Put Your Tables Away

Robert K. Henderson

February 21, 2020

Suppose you have a sample of size 10, and desire to know whether or not the mean of the population from which the sample was obtained is greater than zero.

Most likely, you would calculate a t-statistic t = $\frac{\bar{X}}{\frac{S}{\sqrt{n}}}$, where

$\bar{X}$ = sample mean, S = sample standard deviation, n = the sample size = 10 in this case.

Now, suppose you do this, and you get t = 3. You realize this is likely a statistically significant result, but the pesky journal editor requires a p-value.

Hence, it becomes necessary to calculate the probability a student's t random variable with 9 degrees of freedom is greater than equal to t = 3, i.e., $P[t \geq 3 \mid t \sim t_{(9)}]$.

In many stat classes, students are asked to do this using a student's t table, such as that at right.

To get $P[t \geq 3 \mid t \sim t_{(9)}]$, the student has to find the value "3" in the row labeled "9" in the "df" column. It is not there, but the values 2.821 and 3.250 bounding it are.

The value "3" is ~41.725% of the distance between these bounds, so to obtain the desired p-value, it is necessary to find the value ~41.725% of the distance between 0.01 & 0.005, which is ~0.0079.

OR …

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	[illegible]	[illegible]	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300

One could use an Excel utility designed to calculate such probabilities.

Enter desired df = 9

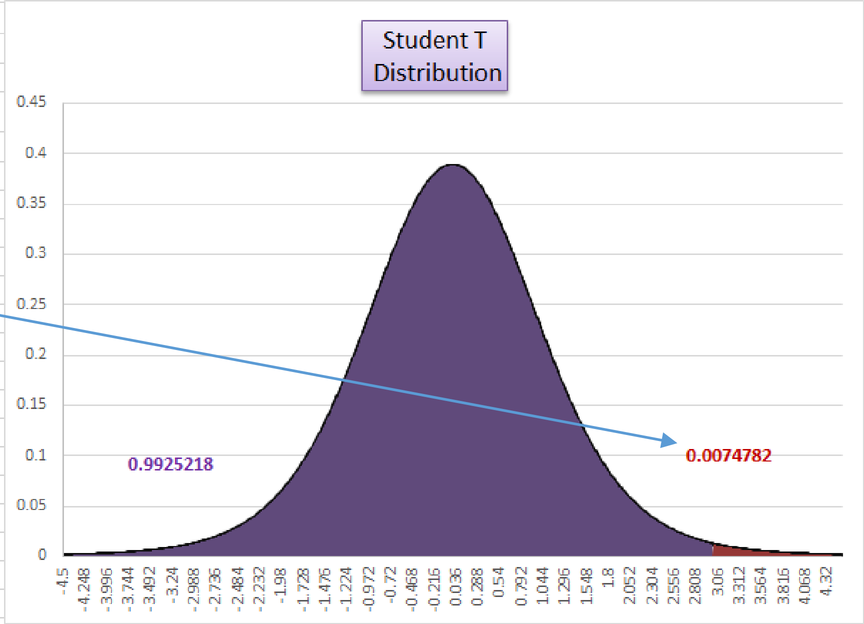
Enter the value of interest =3

Input Information

Degrees of Freedom	9				
Low T Score	3	OR	Probability		Will Default to Data Value if Both Entered
					Note: Any entered Probabilities MUST be between 0 and 1, EXCLUSIVE
Upper T Score		OR	Probability		Will Default to Data Value if Both Entered

Output Results

Area	Data Value	Probability
Below	3	0.9925
Above	3	0.0075
Between	3 & 3	0.0000



Output includes $P[t_{(9)} > 3]$

Note: Result is less than the 0.0079 obtained with the table.

Utility can handle two percentiles as well.
For example, can find $P[-2 < t < 2 \mid t \sim t_{(22)}]$

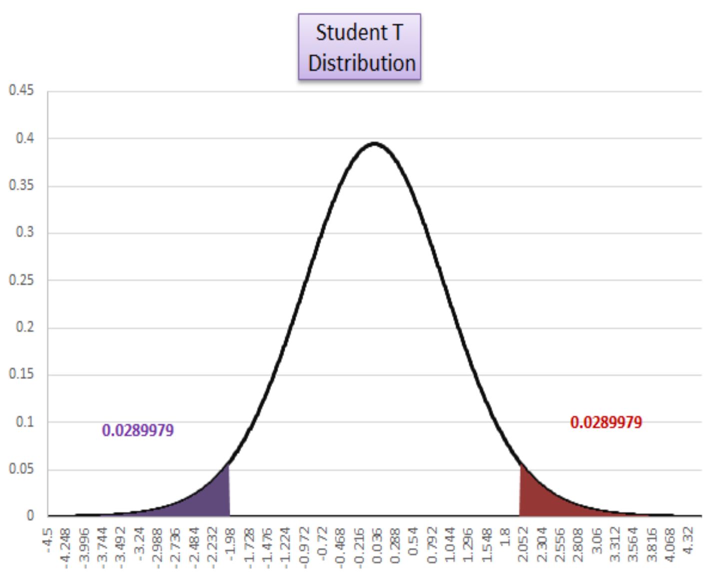
Input Information

Degrees of Freedom	22				
Low T Score	-2	OR	Probability		Will Default to Data Value if Both Entered
				Note: Any entered Probabilities MUST be between 0 and 1, EXCLUSIVE	
Upper T Score	2	OR	Probability		Will Default to Data Value if Both Entered

Output Results

Area	Data Value	Probability
Below	-2	0.0290
Above	2	0.0290
Between	-2 & 2	0.9420

Desired result = 0.9420



Also, can find percentiles given desired probabilities.
For example, can find t_0 for $P[\, t < t_0 \mid t \sim t_{(15)}] = 0.95$

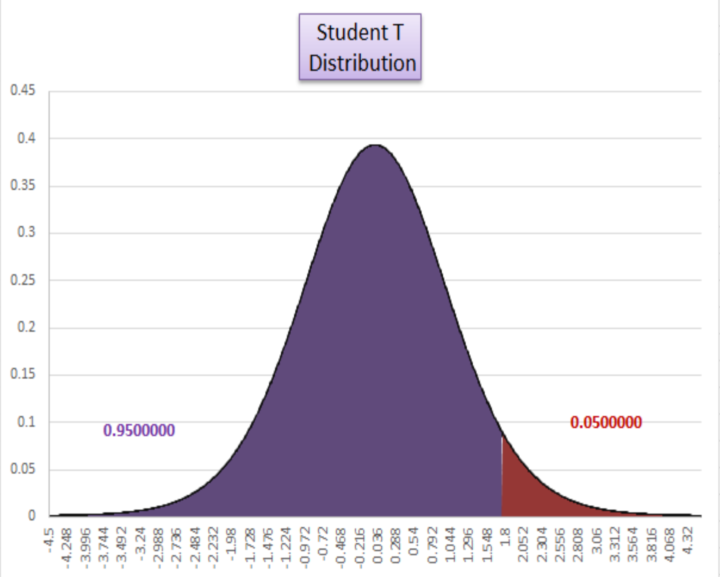
Input Information

Degrees of Freedom	15				
Low T Score		OR	Probability	0.95	Will Default to Data Value if Both Entered
				Note: Any entered Probabilities MUST be between 0 and 1, EXCLUSIVE	
Upper T Score		OR	Probability		Will Default to Data Value if Both Entered

Output Results

Area	Data Value	Probability
Below	1.753	0.9500
Above	1.753	0.0500
Between	1.753 & 1.753	0.0000

Desired result = $t_0 = t_{(15,0.95)}$
= 1.753



How about finding a binomial probability?

Might be necessary when using data to test if a population proportion is smaller or larger than some reference value?

Suppose we had results from an exit poll of 20 randomly selected people voting in the March primary here in Nacogdoches where the respondents were asked who they intended to vote for for president in November.

Suppose further that 14 of the 20 indicated their intent to vote for Donald Trump. Does this result provide sufficient evidence to indicate President Trump is likely to carry Nacogdoches in November?

To answer this, we would need to evaluate the probability of obtaining this observation or one more extreme if the true proportion of Trump voters is ≤ 0.5. This probability can be estimated using the binomial probability model as

P[≥14 Trump voters of 20| % of all Nacogdoches Trump voters is ≤ 50%]

This requires the summation of 7 binomial probabilities:

$$P_i = \binom{20}{i} 0.5^{20}, i = 14, \dots, 20$$

Or, using a binomial table at right adding the values

.037 + .015 + .005 + .001 + .000 + .000 + .000 = .058

OR ...

Table 4 continued

n	r	p .01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95
16	2	.010	.146	.275	.277	.211	.134	.073	.035	.015	.006	.002	.001	.000	.000	.000	.000	.000	.000	.000	.000
	3	.000	.036	.142	.229	.246	.208	.146	.089	.047	.022	.009	.003	.001	.000	.000	.000	.000	.000	.000	.000
	4	.000	.006	.051	.131	.200	.225	.204	.155	.101	.057	.028	.011	.004	.001	.000	.000	.000	.000	.000	.000
	5	.000	.001	.014	.056	.120	.180	.210	.201	.162	.112	.067	.034	.014	.005	.001	.000	.000	.000	.000	.000
	6	.000	.000	.003	.018	.055	.110	.165	.198	.198	.168	.122	.075	.039	.017	.006	.001	.000	.000	.000	.000
	7	.000	.000	.000	.005	.020	.052	.101	.152	.189	.197	.175	.132	.084	.044	.019	.006	.001	.000	.000	.000
	8	.000	.000	.000	.001	.006	.020	.049	.092	.142	.181	.196	.181	.142	.092	.049	.020	.006	.001	.000	.000
	9	.000	.000	.000	.000	.001	.006	.019	.044	.084	.132	.175	.197	.189	.152	.101	.052	.020	.005	.000	.000
	10	.000	.000	.000	.000	.000	.001	.006	.017	.039	.075	.122	.168	.198	.198	.165	.110	.055	.018	.003	.000
	11	.000	.000	.000	.000	.000	.000	.001	.005	.014	.034	.067	.112	.162	.201	.210	.180	.120	.056	.014	.001
	12	.000	.000	.000	.000	.000	.000	.000	.001	.004	.011	.028	.057	.101	.155	.204	.225	.200	.131	.051	.006
	13	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.009	.022	.047	.089	.146	.208	.246	.229	.142	.036
	14	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.002	.006	.015	.035	.073	.134	.211	.277	.275	.146
	15	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.009	.023	.053	.113	.210	.329	.371
	16	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.010	.028	.074	.185	.440
20	0	.818	.358	.122	.039	.012	.003	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	1	.165	.377	.270	.137	.058	.021	.007	.002	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	2	.016	.189	.285	.229	.137	.067	.028	.010	.003	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	3	.001	.060	.190	.243	.205	.134	.072	.032	.012	.004	.001	.000	.000	.000	.000	.000	.000	.000	.000	.000
	4	.000	.013	.090	.182	.218	.190	.130	.074	.035	.014	.005	.001	.000	.000	.000	.000	.000	.000	.000	.000
	5	.000	.002	.032	.103	.175	.202	.179	.127	.075	.036	.015	.005	.001	.000	.000	.000	.000	.000	.000	.000
	6	.000	.000	.009	.045	.109	.169	.192	.171	.124	.075	.037	.015	.005	.001	.000	.000	.000	.000	.000	.000
	7	.000	.000	.002	.016	.055	.112	.164	.184	.166	.122	.074	.037	.015	.005	.001	.000	.000	.000	.000	.000
	8	.000	.000	.000	.005	.022	.061	.114	.161	.180	.162	.120	.073	.035	.014	.004	.001	.000	.000	.000	.000
	9	.000	.000	.000	.001	.007	.027	.065	.116	.160	.177	.160	.119	.071	.034	.012	.003	.000	.000	.000	.000
	10	.000	.000	.000	.000	.002	.010	.031	.069	.117	.159	.176	.159	.117	.069	.031	.010	.002	.000	.000	.000
	11	.000	.000	.000	.000	.000	.003	.012	.034	.071	.119	.160	.177	.160	.116	.065	.027	.007	.001	.000	.000
	12	.000	.000	.000	.000	.000	.001	.004	.014	.035	.073	.120	.162	.180	.161	.114	.061	.022	.005	.000	.000
	13	.000	.000	.000	.000	.000	.000	.001	.005	.015	.037	.074	.122	.166	.184	.164	.112	.055	.016	.002	.000
	14	.000	.000	.000	.000	.000	.000	.000	.001	.005	.015	.037	.075	.124	.171	.192	.169	.109	.045	.009	.000
	15	.000	.000	.000	.000	.000	.000	.000	.000	.001	.005	.015	.036	.075	.127	.179	.202	.175	.103	.032	.002
	16	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.005	.014	.035	.074	.130	.190	.218	.182	.090	.013
	17	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.004	.012	.032	.072	.134	.205	.243	.190	.060
	18	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.010	.028	.067	.137	.229	.285	.189
	19	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.002	.007	.021	.058	.137	.270	.377
	20	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.003	.012	.039	.122	.358

One could use an Excel utility designed to calculate such probabilities.

P[≥14 Trump voters of 20 | % of all Nacogdoches Trump voters is ≤ 50%] = 0.057659

Binomial Probabilities

Exact	n	20	Input
Number	n(Success)	14	Input
of	P[Success]	0.5	Input
Successes	P[X=14 in 20]	0.036964	Output
At Least	n	20	Input
Number	n(Success)	14	Input
of	P[Success]	0.5	Input
Successes	P[X>=14 in 20]	0.057659	Output
At Most	n	20	Input
Number	n(Success)	13	Input
of	P[Success]	0.5	Input
Successes	P[X<=13 in 20]	0.942341	Output

Number	n	20	Input
of	n(Success-Lo)	6	Input
Successes	n(Success-Hi)	14	Input
Between	P[Success]	0.5	Input
	P[6<=X<=14 in 20]	0.958611	Output

Binomial Parameters

n	20	Input
P[Success]	0.5	Input
Mean	10	Output
Variance	5	Output
Std Deviation	2.236068	Output

Often, Binomial Tables are difficult to find for n > 20; however, most real polls have well beyond n = 20 respondents.

What if the primary exit poll obtained responses from 200 voters and 118 of them indicated they would vote for president Trump in November?

Now interested in P[≥ 118 Trump voters in 200 | % of all Nacogdoches Trump voters ≤ 50%] = 0.006565

Binomial Probabilities									
	Exact	**n**	20	Input		**Number**	**n**	20	Input
	Number	**n(Success)**	14	Input		**of**	**n(Success-Lo)**	6	Input
	of	**P[Success]**	0.5	Input		**Successes**	**n(Success-Hi)**	14	Input
	Successes	**P[X=14 in 20]**	**0.036964**	Output		**Between**	**P[Success]**	0.5	Input
						P[6<=X<=14 in 20]		**0.958611**	Output
	At Least	**n**	200	Input					
	Number	**n(Success)**	118	Input		**Binomial Parameters**			
	of	**P[Success]**	0.5	Input			**n**	20	Input
	Successes	**P[X>=118 in 200]**	**0.006565**	Output			**P[Success]**	0.5	Input
							Mean	**10**	Output
	At Most	**n**	20	Input			**Variance**	**5**	Output
	Number	**n(Success)**	13	Input			**Std Deviation**	**2.236068**	Output
	of	**P[Success]**	0.5	Input					
	Successes	**P[X<=13 in 20]**	**0.942341**	Output					

Binomial Utility can also produce 100(1-α)% exact Binomial Confidence Intervals for a population proportion.

95% Confidence intervals for the proportion of all Nacogdoches Trump voters based on the two polls would be

Binomial Confidence Intervals for Population Proportion				
Inputs				
Alpha	0.05		2.9277	This interval more approriate than interval based on Normal approximation
Obs Successes	14			
Sample Size	20			
		Exact Interval		
		Lower		Upper
		Limit	Estimate	Limit
		0.457211	0.7	0.881068

So with n = 20 & 14 Trump voters, we could be 95% confident the true % of all Nacogdoches Trump voters is between ~45.7% & ~88.1%.

Binomial Confidence Intervals for Population Proportion				
Inputs				
Alpha	0.05		11.7891	Normal approximation interval should be similar
Obs Successes	118			
Sample Size	200			
		Exact Interval		
		Lower		Upper
		Limit	Estimate	Limit
		0.518422	0.59	0.658869
		Approximate Interval		
		Lower		Upper
		Limit	Estimate	Limit
		0.521837	0.59	0.658163

But with n = 200 & 118 Trump voters, we could be 95% confident the true % of all Nacogdoches Trump voters is between ~51.8% & ~65.9%.

So the potential of a Normal approximation for these confidence intervals suggests how the

P[≥ 118 Trump voters in 200 | % of all Nacogdoches Trump voters ≤ 50%]

would need to be estimated **WITHOUT** a Binomial Utility & No Binomial Table w/ n = 200

Step 1: Find Expected Count = 200*0.50 =100

Step 2: Find Standard Deviation of Count = $\sqrt{200 * 0.5 * 0.5}$

≈ 7.07107

Step 3: Calculate a Z-score for the Count:

$$Z = \frac{118 - 100}{7.07107} \approx 2.546$$

117.5 (replacing 118)

2.475 (replacing 2.546)

Step 4: Use a Standard Normal Table to Determine Desired Probability

Here, need to find the value ~~60%~~ 50% of the way between

.00554 & .00539 → .00676 & .00657

which is ~~.00545~~ .006665

Note this approximation is not very good
Approximately 17% < Actual = .006565.

Better with Continuity Correction
Approximately 1.5% > Actual = .006565.

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-0	.50000	.49601	.49202	.48803	.48405	.48006	.47608	.47210	.46812	.46414
-0.1	.46017	.45620	.45224	.44828	.44433	.44034	.43640	.43251	.42858	.42465
-0.2	.42074	.41683	.41294	.40905	.40517	.40129	.39743	.39358	.38974	.38591
-0.3	.38209	.37828	.37448	.37070	.36693	.36317	.35942	.35569	.35197	.34827
-0.4	.34458	.34090	.33724	.33360	.32997	.32636	.32276	.31918	.31561	.31207
-0.5	.30854	.30503	.30153	.29806	.29460	.29116	.28774	.28434	.28096	.27760
-0.6	.27425	.27093	.26763	.26435	.26109	.25785	.25463	.25143	.24825	.24510
-0.7	.24196	.23885	.23576	.23270	.22965	.22663	.22363	.22065	.21770	.21476
-0.8	.21186	.20897	.20611	.20327	.20045	.19766	.19489	.19215	.18943	.18673
-0.9	.18406	.18141	.17879	.17619	.17361	.17106	.16853	.16602	.16354	.16109
-1	.15866	.15625	.15386	.15151	.14917	.14686	.14457	.14231	.14007	.13786
-1.1	.13567	.13350	.13136	.12924	.12714	.12507	.12302	.12100	.11900	.11702
-1.2	.11507	.11314	.11123	.10935	.10749	.10565	.10383	.10204	.10027	.09853
-1.3	.09680	.09510	.09342	.09176	.09012	.08851	.08692	.08534	.08379	.08226
-1.4	.08076	.07927	.07780	.07636	.07493	.07353	.07215	.07078	.06944	.06811
-1.5	.06681	.06552	.06426	.06301	.06178	.06057	.05938	.05821	.05705	.05592
-1.6	.05480	.05370	.05262	.05155	.05050	.04947	.04846	.04746	.04648	.04551
-1.7	.04457	.04363	.04272	.04182	.04093	.04006	.03920	.03836	.03754	.03673
-1.8	.03593	.03515	.03438	.03362	.03288	.03216	.03144	.03074	.03005	.02938
-1.9	.02872	.02807	.02743	.02680	.02619	.02559	.02500	.02442	.02385	.02330
-2	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
-2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
-2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
-2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
-2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
-2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
-2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
-2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
-2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
-2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
-3	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
-3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
-3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
-3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
-3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
-3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
-3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
-3.7	.00011	.00010	.00010	.00010	.00009	.00009	.00008	.00008	.00008	.00008
-3.8	.00007	.00007	.00007	.00006	.00006	.00006	.00006	.00005	.00005	.00005
-3.9	.00005	.00005	.00004	.00004	.00004	.00004	.00004	.00004	.00003	.00003
-4	.00003	.00003	.00003	.00003	.00003	.00003	.00002	.00002	.00002	.00002

1.1 – Negative Z Table

However, with a suitable Normal Distribution Excel utility:

Standard Normal has Mean = 0 and Standard Deviation = 1

Input Information

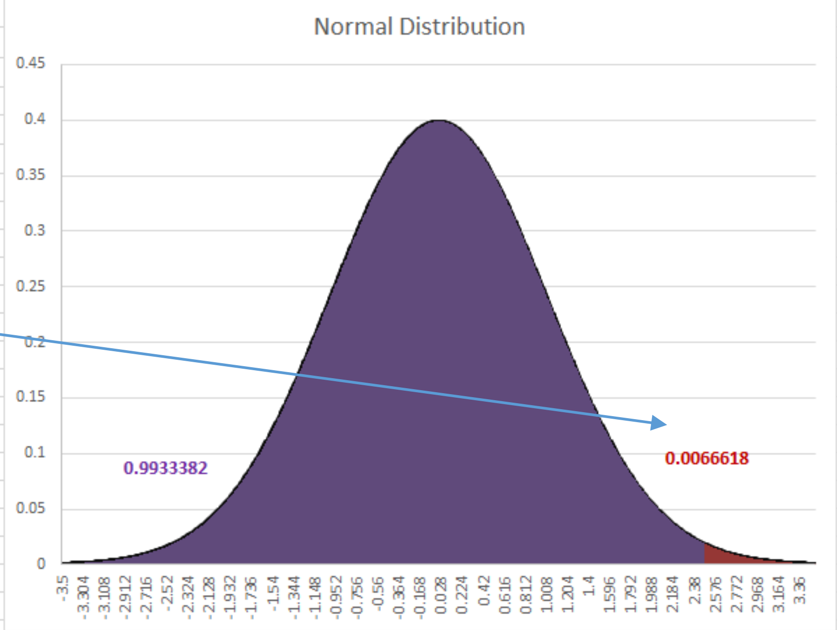
Mean	0	No Entry will Default to 0			
Standard Deviation	1	No Entry or Non-positive Entry will Default to 1			
Data Value	2.475	OR	Probability		Will Default to Data Value if Both Entered
Optional Additional				Note: Any entered Probabilities MUST be between 0 and 1, EXCLUSIVE	
Data Value		OR	Probability		Will Default to Data Value if Both Entered

Desired Z-score

Output Results

Area	Data Value	Probability
Below	2.475	0.9933
Above	2.475	0.0067
Between	2.475 & 2.475	0.0000

Result



Of course, with this utility, there is no need to even calculate the Z-score:

Approximate Count Distribution is Normal with Mean = 100 and Standard Deviation = 7.07107

Enter Observed Count w/ Continuity Correction

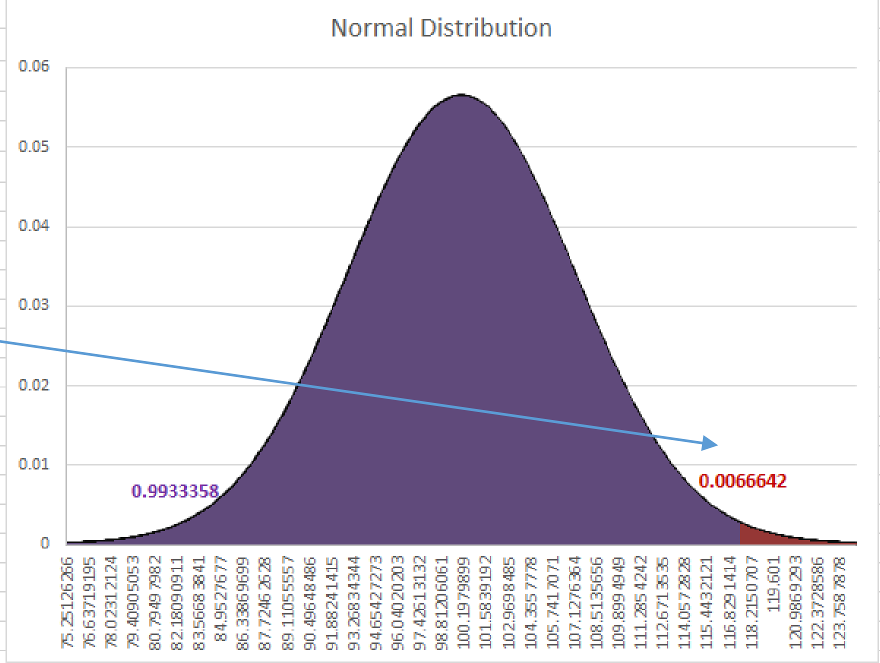
Input Information

Mean	100	No Entry will Default to 0			
Standard Deviation	7.071067812	No Entry or Non-positive Entry will Default to 1			
Data Value	117.5	OR	Probability		Will Default to Data Value if Both Entered
Optional Additional				Note: Any entered Probabilities MUST be between 0 and 1, EXCLUSIVE	
Data Value		OR	Probability		Will Default to Data Value if Both Entered

Output Results

Area	Data Value	Probability
Below	117.5	0.9933
Above	117.5	0.0067
Between	117.5 & 117.5	0.0000

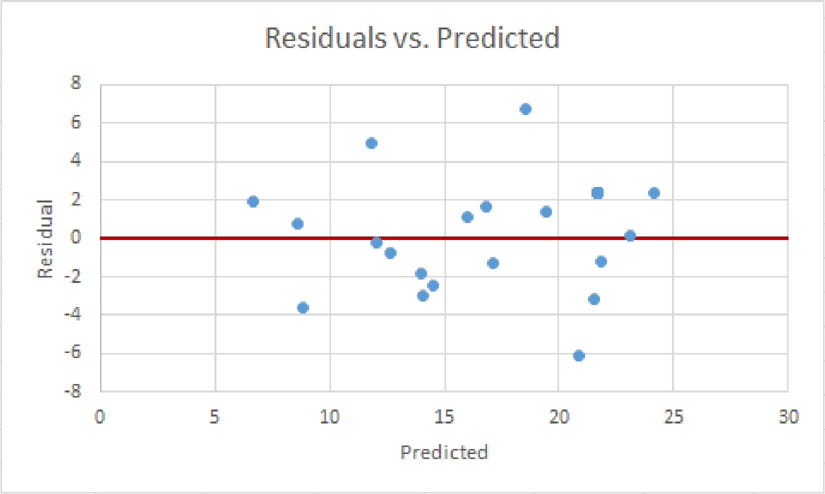
Result

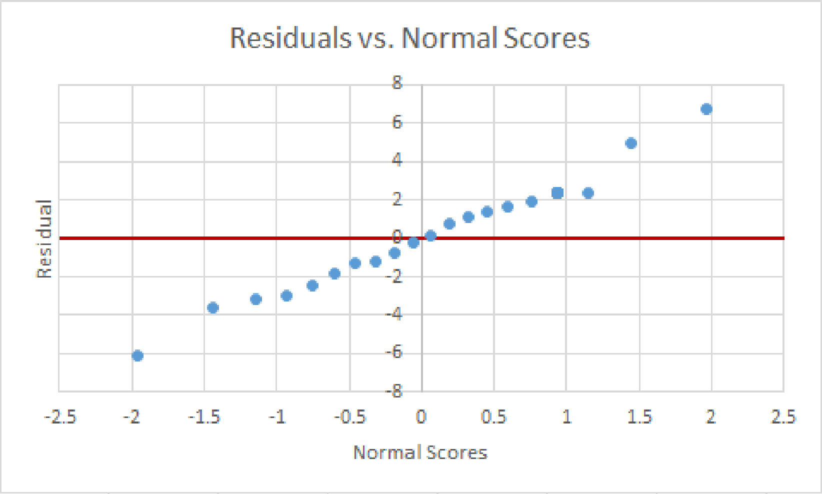


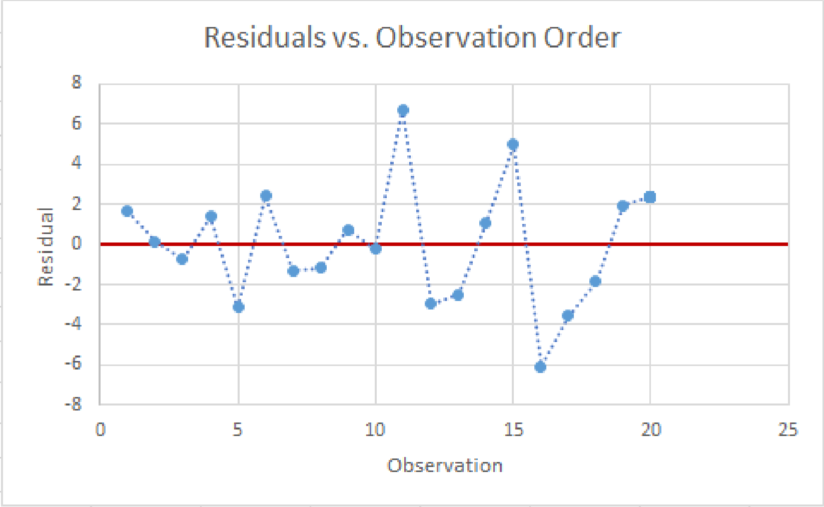
Also, there is a Simple Regression Excel utility available:

Basic Worksheet   Diagnostics Worksheet

Only input is ordered pairs of Predictor (X) and Response (Y) Starting in Row 2. Currently, can accommodate up to n = 1000 data pairs.







Test for Constant Error Variance				
	Breusch-Pagan Chi-Square		0.01406	
		p-value	0.905612	Assumption of Constant Error Variance is REASONABLE
Test for Normally Distributed Errors				
	Ryan-Joiner Correlation		0.989923	
		p-value	0.541667	Assumption of Normally Distributed Errors is REASONABLE
Test for Independent Errors				
	Durbin-Watson Statistic		2.272635	
	Critical	d_L	0.95	
	Values	d_U	1.15	Assumption of Independent Errors is REASONABLE