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AP Statistics 2026

Formula Reference Sheet

Formulas for AP Statistics

I. Descriptive Statistics

Sample Mean

$$\bar{x} = \frac{\sum x_i}{n}$$

Sample Standard Deviation

$$s_x = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

Observed Regression Line

$$y = a + bx$$

Predicted Regression Line

$$\hat{y} = a + bx$$

Slope of the LSRL

$$b = r \cdot \frac{s_y}{s_x}$$

Correlation Coefficient

$$r = \frac{1}{n-1}\sum\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$$

II. Probability and Distributions

Addition Rule

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Conditional Probability

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

Discrete Random Variable

Probability Distribution	Mean	Standard Deviation
Discrete X	$\mu_X = E(X) = \sum x_i \cdot P(x_i)$	$\sigma_X = \sqrt{\sum (x_i - \mu_X)^2 \cdot P(x_i)}$
Binomial B(n, p), x = 0,1,...,n	$\mu_X = np$	$\sigma_X = \sqrt{np(1-p)}$
Geometric Geo(p), x = 1,2,3,...	$\mu_X = \frac{1}{p}$	$\sigma_X = \frac{\sqrt{1-p}}{p}$

Binomial Distribution

$$P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}, \quad x = 0, 1, 2, \ldots, n$$

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Geometric Distribution

$$P(X = x) = (1 - p)^{x-1}p, \quad x = 1, 2, 3, \ldots$$

III. Sampling Distributions and Inferential Statistics

Standardized Test Statistic

$$\text{standardized test statistic} = \frac{\text{statistic} - \text{parameter}}{\text{standard error}}$$

Confidence Interval

$$\text{statistic} \pm (\text{critical value}) \times (\text{standard error of statistic})$$

Chi-Square Statistic

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

Sampling Distributions for Proportions

Random Variable	Parameters of Sampling Distribution	Standard Error of Sample Statistic
For one population:	$\mu_{\hat{p}} = p, \quad \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$	$s_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$
For two populations:	$\mu_{\hat{p}_1 - \hat{p}_2} = p_1 - p_2, \quad \sigma_{\hat{p}_1 - \hat{p}_2} = \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$	$s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$
When p1 = p2 assumed:		$s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\hat{p}_c(1-\hat{p}_c)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}, \quad \hat{p}_c = \frac{X_1 + X_2}{n_1 + n_2}$

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Sampling Distributions for Means

Random Variable	Parameters of Sampling Distribution	Standard Error of Sample Statistic
For one population:	$\mu_{\bar{X}} = \mu, \quad \sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}}$	$s_{\bar{X}} = \frac{s}{\sqrt{n}}$
For two populations:	$\mu_{\bar{X}_1 - \bar{X}_2} = \mu_1 - \mu_2, \quad \sigma_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$	$s_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

Sampling Distributions for Simple Linear Regression

Random Variable	Parameters of Sampling Distribution	Standard Error of Sample Statistic
For slope: b	$\mu_b = \beta, \quad \sigma_b = \frac{\sigma}{s_x\sqrt{n}}, \quad s_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n}}$	$s_b = \frac{s}{s_x\sqrt{n}}, \quad s = \sqrt{\frac{\sum(y_i - \hat{y}_i)^2}{n-2}}, \quad s_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$

* Standard deviation measures variability from the theoretical population. Standard error is the estimate of that standard deviation.

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Symbol Guide

Descriptive Statistics

1a. Sample Mean

$$\bar{x} = \frac{\sum x_i}{n}$$

Symbol	What it means	Example / Note
$\bar{x}$	The sample mean ("x-bar"). Average of your data.	x-bar = 7.4 means the average value is 7.4
Σ	Add everything up (sum of all values)	Sum of x_i = x_1 + x_2 + x_3 + ...
x_i	Each individual data value (x_1, x_2, x_3, ...)	x_1 = first value, x_2 = second value, etc.
n	Sample size -- how many data values you have	n = 30 means you collected 30 data points

> ***Tip:*** *The mean is sensitive to outliers. One very large or small value can pull it significantly.*

1b. Sample Standard Deviation

$$s_x = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

Measures how spread out your data values are around the mean. Bigger s_x means more spread out.

Symbol	What it means	Example / Note
s_x	Sample standard deviation -- measures spread of the data	s_x = 0 means all values are identical
$(x_i - \bar{x})$	How far each value is from the mean (its deviation)	If mean = 5 and x_i = 8, deviation = 3
$(x_i - \bar{x})^2$	Squared deviation -- makes all values positive	Squaring prevents negatives cancelling out

n - 1	Degrees of freedom -- use n-1 (not n) for samples	Using n-1 gives a better estimate of the population

> ***Tip:*** *On the AP exam always use s_x (sample SD). Sigma is reserved for population SD.*

1c. Least Squares Regression Line and Slope

$$\hat{y} = a + bx$$

Predicts the y-value for any given x-value.

Symbol	What it means	Example / Note
$\hat{y}$	The PREDICTED value of y for a given x	y-hat = 12.4 means we predict y = 12.4
a	y-intercept -- value of y-hat when x = 0	Not always meaningful in context
b	Slope -- how much y-hat changes when x increases by 1	b = 2.3 means y increases by 2.3 per unit x
x	The explanatory (predictor) variable value	The value you plug in to get a prediction

$$b = r \cdot \frac{s_y}{s_x}$$

Symbol	What it means	Example / Note
r	Correlation coefficient (-1 to +1) -- strength and direction	r = 0.9 is strong positive; r = -0.3 is weak negative
s_y	Standard deviation of the y-values	How spread out the response variable is
s_x	Standard deviation of the x-values	How spread out the explanatory variable is

> ***Tip:*** *The LSRL always passes through the point (x-bar, y-bar) -- the means of x and y.*

1d. Correlation Coefficient (r)

$$r = \frac{1}{n-1}\sum\left(\frac{x_i - \bar{x}}{s_x}\right)\left(\frac{y_i - \bar{y}}{s_y}\right)$$

Measures how closely points follow a straight line. Always between -1 and +1.

Symbol	What it means	Example / Note
r = +1	Perfect positive linear relationship	As x increases, y always increases exactly
r = -1	Perfect negative linear relationship	As x increases, y always decreases exactly
r = 0	No linear relationship	x and y are not linearly associated
r^2	% of variation in y explained by x (coefficient of determination)	r^2 = 0.81 means 81% of variation explained by x

> ***Tip:*** *r and r-squared are unitless. r-squared is always positive; r can be negative.*

Probability and Distributions

Understanding chance and random variables

3a. Addition Rule

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Symbol	What it means	Example / Note
P(A)	Probability that event A occurs	P(rolling a 6) = 1/6
P(B)	Probability that event B occurs	P(drawing a heart) = 13/52
P(A and B)	Probability BOTH occur at the same time	Subtract to avoid counting twice

> ***Tip:*** *If A and B are mutually exclusive, P(A and B) = 0, so P(A or B) = P(A) + P(B).*

3b. Conditional Probability

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

The probability A occurs, GIVEN THAT B has already occurred.

Symbol	What it means	Example / Note
P(A|B)	Probability of A given B	P(rain | cloudy) = probability of rain knowing it is cloudy
P(A and B)	Probability both A and B occur	The numerator
P(B)	Probability that B occurs	Divide by this to zoom in to the world where B happened

> ***Tip:*** *If P(A|B) = P(A), then A and B are independent.*

3c. Binomial Distribution

$$P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}, \quad x = 0, 1, 2, \ldots, n$$

Symbol	What it means	Example
n	Fixed number of trials	n = 10 flips of a coin
p	Probability of success on each trial (constant)	p = 0.5 for heads
x	Number of successes counted (x = 0 to n)	x = 3 means exactly 3 heads
C(n,x)	"n choose x" -- ways to arrange x successes in n trials	C(10,3) = 120
(1-p)	Probability of failure on one trial	If p = 0.3 then failure = 0.7
$\mu_X = np$	Mean of a binomial distribution	n = 20, p = 0.4 gives mean = 8
$\sigma_X = \sqrt{np(1-p)}$	Standard deviation of a binomial	Measures spread around the mean

> ***Tip:*** *Binomial conditions (BINS): (1) Fixed n (2) Only 2 outcomes (3) Constant p (4) Independent trials.*

3d. Geometric Distribution

$$P(X = x) = (1 - p)^{x-1}p, \quad x = 1, 2, 3, \ldots$$

Symbol	What it means	Example
p	Probability of success on each trial	p = 0.2 means 20% chance each try
x	Trial number on which first success occurs (x = 1, 2, 3, ...)	x = 4 means 1st success on 4th try
(1-p)^(x-1)	Probability of failing x-1 times before first success	x = 4: fail 3 times, so (1-p)^3
$\mu_X = 1/p$	Mean -- expected trials until first success	p = 0.25 means expect 4 trials
$\sigma_X = \sqrt{(1-p)}/p$	Standard deviation of the geometric distribution	Measures spread of waiting time

> ***Tip:*** *Geometric counts TRIALS until the 1st success (no fixed n). Binomial counts SUCCESSES in a fixed n trials.*

Inferential Statistics

Confidence intervals, significance tests, and standard errors

4a. Confidence Interval

$$\text{statistic} \pm (\text{critical value}) \times (\text{standard error of statistic})$$

An interval of plausible values for the true population parameter.

Symbol	What it means	Example / Note
statistic	Your sample result: x-bar (mean) or p-hat (proportion)	x-bar = 52.3 or p-hat = 0.47
critical value	z* or t* -- controls the confidence level	95%: z* = 1.960, t* varies by df
SE	Standard Error -- estimated variability of the statistic	SE = s / sqrt(n) for one mean
margin of error	Critical value x SE -- the +/- part of the interval	Larger n gives a narrower interval

> ***Tip:*** *Wider interval = more confidence, but less precise. 99% CI is wider than 95% CI.*

4b. Standardized Test Statistic

$$\text{standardized test statistic} = \frac{\text{statistic} - \text{parameter}}{\text{standard error}}$$

How many standard errors your sample result is from the null hypothesis value.

Symbol	What it means	Example / Note
statistic	What you calculated from your sample data	x-bar = 48.2 or p-hat = 0.52
parameter	The null hypothesis value (H_0) you are testing against	H_0: mu = 50, so parameter = 50
SE	Standard Error of the statistic	SE = s / sqrt(n) for one mean
Large |z|/|t|	Strong evidence against H_0	|z| > 2 gives roughly p < 0.05

> ***Tip:*** *Use z when you know sigma (population SD) or for proportions. Use t when estimating sigma with s (sample SD).*

4c. Chi-Square Test Statistic

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

Measures how different observed counts are from expected counts if H_0 were true.

Symbol	What it means	Example / Note
O	Observed count -- what you actually counted	O = 45 students chose option A
E	Expected count -- what you expect if H_0 is true	E = row total x col total / table total
(O-E)^2/E	Each cell's contribution to chi-square	Large values = strong evidence against H_0
Σ	Add up contributions from ALL cells	More cells = larger chi-square expected

> ***Tip:*** *Larger chi-square = stronger evidence against H_0. All expected counts must be >= 5.*

4d. Standard Errors -- Complete Reference

What you estimate	Statistic	SE Formula
One proportion	$\hat{p}$	$s_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

Difference of two proportions	$\hat{p}_1 - \hat{p}_2$	$s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$
One mean	$\bar{x}$	$s_{\bar{X}} = \frac{s}{\sqrt{n}}$
Difference of two means	$\bar{X}_1 - \bar{X}_2$	$s_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$
Slope of LSRL	b	$s_b = \frac{s}{s_x\sqrt{n}}, \quad s = \sqrt{\frac{\sum(y_i - \hat{y}_i)^2}{n-2}}, \quad s_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$

Two-proportion z-test pooled SE (when p_1 = p_2 assumed):

$$s_{\hat{p}_1 - \hat{p}_2} = \sqrt{\hat{p}_c(1-\hat{p}_c)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}, \quad \hat{p}_c = \frac{X_1 + X_2}{n_1 + n_2}$$

4e. Chi-Square Test Types

Test Name	df	When to use it
Goodness-of-Fit	k - 1	ONE categorical variable, ONE sample. Does it match a claimed distribution? (k = categories)
Homogeneity	(r-1)(c-1)	ONE categorical variable, MULTIPLE groups. Is the distribution the same across groups?
Independence	(r-1)(c-1)	TWO categorical variables, ONE sample. Are the two variables related or independent?

Expected count formula: E = (row total x column total) / table grand total

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Tables for AP Statistics

Table A Standard Normal Probabilities

Table entry for z is the probability lying below z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549

0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

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Table B t Distribution Critical Values

Table entry for p and C is the point t* with probability p lying above it and probability C lying between -t* and t*.

df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.60
3	.765	.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	.741	.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	.727	.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	.718	.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	.711	.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	.706	.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	.703	.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	.700	.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	.697	.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	.695	.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	.694	.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	.692	.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	.691	.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	.690	.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	.689	.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	.688	.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	.688	.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	.687	.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	.686	.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	.686	.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	.685	.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	.685	.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	.684	.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	.684	.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	.684	.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	.683	.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	.683	.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	.683	.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	.681	.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	.679	.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	.679	.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	.678	.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	.677	.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	.675	.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
inf	.674	.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
C =	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%

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Table C Chi-Square Critical Values

Table entry for p is the point (chi-squared) with probability p lying above it.

df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.32	1.64	2.07	2.71	3.84	5.02	5.41	6.63	7.88	9.14	10.83	12.12
2	2.77	3.22	3.79	4.61	5.99	7.38	7.82	9.21	10.60	11.98	13.82	15.20
3	4.11	4.64	5.32	6.25	7.81	9.35	9.84	11.34	12.84	14.32	16.27	17.73
4	5.39	5.99	6.74	7.78	9.49	11.14	11.67	13.28	14.86	16.42	18.47	20.00
5	6.63	7.29	8.12	9.24	11.07	12.83	13.39	15.09	16.75	18.39	20.51	22.11
6	7.84	8.56	9.45	10.64	12.59	14.45	15.03	16.81	18.55	20.25	22.46	24.10
7	9.04	9.80	10.75	12.02	14.07	16.01	16.62	18.48	20.28	22.04	24.32	26.02
8	10.22	11.03	12.03	13.36	15.51	17.53	18.17	20.09	21.95	23.77	26.12	27.87
9	11.39	12.24	13.29	14.68	16.92	19.02	19.68	21.67	23.59	25.46	27.88	29.67
10	12.55	13.44	14.53	15.99	18.31	20.48	21.16	23.21	25.19	27.11	29.59	31.42
11	13.70	14.63	15.77	17.28	19.68	21.92	22.62	24.72	26.76	28.73	31.26	33.14
12	14.85	15.81	16.99	18.55	21.03	23.34	24.05	26.22	28.30	30.32	32.91	34.82
13	15.98	16.98	18.20	19.81	22.36	24.74	25.47	27.69	29.82	31.88	34.53	36.48
14	17.12	18.15	19.41	21.06	23.68	26.12	26.87	29.14	31.32	33.43	36.12	38.11
15	18.25	19.31	20.60	22.31	25.00	27.49	28.26	30.58	32.80	34.95	37.70	39.72
16	19.37	20.47	21.79	23.54	26.30	28.85	29.63	32.00	34.27	36.46	39.25	41.31
17	20.49	21.61	22.98	24.77	27.59	30.19	31.00	33.41	35.72	37.95	40.79	42.88
18	21.60	22.76	24.16	25.99	28.87	31.53	32.35	34.81	37.16	39.42	42.31	44.43
19	22.72	23.90	25.33	27.20	30.14	32.85	33.69	36.19	38.58	40.88	43.82	45.97
20	23.83	25.04	26.50	28.41	31.41	34.17	35.02	37.57	40.00	42.34	45.31	47.50
21	24.93	26.17	27.66	29.62	32.67	35.48	36.34	38.93	41.40	43.78	46.80	49.01
22	26.04	27.30	28.82	30.81	33.92	36.78	37.66	40.29	42.80	45.20	48.27	50.51
23	27.14	28.43	29.98	32.01	35.17	38.08	38.97	41.64	44.18	46.62	49.73	52.00
24	28.24	29.55	31.13	33.20	36.42	39.36	40.27	42.98	45.56	48.03	51.18	53.48
25	29.34	30.68	32.28	34.38	37.65	40.65	41.57	44.31	46.93	49.44	52.62	54.95
26	30.43	31.79	33.43	35.56	38.89	41.92	42.86	45.64	48.29	50.83	54.05	56.41
27	31.53	32.91	34.57	36.74	40.11	43.19	44.14	46.96	49.64	52.22	55.48	57.86
28	32.62	34.03	35.71	37.92	41.34	44.46	45.42	48.28	50.99	53.59	56.89	59.30
29	33.71	35.14	36.85	39.09	42.56	45.72	46.69	49.59	52.34	54.97	58.30	60.73
30	34.80	36.25	37.99	40.26	43.77	46.98	47.96	50.89	53.67	56.33	59.70	62.16
40	45.62	47.27	49.24	51.81	55.76	59.34	60.44	63.69	66.77	69.70	73.40	76.09
50	56.33	58.16	60.35	63.17	67.50	71.42	72.61	76.15	79.49	82.66	86.66	89.56
60	66.98	68.97	71.34	74.40	79.08	83.30	84.58	88.38	91.95	95.34	99.61	102.7
80	88.13	90.41	93.11	96.58	101.9	106.6	108.1	112.3	116.3	120.1	124.8	128.3
100	109.1	111.7	114.7	118.5	124.3	129.6	131.1	135.8	140.2	144.3	149.4	153.2