Psychology 315, Winter 2021, Exam 1 (v1 key)

Name _____ ID _____

The following problems are worth a total of 100 points. The exam is open book and open note, but not open Google.

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 women.

`61, 62, 64, 65, 68 and 76`

a) (2 pts.) Median height

The median is 64.5 inches

b) (3 pts.) Mean height

$61 + 62 + 64 + 65 + 68 + 76 = 396$

The mean is $\frac{396}{6} = 66$ inches

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

$SS_X = (61 - 66)^2 + (62 - 66)^2 + (64 - 66)^2 + (65 - 66)^2 + (68 - 66)^2 + (76 - 66)^2$

$= 25 + 16 + 4 + 1 + 4 + 100 = 150$

d) (3 pts.) Population variance (MS)

The variance is $\frac{150}{6} = 25$

e) (2 pts.) Population standard deviation (s)

The standard deviation is $\sqrt{25} = 5$ inches

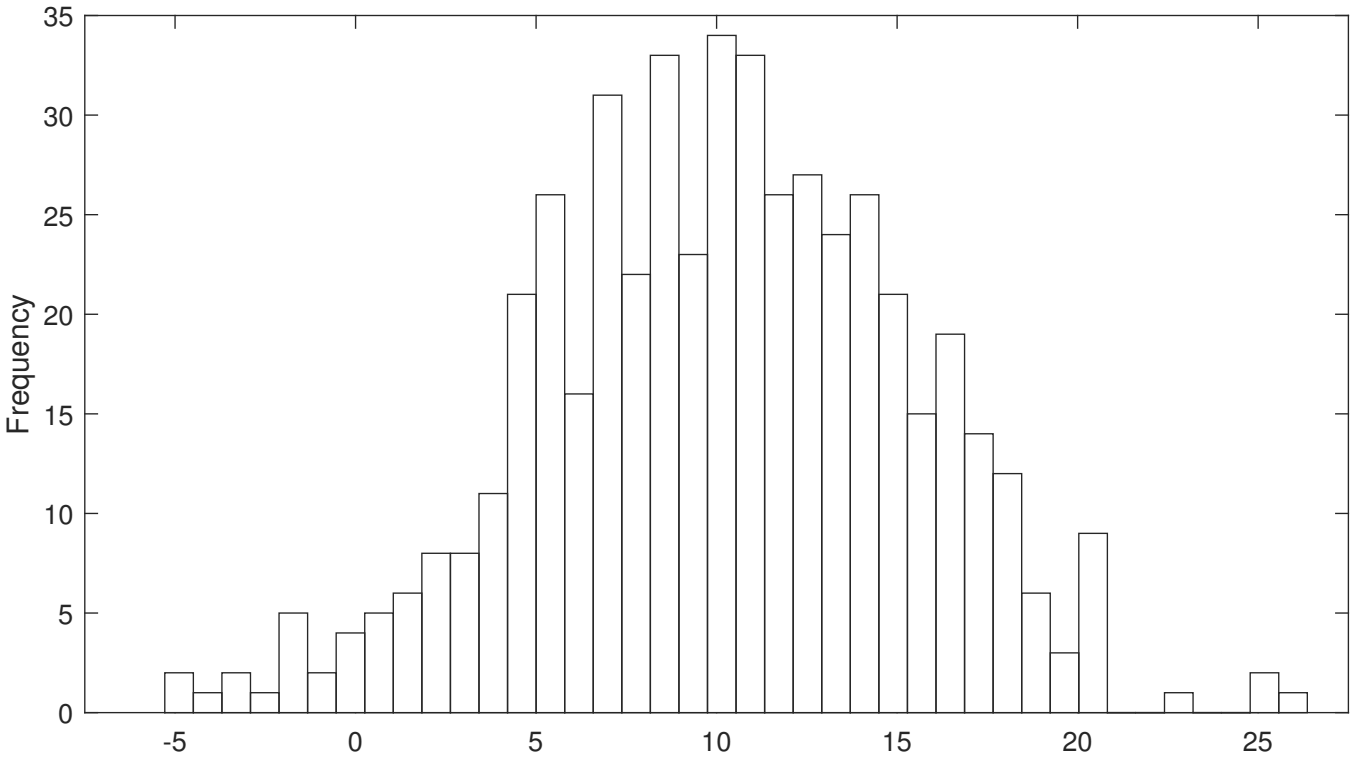
f) (4 pts.) Find the height that is 1.5 standard deviations above the mean.

X = 66 + (1.5)(5) = 73.5 inches

g) (4 pts.) Transform the smallest height into a z-score.

Smallest: $z = \frac{61-66}{5} = \frac{-5}{5} = -1$

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



a) (3 pts.) The mean:

10

b) (2 pts.) The standard deviation:

5

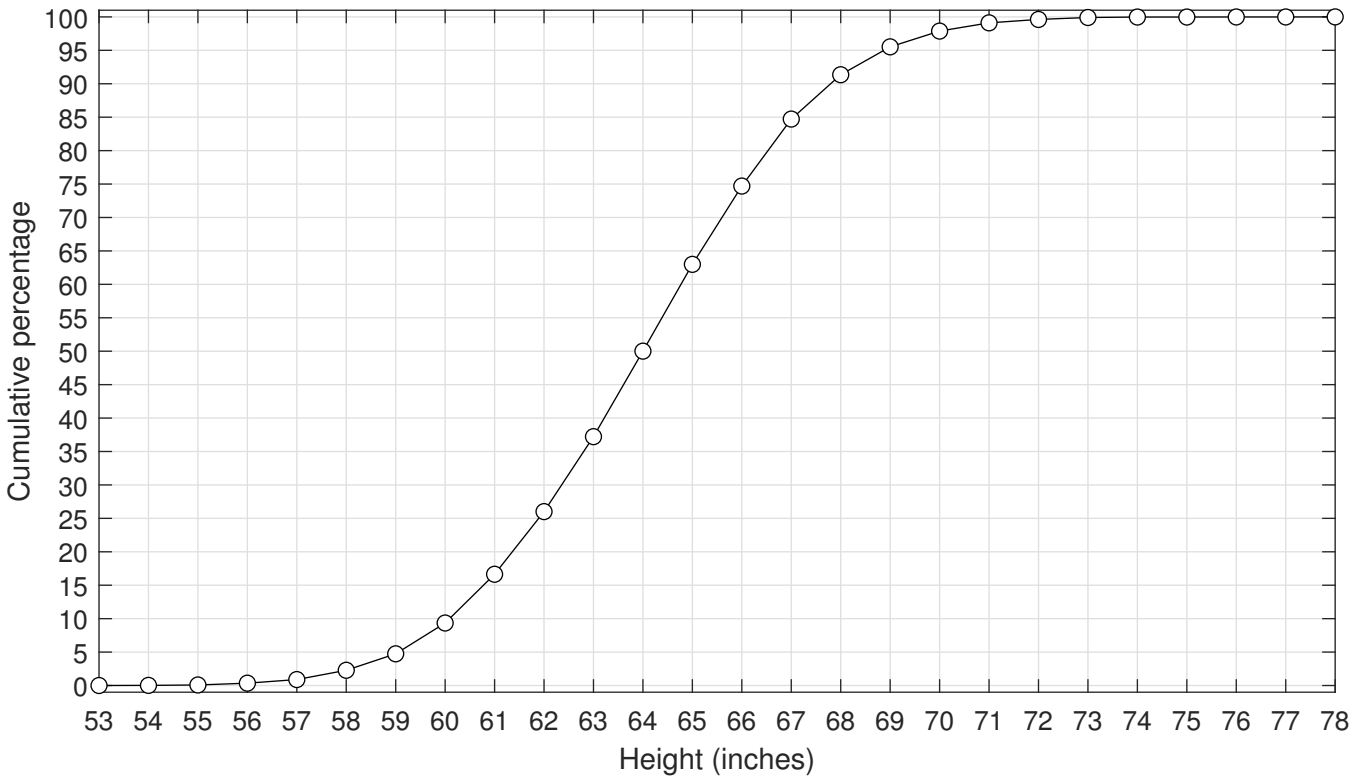
Problem 3a (2 pts.) Circle one: If a sample has a median of 100 and a mean of 115, it is likely:

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

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

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

64 inches.

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

$Q = \frac{P_{75} - P_{25}}{2} = \frac{66-62}{2} = 2$ inches

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

68

d) (5 pts) Assuming that this set of heights is normally distributed, estimate the standard deviation from the graph to the nearest 1/2 inch.

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

This corresponds to a height of about 61 inches.

So one standard deviation is the difference between the mean and this height: (64 - 61) = 3

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 45 minutes with a standard deviation of 6 minutes.

a) (5 pts.) Find the corresponding z-score for 40 minutes (round to two decimal places).

z = $\frac{40-45}{6}$ = -0.83

b) (5 pts.) What percentage of students are still taking the test at 40 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.

c) (5 pts.) To the nearest minute, how long will it be when 99% of the students have finished?

z = 2.33
X = 45 + (2.33)(6) = 58.98 minutes, which rounds to 59 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.

Range
Variance
Mean
Mode
Q
Median

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
preferred outdoor temperature	Interval
choice of computer	Nominal
choice of superpower	Nominal

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	$R = 100\frac{(C-.5)}{10}$
1.3	1	0.5	5
1.4	2	1.5	15
1.5	3	2.5	25
1.6	4	3.5	35
2.3	5	4.5	45
2.4	6	5.5	55
2.7	7	6.5	65
3.1	8	7.5	75
3.2	9	8.5	85
3.6	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 = 3.1 and PH = 3.2

$P_{82} = 3.1 + (3.2 - 3.1)\frac{(82-75)}{(85-75)} = 3.17$

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 110 and 120?

Converting IQ scores to z-scores:

For an IQ of 110, $z = \frac{110-100}{15} = 0.67$

For an IQ of 120, $z = \frac{120-100}{15} = 1.33$

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

The area above z = 0.67 is 0.2514

The area above z = 1.33 is 0.0918

The proportion of IQ's between 110 and 120 is $0.2514 - 0.0918 = 0.1596$

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