IMPORTANT: A z-table, t-table, and chi square table should be attached to this test! Check before beginning this exam.

1) A very common mistake made among people outside of Philadelphia is that they confuse the University of Pennsylvania with Penn State University. This horrible atrocity occurs about 60% of the time. Assuming that people do not influence one another, what is the probability that at least two out of a random sample of five people from Tampa confuse Penn and Penn State?

A) 162 / 625
B) 408 / 625
C) 2853 / 3125
D) 2283 / 3125
E) NOTA

2) If $P(A \mid B) = P(B \mid A)$ but A and B are not independent events, which of the following could be values for P(A) and P(B)?

I) $P(A) = 0, P(B) = 0$
II) $P(A) = .34, P(B) = .66$
III) $P(A) = .99, P(B) = .99$

A) I only
B) III only
C) I, III
D) I, II, III
E) NOTA

3) Ms. Weaver, an AP Statistics teacher, wants to see how students at Palm Harbor University High School did on the AP Statistics exam last year. If two other teachers taught AP Statistics to a total of 60 students, which method should Ms. Weaver use to collect data on the AP exam scores for Statistics?

A) Voluntary Response Sample
B) Census
C) Simple Random Sample
D) Probability Sample
E) NOTA

4) Suppose the population for the baldness factor, which is a numerical measure on the interval (0, 100) with the high numbers representing increased baldness, is normally distributed. Now the baldness factor population has a mean of 64 and a standard deviation of 7. What is the chance that a randomly selected man has severe balding, which is a score ranging fro 75 to 86, exclusively? Round to the nearest percent.

A) 4%
B) 5%
C) 6%
D) 12%
E) NOTA

5) Refer to the information in the previous question. Assuming that baldness factor for all males is a continuous distribution represented by (0, 100), what is the chance that my dad's baldness score, which is a 99.8, is randomly selected from the population of all baldness scores of men?

A) 8.4×10^{-4} C) 5.7×10^{-2} E) NOTA
B) 5.8×10^{-2} D) 1.1×10^{-1}

6) Consider the following information and how the two statements below are able to answer the following question. Note: Do NOT answer the question stated below but choose the answer that gives the best description of statements (1)'s and (2)'s ability to answer it.

Class	Average Age	Number of Students
A	15 years	6
B	16 years	12

Is the standard deviation of ages of students in class A greater than the standard deviation of ages of students in class B?

(1) The difference between the ages of any two student's in class A is always more than a year.
(2) No student in class B is more than six months older than any other student in that class.

A) Statement (1) is sufficient by itself to answer the above question but statement (2) is not sufficient
B) Statement (2) is sufficient by itself to answer the above question but statement (1) is not sufficient
C) Statements (1) and (2) when taken together are sufficient to answer the above question even though either statement by itself is not sufficient
D) Either statements (1) or (2) by itself is sufficient to answer the above question
E) NOTA

7) If X is the average (arithmetic mean) of 6 numbers, which of the following cannot be true?

I) All of the numbers are greater than X
II) All of the numbers are less than or equal to X
III) At least five of the are less than X

A) I only C) I and II E) NOTA
B) II only D) I and III

8) Amy is a pre-law student preparing to take the LSAT test, which is a multiple choice test to evaluate a student's ability to reason. She uses a special computer program to study. The program randomly generates questions that Amy answers until she picks the incorrect choice for one of the questions. At this point, the computer will explain to her why she missed the question. Afterwards, she continues to answer another question in a similar manner as described before. Assuming that Amy has an equally likely chance of answering any randomly generated question when she starts, what probability distribution best describes this situation?

A) Binomial
B) Geometric
C) Uniform
D) Poisson
E) NOTA

9) A one tailed test would be most appropriate in which of the following situations?

A) Taking the hypothesis that there is no significant difference between the productivity of two companies
B) Taking the hypothesis that one process is significantly different from another
C) Taking the hypothesis that more people attended the state convention last year than the year before
D) Taking the hypothesis that one process is significantly worse than another
E) NOTA

10) Mrs. Linder is a very sneaky lady and loves to give pop quizzes. On Monday, she has an 80% of giving one, assuming that the Tampa Bay Buccaneers won the Sunday before. She will normally give a pop quiz on Monday about 50% of the time. Interestingly, the Buccaneers have a 95% chance of winning if Mrs. Linder gives a pop quiz the week before. What is the probability that the Buccaneers win a random Sunday game (assume this value is constant and you have no information on when Mrs. Linder gave her last pop quiz? Round to 2 decimal places.

A) .76
B) .59
C) .48
D) .42
E) NOTA

11) A certain population follows a normal distribution with mean μ and standard deviation $\sigma = 2.5$. You collect data and test the following hypothesis: H_0: $\mu = 17$, $H_{A:}$ $\mu \neq 17$. You then obtain a p-value of .034. Which of the following then must be true?

A) A 95% confidence interval will include the value 17
B) A 95% confidence interval will include the value 15
C) A 99% confidence interval will include the value 17
D) A 99% confidence interval will include the value 15
E) NOTA

12) If we define percentile as the percentage of people who a person did better than on a test, which of the following represents the interval of values that one's percentile could be on the SAT test?

A) [0, 100] C) (0, 100] E) NOTA
B) [0, 100) D) (0, 100)

13) Bacteria in a hamburger are dispersed throughout the meat according to a Poisson distribution. Suppose that a large batch of hamburger has an average contamination of .3 bacteria per gram. Then the probability that a 10 g sample will contain one or fewer bacteria is: (Round to 4 decimal places)

HINT: The formula for Poisson Distribution is:
$P(X = k) = (e^{-\mu} * \mu^{k}) / k!$,
where e = 2.71..., μ = mean of sample, and k = 0, 1, 2, . . .

A) .1991 C) .7408 E) NOTA
B) .2222 D) .9603

Use the following information for questions 14 to 17.

A regular bag of M&Ms is suppose to have an equal number of each color. One day, Beth opens a bag that had 18 blue, 8 green, 15 red, 17 brown, 12 orange, and 16 yellow M&Ms. She wanted to see if her bag is considered "normal" and performs the appropriate hypothesis test.

14) What is the null hypothesis for Beth's test?

A) Each color M&Ms distribution is random and independent of the other's distribution
B) The number of M&Ms is not proportional to the number of colors
C) Beth's bag is not "normal"
D) Each color has an equal number of M&Ms
E) NOTA

15) What is the hundredths place of Beth's test statistic?

A) 3 C) 5 E) NOTA
B) 4 D) 6

16) Beth, who was recently hired to be the CEO of M&M Corporation, is now forced to make an executive decision as to whether her bag is "normal" based on the results of her hypothesis test. Is Beth's bag "normal" at a significance level $\alpha = .05$? What about $\alpha = .01$?

A) Yes for both significance levels
B) No for $\alpha = .05$, Yes for $\alpha = .01$
C) Yes for $\alpha = .05$, No for $\alpha = .01$
D) No for both significance levels
E) NOTA

17) What is the chance that Beth picks a blue M&M out her bag if she accidentally spilled 14 red M&Ms into the bag?

A) .12 C) .18 E) NOTA
B) .16 D) .19

18) If the correlation between the numbers of packs smoked a day and the percentage of the lung affected by cancer tumors is .92, which of the following statements best interprets this value?

A) A smoker has a probability of 92% of becoming diagnosed with lung cancer
B) If a person smokes, he or she will most likely get lung cancer
C) Smoking more and lung cancer tend to occur together in a person
D) Lung cancer tends to occur more often in smokers than in non-smokers
E) NOTA

19) A group of nutritionists is hoping to prove that a new soya bean compound has more protein per gram than roast beef, which has a mean protein content of 20. A random sample of 5 batches of the soya compound have been tested, with the following results:

Protein Content: 15, 22, 17, 19, 23

What assumption(s) do we have to make in order to carry out a legitimate statistical test of the nutritionists' claim?

A) The observations are from a normally distributed population
B) The mean protein content of the 5 batches follows a normal distribution
C) The variance of the population is known
D) Both (A) and (B) must be assumed
E) NOTA

20) Refer to the previous question. What are the appropriate statistical hypotheses and the observed value of the corresponding test statistic?

A) H_0: $\mu = 20$, $H_{A:}$ $\mu < 20$ and $t^* = (19.2 - 20)/\sqrt{11.2/5}$
B) H_0: $\mu = 20$, $H_{A:}$ $\mu > 20$ and $t^* = (19.2 - 20)/\sqrt{11.2/5}$
C) H_0: $\mu = 20$, $H_{A:}$ $\mu > 20$ and $z^* = (19.2 - 20)/\sqrt{11.2/5}$
D) H_0: $\mu = 20$, $H_{A:}$ $\mu < 20$ and $z^* = (19.2 - 20)/\sqrt{11.2/5}$
E) NOTA

21) Suppose an independent research facility wishes to test if a feed Mr. Macfarlane developed increases the mean weight gain compared to the brand name feed. At the conclusion of the experiment, it was found that the new feed gave a 10 kg bigger gain than the old feed. A two sample t-test with the proper one sided alternatives was done and the resulting p-value was .082. This means:

A) There is an 8.2% chance that the null hypothesis is true
B) There was only an 8.2% chance of observing an increase greater than 10 kg (assuming the null hypothesis is true)
C) There was only an 8.2% chance of observing an increase greater than 10 kg (assuming the null hypothesis is not true)
D) There is only an 8.2% chance of getting a 10 kg increase
E) NOTA

22) The following are percentages of fat found in 5 samples in each of two brands of ice cream.

Brand A:	5.7	4.5	6.2	6.3	7.3
Brand B:	6.3	5.7	5.9	6.4	5.1

Which of the following is appropriate to test the hypothesis of equal average fat in the two types of ice cream? Use the conservative estimate for the degrees of freedom.

A) Paired t-test with 5 degrees of freedom
B) Two sample t-test with 9 degrees of freedom
C) Paired t-test with 4 degrees of freedom
D) Two sample t-test with 4 degrees of freedom
E) NOTA

23) Look around at the other people taking this test (but don't cheat because then P(trophy in your future) = 0!) Let's pretend that fifteen of you are selected at random. What is the probability that at least two of the fifteen are born on the same day? 1 year = 365 days.

A) $\approx 1/10$ C) $\approx 2/7$ E) NOTA
B) $\approx 1/4$ D) $\approx 1/3$

24) Rain and Jessi are both SAT teachers. Unfortunately, Rain recently became sick and consequently his class's performances suffered. To help Rain out and make him appear more favorable to the manager, Jessi said she would combine her class's scores with Rain's class's scores. Now Rain's class average on the SAT is 1890 with a variance of 1000 points. Jessi's class average is a 2140 with a standard deviation of 70 points. If the correlation between Rain's class's and Jessi's class's scores is .6, what is the standard deviation of the new combined distribution?

A) 76.6 C) 92.5 E) NOTA
B) 85.0 D) 101.6

25) Mrs. Bryzicki loves coffee a lot; in fact, she loves it almost too much. Mrs. Bryzicki even has a secret recipe for a coffee based drink that will give her extra energy for the entire day. Now on a survey that asked Mrs. Bryzicki to describe what is in her favorite drinks, which for her is the secret coffee energy drink, she lied and said it was Diet Coke. Which of the following terms best describes this situation?

A) Hidden Bias C) Placebo Effect E) NOTA
B) Hawthrone Effect D) Response Bias

26) An insurance company issues a policy on a small boat under the following conditions: The replacement cost ($5000) will be paid for a total loss, i.e. the boat is irreparable. If the boat is not irreparable but the damage is more than $2000, then the insurance company will pay $1500 to the boat owner. Nothing will be paid out for damages costing less than $2000. The company estimates the probability of the first three events to be .02, .10 and .88, respectively. What amount should the company charge if it wishes to make a profit of $50 over the expected amount paid out for any one claim in a year?

A) $165 C) $300 E) NOTA
B) $250 D) $1200

27) Suppose the average score on this test is a 50 and the standard deviation is 10 points. If in order to receive a trophy you would have to be in the 90 %tile, what score would need in order to win one, assuming the scores are normally distributed? Round to the nearest integer.

A) 62
B) 63
C) 75
D) 76
E) NOTA

28) In order to obtain a valid confidence interval, what assumption must be made?

A) We have a "large" random sample from a normal population.
B) We have a "large" random sample from some population (but it need not be a normal one because of the Central Limit Theorem).
C) The population is normal (but we do not require a "large" random sample because of the Central Limit Theorem).
D) The population size is "large" enough to make any sampling distribution approximately normal (because of the Central Limit Theorem).
E) NOTA

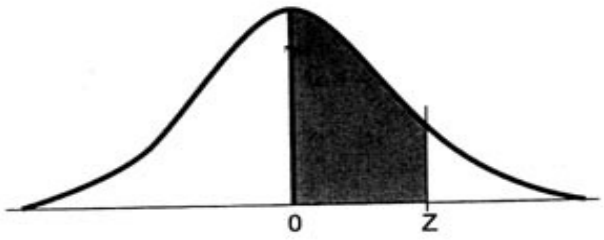
29) Which of the following is a quantitative variable?

A) Gender
B) Phone Number
C) Religious Affiliation
D) Color of FAMAT Trophies
E) NOTA

30) Mrs. Piotrowski, a music buff, wants to estimate the percentage of students in Palm Harbor University who believe that Elvis is still alive. How many students should she sample if she wants a 90% confidence interval that is less than 10 percentage points wide?

A) 68
B) 97
C) 271
D) 385
E) NOTA

Z - Table



This table presents the area between the mean and the Z score . When Z=1.96, the shaded area is 0.4750.

Areas Under the Standard Normal Curve

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	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000									

Source: Adapted by permission from *Statistical Methods* by George W. Snedecor and William G. Cochran, sixth edition © 1967 by The Iowa State University Press, Ames, Iowa, p. 548.

T - Table

df	$t_{0.1}$	$t_{0.05}$	$t_{0.025}$	$t_{0.01}$	$t_{0.005}$
2	1.89	2.92	4.3	6.96	9.92
3	1.64	2.35	3.18	4.54	5.84
4	1.53	2.13	2.78	3.75	4.6
5	1.48	2.02	2.57	3.36	4.03
6	1.44	1.94	2.45	3.14	3.71
7	1.41	1.89	2.36	3.	3.5
8	1.4	1.86	2.31	2.9	3.36
9	1.38	1.83	2.26	2.82	3.25
10	1.37	1.81	2.23	2.76	3.17
11	1.36	1.8	2.2	2.72	3.11
12	1.36	1.78	2.18	2.68	3.05
13	1.35	1.77	2.16	2.65	3.01
14	1.35	1.76	2.14	2.62	2.98
15	1.34	1.75	2.13	2.6	2.95
16	1.34	1.75	2.12	2.58	2.92
17	1.33	1.74	2.11	2.57	2.9
18	1.33	1.73	2.1	2.55	2.88
19	1.33	1.73	2.09	2.54	2.86
20	1.33	1.72	2.09	2.53	2.85
21	1.32	1.72	2.08	2.52	2.83
22	1.32	1.72	2.07	2.51	2.82
23	1.32	1.71	2.07	2.5	2.81
24	1.32	1.71	2.06	2.49	2.8
25	1.32	1.71	2.06	2.49	2.79
26	1.31	1.71	2.06	2.48	2.78
27	1.31	1.7	2.05	2.47	2.77
28	1.31	1.7	2.05	2.47	2.76
29	1.31	1.7	2.05	2.46	2.76
30	1.31	1.7	2.04	2.46	2.75
35	1.31	1.69	2.03	2.44	2.72
40	1.3	1.68	2.02	2.42	2.7
50	1.3	1.68	2.01	2.4	2.68
60	1.3	1.67	2.	2.39	2.66
70	1.29	1.67	1.99	2.38	2.65
80	1.29	1.66	1.99	2.37	2.64
90	1.29	1.66	1.99	2.37	2.63
100	1.29	1.66	1.98	2.36	2.63
200	1.29	1.65	1.97	2.35	2.6
300	1.28	1.65	1.97	2.34	2.59
400	1.28	1.65	1.97	2.34	2.59
∞	$z_{0.1}$	$z_{0.05}$	$z_{0.025}$	$z_{0.01}$	$z_{0.005}$
	1.28	1.645	1.96	2.33	2.58

Chi-Square Table

χ^2 CRITICAL VALUES

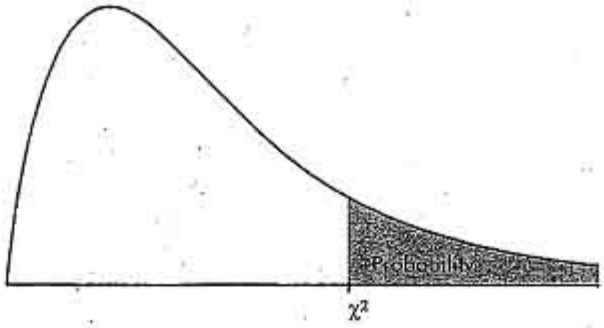


TABLE C: χ^2 CRITICAL VALUES

	Tail probability p										
df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001
1	1.32	1.64	2.07	2.71	3.84	5.02	5.41	6.63	7.88	9.14	10.83
2	2.77	3.22	3.79	4.61	5.99	7.38	7.82	9.21	10.60	11.98	13.82
3	4.11	4.64	5.32	6.25	7.81	9.35	9.84	11.34	12.84	14.32	16.27
4	5.39	5.99	6.74	7.78	9.49	11.14	11.67	13.28	14.86	16.42	18.47
5	6.63	7.29	8.12	9.24	11.07	12.83	13.39	15.09	16.75	18.39	20.51
6	7.84	8.56	9.45	10.64	12.59	14.45	15.03	16.81	18.55	20.25	22.46
7	9.04	9.80	10.75	12.02	14.07	16.01	16.62	18.48	20.28	22.04	24.32
8	10.22	11.03	12.03	13.36	15.51	17.53	18.17	20.09	21.95	23.77	26.12
9	11.39	12.24	13.29	14.68	16.92	19.02	19.68	21.67	23.59	25.46	27.88
10	12.55	13.44	14.53	15.99	18.31	20.48	21.16	23.21	25.19	27.11	29.59
11	13.70	14.63	15.77	17.28	19.68	21.92	22.62	24.72	26.76	28.73	31.26
12	14.85	15.81	16.99	18.55	21.03	23.34	24.05	26.22	28.30	30.32	32.91
13	15.98	16.98	18.20	19.81	22.36	24.74	25.47	27.69	29.82	31.88	34.53
14	17.12	18.15	19.41	21.06	23.68	26.12	26.87	29.14	31.32	33.43	36.12
15	18.25	19.31	20.60	22.31	25.00	27.49	28.26	30.58	32.80	34.95	37.70
16	19.37	20.47	21.79	23.54	26.30	28.85	29.63	32.00	34.27	36.46	39.25
17	20.49	21.61	22.98	24.77	27.59	30.19	31.00	33.41	35.72	37.95	40.79
18	21.60	22.76	24.16	25.99	28.87	31.53	32.35	34.81	37.16	39.42	42.31
19	22.72	23.90	25.33	27.20	30.14	32.85	33.69	36.19	38.58	40.88	43.82
20	23.83	25.04	26.50	28.41	31.41	34.17	35.02	37.57	40.00	42.34	45.31
21	24.93	26.17	27.66	29.62	32.67	35.48	36.34	38.93	41.40	43.78	46.80
22	26.04	27.30	28.82	30.81	33.92	36.78	37.66	40.29	42.80	45.20	48.27
23	27.14	28.43	29.98	32.01	35.17	38.08	38.97	41.64	44.18	46.62	49.73
24	28.24	29.55	31.13	33.20	36.42	39.36	40.27	42.98	45.56	48.03	51.18
25	29.34	30.68	32.28	34.38	37.65	40.65	41.57	44.31	46.93	49.44	52.62
26	30.43	31.79	33.43	35.56	38.89	41.92	42.86	45.64	48.29	50.83	54.05
27	31.53	32.91	34.57	36.74	40.11	43.19	44.14	46.96	49.64	52.22	55.48
28	32.62	34.03	35.71	37.92	41.34	44.46	45.42	48.28	50.99	53.59	56.89
29	33.71	35.14	36.85	39.09	42.56	45.72	46.69	49.59	52.34	54.97	58.30
30	34.80	36.25	37.99	40.26	43.77	46.98	47.96	50.89	53.67	56.33	59.70
40	45.62	47.27	49.24	51.81	55.76	59.34	60.44	63.69	66.77	69.70	73.40
50	56.33	58.16	60.35	63.17	67.50	71.42	72.61	76.15	79.49	82.66	86.66
60	66.98	68.97	71.34	74.40	79.08	83.30	84.58	88.38	91.95	95.34	99.61
80	88.13	90.41	93.11	96.58	101.9	106.6	108.1	112.3	116.3	120.1	124.8
100	109.1	111.7	114.7	118.5	124.3	129.6	131.1	135.8	140.2	144.3	149.4