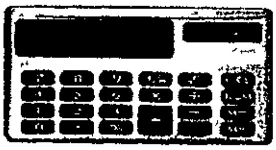
UNIVERSITY EXAMINATIONS



UNIVERSITEITSEKSAMENS

UNISA university of south africa

STA1510 (473711) May/June 2015

BASIC STATISTICS

Duration 2 Hours 100 Marks

EXAMINERS
FIRST MR TP MOHLALA
SECOND DR EM RAPOO

Use of a non-programmable pocket calculator is permissible

Closed book examination.

This examination question paper remains the property of the University of South Africa and may not be removed from the examination venue

This examination paper consists of 22 pages, including 2 pages of formulae (p 12–13) plus 9 pages of tables (pp 14–22) as well as instructions for the completion of a mark reading sheet

Please complete the attendance register on the back page, tear off and hand it to the invigilator.

Answer question paper on a mark-reading sheet and place in green answer book provided for rough work.

INSTRUCTIONS

Answer all 25 questions on one mark reading sheet

[TURN OVER]

Question 1

A summary measure that is computed to describe a characteristic from only a sample of the population is called

1 a parameter

2 a census

3 a statistic

4 the scientific method

5 a sample

Question 2

Which of the following is a discrete quantitative (numerical) variable?

1 the amount of calories contained in a 50-grams package of cheese

2 the volume of water released from a dam

3 the distance you drove yesterday

4 the number of employees of an insurance company

5 the amount of time a student spent studying for an exam

Question 3

The following are the duration in minutes of a sample of long-distance phone calls made within the Republic of South Africa reported by one long-distance carrier

Time (in Minutes)	Relative Frequency
0 but less than 5	0 37
5 but less than 10	0 22
10 but less than 15	0 15
15 but less than 20	0 10
20 but less than 25	0 07
25 but less than 30	0 07
30 or more	0 02

Referring to the table, what is the cumulative relative frequency for the percentage of calls that lasted 10 minutes or more?

1 0 16

2 0 24

3 0 41

4 0 90

5 0 74

Question 4

Refer to the table on question 3.
If 100 calls were sampled, ________ of them would have lasted less than 15 minutes

1 26

2 74

3 10

4 90

5 37

Question 5

In right-skewed distributions, which of the following is the correct statement?

1 The distance from Q_1 to Q_2 is greater than the distance from Q_2 to Q_3

2 The distance from Q_1 to Q_2 is less than the distance from Q_2 to Q_3.

3 The arithmetic mean is less than the median

4 The mode is greater than the arithmetic mean

5 The distance from Q_1 to Q_2 equals to the distance from Q_2 to Q_3.

Question 6

In a recent academic year, many public universities in South Africa raised tuition and fees due to a decrease in state subsidies The change in the cost of tuition, a shared room, and the most popular meal plan from the previous academic year for a sample of 10 public universities were as follows R1589, R593, R1223, R869, R423, R1720, R708, R1425, R922 and R308

Referring to the information, what is the interquartile range of the change in the cost?

1 R593

2 R1000

3 R1425

4 R832

5 R922

Question 7

The employees of a company were surveyed on questions regarding their educational background (college degree or no college degree) and marital status (single or married) Of the 600 employees, 400 had college degrees 100 were single, and 60 were single college graduates The probability that an employee of the company does not have a college degree is ________

1 0 10

2 0 33

3 0 67

4 0 75

5 0 733

[TURN OVER]

Question 8

The probability that a new advertising campaign will increase sales is assessed as being 0 80 The probability that the cost of developing the new ad campaign can be kept within the original budget allocation is 0 40 Assuming that the two events are independent, the probability that the cost is not kept within budget or the campaign will not increase sales is ________

1 0 12

2 0 32

3 0 68

4 0 88

5 0 20

Question 9

Mothers Against Drunk Driving is a very visible group whose main focus is to educate the public about the harm caused by drunk drivers A study was recently done that emphasized the problem we all face with drinking and driving Four hundred accidents that occurred on a Saturday night were analyzed Two items noted were the number of vehicles involved and whether alcohol played a role in the accident The numbers are shown below

	Number of Vehicles Involved			
Did alcohol play a role?	1	2	3	Totals
Yes	50	100	20	170
No	25	175	30	230
Totals	75	275	50	400

Referring to the table, given that alcohol was not involved, what proportion of the accidents were multiple vehicles?

1 50/170 or 29 41%

2 120/170 or 70 59%

3 205/230 or 89 13%

4 25/230 or 10 87%

5 20/230 or 8 70%

Question 10

If $n = 10$ and $\pi = 0\ 70$, then the standard deviation of the binomial distribution is ________

1 0 07

2 1 45

3 7 00

4 14 29

5 2 10

Question 11

The number of power outages at a nuclear power plant has a Poisson distribution with a mean of 3 5 outages per year The probability that there will be at least three power outages in a year is ________

1 0 0302

2 0 6791

3 0 2158

4 0 5367

5 0 3209

Question 12

Two different designs on a new line of winter jackets for the coming winter are available for your manufacturing plants Your profit (in thousands of rands) will depend on the taste of the consumers when winter arrives The probability of the three possible different tastes of the consumers and the corresponding profits are presented in the following table

Probability	Taste	Design A	Design B
0 2	more conservative	180	520
0 5	no change	230	310
0 3	more liberal	350	270

Referring to the table, what is your expected profit when Design A is chosen?

1 R256000

2 R340000

3 R180000

4 R520000

5 R350000

[TURN OVER]

Question 13

If we know that the length of time it takes a college student to find a parking spot in the library parking lot follows a normal distribution with a mean of 3 5 minutes and a standard deviation of 1 minute, find the probability that a randomly selected college student will find a parking spot in the library parking lot in less than 3 minutes

1 0 3551

2 0 3085

3 0 2674

4 0 1915

5 0 5000

Question 14

Suppose Z has a standard normal distribution with a mean of 0 and standard deviation of 1 The probability that Z values are larger than ________ is 0 3483

1 −0 39

2 1 03

3 0 99

4 1

5 0 39

Question 15

The amount of tea leaves in a can from a particular production line is normally distributed with $\mu = 110$ grams and $\sigma = 25$ grams A sample of 25 cans is to be selected What is the probability that the sample mean will be greater than 100 grams?

1 0 0228

2 0 3085

3 0 2674

4 0 9772

5 0 1587

[TURN OVER]

Question 16

According to a survey, only 15% of customers who visited the web site of a major retail store made a purchase Random samples of size 50 are selected What proportion of the samples will have less than 15% of customers who will make a purchase after visiting the web site?

1 0 5000

2 0 3085

3 0 2674

4 0 1587

5 0 8413

Question 17

A university dean is interested in determining the proportion of students who receive some sort of financial aid Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid The 95% confidence interval for π is $0\ 59 \pm 0\ 07$ Interpret this interval

1 We are 95% confident that the true proportion of all students receiving financial aid is between 0 52 and 0 66

2 95% of the students get between 52% and 66% of their tuition paid for by financial aid

3 We are 95% confident that between 52% and 66% of the sampled students receive some sort of financial aid

4 We are 95% confident that 59% of the students are on some sort of financial aid

5 We are 95% confident that 66% of the students are on some sort of financial aid

Question 18

A hotel chain wants to estimate the mean number of rooms rented daily in a given month The population of rooms rented daily is assumed to be normally distributed for each month with a standard deviation of 24 rooms During February, a sample of 25 days has a sample mean of 37 rooms

A 99% confidence interval for the mean number of rooms rented daily in a given month is from _______ to _______

1 37 02 to 49 36

2 27 59 to 46 41

3 25 82 to 48 18

4 37 02 to 50 19

5 24 64 to 49 36

Question 19

A major DVD rental chain is considering opening a new store in an area that currently does not have any such stores The chain will open if there is evidence that more than 5, 000of the 20, 000 households in the area are equipped with DVD players It conducts a telephone poll of 300 randomly selected households in the area and finds that 96 have DVD players The p-value associated with the test statistic in this problem is approximately equal to ________

1 0 0100

2 0 0051

3 0 0026

4 0 0013

5 0 9974

Question 20

A survey claims that 9 out of 10 doctors recommend aspirin for their patients with headaches To test this claim against the alternative that the actual proportion of doctors who recommend aspirin is less than 0 90, a random sample of 100 doctors results in 83 who indicate that they recommend aspirin The value of the test statistic in this problem is approximately equal to ________

1 −4 12

2 −2 33

3 −1 86

4 −0 07

5 4 12

Question 21

The owner of a local nightclub has recently surveyed a random sample of $n = 250$ customers of the club She would now like to determine whether or not the mean age of her customers is greater than 30 If so, she plans to alter the entertainment to appeal to an older crowd If not, no entertainment changes will be made The appropriate hypotheses to test are

1 H_0 $\mu \geq 30$ versus H_1 $\mu < 30$

2 H_0 $\mu \leq 30$ versus H_1 $\mu > 30$

3 H_0 $\bar{X} \geq 30$ versus H_1 $\bar{X} < 30$

4 H_0 $\bar{X} \leq 30$ versus H_1 $\bar{X} > 30$

5 H_0 $\mu \leq 30$ versus H_1 $\mu \neq 30$

[TURN OVER]

Question 22

One criterion used to evaluate employees in the assembly section of a large factory is the number of defective pieces per 1, 000 parts produced The quality control department wants to find out whether there is a relationship between years of experience and defect rate Since the job is repetitious after the initial training period, any improvement due to a learning effect might be offset by a loss of motivation A defect rate is calculated for each worker in a yearly evaluation The results for 100 workers are given in the table below

		Years Since Training Period		
		< 1 Year	1 – 4 Years	5 – 9 Years
Defect Rate	High	6	9	9
	Average	9	19	23
	Low	7	8	10

Referring to the table, find the rejection region necessary for testing at the 0 05 level of significance whether there is a relationship between defect rate and years of experience

1 Reject H_0 if $\chi^2 > 16\ 919$

2 Reject H_0 if $\chi^2 > 15\ 507$

3 Reject H_0 if $\chi^2 > 11\ 143$

4 Reject H_0 if $\chi^2 > 9\ 488$

5 Reject H_0 if $\chi^2 > 5\ 991$

Question 23

Refer to the table on **question 22**

What is the expected number of employees with less than 1 year of training time and a high defect rate?

1 0 36

2 8 64

3 5 28

4 9.17

5 10 08

[TURN OVER]

Question 24

The director of cooperative education at a state college wants to examine the effect of cooperative education job experience on marketability in the work place She takes a random sample of four students For these four she finds out how many times each had a cooperative education job (independent variable) and how many job offers (dependent variable) they received upon graduation These data are presented in the table below

Student	Co-op Jobs	Job Offer
1	1	4
2	2	6
3	1	3
4	0	1

Referring to the table the prediction for the number of job offers for a person with two cooperative education jobs is ________

1 1

2 2 5

3 18

4 3

5 6

Question 25

Refer to the table on **question 24**, the error or residual sum of squares (SSE) is ________

1 49

2 47 5

3 13 0

4 12 5

5 0 50

Formulae / Formules

$$\overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

$$S^2 = \frac{\sum_{i=1}^{n} (X_i - \overline{X})^2}{(n-1)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$$

$$\mu = E(X) = \sum_{i=1}^{N} X_i P(X_i)$$

$$\sigma^2 = \sum_{i=1}^{N} [X_i - E(X)^2] \, p(X_i)$$

$$P(X) = \frac{n!}{X!(n-X)!} \pi^X (1-\pi)^{n-X} \quad X = 0, 1, 2, \quad n$$

$$P(X) = \frac{e^{-\lambda} \lambda^X}{X!} \quad X = 0, 1 \; 2 \quad , \infty$$

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

$$\sigma_{\overline{X}} = \frac{\sigma}{\sqrt{n}}$$

$$\sigma_p = \sqrt{\frac{\pi(1-\pi)}{n}}$$

$$\overline{X} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$$

[TURN OVER]

$$\overline{X} \pm t_{\frac{\alpha}{2}} \frac{S}{\sqrt{n}}$$

$$p \pm Z_{\frac{\alpha}{2}} \sqrt{\frac{p(1-p)}{n}}$$

$$z_{STAT} = \frac{\overline{X} - \mu}{\sigma_{\overline{X}}}$$

$$Z_{STAT} = \frac{p - \pi}{\sigma_p}$$

$$\chi^2_{STAT} = \sum_{\text{all cells}} \frac{(f_0 - f_e)^2}{f_e}$$

$$SSE = \sum Y_i^2 - b_0 \sum Y_i - b_1 \sum X_i Y_i$$

$$SSR = b_0 \sum Y_i + b_1 \sum X_i Y_i - \frac{\left(\sum Y_i\right)^2}{n}$$

$$SST = \sum Y_i^2 - \frac{\left(\sum Y_i\right)^2}{n}$$

$$b_1 = \frac{SSXY}{SSX}$$

$$b_0 = \overline{Y} - b_1 \overline{X}$$

$$SSXY = \sum X_i Y_i - \frac{\left(\sum X_i\right)\left(\sum Y_i\right)}{n}$$

$$r^2 = \frac{SSR}{SST}$$

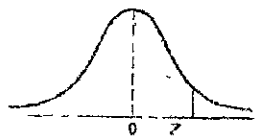
$$SSX = \sum X_i^2 - \frac{\left(\sum X_i\right)^2}{n}$$

Table 1. Standardized Normal Distribution

Tabel 1: Standaardnormaalverdeling

The Standardized Normal Distribution

Entry represents area under the standardized normal distribution from the mean to Z



Z	00	01	.02	03	04	05	06	07	08	09
0.0	0000	0040	0080	0120	0160	0199	0239	0279	0319	0359
0.1	0398	0438	0478	0517	0557	0596	0636	0675	0714	0753
0.2	0793	0832	0871	0910	0948	0987	1026	1064	1103	1141
0.3	1179	1217	1255	1293	1331	1368	1406	1443	1480	1517
0.4	1554	1591	1628	1664	1700	1736	1772	1808	1844	1879
0.5	1915	1950	1985	2019	2054	2088	2123	2157	2190	2224
0.6	2257	2291	2324	2357	.2389	2422	2454	2486	2518	2549
0.7	2580	2612	2642	2673	2704	2734	2764	2794	2823	2852
0.8	2881	2910	2939	2967	2995	3023	3051	3078	3106	.3133
0.9	3159	3186	3212	3238	3264	3289	3315	3340	3365	3389
1.0	3413	3438	.3461	3485	3508	3531	3554	3577	3599	3621
1.1	3643	3665	3686	3708	3729	3749	3770	3790	3810	3830
1.2	3849	3869	3888	3907	3925	3944	3962	3980	3997	4015
1.3	4032	4049	4066	4082	4099	4115	4131	4147	4162	4177
1.4	4192	4207	4222	4236	4251	4265	4279	4292	4306	4319
1.5	4332	4345	4357	4370	4382	4394	4406	4418	4429	4441
1.6	4452	4463	4474	4484	4495	4505	4515	4525	4535	4545
1.7	4554	4564	4573	4582	4591	4599	4608	4616	4625	4633
1.8	4641	4649	4656	4664	4671	4678	4686	4693	4699	4706
1.9	4713	4719	4726	4732	4738	4744	4750	4756	4761	4767
2.0	4772	4778	4783	4788	4793	4798	4803	4808	4812	4817
2.1	4821	4826	4830	4834	4838	4842	4846	4850	4854	4857
2.2	4861	4864	4868	4871	4875	4878	4881	4884	4887	4890
2.3	4893	4896	4898	4901	4904	4906	4909	4911	4913	4916
2.4	4918	4920	4922	4925	4927	4929	4931	4932	4934	4936
2.5	4938	4940	4941	4943	4945	4946	4948	4949	4951	4952
2.6	4953	4955	4956	4957	4959	4960	4961	4962	4963	4964
2.7	4965	4966	4967	4968	4969	4970	4971	4972	4973	4974
2.8	4974	4975	4976	4977	4977	4978	4979	4979	4980	4981
2.9	4981	4982	4982	4983	4984	4984	4985	4985	4986	4986
3.0	49865	49869	49874	49878	49882	49886	49889	49893	49897	49900
3.1	49903	49906	49910	49913	49916	49918	49921	49924	49926	49929
3.2	49931	49934	49936	49938	49940	49942	49944	49946	49948	49950
3.3	49952	49953	49955	49957	49958	49960	49961	49962	49964	49965
3.4	.49966	49968	49969	49970	49971	49972	49973	49974	49975	49976
3.5	49977	49978	49978	49979	49980	49981	49981	49982	49983	49983
3.6	49984	49985	49985	49986	49986	49987	49987	49988	49988	49989
3.7	49989	49990	49990	49990	49991	49991	49992	49992	49992	49992
3.8	49993	49993	49993	49994	49994	49994	49994	49995	49995	49995
3.9	49995	49995	49996	49996	49996	49996	49996	49996	49997	49997

Table 2A: Cumulative Standardized Normal Distribution ($Z < 0$)

Tabel 2A: Kumulatiewe Standaardnormaalverdeling ($Z < 0$)

The Cumulative Standardized Normal Distribution

Entry represents area under the cumulative standardized normal distribution from $-\infty$ to Z

Cumulative Probabilities

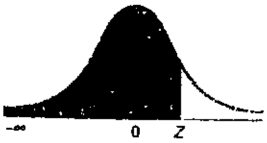
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
−6.0	0.000000001									
−5.5	0.000000019									
−5.0	0.000000287									
−4.5	0.000003398									
−4.0	0.000031671									
−3.9	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003
−3.8	0.00007	0.00007	0.00007	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005
−3.7	0.00011	0.00010	0.00010	0.00010	0.00009	0.00009	0.00008	0.00008	0.00008	0.00008
−3.6	0.00016	0.00015	0.00015	0.00014	0.00014	0.00013	0.00013	0.00012	0.00012	0.00011
−3.5	0.00023	0.00022	0.00022	0.00021	0.00020	0.00019	0.00019	0.00018	0.00017	0.00017
−3.4	0.00034	0.00032	0.00031	0.00030	0.00029	0.00028	0.00027	0.00026	0.00025	0.00024
−3.3	0.00048	0.00047	0.00045	0.00043	0.00042	0.00040	0.00039	0.00038	0.00036	0.00035
−3.2	0.00069	0.00066	0.00064	0.00062	0.00060	0.00058	0.00056	0.00054	0.00052	0.00050
−3.1	0.00097	0.00094	0.00090	0.00087	0.00084	0.00082	0.00079	0.00076	0.00074	0.00071
−3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00103	0.00100
−2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.7	0.2420	0.2388	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2482	0.2451
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table 2B: Cumulative Standardized Normal Distribution ($Z > 0$)

Tabel 2B Kumulatiewe Standaardnormaalverdeling ($Z > 0$)

The Cumulative Standardized Normal Distribution (*Continued*)

Entry represents area under the cumulative standardized normal distribution from $-\infty$ to Z



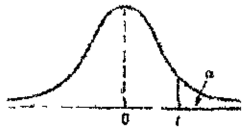
	Cumulative Probabilities									
Z	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7518	0.7549
0.7	0.7580	0.7612	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99897	0.99900
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983
3.6	0.99984	0.99985	0.99985	0.99986	0.99986	0.99987	0.99987	0.99988	0.99988	0.99989
3.7	0.99989	0.99990	0.99990	0.99990	0.99991	0.99991	0.99992	0.99992	0.99992	0.99992
3.8	0.99993	0.99993	0.99993	0.99994	0.99994	0.99994	0.99994	0.99995	0.99995	0.99995
3.9	0.99995	0.99995	0.99996	0.99996	0.99996	0.99996	0.99996	0.99996	0.99997	0.99997
4.0	0.999968329									
4.5	0.999996602									
5.0	0.999999713									
5.5	0.999999981									
6.0	0.999999999									

Table 3A: Critical values of t

Tabel 3A: Kritieke waardes van t

Critical Values of t

For a particular number of degrees of freedom, entry represents the critical value of t corresponding to the cumulative probability $(1 - \alpha)$ and a specified upper tail area (α)



Degrees of Freedom	Cumulative Probabilities					
	0.75	0.90	0.95	0.975	0.99	0.995
	Upper-Tail Areas					
	0.25	0.10	0.05	0.025	0.01	0.005
1	1.0000	3.0777	6.3138	12.7062	31.8207	63.6574
2	0.8165	1.8856	2.9200	4.3027	6.9646	9.9248
3	0.7649	1.6377	2.3534	3.1824	4.5407	5.8409
4	0.7407	1.5332	2.1318	2.7764	3.7469	4.6041
5	0.7267	1.4759	2.0150	2.5706	3.3649	4.0322
6	0.7176	1.4398	1.9432	2.4469	3.1427	3.7074
7	0.7111	1.4149	1.8946	2.3646	2.9980	3.4995
8	0.7064	1.3968	1.8595	2.3060	2.8965	3.3554
9	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498
10	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693
11	0.6974	1.3634	1.7959	2.2010	2.7181	3.1058
12	0.6955	1.3562	1.7823	2.1788	2.6810	3.0545
13	0.6938	1.3502	1.7709	2.1604	2.6503	3.0123
14	0.6924	1.3450	1.7613	2.1448	2.6245	2.9768
15	0.6912	1.3406	1.7531	2.1315	2.6025	2.9467
16	0.6901	1.3368	1.7459	2.1199	2.5835	2.9208
17	0.6892	1.3334	1.7396	2.1098	2.5669	2.8982
18	0.6884	1.3304	1.7341	2.1009	2.5524	2.8784
19	0.6876	1.3277	1.7291	2.0930	2.5395	2.8609
20	0.6870	1.3253	1.7247	2.0860	2.5280	2.8453
21	0.6864	1.3232	1.7207	2.0796	2.5177	2.8314
22	0.6858	1.3212	1.7171	2.0739	2.5083	2.8188
23	0.6853	1.3195	1.7139	2.0687	2.4999	2.8073
24	0.6848	1.3178	1.7109	2.0639	2.4922	2.7969
25	0.6844	1.3163	1.7081	2.0595	2.4851	2.7874
26	0.6840	1.3150	1.7056	2.0555	2.4786	2.7787
27	0.6837	1.3137	1.7033	2.0518	2.4727	2.7707
28	0.6834	1.3125	1.7011	2.0484	2.4671	2.7633
29	0.6830	1.3114	1.6991	2.0452	2.4620	2.7564
30	0.6828	1.3104	1.6973	2.0423	2.4573	2.7500
31	0.6825	1.3095	1.6955	2.0395	2.4528	2.7440
32	0.6822	1.3086	1.6939	2.0369	2.4487	2.7385
33	0.6820	1.3077	1.6924	2.0345	2.4448	2.7333
34	0.6818	1.3070	1.6909	2.0322	2.4411	2.7284
35	0.6816	1.3062	1.6896	2.0301	2.4377	2.7238
36	0.6814	1.3055	1.6883	2.0281	2.4345	2.7195
37	0.6812	1.3049	1.6871	2.0262	2.4314	2.7154
38	0.6810	1.3042	1.6860	2.0244	2.4286	2.7116
39	0.6808	1.3036	1.6849	2.0227	2.4258	2.7079
40	0.6807	1.3031	1.6839	2.0211	2.4233	2.7045
41	0.6805	1.3025	1.6829	2.0195	2.4208	2.7012
42	0.6804	1.3020	1.6820	2.0181	2.4185	2.6981
43	0.6802	1.3016	1.6811	2.0167	2.4163	2.6951
44	0.6801	1.3011	1.6802	2.0154	2.4141	2.6923
45	0.6800	1.3006	1.6794	2.0141	2.4121	2.6896
46	0.6799	1.3002	1.6787	2.0129	2.4102	2.6870
47	0.6797	1.2998	1.6779	2.0117	2.4083	2.6846
48	0.6796	1.2994	1.6772	2.0106	2.4066	2.6822

Table 3B: Critical values of *t*

Tabel 3B: Kritieke waardes van *t*

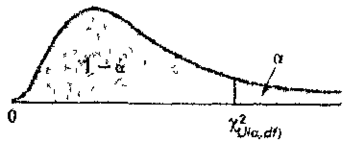
Degrees of Freedom	Cumulative Probabilities					
	0.75	0.90	0.95	0.975	0.99	0.995
	Upper-Tail Areas					
	0.25	0.10	0.05	0.025	0.01	0.005
49	0.6795	1.2991	1.6766	2.0096	2.4049	2.6800
50	0.6794	1.2987	1.6759	2.0086	2.4033	2.6778
51	0.6793	1.2984	1.6753	2.0076	2.4017	2.6757
52	0.6792	1.2980	1.6747	2.0066	2.4002	2.6737
53	0.6791	1.2977	1.6741	2.0057	2.3988	2.6718
54	0.6791	1.2974	1.6736	2.0049	2.3974	2.6700
55	0.6790	1.2971	1.6730	2.0040	2.3961	2.6682
56	0.6789	1.2969	1.6725	2.0032	2.3948	2.6665
57	0.6788	1.2966	1.6720	2.0025	2.3936	2.6649
58	0.6787	1.2963	1.6716	2.0017	2.3924	2.6633
59	0.6787	1.2961	1.6711	2.0010	2.3912	2.6618
60	0.6786	1.2958	1.6706	2.0003	2.3901	2.6603
61	0.6785	1.2956	1.6702	1.9996	2.3890	2.6589
62	0.6785	1.2954	1.6698	1.9990	2.3880	2.6575
63	0.6784	1.2951	1.6694	1.9983	2.3870	2.6561
64	0.6783	1.2949	1.6690	1.9977	2.3860	2.6549
65	0.6783	1.2947	1.6686	1.9971	2.3851	2.6536
66	0.6782	1.2945	1.6683	1.9966	2.3842	2.6524
67	0.6782	1.2943	1.6679	1.9960	2.3833	2.6512
68	0.6781	1.2941	1.6676	1.9955	2.3824	2.6501
69	0.6781	1.2939	1.6672	1.9949	2.3816	2.6490
70	0.6780	1.2938	1.6669	1.9944	2.3808	2.6479
71	0.6780	1.2936	1.6666	1.9939	2.3800	2.6469
72	0.6779	1.2934	1.6663	1.9935	2.3793	2.6459
73	0.6779	1.2933	1.6660	1.9930	2.3785	2.6449
74	0.6778	1.2931	1.6657	1.9925	2.3778	2.6439
75	0.6778	1.2929	1.6654	1.9921	2.3771	2.6430
76	0.6777	1.2928	1.6652	1.9917	2.3764	2.6421
77	0.6777	1.2926	1.6649	1.9913	2.3758	2.6412
78	0.6776	1.2925	1.6646	1.9908	2.3751	2.6403
79	0.6776	1.2924	1.6644	1.9905	2.3745	2.6395
80	0.6776	1.2922	1.6641	1.9901	2.3739	2.6387
81	0.6775	1.2921	1.6639	1.9897	2.3733	2.6379
82	0.6775	1.2920	1.6636	1.9893	2.3727	2.6371
83	0.6775	1.2918	1.6634	1.9890	2.3721	2.6364
84	0.6774	1.2917	1.6632	1.9886	2.3716	2.6356
85	0.6774	1.2916	1.6630	1.9883	2.3710	2.6349
86	0.6774	1.2915	1.6628	1.9879	2.3705	2.6342
87	0.6773	1.2914	1.6626	1.9876	2.3700	2.6335
88	0.6773	1.2912	1.6624	1.9873	2.3695	2.6329
89	0.6773	1.2911	1.6622	1.9870	2.3690	2.6322
90	0.6772	1.2910	1.6620	1.9867	2.3685	2.6316
91	0.6772	1.2909	1.6618	1.9864	2.3680	2.6309
92	0.6772	1.2908	1.6616	1.9861	2.3676	2.6303
93	0.6771	1.2907	1.6614	1.9858	2.3671	2.6297
94	0.6771	1.2906	1.6612	1.9855	2.3667	2.6291
95	0.6771	1.2905	1.6611	1.9853	2.3662	2.6286
96	0.6771	1.2904	1.6609	1.9850	2.3658	2.6280
97	0.6770	1.2903	1.6607	1.9847	2.3654	2.6275
98	0.6770	1.2902	1.6606	1.9845	2.3650	2.6269
99	0.6770	1.2902	1.6604	1.9842	2.3646	2.6264
100	0.6770	1.2901	1.6602	1.9840	2.3642	2.6259
110	0.6767	1.2893	1.6588	1.9818	2.3607	2.6213
120	0.6765	1.2886	1.6577	1.9799	2.3578	2.6174
∞	0.6745	1.2816	1.6449	1.9600	2.3263	2.5758

Table 4: Critical values of χ^2

Tabel 4. Kritieke waardes van χ^2

Critical Values of χ^2

For a particular number of degrees of freedom, entry represents the critical value of χ^2 corresponding to the cumulative probability $(1 - \alpha)$ and a specified upper-tail area (α)



Degrees of Freedom	Cumulative Probabilities											
	0.005	0.01	0.025	0.05	0.10	0.25	0.75	0.90	0.95	0.975	0.99	0.995
	Upper-Tail Areas (α)											
	0.995	0.99	0.975	0.95	0.90	0.75	0.25	0.10	0.05	0.025	0.01	0.005
1			0.001	0.004	0.016	0.102	1.323	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	0.575	2.773	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	1.213	4.108	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	1.923	5.385	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	2.675	6.626	9.236	11.071	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	3.455	7.841	10.645	12.592	14.449	16.812	18.458
7	0.989	1.239	1.690	2.167	2.833	4.255	9.037	12.017	14.067	6.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	5.071	10.219	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	5.899	11.389	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	6.737	12.549	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	7.584	13.701	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	8.438	14.845	18.549	21.026	23.337	26.217	28.299
13	3.565	4.107	5.009	5.892	7.042	9.299	15.984	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	10.165	17.117	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	11.037	18.245	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	11.912	19.369	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	12.792	20.489	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	13.675	21.605	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	14.562	22.718	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	15.452	23.828	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	16.344	24.935	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.042	17.240	26.039	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	18.137	27.141	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	19.037	28.241	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	19.939	29.339	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	20.843	30.435	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	21.749	31.528	36.741	40.113	43.194	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	22.657	32.620	37.916	41.337	44.461	48.278	50.993
29	13.121	14.257	16.047	17.708	19.768	23.567	33.711	39.087	42.557	45.722	49.588	52.336
30	13.787	14.954	16.791	18.493	20.599	24.478	34.800	40.256	43.773	46.979	50.892	53.672

For larger values of degrees of freedom (df) the expression $Z = \sqrt{2\chi^2} - \sqrt{2(df) - 1}$ may be used and the resulting upper-tail area can be found from the cumulative standardized normal distribution (Table E.2)

Table 5 Binomial Probabilities

Tabel 5: Binomiaalwaarskynlikhede

Table of Binomial Probabilities

For a given combination of n and π entry indicates the probability of obtaining a specified value of X. To locate entry when $\pi \leq .50$ read π across the top heading and both n and X down the left margin when $\pi \geq .50$ read π across the bottom heading and both n and X up the right margin

n	X	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	X	n
2	0	0.9801	0.9604	0.9409	0.9216	0.9025	0.8836	0.8649	0.8464	0.8281	0.8100	0.7225	0.6400	0.5625	0.4900	0.4225	0.3600	0.3025	0.2500	2	
	1	0.0198	0.0392	0.0582	0.0768	0.0950	0.1128	0.1302	0.1472	0.1638	0.1800	0.2550	0.3200	0.3750	0.4200	0.4550	0.4800	0.4950	0.5000	1	
	2	0.0001	0.0004	0.0009	0.0016	0.0025	0.0036	0.0049	0.0064	0.0081	0.0100	0.0225	0.0400	0.0625	0.0900	0.1225	0.1600	0.2025	0.2500	0	2
3	0	0.9703	0.9412	0.9127	0.8847	0.8574	0.8306	0.8044	0.7787	0.7536	0.7290	0.6141	0.5120	0.4219	0.3430	0.2746	0.2160	0.1664	0.1250	3	
	1	0.0294	0.0576	0.0847	0.1106	0.1354	0.1590	0.1816	0.2031	0.2236	0.2430	0.3251	0.3840	0.4219	0.4410	0.4436	0.4320	0.4084	0.3750	2	
	2	0.0003	0.0012	0.0026	0.0046	0.0071	0.0102	0.0137	0.0177	0.0221	0.0270	0.0574	0.0960	0.1406	0.1890	0.2389	0.2880	0.3341	0.3750	1	
	3	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0003	0.0005	0.0007	0.0010	0.0034	0.0080	0.0156	0.0270	0.0429	0.0640	0.0911	0.1250	0	3
4	0	0.9606	0.9224	0.8853	0.8493	0.8145	0.7807	0.7481	0.7164	0.6857	0.6561	0.5220	0.4096	0.3164	0.2401	0.1785	0.1296	0.0915	0.0625	4	
	1	0.0388	0.0753	0.1095	0.1416	0.1715	0.1993	0.2252	0.2492	0.2713	0.2916	0.3685	0.4096	0.4219	0.4116	0.3845	0.3456	0.2995	0.2500	3	
	2	0.0006	0.0023	0.0051	0.0088	0.0135	0.0191	0.0254	0.0325	0.0402	0.0486	0.0975	0.1536	0.2109	0.2646	0.3105	0.3456	0.3675	0.3750	2	
	3	0.0000	0.0000	0.0001	0.0002	0.0005	0.0008	0.0013	0.0019	0.0027	0.0036	0.0115	0.0256	0.0469	0.0756	0.1115	0.1536	0.2005	0.2500	1	
	4	—	—	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0005	0.0016	0.0039	0.0081	0.0150	0.0256	0.0410	0.0625	0	4
5	0	0.9510	0.9039	0.8587	0.8154	0.7738	0.7339	0.6957	0.6591	0.6240	0.5905	0.4437	0.3277	0.2373	0.1681	0.1160	0.0778	0.0503	0.0312	5	
	1	0.0480	0.0922	0.1328	0.1699	0.2036	0.2342	0.2618	0.2866	0.3086	0.3280	0.3915	0.4096	0.3955	0.3601	0.3124	0.2592	0.2059	0.1562	4	
	2	0.0010	0.0038	0.0082	0.0142	0.0214	0.0299	0.0394	0.0498	0.0610	0.0729	0.1382	0.2048	0.2637	0.3087	0.3364	0.3456	0.3369	0.3125	3	
	3	0.0000	0.0001	0.0003	0.0006	0.0011	0.0019	0.0030	0.0043	0.0060	0.0081	0.0244	0.0512	0.0879	0.1323	0.1811	0.2304	0.2757	0.3125	2	
	4	—	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0003	0.0004	0.0022	0.0064	0.0146	0.0283	0.0488	0.0768	0.1128	0.1562	1	
	5	—	—	—	—	—	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0010	0.0024	0.0053	0.0102	0.0185	0.0312	0	5
6	0	0.9415	0.8858	0.8330	0.7828	0.7351	0.6899	0.6470	0.6064	0.5679	0.5314	0.3771	0.2621	0.1780	0.1176	0.0754	0.0467	0.0277	0.0156	6	
	1	0.0571	0.1085	0.1546	0.1957	0.2321	0.2642	0.2922	0.3164	0.3370	0.3543	0.3993	0.3932	0.3560	0.3025	0.2437	0.1866	0.1359	0.0937	5	
	2	0.0014	0.0055	0.0120	0.0204	0.0305	0.0422	0.0550	0.0688	0.0833	0.0984	0.1762	0.2458	0.2966	0.3241	0.3280	0.3110	0.2780	0.2344	4	
	3	0.0000	0.0002	0.0005	0.0011	0.0021	0.0036	0.0055	0.0080	0.0110	0.0146	0.0415	0.0819	0.1318	0.1852	0.2355	0.2765	0.3032	0.3125	3	
	4	—	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005	0.0008	0.0012	0.0055	0.0154	0.0330	0.0595	0.0951	0.1372	0.1861	0.2344	2	
	5	—	—	—	—	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0015	0.0044	0.0102	0.0205	0.0369	0.0609	0.0937	1	
	6	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0002	0.0007	0.0018	0.0041	0.0053	0.0156	0	6

Table 5 (continued)

Tabel 5 (vervolg)

n	X	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.85	0.80	0.75	0.70	0.65	0.60	0.55	0.50	X	n
7	0	0.9321	0.8681	0.8080	0.7514	0.6983	0.6485	0.6017	0.5578	0.5168	0.4783	0.3206	0.2097	0.1335	0.0824	0.0490	0.0280	0.0152	0.0078	7	
	1	0.0659	0.1240	0.1749	0.2192	0.2573	0.2897	0.3170	0.3396	0.3578	0.3720	0.3960	0.3670	0.3115	0.2471	0.1848	0.1306	0.0872	0.0547	6	
	2	0.0020	0.0076	0.0162	0.0274	0.0406	0.0555	0.0716	0.0886	0.1061	0.1240	0.2097	0.2753	0.3115	0.3177	0.2985	0.2613	0.2140	0.1641	5	
	3	0.0000	0.0003	0.0008	0.0019	0.0036	0.0059	0.0090	0.0128	0.0175	0.0230	0.0617	0.1147	0.1730	0.2269	0.2679	0.2903	0.2918	0.2734	4	
	4	—	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0011	0.0017	0.0026	0.0109	0.0287	0.0577	0.0972	0.1442	0.1935	0.2388	0.2734	3	
	5	—	—	—	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0012	0.0043	0.0115	0.0250	0.0466	0.0774	0.1172	0.1641	2	
	6	—	—	—	—	—	—	—	0.0000	0.0000	0.0000	0.0001	0.0004	0.0013	0.0036	0.0084	0.0172	0.0320	0.0547	1	
	7	—	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0002	0.0006	0.0016	0.0037	0.0078	0	7
8	0	0.9227	0.8508	0.7837	0.7214	0.6634	0.6096	0.5596	0.5132	0.4703	0.4305	0.2725	0.1678	0.1001	0.0576	0.0319	0.0168	0.0084	0.0039	8	
	1	0.0746	0.1389	0.1939	0.2405	0.2793	0.3113	0.3370	0.3570	0.3721	0.3826	0.3847	0.3355	0.2670	0.1977	0.1373	0.0896	0.0548	0.0312	7	
	2	0.0026	0.0099	0.0210	0.0351	0.0515	0.0695	0.0888	0.1087	0.1286	0.1488	0.2376	0.2936	0.3115	0.2965	0.2587	0.2090	0.1569	0.1094	6	
	3	0.0001	0.0004	0.0013	0.0029	0.0054	0.0089	0.0134	0.0189	0.0255	0.0331	0.0839	0.1468	0.2076	0.2541	0.2786	0.2787	0.2568	0.2187	5	
	4	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0013	0.0021	0.0031	0.0046	0.0185	0.0459	0.0865	0.1361	0.1875	0.2322	0.2627	0.2734	4	
	5	—	—	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0004	0.0026	0.0092	0.0231	0.0467	0.0808	0.1239	0.1719	0.2187	3	
	6	—	—	—	—	—	—	0.0000	0.0000	0.0000	0.0000	0.0002	0.0011	0.0038	0.0100	0.0217	0.0413	0.0703	0.1094	2	
	7	—	—	—	—	—	—	—	—	—	—	0.0000	0.0001	0.0004	0.0012	0.0033	0.0079	0.0164	0.0312	1	
	8	—	—	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0002	0.0007	0.0017	0.0039	0	8
9	0	0.9135	0.8337	0.7602	0.6925	0.6302	0.5730	0.5204	0.4722	0.4279	0.3874	0.2316	0.1342	0.0751	0.0404	0.0207	0.0101	0.0046	0.0020	9	
	1	0.0830	0.1531	0.2116	0.2597	0.2985	0.3292	0.3525	0.3695	0.3809	0.3874	0.3679	0.3020	0.2253	0.1556	0.1004	0.0605	0.0339	0.0176	8	
	2	0.0034	0.0125	0.0262	0.0433	0.0629	0.0840	0.1061	0.1285	0.1507	0.1722	0.2597	0.3020	0.3003	0.2668	0.2162	0.1612	0.1110	0.0703	7	
	3	0.0001	0.0006	0.0019	0.0042	0.0077	0.0125	0.0186	0.0261	0.0348	0.0446	0.1069	0.1762	0.2336	0.2668	0.2716	0.2508	0.2119	0.1641	6	
	4	0.0000	0.0000	0.0001	0.0003	0.0006	0.0012	0.0021	0.0034	0.0052	0.0074	0.0283	0.0661	0.1168	0.1715	0.2194	0.2508	0.2600	0.2461	5	
	5	—	—	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005	0.0008	0.0050	0.0165	0.0390	0.0735	0.1181	0.1672	0.2128	0.2461	4	
	6	—	—	—	—	—	0.0000	0.0000	0.0000	0.0000	0.0001	0.0006	0.0028	0.0087	0.0210	0.0424	0.0743	0.1160	0.1641	3	
	7	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0003	0.0012	0.0039	0.0098	0.0212	0.0407	0.0703	2	
	8	—	—	—	—	—	—	—	—	—	—	—	0.0000	0.0001	0.0004	0.0013	0.0035	0.0083	0.0176	1	
	9	—	—	—	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0003	0.0008	0.0020	0	9
10	0	0.9044	0.8171	0.7374	0.6648	0.5987	0.5386	0.4840	0.4344	0.3894	0.3487	0.1969	0.1074	0.0563	0.0282	0.0135	0.0060	0.0025	0.0010	10	
	1	0.0914	0.1667	0.2281	0.2770	0.3151	0.3438	0.3643	0.3777	0.3851	0.3874	0.3474	0.2684	0.1877	0.1211	0.0725	0.0403	0.0207	0.0098	9	
	2	0.0042	0.0153	0.0317	0.0519	0.0746	0.0988	0.1234	0.1478	0.1714	0.1937	0.2759	0.3020	0.2816	0.2335	0.1757	0.1209	0.0763	0.0439	8	
	3	0.0001	0.0008	0.0026	0.0058	0.0105	0.0168	0.0248	0.0343	0.0452	0.0574	0.1298	0.2013	0.2503	0.2668	0.2522	0.2150	0.1665	0.1172	7	
	4	0.0000	0.0000	0.0001	0.0004	0.0010	0.0019	0.0033	0.0052	0.0078	0.0112	0.0401	0.0881	0.1460	0.2001	0.2377	0.2508	0.2384	0.2051	6	
	5	—	—	0.0000	0.0000	0.0001	0.0001	0.0003	0.0005	0.0009	0.0015	0.0085	0.0264	0.0584	0.1029	0.1536	0.2007	0.2340	0.2461	5	
	6	—	—	—	—	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0012	0.0055	0.0162	0.0368	0.0689	0.1115	0.1596	0.2051	4	
	7	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0008	0.0031	0.0090	0.0212	0.0425	0.0746	0.1172	3	
	8	—	—	—	—	—	—	—	—	—	—	0.0000	0.0001	0.0004	0.0014	0.0043	0.0106	0.0229	0.0439	2	
	9	—	—	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0005	0.0016	0.0042	0.0098	1	
	10	—	—	—	—	—	—	—	—	—	—	—	—	—	0.0000	0.0000	0.0001	0.0003	0.0010	0	10

continued

Table 6: Poisson Probabilities

Tabel 6: Poisson-waarskynlikhede

Table of Poisson Probabilities
For a given value of λ, entry indicates the probability of a specified value of x

x	λ = 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	0.9048	0.8187	0.7408	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066	0.3679
1	0.0905	0.1637	0.2222	0.2681	0.3033	0.3293	0.3476	0.3595	0.3659	0.3679
2	0.0045	0.0164	0.0333	0.0536	0.0758	0.0988	0.1217	0.1438	0.1647	0.1839
3	0.0002	0.0011	0.0033	0.0072	0.0126	0.0198	0.0284	0.0383	0.0494	0.0613
4	0.0000	0.0001	0.0003	0.0007	0.0016	0.0030	0.0050	0.0077	0.0111	0.0153
5	0.0000	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0012	0.0020	0.0031
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

x	λ = 1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	0.3329	0.3012	0.2725	0.2466	0.2231	0.2019	0.1827	0.1653	0.1496	0.1353
1	0.3662	0.3614	0.3543	0.3452	0.3347	0.3230	0.3106	0.2975	0.2842	0.2707
2	0.2014	0.2169	0.2303	0.2417	0.2510	0.2584	0.2640	0.2678	0.2700	0.2707
3	0.0738	0.0867	0.0998	0.1128	0.1255	0.1378	0.1496	0.1607	0.1710	0.1804
4	0.0203	0.0260	0.0324	0.0395	0.0471	0.0551	0.0636	0.0723	0.0812	0.0902
5	0.0045	0.0062	0.0084	0.0111	0.0141	0.0176	0.0216	0.0260	0.0309	0.0361
6	0.0008	0.0012	0.0018	0.0026	0.0035	0.0047	0.0061	0.0078	0.0098	0.0120
7	0.0001	0.0002	0.0003	0.0005	0.0008	0.0011	0.0015	0.0020	0.0027	0.0034
8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005	0.0006	0.0009
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002

x	λ = 2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
0	0.1225	0.1108	0.1003	0.0907	0.0821	0.0743	0.0672	0.0608	0.0550	0.0498
1	0.2572	0.2438	0.2306	0.2177	0.2052	0.1931	0.1815	0.1703	0.1596	0.1494
2	0.2700	0.2681	0.2652	0.2613	0.2565	0.2510	0.2450	0.2384	0.2314	0.2240
3	0.1890	0.1966	0.2033	0.2090	0.2138	0.2176	0.2205	0.2225	0.2237	0.2240
4	0.0992	0.1082	0.1169	0.1254	0.1336	0.1414	0.1488	0.1557	0.1622	0.1680
5	0.0417	0.0476	0.0538	0.0602	0.0668	0.0735	0.0804	0.0872	0.0940	0.1008
6	0.0146	0.0174	0.0206	0.0241	0.0278	0.0319	0.0362	0.0407	0.0455	0.0504
7	0.0044	0.0055	0.0068	0.0083	0.0099	0.0118	0.0139	0.0163	0.0188	0.0216
8	0.0011	0.0015	0.0019	0.0025	0.0031	0.0038	0.0047	0.0057	0.0068	0.0081
9	0.0003	0.0004	0.0005	0.0007	0.0009	0.0011	0.0014	0.0018	0.0022	0.0027
10	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0006	0.0008
11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0002
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

x	λ = 3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
0	0.0450	0.0408	0.0369	0.0334	0.0302	0.0273	0.0247	0.0224	0.0202	0.0183
1	0.1397	0.1340	0.1217	0.1135	0.1057	0.0984	0.0915	0.0850	0.0789	0.0733
2	0.2165	0.2087	0.2008	0.1929	0.1850	0.1771	0.1692	0.1615	0.1539	0.1465
3	0.2237	0.2226	0.2209	0.2186	0.2158	0.2125	0.2087	0.2046	0.2001	0.1954
4	0.1734	0.1781	0.1823	0.1858	0.1888	0.1912	0.1931	0.1944	0.1951	0.1954
5	0.1075	0.1140	0.1203	0.1264	0.1322	0.1377	0.1429	0.1477	0.1522	0.1563
6	0.0555	0.0608	0.0662	0.0716	0.0771	0.0826	0.0881	0.0936	0.0989	0.1042
7	0.0246	0.0278	0.0312	0.0348	0.0385	0.0425	0.0466	0.0508	0.0551	0.0595
8	0.0095	0.0111	0.0129	0.0148	0.0169	0.0191	0.0215	0.0241	0.0269	0.0298
9	0.0033	0.0040	0.0047	0.0056	0.0066	0.0076	0.0089	0.0102	0.0116	0.0132
10	0.0010	0.0013	0.0016	0.0019	0.0023	0.0028	0.0033	0.0039	0.0045	0.0053
11	0.0003	0.0004	0.0005	0.0006	0.0007	0.0009	0.0011	0.0013	0.0016	0.0019
12	0.0001	0.0001	0.0001	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006
13	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

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EXAMINATION MARK READING SHEET — EKSAMEN-MERKLEESBLAD

PART 1 (GENERAL/ALGEMEEN) DEEL 1

STUDY UNIT e.g. PSY100-X / STUDIE EENHEID bv PSY100-X (1)

INITIALS AND SURNAME / VOORLETTERS EN VAN (3) ______________________

DATE OF EXAMINATION / DATUM VAN EKSAMEN (4) ______________________

PAPER NUMBER / VRAESTELNOMMER (2)

EXAMINATION CENTRE (E.G. PRETORIA) / EKSAMENSENTRUM (BV PRETORIA) (5) ______________________

STUDENT NUMBER / STUDENTENOMMER (6)

[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]
[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]
[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]
[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]
[6]	[6]	[6]	[6]	[6]	[6]	[6]	[6]
[7]	[7]	[7]	[7]	[7]	[7]	[7]	[7]
[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]
[9]	[9]	[9]	[9]	[9]	[9]	[9]	[9]

(7)

UNIQUE PAPER NO / UNIEKE VRAESTEL NR (8)

[0]	[0]	[0]	[0]	[0]	[0]
[1]	[1]	[1]	[1]	[1]	[1]
[2]	[2]	[2]	[2]	[2]	[2]
[3]	[3]	[3]	[3]	[3]	[3]
[4]	[4]	[4]	[4]	[4]	[4]
[5]	[5]	[5]	[5]	[5]	[5]
[6]	[6]	[6]	[6]	[6]	[6]
[7]	[7]	[7]	[7]	[7]	[7]
[8]	[8]	[8]	[8]	[8]	[8]
[9]	[9]	[9]	[9]	[9]	[9]

(9)

For use by examination invigilator
Vir gebruik deur eksamenopsiener

IMPORTANT

1. USE ONLY AN HB PENCIL TO COMPLETE THIS SHEET
2. MARK LIKE THIS
3. CHECK THAT YOUR INITIALS AND SURNAME HAS BEEN FILLED IN CORRECTLY
4. ENTER YOUR STUDENT NUMBER FROM LEFT TO RIGHT
5. CHECK THAT YOUR STUDENT NUMBER HAS BEEN FILLED IN CORRECTLY
6. CHECK THAT THE UNIQUE NUMBER HAS BEEN FILLED IN CORRECTLY
7. CHECK THAT ONLY ONE ANSWER PER QUESTION HAS BEEN MARKED
8. DO NOT FOLD

BELANGRIK

1. GEBRUIK SLEGS 'N HB POTLOOD OM HIERDIE BLAD TE VOLTOOI
2. MERK AS VOLG
3. KONTROLEER DAT U VOORLETTERS EN VAN REG INGEVUL IS
4. VUL U STUDENTENOMMER VAN LINKS NA REGS IN
5. KONTROLEER DAT U DIE KORREKTE STUDENTENOMMER VERSTREK HET
6. KONTROLEER DAT DIE UNIEKE NOMMER REG INGEVUL IS
7. MAAK SEKER DAT NET EEN ALTERNATIEF PER VRAAG GEMERK IS
8. MOENIE VOU NIE

PART 2 (ANSWERS/ANTWOORDE) DEEL 2

(10)

1	[1] [2] [3] [4] [5]	36	[1] [2] [3] [4] [5]	71	[1] [2] [3] [4] [5]	106	[1] [2] [3] [4] [5]
2	[1] [2] [3] [4] [5]	37	[1] [2] [3] [4] [5]	72	[1] [2] [3] [4] [5]	107	[1] [2] [3] [4] [5]
3	[1] [2] [3] [4] [5]	38	[1] [2] [3] [4] [5]	73	[1] [2] [3] [4] [5]	108	[1] [2] [3] [4] [5]
4	[1] [2] [3] [4] [5]	39	[1] [2] [3] [4] [5]	74	[1] [2] [3] [4] [5]	109	[1] [2] [3] [4] [5]
5	[1] [2] [3] [4] [5]	40	[1] [2] [3] [4] [5]	75	[1] [2] [3] [4] [5]	110	[1] [2] [3] [4] [5]
6	[1] [2] [3] [4] [5]	41	[1] [2] [3] [4] [5]	76	[1] [2] [3] [4] [5]	111	[1] [2] [3] [4] [5]
7	[1] [2] [3] [4] [5]	42	[1] [2] [3] [4] [5]	77	[1] [2] [3] [4] [5]	112	[1] [2] [3] [4] [5]
8	[1] [2] [3] [4] [5]	43	[1] [2] [3] [4] [5]	78	[1] [2] [3] [4] [5]	113	[1] [2] [3] [4] [5]
9	[1] [2] [3] [4] [5]	44	[1] [2] [3] [4] [5]	79	[1] [2] [3] [4] [5]	114	[1] [2] [3] [4] [5]
10	[1] [2] [3] [4] [5]	45	[1] [2] [3] [4] [5]	80	[1] [2] [3] [4] [5]	115	[1] [2] [3] [4] [5]
11	[1] [2] [3] [4] [5]	46	[1] [2] [3] [4] [5]	81	[1] [2] [3] [4] [5]	116	[1] [2] [3] [4] [5]
12	[1] [2] [3] [4] [5]	47	[1] [2] [3] [4] [5]	82	[1] [2] [3] [4] [5]	117	[1] [2] [3] [4] [5]
13	[1] [2] [3] [4] [5]	48	[1] [2] [3] [4] [5]	83	[1] [2] [3] [4] [5]	118	[1] [2] [3] [4] [5]
14	[1] [2] [3] [4] [5]	49	[1] [2] [3] [4] [5]	84	[1] [2] [3] [4] [5]	119	[1] [2] [3] [4] [5]
15	[1] [2] [3] [4] [5]	50	[1] [2] [3] [4] [5]	85	[1] [2] [3] [4] [5]	120	[1] [2] [3] [4] [5]
16	[1] [2] [3] [4] [5]	51	[1] [2] [3] [4] [5]	86	[1] [2] [3] [4] [5]	121	[1] [2] [3] [4] [5]
17	[1] [2] [3] [4] [5]	52	[1] [2] [3] [4] [5]	87	[1] [2] [3] [4] [5]	122	[1] [2] [3] [4] [5]
18	[1] [2] [3] [4] [5]	53	[1] [2] [3] [4] [5]	88	[1] [2] [3] [4] [5]	123	[1] [2] [3] [4] [5]
19	[1] [2] [3] [4] [5]	54	[1] [2] [3] [4] [5]	89	[1] [2] [3] [4] [5]	124	[1] [2] [3] [4] [5]
20	[1] [2] [3] [4] [5]	55	[1] [2] [3] [4] [5]	90	[1] [2] [3] [4] [5]	125	[1] [2] [3] [4] [5]
21	[1] [2] [3] [4] [5]	56	[1] [2] [3] [4] [5]	91	[1] [2] [3] [4] [5]	126	[1] [2] [3] [4] [5]
22	[1] [2] [3] [4] [5]	57	[1] [2] [3] [4] [5]	92	[1] [2] [3] [4] [5]	127	[1] [2] [3] [4] [5]
23	[1] [2] [3] [4] [5]	58	[1] [2] [3] [4] [5]	93	[1] [2] [3] [4] [5]	128	[1] [2] [3] [4] [5]
24	[1] [2] [3] [4] [5]	59	[1] [2] [3] [4] [5]	94	[1] [2] [3] [4] [5]	129	[1] [2] [3] [4] [5]
25	[1] [2] [3] [4] [5]	60	[1] [2] [3] [4] [5]	95	[1] [2] [3] [4] [5]	130	[1] [2] [3] [4] [5]
26	[1] [2] [3] [4] [5]	61	[1] [2] [3] [4] [5]	96	[1] [2] [3] [4] [5]	131	[1] [2] [3] [4] [5]
27	[1] [2] [3] [4] [5]	62	[1] [2] [3] [4] [5]	97	[1] [2] [3] [4] [5]	132	[1] [2] [3] [4] [5]
28	[1] [2] [3] [4] [5]	63	[1] [2] [3] [4] [5]	98	[1] [2] [3] [4] [5]	133	[1] [2] [3] [4] [5]
29	[1] [2] [3] [4] [5]	64	[1] [2] [3] [4] [5]	99	[1] [2] [3] [4] [5]	134	[1] [2] [3] [4] [5]
30	[1] [2] [3] [4] [5]	65	[1] [2] [3] [4] [5]	100	[1] [2] [3] [4] [5]	135	[1] [2] [3] [4] [5]
31	[1] [2] [3] [4] [5]	66	[1] [2] [3] [4] [5]	101	[1] [2] [3] [4] [5]	136	[1] [2] [3] [4] [5]
32	[1] [2] [3] [4] [5]	67	[1] [2] [3] [4] [5]	102	[1] [2] [3] [4] [5]	137	[1] [2] [3] [4] [5]
33	[1] [2] [3] [4] [5]	68	[1] [2] [3] [4] [5]	103	[1] [2] [3] [4] [5]	138	[1] [2] [3] [4] [5]
34	[1] [2] [3] [4] [5]	69	[1] [2] [3] [4] [5]	104	[1] [2] [3] [4] [5]	139	[1] [2] [3] [4] [5]
35	[1] [2] [3] [4] [5]	70	[1] [2] [3] [4] [5]	105	[1] [2] [3] [4] [5]	140	[1] [2] [3] [4] [5]