UNIVERSITY AT ALBANY
STATE UNIVERSITY OF NEW YORK

AMAT 108 Elementary Statistics — Exam 3
Fall 2024 — Version A

Print Name:

UAlbany Email:

Directions: You have **80 minutes** to answer the following questions. For all multiple-choice questions, select **one** answer from among the choices given. No explanation is required to be shown, and no partial credit will be given. Make sure to **completely** fill in the circle corresponding to your chosen answer. For all free-response questions, you **must** show all necessary work to receive full credit. An answer with no work, even if correct, will not receive full credit. Please circle or box your final answer. All work, if needed, is to be rounded to **at least five** decimal places.

No notes, textbooks, mobile phones, or other aids are allowed. Only scientific calculators are allowed. **Do not detach these pages.**

Please indicate your section with a check mark (✓) in the left-most column.

✓	**Section**	**Instructor Name**	**Meeting Time**	**Meeting Days**	**Meeting Location**
	1724	Douglas Rosenberg	3:00PM	T/TH	ES 140
	1725	James Lamatina	12:00PM	T/TH	LC 25
	1726	John Racquet	3:00PM	M/W	LC 2
	3414	Chris Lange	4:30PM	T/TH	HU 132
	3807	Tung Lam	11:40AM	M/W	HU 129
	3808	Luciano Medina	10:30AM	T/TH	ES 144
	3809	James Lamatina	9:00AM	T/TH	HU 124
	4551	Tung Lam	8:00AM	M/W	ES 140
	4803	Peter Young	9:00AM	T/TH	ES 139
	4960	Peter Young	12:00PM	T/TH	ES 140
	5574	Chris Lange	3:00PM	T/TH	SS 133

Exam Scoring:

Page	Possible Points	Points Earned
3	7	
4	11	
5	7	
6	7	
7	5	
8	5	
9	5	
Total Points	47	
Percentage		

Questions 1 and 2 are based on the following: Suppose $n = 18$ and the conditions for the confidence interval for p and the confidence interval for μ are met.

1. Which of the following is the 97% z^* critical number? (1 pt.)

① 2.356 ④ 2.170

② 2.110 ⑤ 2.101

③ 2.368

2. Which of the following is an appropriate 97% t^* critical number? (1 pt.)

① 2.356 ④ 2.170

② 2.110 ⑤ 2.101

③ 2.368

3. The null hypothesis of a statistical test is as follows:

$$H_0\text{: The mean IQ of statistics professors is 130}$$

Which of the following leads to a Type 1 error (false-positive)? (1 pt.)

① We fail to reject H_0 when the results from a sample of statistics professors had a mean IQ of 130.

② We fail to reject H_0 when the results from a sample of statistics professors did not have a mean IQ of 130.

③ We reject H_0 when the results from a sample of statistics professors had a mean IQ of 130.

④ We reject H_0 when the results from a sample of statistics professors did not have a mean IQ of 130.

4. Below are several claims about either population or sample characteristics. Choose ***all*** claims that are invalid as statistical hypotheses. (4 pts.)

① $\mu < 190$ ② $\hat{p} \neq 0.27$

③ $\overline{x} > 45$ ④ $p = 0.73$

5. From a sample of 954 patients that had a certain type of surgery, approximately 26% experienced complications.

(a) Are all requirements for the Large-Sample Confidence Interval for p met? (1 pt.)

① Yes, because the population of interest has a normal distribution.

② Yes, because the sample size is sufficiently large.

③ Yes, because the success-failure conditions are met.

④ No, because none of the above apply.

(b) Find the 90% z^* critical number. Express your answer to three decimal places. (1 pt.)

(c) Construct a central 90% confidence interval for the proportion of all patients having this type of surgery that experienced complications. Round both endpoints to three decimal places. (6 pts.)

(d) Find a conservative estimate for the sample size required to estimate the proportion of all patients having this type of surgery that experienced complications to within 0.021 with 90% confidence. Round your answer up to the nearest whole number. (3 pts.)

6. A random sample of 51 workers at a large corporation has an average of 1.8 hours per day of distractions (emails, phone calls, impromptu visits, etc.) with a standard deviation of 0.34 hours per day.
   (a) Find an appropriate 96% t^* critical number. Express your answer to three decimal places. (1 pt.)

   (b) Construct a central 96% confidence interval for the mean hours of distraction per day for all workers at the corporation. Round both endpoints to three decimal places. (6 pts.)

7. The Energy Information Administration reported that 51.7% of homes in the US were heated by natural gas. A random sample of 220 homes found that 124 were heated by natural gas. We wish to know if there is enough evidence to conclude that the reported percentage is an underestimate.
   (a) Select the correct pair of statistical hypotheses. (1 pt.)

① H_0: $p = 0.517$ vs. H_1: $p < 0.517$	② H_0: $p = 0.517$ vs. H_1: $p \neq 0.517$	③ H_0: $p = 0.517$ vs. H_1: $p > 0.517$

   (b) Compute the sample proportion. Round your answer to five decimal places. (3 pts.)

   (c) Use your answer in (b) to compute the z^* test statistic. Round your answer to *two* decimal places. (3 pts.)

Parts (d), (e), and (f) are on the next page...

(d) Which of the following correctly describes the distribution of the test statistic? (1 pt.)

① It has a normal distribution with mean 1 and standard deviation 2.

② It has a normal distribution with mean 1 and standard deviation 0.

③ It has a standard normal distribution.

④ It has a normal distribution with mean 2 and standard deviation 1.

(e) Compute the *p-value* of the test, as discussed in class, and express your answer to *four* decimal places. (3 pts.)

(f) Which of the following is the correct conclusion? (1 pt.)

① Fail to reject H_0 at $\alpha = 0.05$. We do not have enough evidence to conclude that the reported percentage is an underestimate.

② Reject H_0 at $\alpha = 0.05$, but fail to reject H_0 at $\alpha = 0.01$. We have a slight amount of evidence to conclude that the reported percentage is an underestimate.

③ Reject H_0 at $\alpha = 0.01$, but fail to reject H_0 at $\alpha = 0.001$. We have a convincing amount of evidence to conclude that the reported percentage is an underestimate.

④ Reject H_0 at $\alpha = 0.001$. We have an overwhelming amount of evidence to conclude that the reported percentage is an underestimate.

8. According to the American Pet Products Manufacturers' Association, cat owners spend an average of \$179 annually in routine vet visits. A random sample of 71 cat owners found that they spend an average of \$186.27 with a standard deviation of \$21.04. We wish to know if there is enough evidence to conclude that the reported average is incorrect.

(a) Select the correct pair of statistical hypotheses. (1 pt.)

① H_0: $\mu = 179$ vs. H_1: $\mu \neq 179$

② H_0: $\mu = 179$ vs. H_1: $\mu > 179$

③ H_0: $\mu = 179$ vs. H_1: $\mu < 179$

(b) Are all requirements for the One-Sample T Test for μ met? (1 pt.)

① Yes, because the population of interest has a normal distribution.

② Yes, because the collected sample has a normal distribution.

③ Yes, because the sample size is sufficiently large.

④ No, because none of the above apply.

(c) Compute the t^* test statistic. Round your answer to *one* decimal place. (3 pts.)

Parts (d), (e), and (f) are on the next page...

(d) The test statistic has a t distribution with how many degrees of freedom? (1 pt.)

① 71 ② 69 ③ 70 ④ 178

(e) Compute the *p-value* of the test, as discussed in class, and express your answer to *three* decimal places. (3 pts.)

(f) Which of the following is the correct conclusion? (1 pt.)

① Fail to reject H_0 at $\alpha = 0.05$. We do not have enough evidence to conclude that the reported average is incorrect.

② Reject H_0 at $\alpha = 0.05$, but fail to reject H_0 at $\alpha = 0.01$. We have a slight amount of evidence to conclude that the reported average is incorrect.

③ Reject H_0 at $\alpha = 0.01$, but fail to reject H_0 at $\alpha = 0.001$. We have a convincing amount of evidence to conclude that the reported average is incorrect.

④ Reject H_0 at $\alpha = 0.001$. We have an overwhelming amount of evidence to conclude that the reported average is incorrect.

Formula Sheet:

- Sample proportion:

$$\hat{p} = \frac{\text{number of successes in sample}}{n}$$

- Confidence interval form:

$$\text{point estimate} \pm \text{margin of error}$$

  Margin of error is also the bound on the error of estimation

- Success/failure condition for the sampling distribution of $\hat{p}$ to be approximately normal:

$$np \geq 10 \qquad\qquad n(1-p) \geq 10$$

- Confidence interval for a population proportion:

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

- Determining the sample size needed to be within M = margin of error under a certain confidence level:

$$n = p(1-p)\left(\frac{z^*}{M}\right)^2$$

- To find the conservatively large sample size needed, set $p = 0.5$.

- Confidence interval for a population mean (when σ unknown):

$$\overline{x} \pm \frac{t^* s}{\sqrt{n}} \qquad\qquad df = n - 1$$

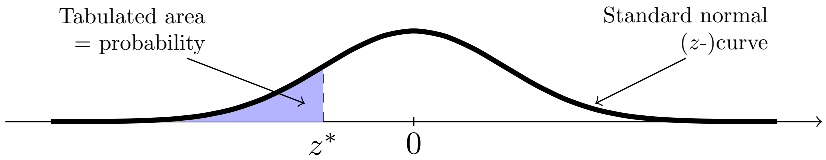
- z-test statistic for hypothesis testing of a population proportion:

$$z^* = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

- t-test statistic for hypothesis testing of a population mean (when σ unknown):

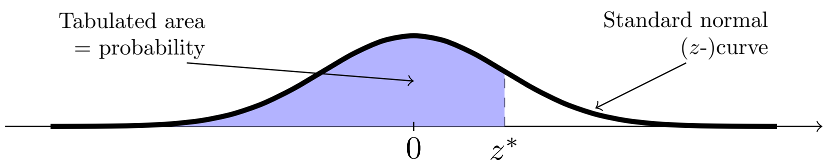
$$t^* = \frac{\overline{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)} \qquad\qquad df = n - 1$$

Standard Normal Table



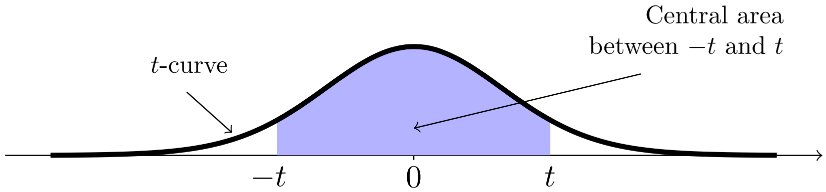
z^*	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
-3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
-3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
-3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-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	0.2389	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	0.2483	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

Standard Normal Table



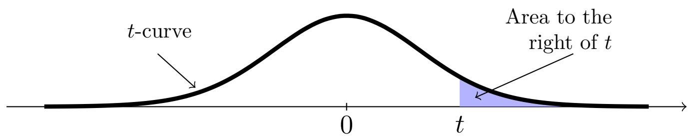
z^*	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	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	0.7517	0.7549
0.7	0.7580	0.7611	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	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

t-Distribution Table of Critical Values



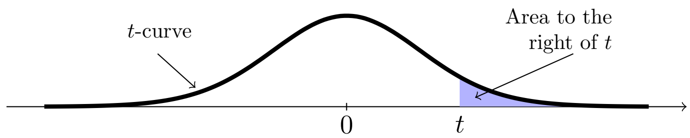
degree of freedom	80%	90%	95%	96%	97%	98%	99%	99.8%	99.9%
	Central Area Captured / Confidence Level								
1	3.078	6.314	12.706	15.895	21.205	31.821	63.657	318.309	636.619
2	1.886	2.920	4.303	4.849	5.643	6.965	9.925	22.327	31.599
3	1.638	2.353	3.182	3.482	3.896	4.541	5.841	10.215	12.924
4	1.533	2.132	2.776	2.999	3.298	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	2.757	3.003	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	2.612	2.829	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.517	2.715	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.449	2.634	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.398	2.574	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.359	2.527	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.328	2.491	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.303	2.461	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.282	2.436	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.264	2.415	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.249	2.397	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.235	2.382	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.224	2.368	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.214	2.356	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.205	2.346	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.197	2.336	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.189	2.328	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.183	2.320	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.177	2.313	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.172	2.307	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.167	2.301	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.162	2.296	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.158	2.291	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.154	2.286	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.150	2.282	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.147	2.278	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.123	2.250	2.423	2.704	3.307	3.551
50	1.299	1.676	2.009	2.109	2.234	2.403	2.678	3.261	3.496
60	1.296	1.671	2.000	2.099	2.223	2.390	2.660	3.232	3.460
70	1.294	1.667	1.994	2.093	2.215	2.381	2.648	3.211	3.435
80	1.292	1.664	1.990	2.088	2.209	2.374	2.639	3.195	3.416
90	1.291	1.662	1.987	2.084	2.205	2.368	2.632	3.183	3.402
100	1.290	1.660	1.984	2.081	2.201	2.364	2.626	3.174	3.390
110	1.289	1.659	1.982	2.078	2.199	2.361	2.621	3.166	3.381
120	1.289	1.658	1.980	2.076	2.196	2.358	2.617	3.160	3.373
z-critical $= \infty$	1.282	1.645	1.960	2.054	2.170	2.326	2.576	3.090	3.291

Tail Areas for t Curves



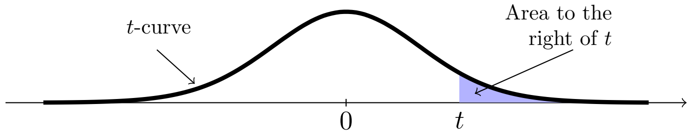
t^* \ df	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
0.0	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
0.1	0.468	0.465	0.463	0.463	0.462	0.462	0.462	0.461	0.461	0.461
0.2	0.437	0.430	0.427	0.426	0.425	0.424	0.424	0.423	0.423	0.423
0.3	0.407	0.396	0.392	0.390	0.388	0.387	0.386	0.386	0.385	0.385
0.4	0.379	0.364	0.358	0.355	0.353	0.352	0.351	0.350	0.349	0.349
0.5	0.352	0.333	0.326	0.322	0.319	0.317	0.316	0.315	0.315	0.314
0.6	0.328	0.305	0.295	0.290	0.287	0.285	0.284	0.283	0.282	0.281
0.7	0.306	0.278	0.267	0.261	0.258	0.255	0.253	0.252	0.251	0.250
0.8	0.285	0.254	0.241	0.234	0.230	0.227	0.225	0.223	0.222	0.221
0.9	0.267	0.232	0.217	0.210	0.205	0.201	0.199	0.197	0.196	0.195
1.0	0.250	0.211	0.196	0.187	0.182	0.178	0.175	0.173	0.172	0.170
1.1	0.235	0.193	0.176	0.167	0.161	0.157	0.154	0.152	0.150	0.149
1.2	0.221	0.177	0.158	0.148	0.142	0.138	0.135	0.132	0.130	0.129
1.3	0.209	0.162	0.142	0.132	0.125	0.121	0.117	0.115	0.113	0.111
1.4	0.197	0.148	0.128	0.117	0.110	0.106	0.102	0.100	0.098	0.096
1.5	0.187	0.136	0.115	0.104	0.097	0.092	0.089	0.086	0.084	0.082
1.6	0.178	0.125	0.104	0.092	0.085	0.080	0.077	0.074	0.072	0.070
1.7	0.169	0.116	0.094	0.082	0.075	0.070	0.066	0.064	0.062	0.060
1.8	0.161	0.107	0.085	0.073	0.066	0.061	0.057	0.055	0.053	0.051
1.9	0.154	0.099	0.077	0.065	0.058	0.053	0.050	0.047	0.045	0.043
2.0	0.148	0.092	0.070	0.058	0.051	0.046	0.043	0.040	0.038	0.037
2.1	0.141	0.085	0.063	0.052	0.045	0.040	0.037	0.034	0.033	0.031
2.2	0.136	0.079	0.058	0.046	0.040	0.035	0.032	0.029	0.028	0.026
2.3	0.131	0.074	0.052	0.041	0.035	0.031	0.027	0.025	0.023	0.022
2.4	0.126	0.069	0.048	0.037	0.031	0.027	0.024	0.022	0.020	0.019
2.5	0.121	0.065	0.044	0.033	0.027	0.023	0.020	0.018	0.017	0.016
2.6	0.117	0.061	0.040	0.030	0.024	0.020	0.018	0.016	0.014	0.013
2.7	0.113	0.057	0.037	0.027	0.021	0.018	0.015	0.014	0.012	0.011
2.8	0.109	0.054	0.034	0.024	0.019	0.016	0.013	0.012	0.010	0.009
2.9	0.106	0.051	0.031	0.022	0.017	0.014	0.011	0.010	0.009	0.008
3.0	0.102	0.048	0.029	0.020	0.015	0.012	0.010	0.009	0.007	0.007
3.1	0.099	0.045	0.027	0.018	0.013	0.011	0.009	0.007	0.006	0.006
3.2	0.096	0.043	0.025	0.016	0.012	0.009	0.008	0.006	0.005	0.005
3.3	0.094	0.040	0.023	0.015	0.011	0.008	0.007	0.005	0.005	0.004
3.4	0.091	0.038	0.021	0.014	0.010	0.007	0.006	0.005	0.004	0.003
3.5	0.089	0.036	0.020	0.012	0.009	0.006	0.005	0.004	0.003	0.003
3.6	0.086	0.035	0.018	0.011	0.008	0.006	0.004	0.003	0.003	0.002
3.7	0.084	0.033	0.017	0.010	0.007	0.005	0.004	0.003	0.002	0.002
3.8	0.082	0.031	0.016	0.010	0.006	0.004	0.003	0.003	0.002	0.002
3.9	0.080	0.030	0.015	0.009	0.006	0.004	0.003	0.002	0.002	0.001
4.0	0.078	0.029	0.014	0.008	0.005	0.004	0.003	0.002	0.002	0.001
4.1	0.076	0.027	0.013	0.007	0.005	0.003	0.002	0.002	0.001	0.001
4.2	0.074	0.026	0.012	0.007	0.004	0.003	0.002	0.001	0.001	0.001
4.3	0.073	0.025	0.012	0.006	0.004	0.003	0.002	0.001	0.001	0.001

Tail Areas for t Curves



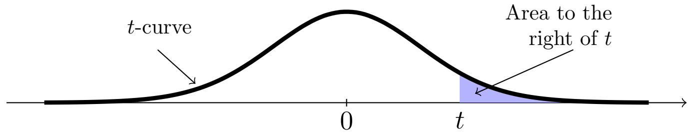
t^* \ df	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
0.0	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
0.1	0.461	0.461	0.461	0.461	0.461	0.461	0.461	0.461	0.461	0.461
0.2	0.423	0.422	0.422	0.422	0.422	0.422	0.422	0.422	0.422	0.422
0.3	0.385	0.385	0.384	0.384	0.384	0.384	0.384	0.384	0.384	0.384
0.4	0.348	0.348	0.348	0.348	0.347	0.347	0.347	0.347	0.347	0.347
0.5	0.313	0.313	0.313	0.312	0.312	0.312	0.312	0.312	0.311	0.311
0.6	0.280	0.280	0.279	0.279	0.279	0.278	0.278	0.278	0.278	0.278
0.7	0.249	0.249	0.248	0.248	0.247	0.247	0.247	0.246	0.246	0.246
0.8	0.220	0.220	0.219	0.219	0.218	0.218	0.217	0.217	0.217	0.217
0.9	0.194	0.193	0.192	0.192	0.191	0.191	0.190	0.190	0.190	0.189
1.0	0.169	0.169	0.168	0.167	0.167	0.166	0.166	0.165	0.165	0.165
1.1	0.147	0.146	0.146	0.145	0.144	0.144	0.143	0.143	0.143	0.142
1.2	0.128	0.127	0.126	0.125	0.124	0.124	0.123	0.123	0.122	0.122
1.3	0.110	0.109	0.108	0.107	0.107	0.106	0.105	0.105	0.105	0.104
1.4	0.095	0.093	0.092	0.092	0.091	0.090	0.090	0.089	0.089	0.088
1.5	0.081	0.080	0.079	0.078	0.077	0.077	0.076	0.075	0.075	0.075
1.6	0.069	0.068	0.067	0.066	0.065	0.065	0.064	0.064	0.063	0.063
1.7	0.059	0.057	0.056	0.056	0.055	0.054	0.054	0.053	0.053	0.052
1.8	0.050	0.049	0.048	0.047	0.046	0.045	0.045	0.044	0.044	0.043
1.9	0.042	0.041	0.040	0.039	0.038	0.038	0.037	0.037	0.036	0.036
2.0	0.035	0.034	0.033	0.033	0.032	0.031	0.031	0.030	0.030	0.030
2.1	0.030	0.029	0.028	0.027	0.027	0.026	0.025	0.025	0.025	0.024
2.2	0.025	0.024	0.023	0.023	0.022	0.021	0.021	0.021	0.020	0.020
2.3	0.021	0.020	0.019	0.019	0.018	0.018	0.017	0.017	0.016	0.016
2.4	0.018	0.017	0.016	0.015	0.015	0.014	0.014	0.014	0.013	0.013
2.5	0.015	0.014	0.013	0.013	0.012	0.012	0.011	0.011	0.011	0.011
2.6	0.012	0.012	0.011	0.010	0.010	0.010	0.009	0.009	0.009	0.009
2.7	0.010	0.010	0.009	0.009	0.008	0.008	0.008	0.007	0.007	0.007
2.8	0.009	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.006
2.9	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.005	0.004
3.0	0.006	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004
3.1	0.005	0.005	0.004	0.004	0.004	0.003	0.003	0.003	0.003	0.003
3.2	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002
3.3	0.004	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
3.4	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001
3.5	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001
3.6	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.7	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.8	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.9	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000
4.0	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
4.1	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000
4.2	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.3	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Tail Areas for t Curves



t^* \ df	21	22	23	24	25	26	27	28	29	30
0.0	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
0.1	0.461	0.461	0.461	0.461	0.461	0.461	0.461	0.461	0.461	0.461
0.2	0.422	0.422	0.422	0.422	0.422	0.422	0.421	0.421	0.421	0.421
0.3	0.384	0.383	0.383	0.383	0.383	0.383	0.383	0.383	0.383	0.383
0.4	0.347	0.347	0.346	0.346	0.346	0.346	0.346	0.346	0.346	0.346
0.5	0.311	0.311	0.311	0.311	0.311	0.311	0.311	0.310	0.310	0.310
0.6	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277
0.7	0.246	0.246	0.245	0.245	0.245	0.245	0.245	0.245	0.245	0.245
0.8	0.216	0.216	0.216	0.216	0.216	0.215	0.215	0.215	0.215	0.215
0.9	0.189	0.189	0.189	0.189	0.188	0.188	0.188	0.188	0.188	0.188
1.0	0.164	0.164	0.164	0.164	0.163	0.163	0.163	0.163	0.163	0.163
1.1	0.142	0.142	0.141	0.141	0.141	0.141	0.141	0.140	0.140	0.140
1.2	0.122	0.121	0.121	0.121	0.121	0.120	0.120	0.120	0.120	0.120
1.3	0.104	0.104	0.103	0.103	0.103	0.103	0.102	0.102	0.102	0.102
1.4	0.088	0.088	0.087	0.087	0.087	0.087	0.086	0.086	0.086	0.086
1.5	0.074	0.074	0.074	0.073	0.073	0.073	0.073	0.072	0.072	0.072
1.6	0.062	0.062	0.062	0.061	0.061	0.061	0.061	0.060	0.060	0.060
1.7	0.052	0.052	0.051	0.051	0.051	0.051	0.050	0.050	0.050	0.050
1.8	0.043	0.043	0.042	0.042	0.042	0.042	0.042	0.041	0.041	0.041
1.9	0.036	0.035	0.035	0.035	0.035	0.034	0.034	0.034	0.034	0.034
2.0	0.029	0.029	0.029	0.028	0.028	0.028	0.028	0.028	0.027	0.027
2.1	0.024	0.024	0.023	0.023	0.023	0.023	0.023	0.022	0.022	0.022
2.2	0.020	0.019	0.019	0.019	0.019	0.018	0.018	0.018	0.018	0.018
2.3	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.015	0.014	0.014
2.4	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011
2.5	0.010	0.010	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009
2.6	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007
2.7	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
2.8	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.004
2.9	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003
3.0	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
3.1	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
3.2	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
3.3	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
3.4	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.5	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.6	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.7	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
3.8	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Tail Areas for t Curves



t^* \ df	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**110**	**120**	$\infty = z$
0.0	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
0.1	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
0.2	0.421	0.421	0.421	0.421	0.421	0.421	0.421	0.421	0.421	0.421
0.3	0.383	0.383	0.383	0.383	0.382	0.382	0.382	0.382	0.382	0.382
0.4	0.346	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345
0.5	0.310	0.310	0.309	0.309	0.309	0.309	0.309	0.309	0.309	0.309
0.6	0.276	0.276	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.274
0.7	0.244	0.244	0.243	0.243	0.243	0.243	0.243	0.243	0.243	0.242
0.8	0.214	0.214	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.212
0.9	0.187	0.186	0.186	0.186	0.185	0.185	0.185	0.185	0.185	0.184
1.0	0.162	0.161	0.161	0.160	0.160	0.160	0.160	0.160	0.160	0.159
1.1	0.139	0.138	0.138	0.138	0.137	0.137	0.137	0.137	0.137	0.136
1.2	0.119	0.118	0.117	0.117	0.117	0.117	0.116	0.116	0.116	0.115
1.3	0.101	0.100	0.099	0.099	0.099	0.098	0.098	0.098	0.098	0.097
1.4	0.085	0.084	0.083	0.083	0.083	0.082	0.082	0.082	0.082	0.081
1.5	0.071	0.070	0.069	0.069	0.069	0.069	0.068	0.068	0.068	0.067
1.6	0.059	0.058	0.057	0.057	0.057	0.057	0.056	0.056	0.056	0.055
1.7	0.048	0.048	0.047	0.047	0.047	0.046	0.046	0.046	0.046	0.045
1.8	0.040	0.039	0.038	0.038	0.038	0.038	0.037	0.037	0.037	0.036
1.9	0.032	0.032	0.031	0.031	0.031	0.030	0.030	0.030	0.030	0.029
2.0	0.026	0.025	0.025	0.025	0.024	0.024	0.024	0.024	0.024	0.023
2.1	0.021	0.020	0.020	0.020	0.019	0.019	0.019	0.019	0.019	0.018
2.2	0.017	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.015	0.014
2.3	0.013	0.013	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.011
2.4	0.011	0.010	0.010	0.010	0.009	0.009	0.009	0.009	0.009	0.008
2.5	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.006
2.6	0.006	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.005
2.7	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.003
2.8	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
2.9	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002
3.0	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001
3.1	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
3.3	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
3.4	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000
3.5	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000