53	1 48	1 42	1 38	1 28
1000	3 85	3 00	2 61	2 38	2 22	2 11	2 02	1 95	1 89	1 84	1 68	1 58	1 52	1 47	1 41	1 36	1 26
10000	3 84	3 00	2 61	2 37	2 21	2 10	2 01	1 94	1 88	1 83	1 67	1 57	1 51	1 46	1 40	1 35	1 25

Table A1 5 Table of the F-distribution: $\alpha = 0\ 01$

Numerator degrees of freedom (df)

Denominator degrees of freedom (df)	1	2	3	4	5	6	7	8	9	10	15	20	25	30	40	50	100
1	4052 18	4999 50	5403 35	5624 58	5763 65	5858 99	5928 36	5981 07	6022 47	6055 85	6157 29	6208 73	6239 86	6260 65	6286 78	6286 40	6333 90
2	98 50	99 00	99 17	99 25	99 30	99 33	99 36	99 37	99 39	99 40	99 43	99 45	99 46	99 47	99 47	99 48	99 49
3	34 12	30 82	29 46	28 71	28 24	27 91	27 67	27 49	27 35	27 23	26 87	26 69	26 58	26 51	26 41	26 41	26 24
4	21 20	18 00	16 69	15 98	15 52	15 21	14 98	14 80	14 66	14 55	14 20	14 02	13 91	13 84	13 75	13 75	13 58
5	16 26	13 27	12 06	11 39	10 97	10 67	10 46	10 29	10 16	10 05	9 72	9 55	9 45	9 38	9 29	9 29	9 13
6	13 75	10 93	9 78	9 15	8 75	8 47	8 26	8 10	7 98	7 87	7 56	7 40	7 30	7 23	7 14	7 14	6 99
7	12 25	9 55	8 45	7 85	7 46	7 19	6 99	6 84	6 72	6 62	6 31	6 16	6 06	5 99	5 91	5 91	5 75
8	11 26	8 65	7 59	7 01	6 63	6 37	6 18	6 03	5 91	5 81	5 52	5 36	5 26	5 20	5 12	5 12	4 96
9	10 56	8 02	6 99	6 42	6 06	5 80	5 61	5 47	5 35	5 26	4 96	4 81	4 71	4 65	4 57	4 57	4 41
10	10 04	7 56	6 55	5 99	5 64	5 39	5 20	5 06	4 94	4 85	4 56	4 41	4 31	4 25	4 17	4 17	4 01
11	9 65	7 21	6 22	5 67	5 32	5 07	4 89	4 74	4 63	4 54	4 25	4 10	4 01	3 94	3 86	3 86	3 71
12	9 33	6 93	5 95	5 41	5 06	4 82	4 64	4 50	4 39	4 30	4 01	3 86	3 76	3 70	3 62	3 62	3 47
13	9 07	6 70	5 74	5 21	4 86	4 62	4 44	4 30	4 19	4 10	3 82	3 67	3 57	3 51	3 43	3 43	3 27
14	8 86	6 52	5 56	5 04	4 70	4 46	4 28	4 14	4 03	3 94	3 66	3 51	3 41	3 35	3 27	3 27	3 11
15	8 68	6 36	5 42	4 89	4 56	4 32	4 14	4 00	3 90	3 81	3 52	3 37	3 28	3 21	3 13	3 13	2 98
16	8 53	6 23	5 29	4 77	4 44	4 20	4 03	3 89	3 78	3 69	3 41	3 26	3 16	3 10	3 02	3 02	2 86
17	8 40	6 11	5 19	4 67	4 34	4 10	3 93	3 79	3 68	3 59	3 31	3 16	3 07	3 00	2 92	2 92	2 76
18	8 29	6 01	5 09	4 58	4 25	4 02	3 84	3 71	3 60	3 51	3 23	3 08	2 98	2 92	2 84	2 84	2 68
19	8 19	5 93	5 01	4 50	4 17	3 94	3 77	3 63	3 52	3 43	3 15	3 00	2 91	2 84	2 76	2 76	2 60
20	8 10	5 85	4 94	4 43	4 10	3 87	3 70	3 56	3 46	3 37	3 09	2 94	2 84	2 78	2 70	2 69	2 54
21	8 02	5 78	4 87	4 37	4 04	3 81	3 64	3 51	3 40	3 31	3 03	2 88	2 79	2 72	2 64	2 64	2 48
22	7 95	5 72	4 82	4 31	3 99	3 76	3 59	3 45	3 35	3 26	2 98	2 83	2 73	2 67	2 58	2 58	2 42
23	7 88	5 66	4 77	4 26	3 94	3 71	3 54	3 41	3 30	3 21	2 93	2 78	2 69	2 62	2 54	2 54	2 37
24	7 82	5 61	4 72	4 22	3 90	3 67	3 50	3 36	3 26	3 17	2 89	2 74	2 64	2 58	2 49	2 49	2 33
25	7 77	5 57	4 68	4 18	3 86	3 63	3 46	3 32	3 22	3 13	2 85	2 70	2 60	2 54	2 45	2 45	2 29
26	7 72	5 53	4 64	4 14	3 82	3 59	3 42	3 29	3 18	3 09	2 82	2 66	2 57	2 50	2 42	2 42	2 25
27	7 68	5 49	4 60	4 11	3 79	3 56	3 39	3 26	3 15	3 06	2 78	2 63	2 54	2 47	2 38	2 38	2 22
28	7 64	5 45	4 57	4 07	3 75	3 53	3 36	3 23	3 12	3 03	2 75	2 60	2 51	2 44	2 35	2 35	2 19
29	7 60	5 42	4 54	4 05	3 73	3 50	3 33	3 20	3 09	3 01	2 73	2 57	2 48	2 41	2 33	2 33	2 16
30	7 56	5 39	4 51	4 02	3 70	3 47	3 30	3 17	3 07	2 98	2 70	2 55	2 45	2 39	2 30	2 30	2 13
35	7 42	5 27	4 40	3 91	3 59	3 37	3 20	3 07	2 96	2 88	2 60	2 44	2 35	2 28	2 19	2 19	2 02
40	7 31	5 18	4 31	3 83	3 51	3 29	3 12	2 99	2 89	2 80	2 52	2 37	2 27	2 20	2 11	2 11	1 94
45	7 23	5 11	4 25	3 77	3 45	3 23	3 07	2 94	2 83	2 74	2 46	2 31	2 21	2 14	2 05	2 05	1 88
50	7 17	5 06	4 20	3 72	3 41	3 19	3 02	2 89	2 78	2 70	2 42	2 27	2 17	2 10	2 01	2 01	1 82
60	7 08	4 98	4 13	3 65	3 34	3 12	2 95	2 82	2 72	2 63	2 35	2 20	2 10	2 03	1 94	1 94	1 75
70	7 01	4 92	4 07	3 60	3 29	3 07	2 91	2 78	2 67	2 59	2 31	2 15	2 05	1 98	1 89	1 83	1 70
80	6 96	4 88	4 04	3 56	3 26	3 04	2 87	2 74	2 64	2 55	2 27	2 12	2 01	1 94	1 85	1 79	1 65
90	6 93	4 85	4 01	3 53	3 23	3 01	2 84	2 72	2 61	2 52	2 24	2 09	1 99	1 92	1 82	1 76	1 62
100	6 90	4 82	3 98	3 51	3 21	2 99	2 82	2 69	2 59	2 50	2 22	2 07	1 97	1 89	1 80	1 74	1 60
200	6 76	4 71	3 88	3 41	3 11	2 89	2 73	2 60	2 50	2 41	2 13	1 97	1 87	1 79	1 69	1 63	1 48
300	6 72	4 68	3 85	3 38	3 08	2 86	2 70	2 57	2 47	2 38	2 10	1 94	1 84	1 76	1 66	1 59	1 44
400	6 70	4 66	3 83	3 37	3 06	2 85	2 68	2 56	2 45	2 37	2 08	1 92	1 82	1 75	1 64	1 58	1 42
500	6 69	4 65	3 82	3 36	3 05	2 84	2 68	2 55	2 44	2 36	2 70	1 92	1 81	1 74	1 63	1 57	1 41
10^2	6 66	4 63	3 80	3 34	3 04	2 82	2 66	2 53	2 43	2 34	2 06	1 90	1 79	1 72	1 61	1 54	1 38
10^3	6 64	4 61	3 78	3 32	3 02	2 80	2 64	2 51	2 41	2 32	2 04	1 88	1 77	1 70	1 59	1 53	1 36

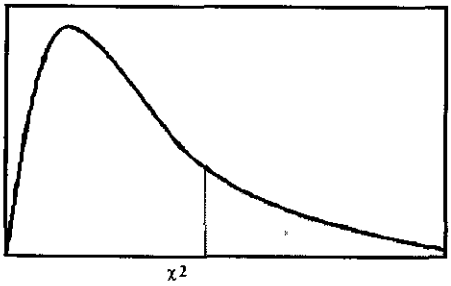


Table A1.7 Values of the χ^2 distribution for varying degrees of freedom (*df*) and α

	α										
	0.0005	**0.001**	**0.005**	**0.01**	**0.025**	**0.05**	**0.1**	**0.15**	**0.2**	**0.25**	**0.3**
1	12 1153	10 8274	7 8794	6 6349	5 0239	3 8415	2 7055	2 0722	1 6424	1 3233	1 0742
2	15 2014	13 8150	10 5965	9 2104	7 3778	5 9915	4 6052	3 7942	3 2189	2 7726	2 4079
3	17 7311	16 2660	12 8381	11 3449	9 3484	7 8147	6 2514	5 3170	4 6416	4 1083	3 6649
4	19 9977	18 4662	14 8602	13 2767	11 1433	9 4877	7 7794	6 7449	5 9886	5 3853	4 8784
5	22 1057	20 5147	16 7496	15 0863	12 8325	11 0705	9 2363	8 1152	7 2893	6 6257	6 0644
6	24 1016	22 4575	18 5475	16 8119	14 4494	12 5916	10 6446	9 4461	8 5581	7 8408	7 2311
7	26 0179	24 3213	20 2777	18 4753	16 0128	14 0671	12 0170	10 7479	9 8032	9 0371	8 3834
8	27 8674	26 1239	21 9549	20 0902	17 5345	15 5073	13 3616	12 0271	11 0301	10 2189	9 5245
9	29 6669	27 8767	23 5893	21 6660	19 0228	16 9190	14 6837	13 2880	12 2421	11 3887	10 6564
10	31 4195	29 5879	25 1881	23 2093	20 4832	18 3070	15 9872	14 5339	13 4420	12 5489	11 7807
11	33 1382	31 2635	26 7569	24 7250	21 9200	19 6752	17 2750	15 7671	14 6314	13 7007	12 8987
12	34 8211	32 9092	28 2997	26 2170	23 3367	21 0261	18 5493	16 9893	15 8120	14 8454	14 0111
13	36 4768	34 5274	29 8193	27 6882	24 7356	22 3620	19 8119	18 2020	16 9848	15 9839	15 1187
14	38 1085	36 1239	31 3194	29 1412	26 1189	23 6848	21 0641	19 4062	18 1508	17 1169	16 2221
15	39 7173	37 6978	32 8015	30 5780	27 4884	24 9958	22 3071	20 6030	19 3107	18 2451	17 3217
16	41 3077	39 2518	34 2671	31 9999	28 8453	26 2962	23 5418	21 7931	20 4651	19 3689	18 4179
17	42 8808	40 7911	35 7184	33 4087	30 1910	27 5871	24 7690	22 9770	21 6146	20 4887	19 5110
18	44 4337	42 3119	37 1564	34 8052	31 5264	28 8693	25 9894	24 1555	22 7595	21 6049	20 6014
19	45 9738	43 8194	38 5821	36 1908	32 8523	30 1435	27 2036	25 3289	23 9004	22 7178	21 6891
20	47 4977	45 3142	39 9969	37 5663	34 1696	31 4104	27 4120	26 4976	25 0375	23 8277	22 7745
21	49 0096	46 7963	41 4009	38 9322	35 4789	32 6706	29 6151	27 6620	26 1711	24 9348	23 8578
22	50 5105	48 2676	42 7957	40 2894	36 7807	33 9245	30 8133	28 8224	27 3015	26 0393	24 9390
23	51 9995	49 7276	44 1814	41 6383	38 0756	35 1725	32 0069	29 9792	24 4288	27 1413	26 0184
24	53 4776	51 1790	45 5584	42 9798	39 3641	36 4150	33 1962	31 1325	29 5533	28 2412	27 0960
25	54 9475	52 6187	49 9280	44 3140	40 6465	37 6525	34 3816	32 2825	30 6752	29 3388	28 1719
26	56 4068	54 0511	48 2898	45 6416	41 9231	38 8851	35 5632	33 4295	31 7946	30 4346	29 2463
27	57 8556	55 4751	49 6450	46 9628	43 1945	40 1133	36 7412	34 5736	32 9117	31 5284	30 3193
28	59 2990	56 8918	50 9936	48 2782	44 4608	41 3372	37 9159	35 7150	34 0266	32 6205	31 3909
29	60 7342	58 3006	52 3355	49 5878	45 7223	42 5569	39 0875	36 8538	35 1394	33 7109	32 4612
30	62 1600	59 1022	53 6719	50 8922	46 9792	43 7730	40 2560	37 9902	36 2502	34 7997	33 5302
31	63 5813	61 0980	55 0025	52 1914	48 2319	44 3853	41 4217	39 1244	37 3591	35 3373	34 5981
32	84 9935	62 4873	56 3280	53 4857	49 4804	48 1942	42 5847	40 2563	38 4663	35 3730	35 6649
33	66 4013	63 8694	57 6423	54 7754	50 7251	47 3999	43 7452	41 3861	39 5718	38 0575	36 7307
34	57 8042	65 2471	58 9637	56 0609	51 9660	48 6024	44 9032	42 5140	40 6756	39 1408	37 7954
35	99 1975	66 6192	60 2748	57 3420	53 2033	49 8018	48 0580	43 6399	41 7780	40 2228	38 8591
36	10 5882	67 3850	61 5811	58 6192	54 4373	50 9985	47 2122	44 7641	42 8788	41 3036	39 9220
37	71 9713	69 3476	62 9832	59 9926	55 6680	52 1923	48 3634	45 8864	43 9782	42 3833	40 9839
38	73 3580	70 7039	64 1812	61 1620	56 8955	53 2835	49 5126	47 0072	45 0763	43 4619	42 0450
39	74 7237	72 0550	65 4753	62 4281	58 1201	54 5722	50 6598	48 1263	46 1730	44 5395	43 1053
40	76 0953	73 4029	66 7660	63 6908	59 3417	55 7585	51 8050	49 2438	47 2685	45 6150	44 1649
45	82 0734	80 0776	73 1660	69 9569	65 4101	61 6562	57 5053	54 8105	52 7288	50 9849	49 4517
50	89 5597	86 6603	79 4898	75 1538	71 4202	57 5048	63 1671	60 3460	58 1638	56 3336	54 7228
55	96 1607	93 1671	85 7491	82 2920	77 3804	73 3115	68 7962	65 8550	53 5772	61 6650	59 9804
60	102 6971	99 6078	91 9518	88 3794	83 2977	79 0820	74 3970	71 3411	68 3721	66 9815	65 2265
100	153 1538	149 4488	140 1697	135 8069	129 5613	124 3421	118 4980	114 6538	111 6567	109 1412	105 9058
1000	1153 7344	1143 9196	1118 9475	1106 3690	1089 5307	1074 6794	1057 7240	1046 2849	1037 8381	1030 1157	1023 2140

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SECTION 1

(1) It is usually possible to collect data from an entire population Is this statement true or false?

(2) On a histogram, which measure of central tendency always refers to the highest point on the distribution?

(3) For the following data set [1, 7, 9, 15, 33, 76, 103, 118], what is the median location?

(4) If the distribution of the ages for a population were positively skewed, what does it say about the age distribution of the population?

(5) A standard deviation of a set of data can be a negative number Is this statement true or false?

(6) Assume a *t*-value in a two-tailed test is significant at the 0,05 level What would be the level of significance of the same *t*-value in a one-tailed test?

(7) A researcher tests a group of boys and a group of girls by means of a statistical aptitude test and comes to the conclusion that girls have a higher statistical aptitude than boys Which is the dependent variable in this research question?

(8) With a non-directional alternative hypothesis you will use a two-tailed test Is this statement true or false?

(9) Given the data
X 23 16 31 29
Y 11 19 8 10

$\sum Y^2 =$

(10) The *df* for Group = 4
The *df* for Error = 45

What is the value of *N*?

(11) The standard normal distribution has a mean of

(12) The pre-test scores of certain employees, after assessing their general knowledge in preparation for a leadership behaviour workshop were as follows 9, 2, 9, 4, 13, 10, 7, 6, 12, 11 The range is

Use the table below to answer questions (13) to (16)

Class interval	Frequency	Cumulative frequency	% Frequency	Cumulative % frequency
75 - 80	6	70	9	100
69 - 74	9	?	13	91
63 - 68	15	55	?	78
57 - 62	14	40	20	?
51 - 56	16	26	23	37
45 - 50	10	10	14	14

(13) The interval size for this distribution is

(14) The cumulative frequency for the class interval [69-74] is

(15) The percentage frequency for the class interval [63-68] is

(16) The cumulative percentage frequencyfor the class interval [57-62] is .

Two departments have entered a crossword puzzle competition to win R15 000 worth of prizes from a leading computer store Department A sent 25 entries while Department B sent in 35 The report from the competition administrators is that 400 entries qualified and from the solution provided both departments qualified Use the above information to answer the following questions [17-19]

(17) What is the probability that Department A will win the first prize?

(18) If Department A wins first prize, what is the probability that Department B will win second prize? (The first prizewinning entry is not put back in the hopper)

(19) What is the probability that the two departments will win first and second prize?

(20) Students were asked to indicate to which degree they find statistics interesting, to which degree they find it difficult and how much effort they are willing to put into their studies The results of a computed Pearson correlation are presented below Use it to answer the question that follows

Correlations

		Effort	Interesting	Difficulty
Effort	Pearson Correlation	1	0 454**	-0 224**
	Sig (2-tailed)		0 000	0 001
	N	235	234	233
Interesting	Pearson Correlation	0 454**	1	-0 281**
	Sig (2-tailed)	0 000		0 000
	N	234	234	232
Difficulty	Pearson Correlation	-0 224**	-0 281**	1
	Sig (2-tailed)	0 001	0 000	
	N	233	232	233

Is the correlation between the amount of effort they are willing to invest and the degree to which students find statistics difficult statistically significant?

TOTAL SECTION 1: [20]

SECTION 2

QUESTION 1 [18]

"The more information people have about the value of statistics, the less their anxiety about statistics"

As an Industrial Psychology student, you decide to use some of the skills you acquired in the course to test this statement You administer a general knowledge quiz on the value of statistics and an anxiety about statistics questionnaire to 15 of your classmates You gathered the appropriate data and after analysing it, you found the following

- The relationship between the degree of information about the value of statistics and anxiety about statistics, was **-0,68**
- The mean of X (information about the value of statistics) was **7,34** and the mean of Y (anxiety about statistics) was **3,47**
- The slope was **-0,66**

Use the results above to answer to the following questions

(a) Interpret the correlation coefficient (2)

(b) What deduction can be made about the nature of the relationship? (1)

(c) Calculate the percentage of common variance between the two sets of scores and then illustrate this percentage diagrammatically (2)

When you presented the results of the calculations to your class mates, you mentioned that you could use a certain formula to predict students' anxiety about statistics, based on their knowledge of the value of statistics score

(d) What is the value of the intercept? (2)

(e) Calculate the anxiety about statistics of a students with a knowledge about statistics score of 4 (1)

(f) Provide a graphic representation of the regression line, by indicating the intercept and predicted value for a student with a knowledge about the value of statistics score of 4 (5)

Students completed a questionnaire to measure their anxiety about statistics The minimum score that can be obtained is 45 (indicating a low degree of anxiety about statistics) and the maximum score is 80 (indicating a high degree of anxiety about statistics) Use the frequency table below to do the following calculations

Class interval	Frequency	Cumulative frequency	% Frequency	Cumulative % frequency
75 - 80	6	70	9	100
69 - 74	9	64	13	91
63 - 68	10	55	14	78
57 - 62	19	45	27	64
51 - 56	16	26	23	37
45 - 50	10	10	14	14

(g) If 65 is considered a high risk score for anxiety about statistics, what is the percentage of students that fall below a high risk score? Or stated differently, determine the percentile rank of a score of 65 (3)

(h) What is the score at which 60% of all students scored? In other words, what score is found at the 60th percentile? (2)

QUESTION 2 **[6]**

You have collected information from your fellow students on how much they have learned in the module of IOP2601 This was done by asking five questions that had to be rated on a five point scale Given a normally distributed population with a mean (μ) of 10, a standard deviation (σ) of 5, and 100 as the number of cases (N), answer the following questions

(a) What is the **proportion** of students with a raw score greater than 5? (2)

(b) What is the **percentage** of students with a raw score greater than 20? (2)

(c) What is the **number** of students with raw scores between 5 and 20? (2)

QUESTION 3 **[10]**

An industrial psychologist wants to determine whether the implementation of a grievance procedure has an influence on employees' attitude towards strikes The grievance procedure has been in place in Organisation A for a long time The effect of the grievance procedure is measured against Organisation B, which has no grievance procedure

The industrial psychologist determined the attitude towards strikes in each organisation The data are as follows (a high score represents a positive attitude towards strikes)

ATTITUDE TOWARDS STRIKES	
ORGANISATION A	**ORGANISATION B**
9	2
7	1
10	6
7	5
5	6
8	5
9	7
8	4
7	6
10	3

The industrial psychologist wants to determine whether there is a meaningful difference in the attitudes towards strikes between the two organisations He decides on a level of significance of $\alpha = 0,05$

(a) Formulate an appropriate null hypothesis (H_0) in symbols (1)
(b) Formulate an appropriate alternative hypothesis (H_1) in symbols (1)
(c) Assuming that your data are normally distributed, select an appropriate statistical test and calculate the test statistic Show ALL calculations (3)

	N	$\bar{X}$	s^2
Organisation A	10	8,0	2,44
Organisation B	10	4,5	3,83

(d) Determine the degrees of freedom (1)
(e) Determine the critical value for a two-tailed test for a significance level of 5% (0,05) (1)
(f) Interpret the results in terms of the rejection or non-rejection of the null hypothesis (1)
(g) Interpret your rejection or non-rejection of the null hypothesis in plain language, in terms of the original problem statement (2)

QUESTION 4 **[12]**

Recent research findings indicate that quite a high number of employees may be suffering from burnout The consequences of burnout are detrimental to both the employee and the organisation You decide to determine the level of burnout experienced by employees currently working in your organisation You suspect that older workers will experience higher levels of burnout than younger workers You therefore collect burnout scores as measured by a well-known Burnout Inventory and divide the data into three age groups The data are presented below

18-30 years old	**31-45 years old**	**46-60 years old**
4	3	10
8	2	8
5	1	9
7	3	8
6	4	7
$\bar{x}$ = 6,0	$\bar{x}$ = 2,6	$\bar{x}$ = 8,4
Total mean	$\bar{X}$ = 5,67	
	ΣX = 85	
	ΣX^2 = 587	

In order to determine if there is a difference in the burnout levels experienced by different age groups, you test the following hypothesis

$$H_0 \quad \mu_1 = \mu_2 = \mu_3 \text{ with } \alpha = 0{,}01$$

(a) Choose an appropriate test statistic to test this hypothesis and calculate the test statistic Present your answers in a summary table (8)

(b) Determine the critical value which will help you to decide whether or not you should reject the null hypothesis at **a significance level of 0,01** (1)

(c) Do you reject the null hypothesis? (1)

(d) Interpret your findings in terms of the original problem statement (2)

QUESTION 5 **[4]**

A recent trend in Industrial Psychology shows that more females than males are entering into postgraduate studies in this field of study A lecturer decides to investigate if this trend is already apparent at undergraduate level The data she collects from the registration department of her university are presented below

	Males	Females
First-year level	17	28
Second-year level	17	34
Third-year level	5	30

She has already calculated the appropriate statistical value and obtained a **chi-square value of 5,70**

(a) Determine the critical value for **a significance level of 0,05** from the appropriate table (1)

(b) Do you reject the null hypothesis? (1)

(c) Interpret your findings in terms of the original problem statement (2)

TOTAL SECTION 2: [50]

GRAND TOTAL: [70]

AFDELING 1

(1) Dit is gewoonlik moontlik om data van 'n totale populasie te versamel Is hierdie stelling waar of vals?

(2) Watter maatstaf van sentrale neiging verwys altyd na die hoogste punt in die verspreiding van 'n histogram?

(3) Wat is die mediaanposisie vir die volgende datastel [1, 7, 9, 15, 33, 76, 103, 118]?

(4) As die verspreiding van ouderdomme vir 'n populasie positief skeef is, watter afleiding kan ons maak oor die verspreding van ouderdom in die populasie?

(5) Die standaardafwyking van 'n stel data kan 'n negatiewe syfer wees Is hierdie stelling waar of vals?

(6) Gestel 'n *t*-waarde in 'n tweekantige toets is betekenisvol op die 0,05 vlak Watter peil van beduindenheid sal dieselfde *t*-waarde in 'n eenkantige toets aanneem?

(7) 'n Navorser toets 'n groep seuns en 'n groep dogters met behulp van 'n statistiese aanlegtoets en kom tot die gevolgtrekking dat dogters 'n hoer statistiese aanleg as seuns het Wat is die afhanklike veranderlike in hierdie navorsingsvraag?

(8) Met 'n nie-rigtinggewende alternatiewe hipotese sal jy 'n tweekantige toets gebruik Is hierdie stelling waar of vals?

(9) Gegewe die data
X 23 16 31 29
Y 11 19 8 10

$\sum Y^2 =$

(10) Die *df* vir Groep = 4
Die *df* vir Fout = 45

Wat is die waarde van *N*?

(11) Die standard-normaalverspreiding het 'n gemiddeld van

(12) Die voortoets-tellings van sekere werknemers, na meting van hulle algemene kennis ter voorbereiding van 'n leierskapsgedragswerkswinkel, was soos volg 9, 2, 9, 4, 13, 10, 7, 6, 12, 11 Die omvang is

Gebruik die tabel hieronder om vrae (13) tot (16) te beantwoord

Klasinterval	Frekwensie	Kumulatiewe frekwensie	% Frekwensie	Kumulatiewe % frekwensie
75 - 80	6	70	9	100
69 - 74	9	**?**	13	91
63 - 68	15	55	**?**	78
57 - 62	14	40	20	**?**
51 - 56	16	26	23	37
45 - 50	10	10	14	14

(13) Die intervalgrootte vir hierdie verspreiding is

(14) Die kumulatiewe frekwensie vir die klasinterval [69-74] is

(15) Die persentasie frekwensie vir die klasinterval [63-68] is

(16) Die kumulatiewe persentasie frekwensie vir die klasinterval [57-62] is

Twee departemente het vir 'n blokkiesraaiselkompetisie ingeskryf om R15 000 se pryse by 'n toonaangewende rekenaarhandelaar te wen Departement A het 25 inskrywings ingestuur terwyl Departement B 35 ingestuur het Die verslag van die administrateurs van die kompetisie is dat 400 inskrywings gekwalifiseer het en uit die oplossing wat voorsien is blyk dit dat altwee departemente gekwalifiseer het Gebruik hierdie inligting om die volgende vrae [17-19] te beantwoord

(17) Wat is die waarskynlikheid dat Departement A die eerste prys sal wen?

(18) Indien Departement A die eerste prys wen, wat is die waarskynlikheid dat Departement B die tweede prys sal wen? (Die eerste pryswenner se inskrywing word nie in die houer teruggeplaas nie)

(19) Wat is die waarskynlikheid dat die twee departemente die eerste en tweede prys sal wen?

(20) Studente is gevra om aan te dui in watter mate hulle statistiek interessant vind (Interesting), in watter mate hulle dit moeilik vind (Difficulty) en in watter mate hulle bereid is om moeite te doen met hulle studies (Effort) Die resultate van 'n Pearson-korrelasie wat gedoen is, word hieronder aangebied Let wel, die uitdruk is slegs in Engels omdat dit so in die statistiese verwerkingsprogram aangebied word Gebruik dit om die vraag te beantwoord wat volg

Correlations

		Effort	Interesting	Difficulty
Effort	Pearson Correlation	1	0 454**	-0 224**
	Sig (2-tailed)		0 000	0 001
	N	235	234	233
Interesting	Pearson Correlation	0 454**	1	-0 281**
	Sig (2-tailed)	0 000		0 000
	N	234	234	232
Difficulty	Pearson Correlation	-0 224**	-0 281**	1
	Sig (2-tailed)	0 001	0 000	
	N	233	232	233

Is die korrelasie tussen die mate waarin studente statistiek moeilik vind (Difficulty) en in watter mate hulle bereid is moeite te doen met hulle studies (Effort) statisties betekenisvol?

TOTAAL AFDELING 1. [20]

AFDELING 2

VRAAG 1 **[18]**

"Hoe meer kennis mense het oor die waarde van statistiek, hoe minder hulle angstigheid oor statistiek"

As 'n bedryfsielkunde-student het jy besluit om die vaardighede wat jy in dié kursus aangeleer het te gebruik om bogenoemde stelling te toets Jy neem 'n vraelys oor mense se kennis van die waarde van statistiek en 'n angstigheidsvraelys af op 15 van jou klasmaats Jy versamel die gepaste data en nadat jy dit geanaliseer het, bevind jy die volgende

- Die verband tussen die mate waarin mense kennis het oor die waarde van statistiek en hulle angstigheid oor statistiek was **-0,68**
- Die gemiddeld van X (kennis oor die waarde van statistiek) was **7,34** en die gemiddeld van Y (angstigheid oor statitiek) was **3,47**
- Die helling was **-0,66**

Gebruik bogenoemde resultate om die volgende vrae te beantwoord

(a) Interpreteer die korrelasiekoeffisient (2)

(b) Watter afleiding kan gemaak word oor die aard van die verband? (1)

(c) Bereken die persentasie gemeenskaplike variansie tussen die twee stelle tellings en illustreer dit diagrammaties (2)

Toe jy die resultate van die berekenings aan jou medestudente bekendmaak, noem jy dat jy 'n sekere formule kan gebruik om studente se angstigheid oor statistiek op grond van hulle kennis oor die waarde van statistiek te voorspel

(d) Wat is die waarde van die afsnit? (2)

(e) Bereken die angstigheid oor statistiek van 'n student met 'n kennis van die waarde van statistiek telling van 4 (1)

(f) Gee 'n grafiese voorstelling van die regressielyn deur onderskeidelik die afsnit en die voorspelde waarde van die student met 'n waarde van statistiek telling van 4 daarop aan te dui (5)

Die studente het 'n vraelys ingevul wat hulle angstigheid oor statistiek meet Die minimum telling wat verkry kan word is 45 (wat 'n aanduiding is dat hulle 'n lae mate van angstigheid ervaar) en die maksimum telling is 80 (wat 'n aanduiding is dat hulle 'n hoe mate van angstigheid ervaar) Gebruik die frekwensieverspreidingstabel hieronder en doen die daaropvolgende berekenings

Klasinterval	Frekwensie	Kumulatiewe frekwensie	% Frekwensie	Kumulatiewe % frekwensie
75 - 80	6	70	9	100
69 - 74	9	64	13	91
63 - 68	10	55	14	78
57 - 62	19	45	27	64
51 - 56	16	26	23	37
46 - 50	10	10	14	14

(g) Indien 65 as 'n hoerisikotelling beskou word, wat is die persentasie studente onder 'n hoerisikotelling val? Of anders gestel, bepaal die persentielrang van 'n telling van 65 (3)

(h) Wat is die telling waar 60% van die studente val? Of anders gestel, watter telling is op die 60ste persentiel? (2)

VRAAG 2 **[6]**

Jy het inligting oor van jou medestudente versamel oor hoe baie hulle geleer het in die module IOP2601 Hulle moes vyf vrae volgens 'n vyfpuntskaal beantwoord Jy werk met 'n normaal verspreide populasie met 'n gemiddeld (μ) van 10, 'n standaardafwyking (σ) van 5 en 'n aantal gevalle (N) van 100 Beantwoord die volgende vrae

(a) Wat is die **proporsie** van studente met 'n routelling groter as 5? (2)

(b) Wat is die **persentasie** van studente met 'n routelling groter as 20? (2)

(c) Wat is die **aantal** studente met routellings tussen 5 en 20? (2)

VRAAG 3 **[10]**

'n Bedryfsielkundige wil vasstel of die instelling van 'n grieweprosedure 'n invloed het op werknemers se houding teenoor stakings Die grieweprosedure is lankal reeds in werking gestel by Organisasie A Die effek hiervan word gemeet teen Organisasie B, waar geen grieweprosedure in werking is nie

Die bedryfsielkundige het in elke organisasie die houding teenoor stakings bepaal Die data is soos volg ('n hoe telling verteenwoordig 'n positiewe houding teenoor stakings)

HOUDING TEENOOR STAKINGS	
ORGANISASIE A	**ORGANISASIE B**
9	2
7	1
10	6
7	5
5	6
8	5
9	7
8	4
7	6
10	3

Die bedryfsielkundige wil vasstel of daar 'n betekenisvolle verskil bestaan tussen die twee organisasies se houding teenoor stakings Hy besluit op 'n beduidenheidsvlak van $\alpha = 0,05$

(a) Formuleer 'n gepaste nulhipotese (H_0) in simbole (1)
(b) Formuleer 'n gepaste alternatiewe hipotese (H_1) in simbole (1)
(c) Aanvaar dat jou data normaal versprei is Kies 'n gepaste statistiese toets en bereken die toetsstatistiek Toon ALLE berekeninge (3)

	N	$\bar{X}$	s^2
Organisasie A	10	8,0	2,44
Organisasie B	10	4,5	3,83

(d) Bepaal die grade van vryheid (1)

(e) Bepaal die kritieke waarde vir 'n tweekantige toets vir 'n beduidendheidsvlak van 5% (0,05) (1)
(f) Interpreteer die resultate na gelang van die verwerping of nie-verwerping van die nulhipotese (1)
(g) Interpreteer jou verwerping of nie-verwerping van die nulhipotese in gewone taal volgens die oorspronklike probleemstelling (2)

VRAAG 4 **[12]**

Onlangse navorsingsresultate toon dat 'n groot aantal werknemers moontlik aan uitbranding lei Die gevolge van uitbranding is tot die nadeel van beide die werknemer en die organisasie Jy besluit om die huidige vlakke van uitbranding onder werknemers in jou organisasie te bepaal Jy vermoed egter dat ouer werknemers hoer vlakke van uitbranding beleef as jonger werknemers Jy versamel daarom die uitbrandingstellings van huidinge werknemers soos gemeet deur 'n welbekende uitbrandingsvraelys en verdeel die data in drie ouderdomskategoriee Die data word hieronder weergegee

18-30 jaar oud	**31-45 jaar oud**	**46-60 jaar oud**
4	3	10
8	2	8
5	1	9
7	3	8
6	4	7
$\bar{x} = 6,0$	$\bar{x} = 2,6$	$\bar{x} = 8,4$
Totale gemiddelde	$\bar{X} = 5,67$	
	$\Sigma X = 85$	
	$\Sigma X^2 = 587$	

Ten einde te bepaal of daar 'n verskil is in die uitbrandingsvlakke van verskillende ouderdomsgroepe, toets jy die volgende hipotese

$$H_0 \quad \mu_1 = \mu_2 = \mu_3 \text{ met } \alpha = 0,01$$

(a) Kies 'n gepaste statistiese toets om hierdie hipotese te toets en bereken die toetsstatistiek Gee jou antwoorde in 'n opsommingstabel (8)

(b) Bepaal die kritiese waarde wat jou gaan help om te besluit of jy die nulhipotese op 'n **beduidendheidsvlak van 0,01** moet verwerp of nie (1)

(c) Verwerp jy die nulhipotese? (1)

(d) Interpreteer jou bevindinge in die lig van die oorspronklike probleemstelling (2)

VRAAG 5 **[4]**

'n Onlangse tendens in Bedryfsielkunde toon dat meer vrouens as mans vir nagraadse studie in hierdie vakgebied registreer 'n Dosent besluit om vas te stel of hierdie tendens reeds op voorgraadse vlak voorkom Die data wat sy van die registrasiedepartement van haar universiteit aangevra het, word hieronder weergegee

	Mans	Vrouens
Eerstejaarsvlak	17	28
Tweedejaarsvlak	17	34
Derdejaarsvlak	5	30

Sy het reeds 'n gepaste statistiese waarde bereken en 'n **chi-kwadraatwaarde van 5,70** gekry

(a) Bepaal die kritieke waarde op **'n beduidenheidsvlak van 0,05** op grond van die gepaste tabel (1)

(b) Verwerp jy die nulhipotese? (1)

(c) Interpreteer die bevinding in die lig van die oorspronklike probleemstelling (2)

TOTAAL AFDELING 2: [50]

GROOTTOTAAL. [70]