

1. The manufacturer of Brand J peanut butter claims that 60% of moms prefer their Brand J peanut butter over Brand S peanut butter. To test this claim, a random sample of 83 mothers was surveyed, and it was found that 46 preferred this Brand J to Brand S.

(a) State an appropriate  $H_0$  and  $H_1$ .

(b) Which hypothesis would you accept if  $\alpha = 0.05$ ?

(c) Find the  $p$ -value for this test.



4. Sixteen girls in the 9th and 10th grades were put in a particular training program. It was thought that the program would increase their speed in the 40-yard dash. Each girl was tested before and after the program. The differences in their times is given below (positive numbers indicate a faster time):

0.28 0.01 0.13 0.33 -0.03 0.07 -0.18 -0.14 -0.33 0.01 0.22 0.29 -0.08 0.23 0.08 0.04

(a) What are appropriate hypotheses  $H_0$  and  $H_1$  to test the claim that speeds would be increased?

(b) Should you accept or reject the claim? Why?

(c) Give a 90% confidence interval for the improvement in time resulting from the training program.

5. A continuous random variable  $X$  has density function given by

$$f(x) = \begin{cases} c \cdot (3 + 2x - x^2) & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

(a) What must  $c$  be?

(b) Find the mean and variance of  $X$ .

6. A farm grows grapes for jelly. Grapes are sampled from each truckload to measure the amount of sugar in the grapes. Ten truckloads were measured with the following results:

16.0 15.2 12.0 16.9 14.4 16.3 15.6 12.9 15.3 15.1

Give a 90% confidence interval for the average amount of sugar in the grapes.

7. A student is interested in whether there is a difference between recreational facilities used by men and women.

Gender	Facility			Total
	Racquetball	Track	Pool	
Male	51	30	63	144
Female	43	48	68	159
Total	94	78	131	303

(a) Test whether facility and gender are independent. Use  $\alpha = 0.05$ .

(b) Give the approximate  $p$ -value for this test.

8. The joint probability density function of  $(X_1, X_2)$  is given by

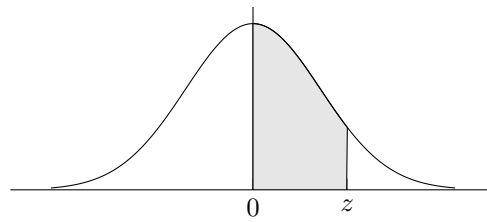
$$f(x_1, x_2) = \begin{cases} (x_1 + x_2)/3 & 0 \leq x_1 \leq 2, 0 \leq x_2 \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

(a) Find  $P(X_1 + X_2 > 1)$ .

(b) Find  $E(X_1)$ ,  $E(X_2)$ .

(c) Find  $Cov(X_1, X_2)$ .

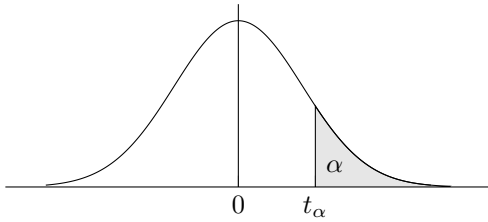
Normal Curve Areas



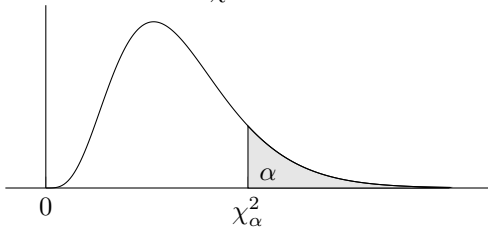
$z$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

Critical values of  $t$

df	$t_{0.100}$	$t_{0.050}$	$t_{0.025}$	$t_{0.010}$	$t_{0.005}$
1	3.078	6.314	12.71	31.82	63.66
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
$\infty$	1.282	1.645	1.960	2.326	2.576



Critical values of  $\chi^2$



df	$\chi_{0.995}^2$	$\chi_{0.990}^2$	$\chi_{0.975}^2$	$\chi_{0.950}^2$	$\chi_{0.900}^2$	$\chi_{0.100}^2$	$\chi_{0.050}^2$	$\chi_{0.025}^2$	$\chi_{0.010}^2$	$\chi_{0.005}^2$
1	0.00003927	0.0001571	0.0009821	0.003932	0.01579	2.706	3.841	5.024	6.635	7.879
2	0.01003	0.02010	0.05064	0.1026	0.2107	4.605	5.991	7.378	9.210	10.60
3	0.07172	0.1148	0.2158	0.3518	0.5844	6.251	7.815	9.348	11.34	12.84
4	0.2070	0.2971	0.4844	0.7107	1.064	7.779	9.488	11.14	13.28	14.86
5	0.4117	0.5543	0.8312	1.145	1.610	9.236	11.07	12.83	15.09	16.75
6	0.6757	0.8721	1.237	1.635	2.204	10.64	12.59	14.45	16.81	18.55
7	0.9893	1.239	1.690	2.167	2.833	12.02	14.07	16.01	18.48	20.28
8	1.344	1.646	2.180	2.733	3.490	13.36	15.51	17.53	20.09	21.95
9	1.735	2.088	2.700	3.325	4.168	14.68	16.92	19.02	21.67	23.59
10	2.156	2.558	3.247	3.940	4.865	15.99	18.31	20.48	23.21	25.19