Psychology 315, Winter 2020, Exam 1 (v2 key)

Name _____ ID _____

Section [AA] (Jessica), [AB] (Jessica), [AC] (Kelly), [AD] (Kelly)

The following problems are worth a total of 100 points. The exam is open book and open note, but not open Google or open to your neighbor's exam. For answers that require calculations, please show your work. **A table for the standard normal distribution is provided at the end of the exam.**

Problem 1 (25 pts.) For this problem, **round all answers to 2 decimal places.**

The following numbers are the heights (in inches) from a sample of 6 men.

`63, 68, 69, 71, 74 and 75`

a) (2 pts.) Median height

The median is 70 inches

b) (3 pts.) Mean height

$63 + 68 + 69 + 71 + 74 + 75 = 420$

The mean is $\frac{420}{6} = 70$ inches

c) (5 pts.) Sums of Squared Deviations (SS_X)

$SS_X = (63 - 70)^2 + (68 - 70)^2 + (69 - 70)^2 + (71 - 70)^2 + (74 - 70)^2 + (75 - 70)^2$

$= 49 + 4 + 1 + 1 + 16 + 25 = 96$

d) (3 pts.) Variance (MS)

The variance is $\frac{96}{6} = 16$

e) (2 pts.) Standard deviation (s)

The standard deviation is $\sqrt{16} = 4$ inches

f) (5 pts.) Find the height that is 1.5 standard deviations above the mean.

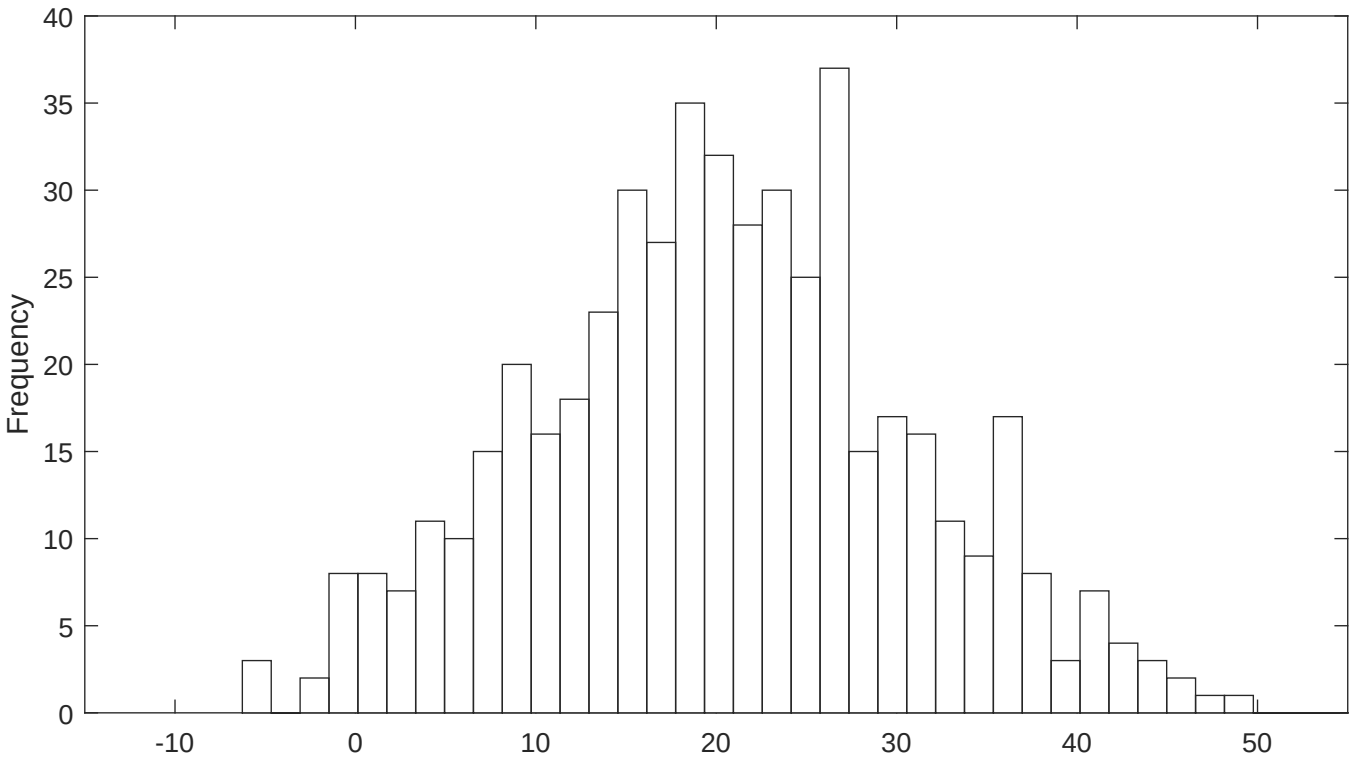
X = 70 + (1.5)(4) = 76 inches

g) (5 pts.) Transform the smallest and largest heights into z-scores.

Smallest: $z = \frac{63-70}{4} = \frac{-7}{4} = -1.75$

Largest: $z = \frac{75-70}{4} = \frac{5}{4} = 1.25$

Problem 2 (5 pts.) For the frequency distribution below, provide your best estimate of:



a) (3 pts.) The mean:

20

b) (2 pts.) The standard deviation:

10

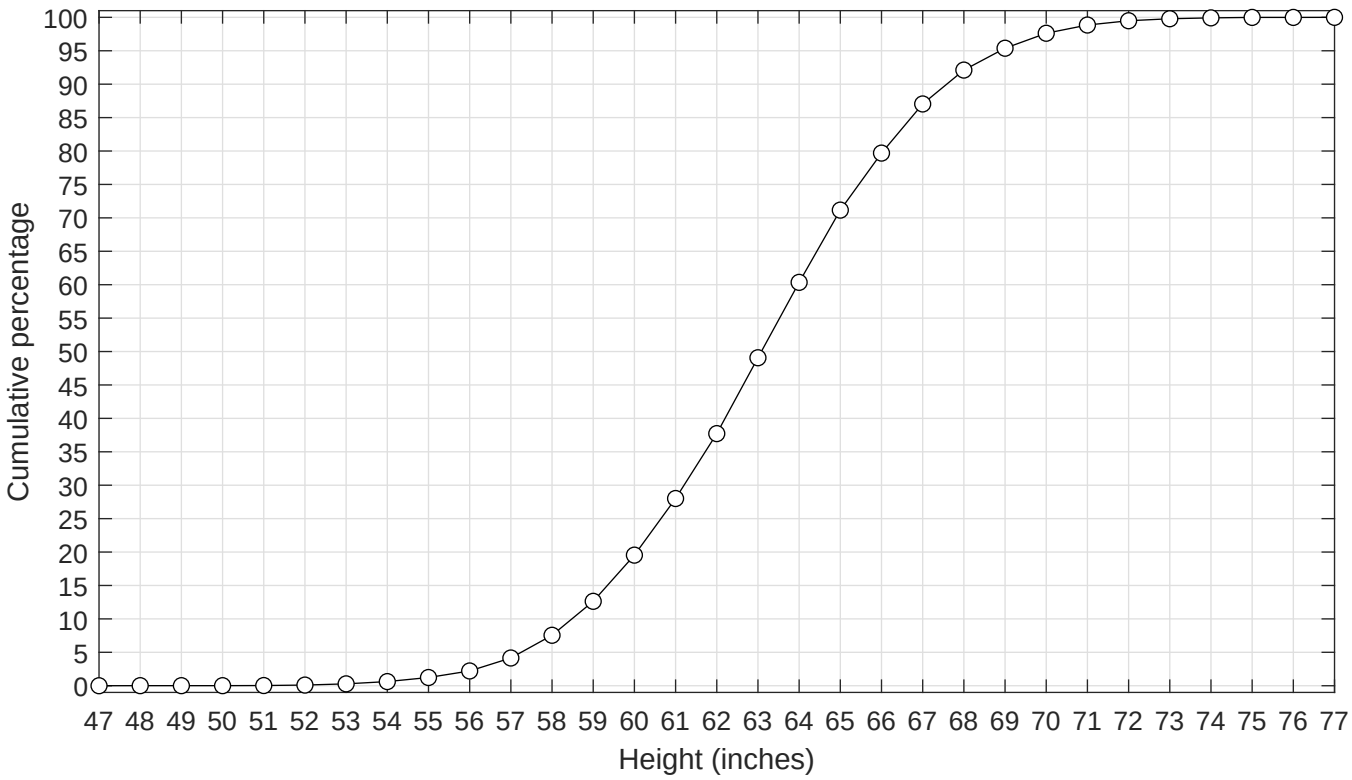
Problem 3a (2 pts.) Circle one: If a sample has a median of 115 and a mean of 100, it is likely:

A) positively skewed
B) negatively skewed
C) normally distributed
D) symmetrical about the mean
E) D and C

Problem 3b (2 pts.) Circle one: For a standard normal distribution, the semi interquartile range (Q) is

A) larger than a standard deviation.
B) equal to the standard deviation.
C) smaller than a standard deviation.
D) equal to the variance.

Problem 4 (20 pts.) For the following cumulative percentage curve for a sample of womens's heights (in inches), estimate:



a) (2 pts.) The median (P_{50}) to the nearest 1/2 inch.

63 inches.

b) (3 pts.) The Semi-Interquartile Range (Q) to the nearest 1/2 inch

$Q = \frac{P_{75} - P_{25}}{2} = \frac{65.5 - 60.5}{2} = 3$ inches

c) (5 pts) The height that exceeds 90% of the rest of the heights to the nearest 1/2 inch.

67.5

d) (5 pts) Assuming that this set of heights is normally distributed, estimate the standard deviation from the graph.

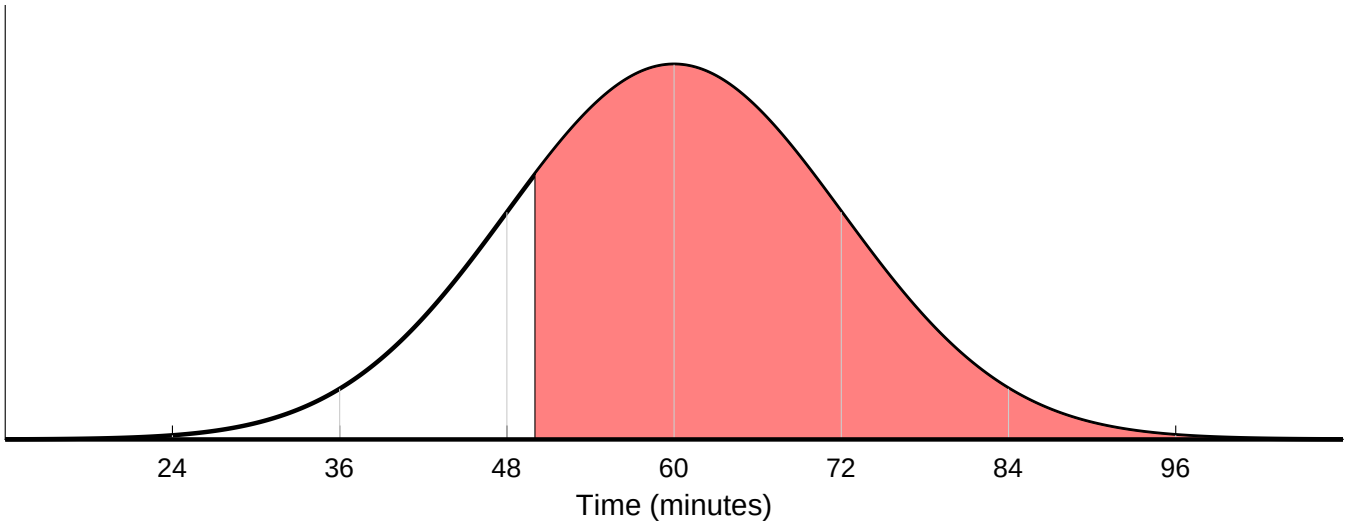
For a normal distribution, one standard deviation below the mean corresponds to the lowest 15.87 percent

This corresponds to a height of about 59.5 inches.

So one standard deviation is the difference between the mean and this height: (63 - 59.5) = 3.5

Problem 5 (15 pts.) Suppose that the amount of time it takes for a class of students to take an exam is distributed normally with a mean of 60 minutes with a standard deviation of 12 minutes.

a) (3 pts.) On the graph below, label the values on the x-axis so that the bell-curve matches these values.



b) (2 pts.) Shade in the region under the curve for times above 50 minutes.

c) (3 pts.) Find the corresponding z-score for 50 minutes (round to two decimal places).

z = $\frac{50-60}{12}$ = -0.83

d) (2 pts.) What percentage of students are still taking the test at 50 minutes? (round to 1 decimal place)

$Pr(z > -0.83) = .5 + Pr(z > 0.83) = 0.2967 + .5 = 0.7967$

79.7 percent of the students.

e) (5 pts.) To the nearest minute, how long will it be when 90% of the students have finished?

z = 1.28
X = 60 + (1.28)(12) = 75 minutes.

Problem 6 (6 points.)

Suppose you have a sample of response times and you replace the longest time with a time that is twice as long. Circle the descriptive statistics that are affected by this change.

Q
Median
Variance
Mean
Range
Mode

Problem 7 (4 pts) For each of the following measures, name the strongest measurement scale that it belongs to:

Measure	**Scale**
number of Facebook friends	Ratio
choice of computer	Nominal
choice of superpower	Nominal
preferred outdoor temperature	Interval

Problem 8 (10 pts) Given the GPA's of 10 students, calculate P_{82} (round to 2 decimal places). Here's a table to help you:

GPA	Rank (C)	C-.5	$R = 100\frac{(C-.5)}{10}$
1	1	0.5	5
1.1	2	1.5	15
1.2	3	2.5	25
1.7	4	3.5	35
1.8	5	4.5	45
2.5	6	5.5	55
2.9	7	6.5	65
3.5	8	7.5	75
3.6	9	8.5	85
4	10	9.5	95

The percentile rank of 82 is between RL = 75 and RH = 85
The percentile point, P_{82}, is therefore between PL = 3.5 and PH = 3.6

$P_{82} = 3.5 + (3.6 - 3.5)\frac{(82-75)}{(85-75)} = 3.57$

Problem 9 (9 points) Given that IQ's are normally distributed with a mean of 100 and a standard devation of 15. What proportion of IQ's fall between 125 and 135?

Converting IQ scores to z-scores:

For an IQ of 125, $z = \frac{125-100}{15} = 1.67$

For an IQ of 135, $z = \frac{135-100}{15} = 2.33$

Converting z-scores to areas under the z-distribution:

The area above z = 1.67 is 0.0475

The area above z = 2.33 is 0.0099

The proportion of IQ's between 125 and 135 is $0.0475 - 0.0099 = 0.0376$

z table: $0 \leq z \leq 0.8$

z	Area between 0 and z	Area beyond z
0.00	0.0000	0.5000
0.01	0.0040	0.4960
0.02	0.0080	0.4920
0.03	0.0120	0.4880
0.04	0.0160	0.4840
0.05	0.0199	0.4801
0.06	0.0239	0.4761
0.07	0.0279	0.4721
0.08	0.0319	0.4681
0.09	0.0359	0.4641
0.10	0.0398	0.4602
0.11	0.0438	0.4562
0.12	0.0478	0.4522
0.13	0.0517	0.4483
0.14	0.0557	0.4443
0.15	0.0596	0.4404
0.16	0.0636	0.4364
0.17	0.0675	0.4325
0.18	0.0714	0.4286
0.19	0.0753	0.4247
0.20	0.0793	0.4207
0.21	0.0832	0.4168
0.22	0.0871	0.4129
0.23	0.0910	0.4090
0.24	0.0948	0.4052
0.25	0.0987	0.4013
0.26	0.1026	0.3974
0.27	0.1064	0.3936
0.28	0.1103	0.3897
0.29	0.1141	0.3859
0.30	0.1179	0.3821
0.31	0.1217	0.3783
0.32	0.1255	0.3745
0.33	0.1293	0.3707
0.34	0.1331	0.3669
0.35	0.1368	0.3632
0.36	0.1406	0.3594
0.37	0.1443	0.3557
0.38	0.1480	0.3520
0.39	0.1517	0.3483
0.40	0.1554	0.3446

z	Area between 0 and z	Area beyond z
0.40	0.1554	0.3446
0.41	0.1591	0.3409
0.42	0.1628	0.3372
0.43	0.1664	0.3336
0.44	0.1700	0.3300
0.45	0.1736	0.3264
0.46	0.1772	0.3228
0.47	0.1808	0.3192
0.48	0.1844	0.3156
0.49	0.1879	0.3121
0.50	0.1915	0.3085
0.51	0.1950	0.3050
0.52	0.1985	0.3015
0.53	0.2019	0.2981
0.54	0.2054	0.2946
0.55	0.2088	0.2912
0.56	0.2123	0.2877
0.57	0.2157	0.2843
0.58	0.2190	0.2810
0.59	0.2224	0.2776
0.60	0.2257	0.2743
0.61	0.2291	0.2709
0.62	0.2324	0.2676
0.63	0.2357	0.2643
0.64	0.2389	0.2611
0.65	0.2422	0.2578
0.66	0.2454	0.2546
0.67	0.2486	0.2514
0.68	0.2517	0.2483
0.69	0.2549	0.2451
0.70	0.2580	0.2420
0.71	0.2611	0.2389
0.72	0.2642	0.2358
0.73	0.2673	0.2327
0.74	0.2704	0.2296
0.75	0.2734	0.2266
0.76	0.2764	0.2236
0.77	0.2794	0.2206
0.78	0.2823	0.2177
0.79	0.2852	0.2148
0.80	0.2881	0.2119

z table: $0.8 \leq z \leq 1.6$

z	Area between 0 and z	Area beyond z
0.80	0.2881	0.2119
0.81	0.2910	0.2090
0.82	0.2939	0.2061
0.83	0.2967	0.2033
0.84	0.2995	0.2005
0.85	0.3023	0.1977
0.86	0.3051	0.1949
0.87	0.3078	0.1922
0.88	0.3106	0.1894
0.89	0.3133	0.1867
0.90	0.3159	0.1841
0.91	0.3186	0.1814
0.92	0.3212	0.1788
0.93	0.3238	0.1762
0.94	0.3264	0.1736
0.95	0.3289	0.1711
0.96	0.3315	0.1685
0.97	0.3340	0.1660
0.98	0.3365	0.1635
0.99	0.3389	0.1611
1.00	0.3413	0.1587
1.01	0.3438	0.1562
1.02	0.3461	0.1539
1.03	0.3485	0.1515
1.04	0.3508	0.1492
1.05	0.3531	0.1469
1.06	0.3554	0.1446
1.07	0.3577	0.1423
1.08	0.3599	0.1401
1.09	0.3621	0.1379
1.10	0.3643	0.1357
1.11	0.3665	0.1335
1.12	0.3686	0.1314
1.13	0.3708	0.1292
1.14	0.3729	0.1271
1.15	0.3749	0.1251
1.16	0.3770	0.1230
1.17	0.3790	0.1210
1.18	0.3810	0.1190
1.19	0.3830	0.1170
1.20	0.3849	0.1151

z	Area between 0 and z	Area beyond z
1.20	0.3849	0.1151
1.21	0.3869	0.1131
1.22	0.3888	0.1112
1.23	0.3907	0.1093
1.24	0.3925	0.1075
1.25	0.3944	0.1056
1.26	0.3962	0.1038
1.27	0.3980	0.1020
1.28	0.3997	0.1003
1.29	0.4015	0.0985
1.30	0.4032	0.0968
1.31	0.4049	0.0951
1.32	0.4066	0.0934
1.33	0.4082	0.0918
1.34	0.4099	0.0901
1.35	0.4115	0.0885
1.36	0.4131	0.0869
1.37	0.4147	0.0853
1.38	0.4162	0.0838
1.39	0.4177	0.0823
1.40	0.4192	0.0808
1.41	0.4207	0.0793
1.42	0.4222	0.0778
1.43	0.4236	0.0764
1.44	0.4251	0.0749
1.45	0.4265	0.0735
1.46	0.4279	0.0721
1.47	0.4292	0.0708
1.48	0.4306	0.0694
1.49	0.4319	0.0681
1.50	0.4332	0.0668
1.51	0.4345	0.0655
1.52	0.4357	0.0643
1.53	0.4370	0.0630
1.54	0.4382	0.0618
1.55	0.4394	0.0606
1.56	0.4406	0.0594
1.57	0.4418	0.0582
1.58	0.4429	0.0571
1.59	0.4441	0.0559
1.60	0.4452	0.0548

z table: $1.6 \leq z \leq 2.4$

z	Area between 0 and z	Area beyond z
1.60	0.4452	0.0548
1.61	0.4463	0.0537
1.62	0.4474	0.0526
1.63	0.4484	0.0516
1.64	0.4495	0.0505
1.65	0.4505	0.0495
1.66	0.4515	0.0485
1.67	0.4525	0.0475
1.68	0.4535	0.0465
1.69	0.4545	0.0455
1.70	0.4554	0.0446
1.71	0.4564	0.0436
1.72	0.4573	0.0427
1.73	0.4582	0.0418
1.74	0.4591	0.0409
1.75	0.4599	0.0401
1.76	0.4608	0.0392
1.77	0.4616	0.0384
1.78	0.4625	0.0375
1.79	0.4633	0.0367
1.80	0.4641	0.0359
1.81	0.4649	0.0351
1.82	0.4656	0.0344
1.83	0.4664	0.0336
1.84	0.4671	0.0329
1.85	0.4678	0.0322
1.86	0.4686	0.0314
1.87	0.4693	0.0307
1.88	0.4699	0.0301
1.89	0.4706	0.0294
1.90	0.4713	0.0287
1.91	0.4719	0.0281
1.92	0.4726	0.0274
1.93	0.4732	0.0268
1.94	0.4738	0.0262
1.95	0.4744	0.0256
1.96	0.4750	0.0250
1.97	0.4756	0.0244
1.98	0.4761	0.0239
1.99	0.4767	0.0233
2.00	0.4772	0.0228

z	Area between 0 and z	Area beyond z
2.00	0.4772	0.0228
2.01	0.4778	0.0222
2.02	0.4783	0.0217
2.03	0.4788	0.0212
2.04	0.4793	0.0207
2.05	0.4798	0.0202
2.06	0.4803	0.0197
2.07	0.4808	0.0192
2.08	0.4812	0.0188
2.09	0.4817	0.0183
2.10	0.4821	0.0179
2.11	0.4826	0.0174
2.12	0.4830	0.0170
2.13	0.4834	0.0166
2.14	0.4838	0.0162
2.15	0.4842	0.0158
2.16	0.4846	0.0154
2.17	0.4850	0.0150
2.18	0.4854	0.0146
2.19	0.4857	0.0143
2.20	0.4861	0.0139
2.21	0.4864	0.0136
2.22	0.4868	0.0132
2.23	0.4871	0.0129
2.24	0.4875	0.0125
2.25	0.4878	0.0122
2.26	0.4881	0.0119
2.27	0.4884	0.0116
2.28	0.4887	0.0113
2.29	0.4890	0.0110
2.30	0.4893	0.0107
2.31	0.4896	0.0104
2.32	0.4898	0.0102
2.33	0.4901	0.0099
2.34	0.4904	0.0096
2.35	0.4906	0.0094
2.36	0.4909	0.0091
2.37	0.4911	0.0089
2.38	0.4913	0.0087
2.39	0.4916	0.0084
2.40	0.4918	0.0082

z table: $2.4 \leq z \leq 3.2$

z	Area between 0 and z	Area beyond z
2.40	0.4918	0.0082
2.41	0.4920	0.0080
2.42	0.4922	0.0078
2.43	0.4925	0.0075
2.44	0.4927	0.0073
2.45	0.4929	0.0071
2.46	0.4931	0.0069
2.47	0.4932	0.0068
2.48	0.4934	0.0066
2.49	0.4936	0.0064
2.50	0.4938	0.0062
2.51	0.4940	0.0060
2.52	0.4941	0.0059
2.53	0.4943	0.0057
2.54	0.4945	0.0055
2.55	0.4946	0.0054
2.56	0.4948	0.0052
2.57	0.4949	0.0051
2.58	0.4951	0.0049
2.59	0.4952	0.0048
2.60	0.4953	0.0047
2.61	0.4955	0.0045
2.62	0.4956	0.0044
2.63	0.4957	0.0043
2.64	0.4959	0.0041
2.65	0.4960	0.0040
2.66	0.4961	0.0039
2.67	0.4962	0.0038
2.68	0.4963	0.0037
2.69	0.4964	0.0036
2.70	0.4965	0.0035
2.71	0.4966	0.0034
2.72	0.4967	0.0033
2.73	0.4968	0.0032
2.74	0.4969	0.0031
2.75	0.4970	0.0030
2.76	0.4971	0.0029
2.77	0.4972	0.0028
2.78	0.4973	0.0027
2.79	0.4974	0.0026
2.80	0.4974	0.0026

z	Area between 0 and z	Area beyond z
2.80	0.4974	0.0026
2.81	0.4975	0.0025
2.82	0.4976	0.0024
2.83	0.4977	0.0023
2.84	0.4977	0.0023
2.85	0.4978	0.0022
2.86	0.4979	0.0021
2.87	0.4979	0.0021
2.88	0.4980	0.0020
2.89	0.4981	0.0019
2.90	0.4981	0.0019
2.91	0.4982	0.0018
2.92	0.4982	0.0018
2.93	0.4983	0.0017
2.94	0.4984	0.0016
2.95	0.4984	0.0016
2.96	0.4985	0.0015
2.97	0.4985	0.0015
2.98	0.4986	0.0014
2.99	0.4986	0.0014
3.00	0.4987	0.0013
3.01	0.4987	0.0013
3.02	0.4987	0.0013
3.03	0.4988	0.0012
3.04	0.4988	0.0012
3.05	0.4989	0.0011
3.06	0.4989	0.0011
3.07	0.4989	0.0011
3.08	0.4990	0.0010
3.09	0.4990	0.0010
3.10	0.4990	0.0010
3.11	0.4991	0.0009
3.12	0.4991	0.0009
3.13	0.4991	0.0009
3.14	0.4992	0.0008
3.15	0.4992	0.0008
3.16	0.4992	0.0008
3.17	0.4992	0.0008
3.18	0.4993	0.0007
3.19	0.4993	0.0007
3.20	0.4993	0.0007