STAT 211 TEST #2

1. This is a 80 minute closed book test.

2. You are allowed to use a NON-PROGRAMMABLE calculator.

3. All electronic devices should be turned off and put away. Please do this now.

4. Make sure you record your multiple choice answers in the appropriate space provided.

5. Please be sure to show all necessary calculations / essential steps for written questions in the space provided.

6. You may use the rough work pages for rough work. These will not be marked. Please be sure and keep all pages of this exam booklet together and stapled.

7. A Normal probability table has also been provided for you.

8. You will be marked on the clarity and completeness of your answers. An answer without a solution is not worth any marks.

Pink /Blue

PART I—MULTIPLE CHOICE ***[1 MARK EACH; NO PART MARKS] Please record your answers on the last page. This page is NOT marked.***

1. Suppose that the wages of workers for a given company are normally distributed with a mean of $15 per hour. When we consider the proportion of the workers earning more than $13 per hour, we see that:

A) it is less than the proportion earning less than $13 per hour.
B) it is greater than the proportion earning less than $18 per hour.
C) it is more than 50%.
D) it is less than the proportion earning more than the mean wage.
E) none of the above statements are correct.

2. If I flip a fair coin 6 times, what is the probability that I will flip more than three tails given that I flipped more than 2 heads?

A) 0.1563
B) 0.4762
C) 0.3847
D) 0.0313
E) none of these

3. A college basketball player fails to make 60% of his free throws. Over the course of the games played during the next month, he will attempt 10 free throws. Assuming free throw attempts are independent, what is the probability that he makes at least 9 of these attempts?

A) 0.0403 B) 0.400 **C) 0.0017** D) 0.0464 E) none of these

~~**4.** The internal auditing staff of a local manufacturing company perform a sample audit each quarter to estimate the proportion of accounts that are delinquent. The historical records of the company show that over the past 8 years 13 percent of the accounts are delinquent. For this quarter, the auditing staff randomly selected 250 customer accounts. What is the approximate probability that more than 40 accounts will be classified as delinquent?~~

~~A) 42.07 % B) 61.03 % C) 7.93 % **D) 38.97 %** E) 90.15%~~

5. An airplane is only allowed a gross passenger weight of 8,000 kg. If the weights of passengers traveling by air between Toronto and Vancouver have a mean of 78 kg and a standard deviation of 7 kg, the approximate probability that the combined weight of 100 passengers will exceed 8,000 kg is:

A) 0.6141 B) 0.4902 C) 0.1103 D) 0.0764 **E) 0.0021**

6. The probability that the Red River will flood in any given year has been estimated from 200 years of historical data to be one in four. This means:

A) The Red River will flood roughly every four years on average.
B) In the next 100 years, the Red River will flood exactly 25 times.
C) In the last 100 years, the Red River flooded exactly 25 times.
D) In the next 100 years, the Red River will flood exactly 25 times.
E) In the next 100 years, it is very likely that the Red River will flood exactly 25 times.

7. A random variable "X" has a distribution represented by the following probability distribution

x_i	$P(X = x_i)$
-1	3c
0	2c
2	2c
4	c

where "c" is a constant real number. The sum of the variance and the mean squared is

A) 191/64 **B)** 27/8
C) 4 D) can not be determined from the given information.

8. In 2006 it was found that 45% of Canadians felt they were overtaxed. If a poll of 1,000 people was conducted, what is the chance that the sample proportion would accurately reflect the population proportion, to within 2 percentage points (either way)?

A) 0.898
B) 0.064
C) 0.987
D) 0.04
E) none of these

Story:
The two-child family is sometimes recommended as a way to achieve zero population growth. To see how well it works, suppose every woman tried to attain it. About 70% would succeed, while 15% would fall short due to infertility, and another 15% would fall short due to never marrying, or early divorce. Assume that P(having a boy) = P(having a girl) = 0.50. So the distribution of children per woman would be roughly as follows:

children	relative frequency
0	30%
1	10%
2	60%

9. Follows from story. As a result of the above distribution, for every 1,000 people in this generation, the number in the next generation would be roughly*:*

:

A) 1300 ***B) 650*** *C) 100* *D) 600* *E) None of these*

10. Follows from story: How would this affect the population in the long-run?

A) It would increase.
B) It would decrease.
C) It would remain constant.
D) It is impossible to say with the information given.

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STAT 211 Test #2 Formula Sheet

1. Expected value and Variance of a Discrete Random Variable: $\mu_X = \sum_{All\ x} x\,p(x)$ and $\sigma_X^2 = \sum_{All\ x} (x-\mu_X)^2\,p(x)$

2. The Binomial Distribution: $p(x) = \frac{n!}{x!(n\text{-}x)!}\,p^x q^{n\text{-}x}$, $x = 0, 1, 2, \ldots, n$. $\mu_X = np$, $\sigma_X^2 = npq$. **Note**: $q = 1\text{-}p$

3. For a Normal random variable, X, $Z = \frac{X-\mu}{\sigma}$

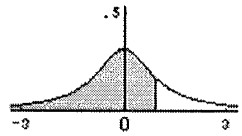
4. The mean and the standard deviation of the sample mean $\bar{x}$: $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

5. The standard deviation of the sample mean $\bar{x}$ for a finite population = $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}\sqrt{\frac{N-n}{N-1}}$

6. $Z = \frac{\bar{X}-\mu}{\sigma_{\bar{x}}}$

7. The mean and the standard deviation of the sample proportion $\hat{p}$: $\mu_{\hat{p}} = p$ and $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$

8. $Z = \frac{\hat{P}-p}{\sigma_{\hat{P}}}$



Quantiles of the T-Distribution

Tabulated values are q-th quantiles for selected values of q from .6 to .999.

area / df	.6	.7	.75	.8	.9	.95	.975	.99	.995	.999
1	0.325	0.727	1.000	1.376	3.078	6.314	12.71	31.82	63.66	318.3
2	0.289	0.617	0.816	1.061	1.886	2.920	4.303	6.965	9.925	22.33
3	0.277	0.584	0.765	0.978	1.638	2.353	3.182	4.541	5.841	10.21
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11	0.260	0.540	0.697	0.876	1.363	1.796	2.201	2.718	3.106	4.025
12	0.259	0.539	0.695	0.873	1.356	1.782	2.179	2.681	3.055	3.930
13	0.259	0.538	0.694	0.870	1.350	1.771	2.160	2.650	3.012	3.852
14	0.258	0.537	0.692	0.868	1.345	1.761	2.145	2.624	2.977	3.787
15	0.258	0.536	0.691	0.866	1.341	1.753	2.131	2.602	2.947	3.733
16	0.258	0.535	0.690	0.865	1.337	1.746	2.120	2.583	2.921	3.686
17	0.257	0.534	0.689	0.863	1.333	1.740	2.110	2.567	2.898	3.646
18	0.257	0.534	0.688	0.862	1.330	1.734	2.101	2.552	2.878	3.610
19	0.257	0.533	0.688	0.861	1.328	1.729	2.093	2.539	2.861	3.579
20	0.257	0.533	0.687	0.860	1.325	1.725	2.086	2.528	2.845	3.552
21	0.257	0.532	0.686	0.859	1.323	1.721	2.080	2.518	2.831	3.527
22	0.256	0.532	0.686	0.858	1.321	1.717	2.074	2.508	2.819	3.505
23	0.256	0.532	0.685	0.858	1.319	1.714	2.069	2.500	2.807	3.485
24	0.256	0.531	0.685	0.857	1.318	1.711	2.064	2.492	2.797	3.467
25	0.256	0.531	0.684	0.856	1.316	1.708	2.060	2.485	2.787	3.450
26	0.256	0.531	0.684	0.856	1.315	1.706	2.056	2.479	2.779	3.435
27	0.256	0.531	0.684	0.855	1.314	1.703	2.052	2.473	2.771	3.421
28	0.256	0.530	0.683	0.855	1.313	1.701	2.048	2.467	2.763	3.408
29	0.256	0.530	0.683	0.854	1.311	1.699	2.045	2.462	2.756	3.396
30	0.256	0.530	0.683	0.854	1.310	1.697	2.042	2.457	2.750	3.385
35	0.255	0.529	0.682	0.852	1.306	1.690	2.030	2.438	2.724	3.340
40	0.255	0.529	0.681	0.851	1.303	1.684	2.021	2.423	2.704	3.307
50	0.255	0.528	0.679	0.849	1.299	1.676	2.009	2.403	2.678	3.261
100	0.254	0.526	0.677	0.845	1.290	1.660	1.984	2.364	2.626	3.174
∞	0.253	0.524	0.674	0.842	1.282	1.645	1.960	2.326	2.576	3.090

Cumulative distribution for a N(0,1) random variable

x	0	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

Table 8.1: The Cumulative Distribution Function $F(x) = P(X \leq x)$ for a $G(0, 1)$ random variable

:

Stat 211 Test 2

Last (Family) Name: **First (Given) Name:**

PART I—WRITTEN QUESTIONS (Show all calculations / formulas used / essential steps in order to receive part or full marks)

1. Suppose the probability distribution of a random variable X can be described by the formula

p(x) = P(X = x) = $\frac{k}{x}$ for each of the values of x = 1, 2, 3, and 4; 0 otherwise.

a. What value of k makes the function a valid probability distribution function? ***[2 marks]***

$$\Sigma p(x) = 1 = \frac{k}{1} + \frac{k}{2} + \frac{k}{3} + \frac{k}{4}$$

$$1 = \frac{25k}{12}$$

$$\frac{12}{25} = k.$$

b. What is the expected value of X? ***[2 marks]*** (If you were unable to solve for the value of k in part a., then express your answer to this question in terms of k, and you could still get full marks for this part of the questions, provided you do it correctly).

$$E(X) = \Sigma[p(x)]x$$

$$= \Sigma\, x\, k/x$$

$$= \Sigma\, k$$

$$= 4k = \frac{48}{25}$$

2) Clearly, state the Central Limit Theorem, as it applies to the sampling distribution of $\bar{Y}$. Be sure to include expected value, spread, and shape here for full marks.
[3 marks]

[[1.5]] Let X_i have mean μ and variance σ^2 for all i

Let X_i be independent of all other X_j's.

Then for large n

[[.5]] [[.5]]

$$\bar{X} \sim N(\mu, \sigma^2/n)$$

[[.5]]

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7. A Normal probability table has also been provided for you.

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Grey / green.

PART I—MULTIPLE CHOICE *[1 MARK EACH; NO PART MARKS] Please record your answers on the last page. This page is NOT marked.*

1. Suppose that the wages of workers for a given company are normally distributed with a mean of $15 per hour. When we consider the proportion of the workers earning more than $13 per hour, we see that:

A) it is less than the proportion earning less than $13 per hour.
B) it is greater than the proportion earning less than $18 per hour.
C) it is less than 50%.
D) it is less than the proportion earning more than the mean wage.
E) none of the above statements are correct.

2. If I flip a fair coin 5 times, what is the probability that I will flip more than two tails given that I flipped more than 1 head?

A) 0.1563
B) 0.3125
C) 0.3847
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3. A college basketball player fails to make 40% of his free throws. Over the course of the games played during the next month, he will attempt 10 free throws. Assuming free throw attempts are independent, what is the probability that he makes at least 9 of these attempts?

A) 0.0403 B) 0.400 C) 0.0017 **D) 0.0464** E) none of these

4. The internal auditing staff of a local manufacturing company perform a sample audit each quarter to estimate the proportion of accounts that are delinquent. The historical records of the company show that over the past 8 years 13 percent of the accounts are delinquent. For this quarter, the auditing staff randomly selected 250 customer accounts. What is the approximate probability that no more than 40 accounts will be classified as delinquent?

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5. An airplane is only allowed a gross passenger weight of 8,000 kg. If the weights of passengers traveling by air between Toronto and Vancouver have a mean of 78 kg and a standard deviation of 7 kg, the approximate probability that the combined weight of 100 passengers will exceed 8,000 kg is:

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6. The probability that the Red River will flood in any given year has been estimated from 200 years of historical data to be one in four. This means:

A) The Red River will flood every four years.
B) In the next 100 years, the Red River will flood exactly 25 times.
C) In the last 100 years, the Red River flooded exactly 25 times.
D) In the next 100 years, the Red River will flood about 25 times.
E) In the next 100 years, it is very likely that the Red River will flood exactly 25 times.

7. A random variable "X" has a distribution represented by the following probability distribution

x_i	$P(X = x_i)$
-1	3c
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where "c" is a constant real number. The variance of the random variable "X" is

A) 191/64 B) 27/8
C) 4 D) can not be determined from the given information.

8. In 2006 it was found that 45% of Canadians felt they were overtaxed. If a poll of 1,000 people was conducted, what is the chance that the sample proportion would accurately reflect the population proportion, to within 2 percentage points (either way)?

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0	20%
1	10%
2	70%

:

9. Follows from story. As a result of the above distribution, for every 1,000 people in this generation, the number in the next generation would be roughly*:*

A) 750 *B) 1500* *C) 100* *D) 700* *E) None of these*

10. Follows from story: How would this affect the population in the long-run?

A) It would decrease.
B) It would increase.
C) It would remain constant.
D) It is impossible to say with the information given.

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STAT 211 Test #2 Formula Sheet

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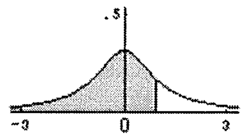
5. The standard deviation of the sample mean $\bar{x}$ for a finite population = $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$

6. $Z = \frac{\bar{X} - \mu}{\sigma_{\bar{x}}}$

7. The mean and the standard deviation of the sample proportion $\hat{p}$: $\mu_{\hat{p}} = p$ and $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$

8. $Z = \frac{\hat{P} - p}{\sigma_{\hat{P}}}$



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14	0.258	0.537	0.692	0.868	1.345	1.761	2.145	2.624	2.977	3.787
15	0.258	0.536	0.691	0.866	1.341	1.753	2.131	2.602	2.947	3.733
16	0.258	0.535	0.690	0.865	1.337	1.746	2.120	2.583	2.921	3.686
17	0.257	0.534	0.689	0.863	1.333	1.740	2.110	2.567	2.898	3.646
18	0.257	0.534	0.688	0.862	1.330	1.734	2.101	2.552	2.878	3.610
19	0.257	0.533	0.688	0.861	1.328	1.729	2.093	2.539	2.861	3.579
20	0.257	0.533	0.687	0.860	1.325	1.725	2.086	2.528	2.845	3.552
21	0.257	0.532	0.686	0.859	1.323	1.721	2.080	2.518	2.831	3.527
22	0.256	0.532	0.686	0.858	1.321	1.717	2.074	2.508	2.819	3.505
23	0.256	0.532	0.685	0.858	1.319	1.714	2.069	2.500	2.807	3.485
24	0.256	0.531	0.685	0.857	1.318	1.711	2.064	2.492	2.797	3.467
25	0.256	0.531	0.684	0.856	1.316	1.708	2.060	2.485	2.787	3.450
26	0.256	0.531	0.684	0.856	1.315	1.706	2.056	2.479	2.779	3.435
27	0.256	0.531	0.684	0.855	1.314	1.703	2.052	2.473	2.771	3.421
28	0.256	0.530	0.683	0.855	1.313	1.701	2.048	2.467	2.763	3.408
29	0.256	0.530	0.683	0.854	1.311	1.699	2.045	2.462	2.756	3.396
30	0.256	0.530	0.683	0.854	1.310	1.697	2.042	2.457	2.750	3.385
35	0.255	0.529	0.682	0.852	1.306	1.690	2.030	2.438	2.724	3.340
40	0.255	0.529	0.681	0.851	1.303	1.684	2.021	2.423	2.704	3.307
50	0.255	0.528	0.679	0.849	1.299	1.676	2.009	2.403	2.678	3.261
100	0.254	0.526	0.677	0.845	1.290	1.660	1.984	2.364	2.626	3.174
∞	0.253	0.524	0.674	0.842	1.282	1.645	1.960	2.326	2.576	3.090

Cumulative distribution for a N(0,1) random variable

x	0	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

Table 8.1: The Cumulative Distribution Function $F(x) = P(X \leq x)$ for a $G(0,1)$ random variable

:

User ID **(i.e. Jsmith):** **Numeric ID** **(i.e. 20202020):**

4 Suppose that the test scores on a Business Stats midterm test are approximately Normally distributed with a mean of 62 and a standard deviation of 11.

a. What is the chance that a random sample of n = 10 students will have an average score of at least 65? ***[3 marks]***

$X \sim N(62, 11^2)$

$\bar{X} \sim N(62, 11^2/10)$

[[1]] $Pr(\bar{X} > 65) = Pr(z > (65-62)/(11/\sqrt{10}))$ [[1 + STZ]]

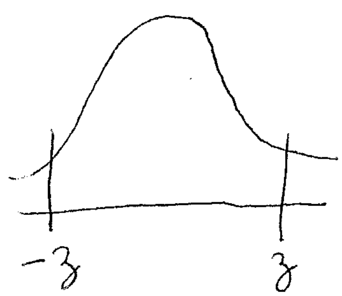
$= Pr(z > (3\sqrt{10})/11)$

$= Pr(z > 0.86)$

$= 1 - Pr(z < 0.86)$

$= 1 - 0.8051 = 19.49\%$. [[1]]

b. If it has been determined that the bottom 5% of students will fail the course, what is the lowest mark that a student can have and still be awarded passing grade? You can assume that a student needs to score 50 or more to pass the course; please note that this method is not used in this course. ***[3 marks]***



$Pr(z < z) = 0.95 \Rightarrow z = 1.645$ [[1]]

$-1.645 = \frac{X - 62}{11}$ [[1]]

$X = 43.905$ [[1]].

PART II—*PLEASE RECORD YOUR MULTIPLE CHOICE ANSWERS HERE:*

User ID (i.e. Jsmith): **Numeric ID (i.e. 20202020):**

3) The amount of daily emissions of sulfur from a power plant has a normal distribution with a mean of 134 pounds and a standard deviation of 22 pounds. The probability is 47.06% that the mean daily emission over an n day period is between 126 and 134 pounds. What is n? (**Hint:** Start with the formula for the Z-score). ***[5 marks]***

$E \sim N(134, 22^2)$

$47.06\% = Pr(126 < \bar{E} < 134)$ [[1 - setup]]

$47.06\% = Pr\left(\frac{126-134}{22/\sqrt{n}} < \bar{E} < 0\right)$ } [[1 STZ]]

$47.06\% = Pr(-0.363\sqrt{n} < Z < 0)$ }

$47.06\% = Pr(Z < 0) - Pr(Z < -0.363\sqrt{n})$

[[1 work]] $47.06\% = 50\% - Pr(Z < -0.363\sqrt{n})$

$2.94\% = Pr(Z > 0.363\sqrt{n})$

$2.94\% = 1 - Pr(Z < 0.363\sqrt{n})$

[[here=1]] $97.06\% = Pr(Z < 0.363\sqrt{n})$

$0.363\sqrt{n} = 1.89 \Rightarrow n = \left(\frac{1.89}{0.363}\right)^2 = 27.109$

$\Rightarrow n = 28$

PART II—*PLEASE RECORD YOUR MULTIPLE CHOICE ANSWERS HERE:* [[1]]