UNIVERSITY OF TORONTO SCARBOROUGH
Department of Computer and Mathematical Sciences
Midterm Test October 2013

STAB22H3 Statistics I
Duration: 1 hour and 45 minutes

Last Name:_____ First Name: _____

Student number: _____

Aids allowed:

- One handwritten letter-sized sheet (both sides) of notes prepared by you
- Non-programmable, non-communicating calculator

Standard normal distribution tables are attached at the end.

This test is based on multiple-choice questions. There are 30 questions. All questions carry equal weight. On the Scantron answer sheet, ensure that you enter your last name, first name (as much of it as fits), and student number (in "Identification").

Mark in each case the best answer out of the alternatives given (**which means the numerically closest answer if the answer is a number and the answer you obtained is not given.**)

Also before you begin, complete the signature sheet, but sign it only when the invigilator collects it. The signature sheet shows that you were present at the exam.

Good luck!!

ExamVersion: A

1. The table below gives the results of a survey of 800 college seniors regarding their undergraduate major and whether or not they plan to go to graduate school.

Graduate School	Business	Engineering	Others
Yes	70	84	126
No	182	208	130

What percentage of the students does not plan to go to graduate school?

(a) 280

(b) 65

(c) 32

(d) 35

(e) 25

2. Using the data in question 1 above, among those students who are majoring in business, what percentage plans to go to graduate school?

(a) 27.78

(b) 8.75

(c) 72.22

(d) 70

(e) 31.5

3. Using the data in question 1 above, among the students who plan to go to graduate school, what percentage is business majors?

(a) 27.78

(b) 8.75

(c) 72.22

(d) 70

(e) 25

4. For simple linear regression, the fitted regression line obtained using the method of least squares is

   (a) the line which makes the sample correlation coefficient as close to +1 or -1 as possible.

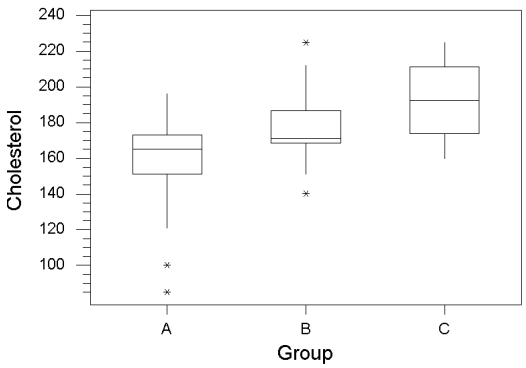
   (b) the line which best splits the data in half, with 50% of the data points lying above the regression line and 50% of the data points lying below the fitted regression line.

   (c) the line which minimizes the number of data points that do not pass through the regression line.

   (d) the line that minimizes the sum of the squared residuals.

   (e) the line which guarantees that the error terms will be normally distributed.

5. The boxplots below displays a comparison of blood cholesterol measurements for three groups of people (group A, B and C):



   Read the following statements based on the above boxplots:

   I The third quartile for group A is less than the first quartile for group B.

   II More than 25 percent of the people in group C have higher cholesterol levels than the person with the highest level in group A.

   III The median for group B is greater than the mean for group B.

   The above statements may or may not be true. Based on the information in the boxplots above, which statement is true?

   (a) Only statement I is true

   (b) Only statement II is true

   (c) Only statements I and II are true

   (d) Only statements II and III are true

   (e) none is true

6. New recruits to the Canadian military have head circumferences that are Normally distributed with mean of 65 cm, and standard deviation of 4 cm. One percent of the helmets manufactured for the recruits should have circumferences bigger than what size?

   (a) 63.06 cm

   (b) 80.9 cm

   (c) 74.3 cm

   (d) 91.23 cm

   (e) 68.9 cm

7. For a simple linear regression model, suppose we fitted a least squares regression line and obtained $\hat{y} = 5 + 3x$. What is the residual associated with the point $(x, y) = (4, 19)$?

   (a) -13

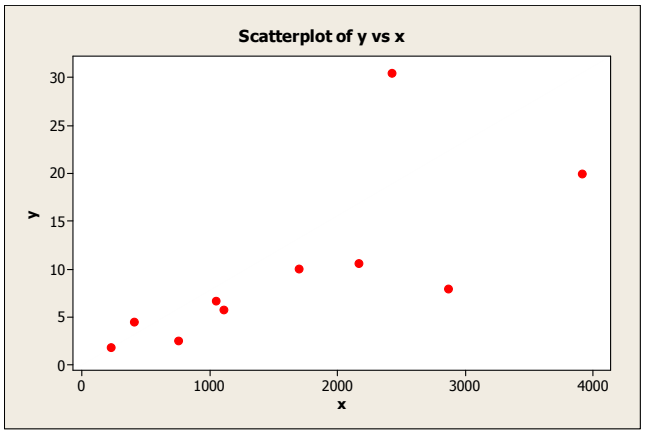
   (b) -2

   (c) 13

   (d) 17

   (e) 2

8. The scatterplot of the data on sale price (y in millions of dollars) and size (x, thousands of sq. ft) for 10 large industrial properties that appeared in the paper " Using Regression Analysis in Real Estate Appraisal" (Appraisal Journal [2002]), is shown below:



Which of the following numbers is closest to the correlation between x and y?

(a) -1

(b) -0.5

(c) 0

(d) 0.6

(e) 1

9. The times that it takes students to complete a STAB22 midterm test are Normally distributed with a mean of 155 minutes with standard deviation of 10 minutes. How much time should be allowed if we wish to ensure that 9 out of 10 students (on average) can complete it? (round your answer to the nearest minute).

(a) 170 or more

(b) 169

(c) 168

(d) 167

(e) 166 or less

10. Based on data from the National Health Survey, the distribution of weights for adult males in the U.S. has a mean weight of 173 pounds and a standard deviation of 30 pounds. Suppose the distribution of weights was skewed to the left. The median weight is one of the following values. Which of the following values is most likely the value of the median weight?

    (a) 173 pounds

    (b) 163 pounds

    (c) 143 pounds

    (d) 188 pounds

    (e) 150 pounds

11. The data set is displayed in the stemplot below:

```
Decimal point is 1 digit(s) to the right of the colon.
0 : 3
1 : 002
2 : 389
3 : 025558
4 : 13
```

    Based on information in this stemplot, which of the following statements is **FALSE**? (Note: only one statement is false.)

    (a) The median is 30.

    (b) The range is 40.

    (c) There are no outliers.

    (d) The third quartile is 35.

    (e) The mean is greater than 40.

12. Data on the mileage per gallon of 20 randomly selected cars are listed below. The values are ordered for convenience.

    12, 13, 15, 16, 16, 17, 18, 18, 19, 19, 20, 20, 22, 23, 24, 26, 26, 27, 27, 29

    What is the interquartile range for the mileage data?

    (a) 8.5 miles per gallon

    (b) 16.5 miles per gallon

    (c) 17 miles per gallon

    (d) 25 miles per gallon

    (e) 12.75 miles per gallon

13. A professor is interested in determining if one could predict the score on a statistics exam from the amount of time spent studying for the exam. What is the explanatory variable in this study?

    (a) the professor

    (b) the score on the exam

    (c) the amount of time spent studying for the exam

    (d) the number of students who wrote the exam

    (e) the number of questions in the exam

14. Heights of males are approximately normally distributed with a mean of 170 cm and a standard deviation of 8 cm. What proportion of males are taller than 176 cm?

    (a) 0.7500

    (b) 0.6000

    (c) 0.2734

    (d) 0.2500

    (e) 0.2266

15. The time to complete a standardized exam is approximately normal with a mean of 70 minutes and a standard deviation of 10 minutes. Using the 68-95-99.7 rule, if students are given 90 minutes to complete the exam, what percentage of students will not be able finish in this time (i.e. they need more than 90 minutes)?

    (a) 32%

    (b) 16%

    (c) 5%

    (d) 2.5 %

    (e) 0.0015 %

16. The general manager of a chain of furniture stores believes that experience is the most important factor in determining the level of success of a salesperson. To examine this belief she records last month's sales (in \$1,000s) and the years of experience of 10 randomly selected salespeople. Summary statistics from this study are given below:

```
Descriptive Statistics: Experience, Sales

Variable     N   Mean  StDev
Experience  10   8.20   6.21
Sales       10  17.50   6.88

Correlation of Experience and Sales = 0.977
```

What is the slope of the least squares regression line of Sales on Experience?

(a) 0.88

(b) 2.08

(c) 0.46

(d) 1.08

(e) 8.20

17. Using information in question 16 above, what proportion of the variability in sales is explained by the linear regression of Sales on Experience? Choose the closest.

(a) 0.98

(b) 0.39

(c) 0.95

(d) 0.46

(e) 0.76

18. The Programme for International Student Assessment (PISA) reported 2006 average mathematics performance scores for 15 year olds in 32 countries. These scores are given below (for convenience they are sorted in increasing order):

```
406   424   459   462   466   474   480   484   490   490   491   492   495
495   496   498   501   502   504   505   506   510   513   520   520   522
523   527   530   531   547   548
```

Some useful summary statistics (StatCrunch output) of these scores are given below:

```
Descriptive Statistics: Score

Variable    N    Mean  StDev      Q1  Median      Q3
Score      32  497.22  30.93  485.50  499.50  520.00
```

Based on $1.5 \times IQR$ rule, how many outliers are there in this data set?

(a) There are no outliers.

(b) Only one outlier.

(c) Only two outliers.

(d) Only three outliers.

(e) More than three outliers.

19. In an effort to improve the overall health and well-being of its employees, a large corporation distributed a written survey to each of its 1400 employees. Data collected included number of hours worked per week, number of hours spent exercising per week, number of hours spent enjoying hobbies per week, and number of hours spent with family/friends per week. Which of the following choices correctly identifies the W's (Note in this question is only interested in three W's: Who, What and why. Please identify the choice that identifies all these three W's correctly.)

(a) Who: The 1400 employees; What: Number of hours spent exercising per week.; Why: To devise a health club plan

(b) Who: The 1400 employees; What: Number of hours worked per week, number of hours spent exercising per week, number of hours spent enjoying hobbies per week, and number of hours spent with family/friends per week; Why: To improve the health and well-being of its employees

(c) Who: Large corporations; What: Number of hours worked per week.; Why: To improve the health and well-being of its employees

(d) Who: The 1400 employees; What: Overall job satisfaction; Why: To improve the health and well-being of its employees

(e) Who: A large corporation; What: Overall job satisfaction; Why: To improve the health and well-being of its employees

20. In a simple linear regression problem, the least squares regression line is given by $y = 2.15 - 1.75x$, and the coefficient of determination is 0.81. What is the correlation between x and y?

    (a) 0.81

    (b) -0.81

    (c) 0.9

    (d) -0.9

    (e) none of the above options gives the correct correlation between x and y

21. A study of 2007 model automobiles was conducted. In the study the following variables were considered: the **Region** in which the car was manufactured (Europe, North America, Asia); the **Type** of automobile (compact, midsize, large), **volume** of the engine in liters, and the type of **Fuel** used (regular, premium, 85% Ethanol). The variables Region, Type, volume, and Fuel are, respectively are:

    (a) quantitative, categorical, categorical, quantitative.

    (b) categorical, quantitative, quantitative, categorical.

    (c) categorical, categorical, quantitative, quantitative.

    (d) categorical, categorical, quantitative, categorical.

    (e) Unable to determine without knowing the values of the various variables.

22. You wish to study which car colors are the most popular among students. Which of the following would be the most useful?

    (a) Boxplot

    (b) Histogram

    (c) Pie chart

    (d) stemplot

    (e) Five-number summary

23. The annual salaries of employees in a company have a Normal distribution with mean \$ 48 000. 16% of the employees in this company have annual salaries of \$ 60 000 and above. What is the standard deviation of the annual salaries of employees in this company? Choose the closest answer if the exact answer is not among the choices below. (Hint: 68-95-99.7 rule can be helpful. You can also answer this question without using 68-95-99.7 rule.)

    (a) \$ 6 000

    (b) \$ 12 000

    (c) \$ 15 000

    (d) \$ 18 000

    (e) \$ 24 000

24. Last year a small statistical consulting company paid each of its five statistical clerks \$22,000, two statistical analysts \$50,000 each, and the senior statistician \$270,000. How many employees in this company earned less than the mean salary?

    (a) 0

    (b) 4

    (c) 5

    (d) 6

    (e) 7

25. The mean income per household in a certain state is \$9500 with a standard deviation of \$1750. The distribution of income is Normal. The middle 95% of incomes are between what two values?

    (a) \$5422 and \$13578

    (b) \$6070 and \$12930

    (c) \$6621 and \$12379

    (d) \$7260 and \$11740

    (e) \$8049 and \$10951

26. For data on a quantitative variable, which of the following is true?

    (a) If the distribution is symmetric, then the range is an appropriate measure of the center.

    (b) If the distribution is symmetric, then the standard deviation is an appropriate measure of the center.

    (c) If the distribution is skewed, then the mean is an appropriate measure of the center.

    (d) If the distribution is skewed, then the median is an appropriate measure of the center.

    (e) If the distribution is skewed, then the standard deviation is an appropriate measure of the spread.

27. Pulse rates of ten students are given below:

    32, 60, 62, 64, 66, 68, 72, 76, 80, 82

    What would be a five-number summary for these pulse rates?

    (a) 32, 64, 67, 78, 82

    (b) 32, 62, 67, 76, 82

    (c) 60, 62, 70, 78, 80

    (d) 32, 62, 68, 76, 82

    (e) 32, 61, 67, 78, 82

28. The pulse rate of 32 in the data set in question 27 above, is an outlier. That student has entered his pulse rate incorrectly. His correct pulse rate was 64. If we correct this outlier, what will happen to the following statistics?

    (a) Mean remains the same, median remains the same, IQR decreases.

    (b) Mean increases, median remains the same, IQR increases.

    (c) Mean increases, median increases and IQR remain the same.

    (d) Mean increases, median remains the same, IQR decreases.

    (e) Mean increases, median remains the same, IQR remains the same.

29. Of the following measures: mean, median, IQR (inter quartile range), and standard deviation, which measures are resistant to outliers?

    (a) Mean and median

    (b) Median and IQR

    (c) Mean and standard deviation

    (d) Median and standard deviation

    (e) None of the above

30. The two-way table below shows the distribution of the number of members in a fitness club classified by two variables.

	Women	Men
Vegetarian	9	3
Non-vegetarian	8	10

Based on this information, which of the following statements is true?

(a) Women in that club are more likely to be vegetarian than men.

(b) Women in that club are more likely to be non-vegetarian than men.

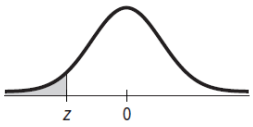
(c) Women in that club are less likely to be vegetarian than men.

(d) Among vegetarians in this club, there are more men than women.

(e) None of the above statements is true.

END OF TEST

Table Z
Areas under the standard Normal curve



Second decimal place in z										
0.09	*0.08*	*0.07*	*0.06*	*0.05*	*0.04*	*0.03*	*0.02*	*0.01*	*0.00*	z
									0.0000[†]	*−3.9*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.8*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.7*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	*−3.6*
0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*−3.5*
0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*−3.4*
0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	*−3.3*
0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	*−3.2*
0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	*−3.1*
0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	*−3.0*
0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019	*−2.9*
0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026	*−2.8*
0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	*−2.7*
0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047	*−2.6*
0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062	*−2.5*
0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082	*−2.4*
0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107	*−2.3*
0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139	*−2.2*
0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179	*−2.1*
0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228	*−2.0*
0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287	*−1.9*
0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359	*−1.8*
0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446	*−1.7*
0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548	*−1.6*
0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668	*−1.5*
0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808	*−1.4*
0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968	*−1.3*
0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151	*−1.2*
0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357	*−1.1*
0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587	*−1.0*
0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841	*−0.9*
0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119	*−0.8*
0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420	*−0.7*
0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743	*−0.6*
0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085	*−0.5*
0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446	*−0.4*
0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821	*−0.3*
0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207	*−0.2*
0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602	*−0.1*
0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000	*−0.0*

[†]For $z \leq -3.90$, the areas are 0.0000 to four decimal places.

Table Z (cont.)
Areas under the standard Normal curve

	Second decimal place in z									
z	*0.00*	*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
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

†For $z \geq 3.90$, the areas are 1.0000 to four decimal places.

UNIVERSITY OF TORONTO SCARBOROUGH
Department of Computer and Mathematical Sciences
Midterm Test October 2013

STAB22H3 Statistics I
Duration: 1 hour and 45 minutes

Last Name:_____ First Name: _____

Student number: _____

Aids allowed:

- One handwritten letter-sized sheet (both sides) of notes prepared by you
- Non-programmable, non-communicating calculator

Standard normal distribution tables are attached at the end.

This test is based on multiple-choice questions. There are 30 questions. All questions carry equal weight. On the Scantron answer sheet, ensure that you enter your last name, first name (as much of it as fits), and student number (in "Identification").

Mark in each case the best answer out of the alternatives given (**which means the numerically closest answer if the answer is a number and the answer you obtained is not given.**)

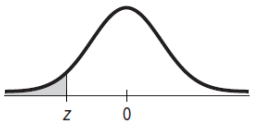
Also before you begin, complete the signature sheet, but sign it only when the invigilator collects it. The signature sheet shows that you were present at the exam.

Good luck!!

Answer Key for Exam A

1. (b)
2. (a)
3. (e)
4. (d)
5. (b)
6. (c)
7. (e)
8. (d)
9. (c)
10. (d)
11. (e)
12. (a)
13. (c)
14. (e)
15. (d)
16. (d)
17. (c)
18. (c)
19. (b)
20. (d)
21. (d)
22. (c)
23. (b)
24. (e)
25. (b)
26. (d)
27. (b)
28. (d)
29. (b)
30. (a)

Table Z
Areas under the standard Normal curve



Second decimal place in z										
0.09	*0.08*	*0.07*	*0.06*	*0.05*	*0.04*	*0.03*	*0.02*	*0.01*	*0.00*	z
									0.0000[†]	*−3.9*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.8*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.7*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	*−3.6*
0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*−3.5*
0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*−3.4*
0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	*−3.3*
0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	*−3.2*
0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	*−3.1*
0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	*−3.0*
0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019	*−2.9*
0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026	*−2.8*
0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	*−2.7*
0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047	*−2.6*
0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062	*−2.5*
0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082	*−2.4*
0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107	*−2.3*
0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139	*−2.2*
0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179	*−2.1*
0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228	*−2.0*
0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287	*−1.9*
0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359	*−1.8*
0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446	*−1.7*
0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548	*−1.6*
0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668	*−1.5*
0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808	*−1.4*
0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968	*−1.3*
0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151	*−1.2*
0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357	*−1.1*
0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587	*−1.0*
0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841	*−0.9*
0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119	*−0.8*
0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420	*−0.7*
0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743	*−0.6*
0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085	*−0.5*
0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446	*−0.4*
0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821	*−0.3*
0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207	*−0.2*
0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602	*−0.1*
0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000	*−0.0*

[†]For $z \leq -3.90$, the areas are 0.0000 to four decimal places.

Table Z (cont.)
Areas under the standard Normal curve

	Second decimal place in z									
z	*0.00*	*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
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

†For $z \geq 3.90$, the areas are 1.0000 to four decimal places.

UNIVERSITY OF TORONTO SCARBOROUGH
Department of Computer and Mathematical Sciences
Midterm Test October 2013

STAB22H3 Statistics I
Duration: 1 hour and 45 minutes

Last Name:_____ First Name: _____

Student number: _____

Aids allowed:

- One handwritten letter-sized sheet (both sides) of notes prepared by you
- Non-programmable, non-communicating calculator

Standard normal distribution tables are attached at the end.

This test is based on multiple-choice questions. There are 30 questions. All questions carry equal weight. On the Scantron answer sheet, ensure that you enter your last name, first name (as much of it as fits), and student number (in "Identification").

Mark in each case the best answer out of the alternatives given (**which means the numerically closest answer if the answer is a number and the answer you obtained is not given.**)

Also before you begin, complete the signature sheet, but sign it only when the invigilator collects it. The signature sheet shows that you were present at the exam.

Good luck!!

ExamVersion: B

1. The time to complete a standardized exam is approximately normal with a mean of 70 minutes and a standard deviation of 10 minutes. Using the 68-95-99.7 rule, if students are given 90 minutes to complete the exam, what percentage of students will not be able finish in this time (i.e. they need more than 90 minutes)?

   (a) 32%

   (b) 16%

   (c) 5%

   (d) 2.5 %

   (e) 0.0015 %

2. A professor is interested in determining if one could predict the score on a statistics exam from the amount of time spent studying for the exam. What is the explanatory variable in this study?

   (a) the professor

   (b) the score on the exam

   (c) the amount of time spent studying for the exam

   (d) the number of students who wrote the exam

   (e) the number of questions in the exam

3. Heights of males are approximately normally distributed with a mean of 170 cm and a standard deviation of 8 cm. What proportion of males are taller than 176 cm?

   (a) 0.7500

   (b) 0.6000

   (c) 0.2734

   (d) 0.2500

   (e) 0.2266

4. For a simple linear regression model, suppose we fitted a least squares regression line and obtained $\hat{y} = 5 + 3x$. What is the residual associated with the point $(x, y) = (4, 19)$?

   (a) -13

   (b) -2

   (c) 13

   (d) 17

   (e) 2

5. The general manager of a chain of furniture stores believes that experience is the most important factor in determining the level of success of a salesperson. To examine this belief she records last month's sales (in \$1,000s) and the years of experience of 10 randomly selected salespeople. Summary statistics from this study are given below:

```
Descriptive Statistics: Experience, Sales

Variable     N   Mean  StDev
Experience  10   8.20   6.21
Sales       10  17.50   6.88

Correlation of Experience and Sales = 0.977
```

What is the slope of the least squares regression line of Sales on Experience?

(a) 0.88

(b) 2.08

(c) 0.46

(d) 1.08

(e) 8.20

6. Using information in question 5 above, what proportion of the variability in sales is explained by the linear regression of Sales on Experience? Choose the closest.

(a) 0.98

(b) 0.39

(c) 0.95

(d) 0.46

(e) 0.76

7. The data set is displayed in the stemplot below:

```
Decimal point is 1 digit(s) to the right of the colon.
0 : 3
1 : 002
2 : 389
3 : 025558
4 : 13
```

Based on information in this stemplot, which of the following statements is **FALSE**? (Note: only one statement is false.)

(a) The median is 30.

(b) The range is 40.

(c) There are no outliers.

(d) The third quartile is 35.

(e) The mean is greater than 40.

8. Of the following measures: mean, median, IQR (inter quartile range), and standard deviation, which measures are resistant to outliers?

(a) Mean and median

(b) Median and IQR

(c) Mean and standard deviation

(d) Median and standard deviation

(e) None of the above

9. The table below gives the results of a survey of 800 college seniors regarding their undergraduate major and whether or not they plan to go to graduate school.

Graduate School	Business	Engineering	Others
Yes	70	84	126
No	182	208	130

What percentage of the students does not plan to go to graduate school?

(a) 280

(b) 65

(c) 32

(d) 35

(e) 25

10. Using the data in question 9 above, among those students who are majoring in business, what percentage plans to go to graduate school?

    (a) 27.78

    (b) 8.75

    (c) 72.22

    (d) 70

    (e) 31.5

11. Using the data in question 9 above, among the students who plan to go to graduate school, what percentage is business majors?

    (a) 27.78

    (b) 8.75

    (c) 72.22

    (d) 70

    (e) 25

12. You wish to study which car colors are the most popular among students. Which of the following would be the most useful?

    (a) Boxplot

    (b) Histogram

    (c) Pie chart

    (d) stemplot

    (e) Five-number summary

13. For simple linear regression, the fitted regression line obtained using the method of least squares is

    (a) the line which makes the sample correlation coefficient as close to +1 or -1 as possible.

    (b) the line which best splits the data in half, with 50% of the data points lying above the regression line and 50% of the data points lying below the fitted regression line.

    (c) the line which minimizes the number of data points that do not pass through the regression line.

    (d) the line that minimizes the sum of the squared residuals.

    (e) the line which guarantees that the error terms will be normally distributed.

14. The two-way table below shows the distribution of the number of members in a fitness club classified by two variables.

	Women	Men
Vegetarian	9	3
Non-vegetarian	8	10

Based on this information, which of the following statements is true?

(a) Women in that club are more likely to be vegetarian than men.

(b) Women in that club are more likely to be non-vegetarian than men.

(c) Women in that club are less likely to be vegetarian than men.

(d) Among vegetarians in this club, there are more men than women.

(e) None of the above statements is true.

15. Last year a small statistical consulting company paid each of its five statistical clerks \$22,000, two statistical analysts \$50,000 each, and the senior statistician \$270,000. How many employees in this company earned less than the mean salary?

(a) 0

(b) 4

(c) 5

(d) 6

(e) 7

16. In an effort to improve the overall health and well-being of its employees, a large corporation distributed a written survey to each of its 1400 employees. Data collected included number of hours worked per week, number of hours spent exercising per week, number of hours spent enjoying hobbies per week, and number of hours spent with family/friends per week. Which of the following choices correctly identifies the W's (Note in this question is only interested in three W's: Who, What and why. Please identify the choice that identifies all these three W's correctly.)

    (a) Who: The 1400 employees; What: Number of hours spent exercising per week.; Why: To devise a health club plan

    (b) Who: The 1400 employees; What: Number of hours worked per week, number of hours spent exercising per week, number of hours spent enjoying hobbies per week, and number of hours spent with family/friends per week; Why: To improve the health and well-being of its employees

    (c) Who: Large corporations; What: Number of hours worked per week.; Why: To improve the health and well-being of its employees

    (d) Who: The 1400 employees; What: Overall job satisfaction; Why: To improve the health and well-being of its employees

    (e) Who: A large corporation; What: Overall job satisfaction; Why: To improve the health and well-being of its employees

17. Pulse rates of ten students are given below:

    32, 60, 62, 64, 66, 68, 72, 76, 80, 82

    What would be a five-number summary for these pulse rates?

    (a) 32, 64, 67, 78, 82

    (b) 32, 62, 67, 76, 82

    (c) 60, 62, 70, 78, 80

    (d) 32, 62, 68, 76, 82

    (e) 32, 61, 67, 78, 82

18. The pulse rate of 32 in the data set in question 17 above, is an outlier. That student has entered his pulse rate incorrectly. His correct pulse rate was 64. If we correct this outlier, what will happen to the following statistics?

    (a) Mean remains the same, median remains the same, IQR decreases.

    (b) Mean increases, median remains the same, IQR increases.

    (c) Mean increases, median increases and IQR remain the same.

    (d) Mean increases, median remains the same, IQR decreases.

    (e) Mean increases, median remains the same, IQR remains the same.

19. In a simple linear regression problem, the least squares regression line is given by $y = 2.15 - 1.75x$, and the coefficient of determination is 0.81. What is the correlation between x and y?

    (a) 0.81

    (b) -0.81

    (c) 0.9

    (d) -0.9

    (e) none of the above options gives the correct correlation between x and y

20. The mean income per household in a certain state is \$9500 with a standard deviation of \$1750. The distribution of income is Normal. The middle 95% of incomes are between what two values?

    (a) \$5422 and \$13578

    (b) \$6070 and \$12930

    (c) \$6621 and \$12379

    (d) \$7260 and \$11740

    (e) \$8049 and \$10951

21. The Programme for International Student Assessment (PISA) reported 2006 average mathematics performance scores for 15 year olds in 32 countries. These scores are given below (for convenience they are sorted in increasing order):

```
406   424   459   462   466   474   480   484   490   490   491   492   495
495   496   498   501   502   504   505   506   510   513   520   520   522
523   527   530   531   547   548
```

    Some useful summary statistics (StatCrunch output) of these scores are given below:

```
Descriptive Statistics: Score

Variable    N    Mean  StDev      Q1  Median      Q3
Score      32  497.22  30.93  485.50  499.50  520.00
```

    Based on $1.5 \times IQR$ rule, how many outliers are there in this data set?

    (a) There are no outliers.

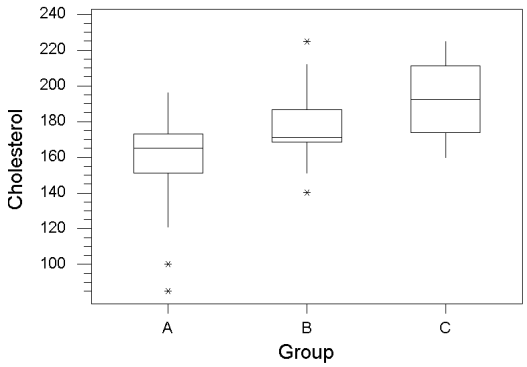
    (b) Only one outlier.

    (c) Only two outliers.

    (d) Only three outliers.

    (e) More than three outliers.

22. The boxplots below displays a comparison of blood cholesterol measurements for three groups of people (group A, B and C):



Read the following statements based on the above boxplots:

I The third quartile for group A is less than the first quartile for group B.

II More than 25 percent of the people in group C have higher cholesterol levels than the person with the highest level in group A.

III The median for group B is greater than the mean for group B.

The above statements may or may not be true. Based on the information in the boxplots above, which statement is true?

(a) Only statement I is true

(b) Only statement II is true

(c) Only statements I and II are true

(d) Only statements II and III are true

(e) none is true

23. The annual salaries of employees in a company have a Normal distribution with mean \$ 48 000. 16% of the employees in this company have annual salaries of \$ 60 000 and above. What is the standard deviation of the annual salaries of employees in this company? Choose the closest answer if the exact answer is not among the choices below. (Hint: 68-95-99.7 rule can be helpful. You can also answer this question without using 68-95-99.7 rule.)

(a) \$ 6 000

(b) \$ 12 000

(c) \$ 15 000

(d) \$ 18 000

(e) \$ 24 000

24. Based on data from the National Health Survey, the distribution of weights for adult males in the U.S. has a mean weight of 173 pounds and a standard deviation of 30 pounds. Suppose the distribution of weights was skewed to the left. The median weight is one of the following values. Which of the following values is most likely the value of the median weight?

    (a) 173 pounds

    (b) 163 pounds

    (c) 143 pounds

    (d) 188 pounds

    (e) 150 pounds

25. For data on a quantitative variable, which of the following is true?

    (a) If the distribution is symmetric, then the range is an appropriate measure of the center.

    (b) If the distribution is symmetric, then the standard deviation is an appropriate measure of the center.

    (c) If the distribution is skewed, then the mean is an appropriate measure of the center.

    (d) If the distribution is skewed, then the median is an appropriate measure of the center.

    (e) If the distribution is skewed, then the standard deviation is an appropriate measure of the spread.

26. Data on the mileage per gallon of 20 randomly selected cars are listed below. The values are ordered for convenience.

    12, 13, 15, 16, 16, 17, 18, 18, 19, 19, 20, 20, 22, 23, 24, 26, 26, 27, 27, 29

    What is the interquartile range for the mileage data?

    (a) 8.5 miles per gallon

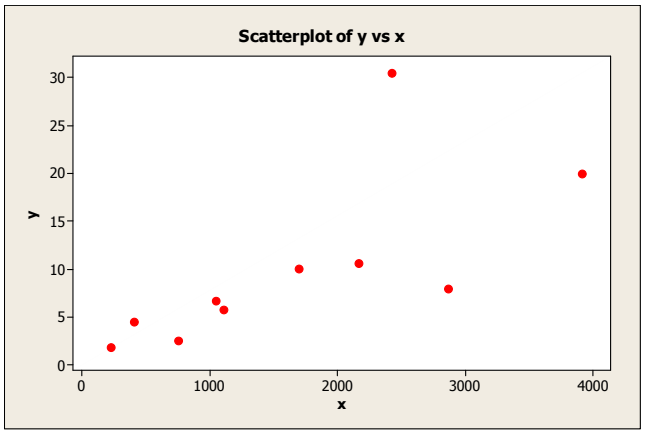
    (b) 16.5 miles per gallon

    (c) 17 miles per gallon

    (d) 25 miles per gallon

    (e) 12.75 miles per gallon

27. The scatterplot of the data on sale price (y in millions of dollars) and size (x, thousands of sq. ft) for 10 large industrial properties that appeared in the paper " Using Regression Analysis in Real Estate Appraisal" (Appraisal Journal [2002]), is shown below:



Which of the following numbers is closest to the correlation between x and y?

(a) -1

(b) -0.5

(c) 0

(d) 0.6

(e) 1

28. The times that it takes students to complete a STAB22 midterm test are Normally distributed with a mean of 155 minutes with standard deviation of 10 minutes. How much time should be allowed if we wish to ensure that 9 out of 10 students (on average) can complete it? (round your answer to the nearest minute).

(a) 170 or more

(b) 169

(c) 168

(d) 167

(e) 166 or less

29. A study of 2007 model automobiles was conducted. In the study the following variables were considered: the **Region** in which the car was manufactured (Europe, North America, Asia); the **Type** of automobile (compact, midsize, large), **volume** of the engine in liters, and the type of **Fuel** used (regular, premium, 85% Ethanol). The variables Region, Type, volume, and Fuel are, respectively are:

    (a) quantitative, categorical, categorical, quantitative.

    (b) categorical, quantitative, quantitative, categorical.

    (c) categorical, categorical, quantitative, quantitative.

    (d) categorical, categorical, quantitative, categorical.

    (e) Unable to determine without knowing the values of the various variables.

30. New recruits to the Canadian military have head circumferences that are Normally distributed with mean of 65 cm, and standard deviation of 4 cm. One percent of the helmets manufactured for the recruits should have circumferences bigger than what size?

    (a) 63.06 cm

    (b) 80.9 cm

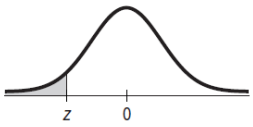
    (c) 74.3 cm

    (d) 91.23 cm

    (e) 68.9 cm

END OF TEST

Table Z
Areas under the standard Normal curve



Second decimal place in z										
0.09	*0.08*	*0.07*	*0.06*	*0.05*	*0.04*	*0.03*	*0.02*	*0.01*	*0.00*	z
									0.0000[†]	*−3.9*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.8*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.7*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	*−3.6*
0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*−3.5*
0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*−3.4*
0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	*−3.3*
0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	*−3.2*
0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	*−3.1*
0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	*−3.0*
0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019	*−2.9*
0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026	*−2.8*
0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	*−2.7*
0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047	*−2.6*
0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062	*−2.5*
0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082	*−2.4*
0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107	*−2.3*
0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139	*−2.2*
0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179	*−2.1*
0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228	*−2.0*
0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287	*−1.9*
0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359	*−1.8*
0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446	*−1.7*
0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548	*−1.6*
0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668	*−1.5*
0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808	*−1.4*
0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968	*−1.3*
0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151	*−1.2*
0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357	*−1.1*
0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587	*−1.0*
0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841	*−0.9*
0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119	*−0.8*
0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420	*−0.7*
0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743	*−0.6*
0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085	*−0.5*
0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446	*−0.4*
0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821	*−0.3*
0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207	*−0.2*
0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602	*−0.1*
0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000	*−0.0*

[†]For $z \leq -3.90$, the areas are 0.0000 to four decimal places.

Table Z (cont.)
Areas under the standard Normal curve

	Second decimal place in z									
z	*0.00*	*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
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

†For $z \geq 3.90$, the areas are 1.0000 to four decimal places.

UNIVERSITY OF TORONTO SCARBOROUGH
Department of Computer and Mathematical Sciences
Midterm Test October 2013

STAB22H3 Statistics I
Duration: 1 hour and 45 minutes

Last Name:_____ First Name: _____

Student number: _____

Aids allowed:

- One handwritten letter-sized sheet (both sides) of notes prepared by you
- Non-programmable, non-communicating calculator

Standard normal distribution tables are attached at the end.

This test is based on multiple-choice questions. There are 30 questions. All questions carry equal weight. On the Scantron answer sheet, ensure that you enter your last name, first name (as much of it as fits), and student number (in "Identification").

Mark in each case the best answer out of the alternatives given (**which means the numerically closest answer if the answer is a number and the answer you obtained is not given.**)

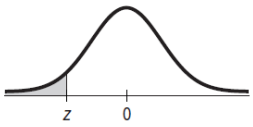
Also before you begin, complete the signature sheet, but sign it only when the invigilator collects it. The signature sheet shows that you were present at the exam.

Good luck!!

Answer Key for Exam B

1. (d)
2. (c)
3. (e)
4. (e)
5. (d)
6. (c)
7. (e)
8. (b)
9. (b)
10. (a)
11. (e)
12. (c)
13. (d)
14. (a)
15. (e)
16. (b)
17. (b)
18. (d)
19. (d)
20. (b)
21. (c)
22. (b)
23. (b)
24. (d)
25. (d)
26. (a)
27. (d)
28. (c)
29. (d)
30. (c)

Table Z
Areas under the standard Normal curve



Second decimal place in z										
0.09	*0.08*	*0.07*	*0.06*	*0.05*	*0.04*	*0.03*	*0.02*	*0.01*	*0.00*	z
									0.0000[†]	*−3.9*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.8*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.7*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	*−3.6*
0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*−3.5*
0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*−3.4*
0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	*−3.3*
0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	*−3.2*
0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	*−3.1*
0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	*−3.0*
0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019	*−2.9*
0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026	*−2.8*
0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	*−2.7*
0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047	*−2.6*
0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062	*−2.5*
0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082	*−2.4*
0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107	*−2.3*
0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139	*−2.2*
0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179	*−2.1*
0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228	*−2.0*
0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287	*−1.9*
0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359	*−1.8*
0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446	*−1.7*
0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548	*−1.6*
0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668	*−1.5*
0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808	*−1.4*
0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968	*−1.3*
0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151	*−1.2*
0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357	*−1.1*
0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587	*−1.0*
0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841	*−0.9*
0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119	*−0.8*
0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420	*−0.7*
0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743	*−0.6*
0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085	*−0.5*
0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446	*−0.4*
0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821	*−0.3*
0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207	*−0.2*
0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602	*−0.1*
0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000	*−0.0*

[†]For $z \leq -3.90$, the areas are 0.0000 to four decimal places.

Table Z (cont.)
Areas under the standard Normal curve

	Second decimal place in z									
z	*0.00*	*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
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000†									

†For $z \geq 3.90$, the areas are 1.0000 to four decimal places.