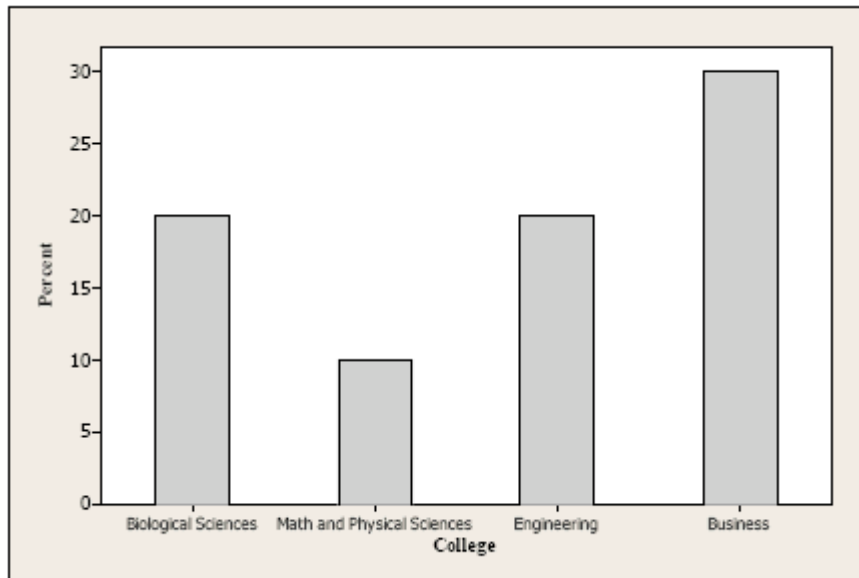Name: _____ Date: _____

Use the following to answer questions 1-2.

A large university is divided into six colleges, with most students graduating from four of these colleges. The following bar chart gives the distribution of the percent graduating from the four most popular colleges in 2003.

1. The percent of students graduating from the either Engineering or Business is
   A) approximately 30%.
   B) approximately 40%.
   C) approximately 50%.
   D) over 60%.

2. Which of the following is a correct statement?
   A) A timeplot of the 2003 distribution would be more informative.
   B) The bar graph is skewed to the right.
   C) The bar graph is skewed to the left.
   D) It would be correct to make a pie chart if you added an "Other" category.

3. A researcher measures the correlation between two variables. This correlation tells us
    A) whether there is a relation between two variables.
    B) whether a scatterplot shows an interesting pattern.
    C) whether a cause and effect relation exists between two variables.
    D) the strength and direction of a straight line relation between two variables.

4. Do bald men have more heart attacks? In a study, the proportion of bald men who have had
    a heart attack was compared to the proportion of non-bald men that have had heart attacks.
    Which of the following is true for this study?
    A) the response variable is whether a man had a heart attack.
    B) the explanatory variable is whether a man had a heart attack.
    C) the explanatory variable is whether a man is bald.
    D) both (a) and (c).

5. The time to complete a standardized exam is approximately Normal with a mean of 70
    minutes and a standard deviation of 10 minutes. How much time should be given to
    complete the exam so 80% of the students will complete the exam in the time given?
    A) 84 minutes
    B) 78.4 minutes
    C) 92.8 minutes
    D) 79.8 minutes

Use the following to answer questions 6-8.

A market research company employs a large number of typists to enter data into a
computer database. The time taken for new typists to learn the computer system is known
to have a Normal distribution with a mean of 130 minutes and a standard deviation of 20
minutes. A candidate is automatically hired if he or she learns the computer system in less
than 100 minutes. A cut-off time is set at the slowest 40% of the learning distribution.
Anyone slower than this cut-off time is not hired.

6. The proportion of new typists that take under two hours to learn the computer system is
    A) 0.023.
    B) 0.067.
    C) 0.159.
    D) 0.309

7. What proportion of candidates will be automatically hired?
   A) 0.023
   B) 0.067
   C) 0.159
   D) 0.309

8. What is the cut-off time the market research company uses?
   A) 2 hours and 8 minutes
   B) 2 hours and 14 minutes
   C) 2 hours and 30 minutes
   D) 2 hours and 40 minutes

9. For the following density curve, the median is
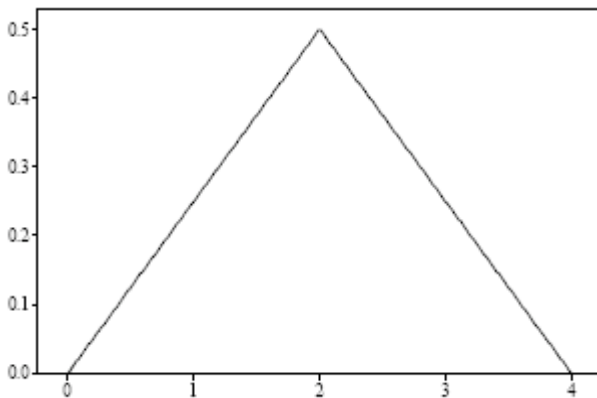
   A) 0.50.
   B) 1.50.
   C) 2.00.
   D) 3.50.

10. A consumer group surveyed the price for a certain item in five different stores and reported the median price as $15. We visited four of the five stores and found the price to be $10, $15, $15, and $25. Assuming that the consumer group is correct, the price of the item at the store that we did not visit
    A) must be $15.
    B) must be below $15.
    C) must be above $15.
    D) can be any value.

11. It is a fact that "amount of ice cream purchased" and "number of drowning deaths" each month are strongly correlated. That is, during months where more ice cream is purchased nationally, more drowning deaths tend to occur, and during months during which less ice cream is purchased, fewer drowning deaths tend to occur. Which of the following statements is true?
    A) Eating more ice cream causes an increase in risk of drowning.
    B) There may be a lurking variable (such as temperature) that simultaneously impacts both variables in this study. Correlation doesn't imply causation.
    C) The correlation between "drowning deaths" and "amount of ice cream purchased" is negative.
    D) Both (b) and (c) are true, while (a) is false.

12. The amount of milk sold each day by a grocery store varies according to the Normal distribution with mean 130 gallons and standard deviation 12 gallons. On a randomly selected day, the probability that the store sells at least 154 gallons is
    A) .0228.
    B) .1587.
    C) .8413.
    D) .9772.

Use the following to answer questions 13-15.

A survey of undergraduate college students at a small university was recently done by an administrator in charge of residential life services. A random sample of 300 students was selected from each class level (freshman, sophomore, junior, senior). Each student was asked to complete and return a short questionnaire on quality of campus residence. Some students returned the questionnaire, and some didn't. This is summarized in the table below:

Class	Returned	Not Response	Total
Freshman	110	190	300
Sophomore	130	170	300
Junior	170	130	300
Senior	160	140	300

13. Which of the following conclusions seems to be supported by the data?
    A) Juniors and seniors appear to be more likely to return the survey than freshmen and sophomores.
    B) Juniors and seniors are happier with the quality of campus residences than freshman and sophomores.
    C) Students that did not return the questionnaire are unhappy with the quality of campus residences.
    D) The percentage of students returning the questionnaire is the same for each class.

14. What percentage of freshmen returned the questionnaire?

15. What percentage of all students surveyed returned the questionnaire?

Use the following to answer questions 16-17.

According to the October 2003 Current Population Survey, the following table summarizes probabilities for randomly selecting a full-time student in various age groups:

Age	15-17	18-24	25-34	35 or older
Probability	.009	.623	.210	.158

16. If we randomly select a full-time student, what is the probability that he/she is 25 or older?
    A) .250
    B) .368
    C) .623
    D) impossible to determine from the information given.

17. If we randomly select a full-time student, the probability that he/she is 18-30 years old is
    A) .50.
    B) .623.
    C) .842.
    D) impossible to determine from the information provided.

18. To say that a six-sided die is "fair" means that when it is rolled, each of the outcomes 1, 2, 3, 4, 5, and 6 has probability 1/6 of ending face up. This means
    A) in the next 6 rolls of the die, exactly one of the outcomes will be 1.
    B) in the next 6 rolls of the die, at least one of the outcomes will be 1.
    C) in the next 6 rolls of the die, at most one of the outcomes will be 1.
    D) none of the above.

Use the following to answer questions 19-21.

A sample was taken of the verbal SAT scores of applicants to a California State College. The following is a boxplot of the scores.

Boxplot of VERBAL GRE
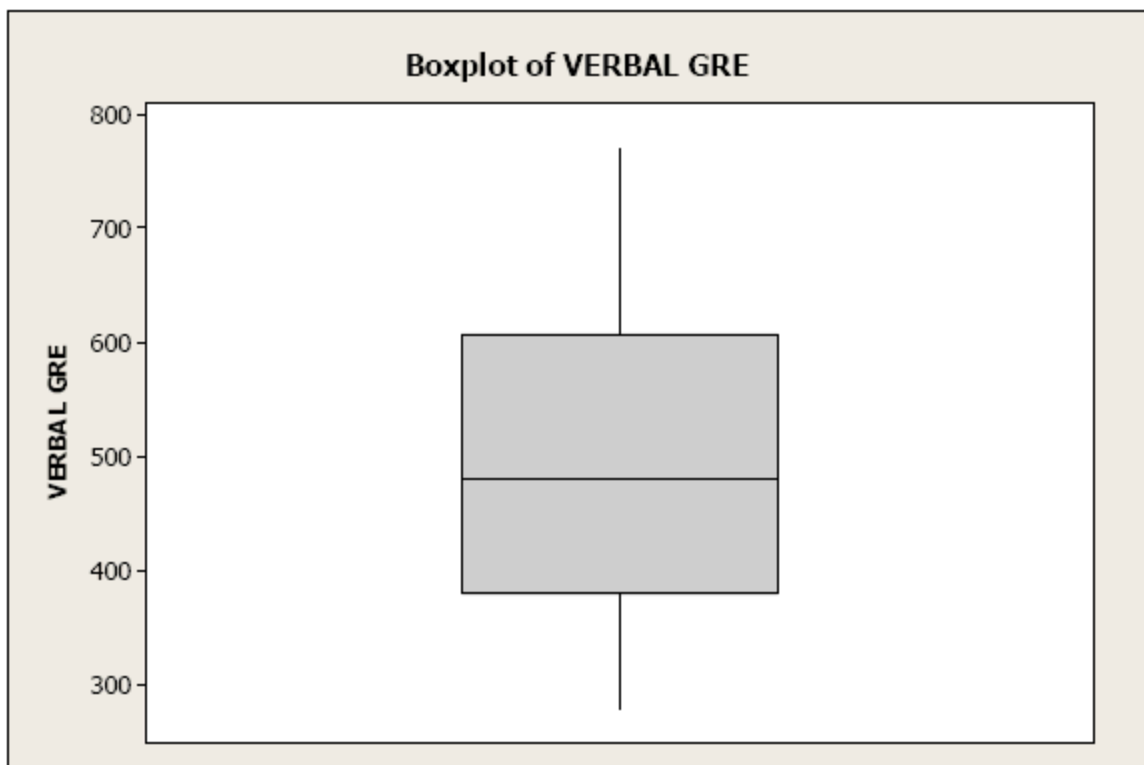
19. About 50% of the applicants had SAT verbal scores exceeding
    A) 400.
    B) 500.
    C) 600.
    D) 700.

20. If each person increased his or her score by 20 points then
    A) the standard deviation would increase by 20.
    B) the first quartile would increase by 20.
    C) the interquartile range would increase by 20.
    D) None of the above.

21. Based on this boxplot, which of the following statements is true?
    A) The distribution of GRE scores is fairly symmetric.
    B) About half the students scored over 500.
    C) Nobody scored an 800.
    D) All of the above.

22. You toss a fair coin 3 times. What is the probability that you get a total of 2 heads? What is the probability that you get a head in the first throw and a tail in the second?

23. the heights (in feet) and weights (in pounds) of four people are (6,180), (5,160), (5.5, 170) and (6.1,180). Find the regression (least squares) line . Show all your work.
    If John has a height of 5.8 feet, estimate his weight using the regression line

Use the following to answer questions 24-27.

A stemplot of ages of 18 faculty members in a college math department follows. 4|3 represents 43 years. 3

```
3 | 2 4 8 9 9
4 | 0 3 5 6 9
5 | 3 4 7 8 9 9
6 | 3 8
```


24. what is the median age (in years) of the faculty members at Wilmington State ?

25. If the eldest faculty member retires and is replaced by a 26-year-old, the median age will
    A) decrease by 2 years.
    B) stay the same.
    C) increase by 2 years.
    D) increase by 4 years.

26. what is the first quartile of the age of the faculty members at Wilmington State ?

27. The 1.5 * *IQR* rule would identify an age as a high outlier if it exceeded
    A) 19 years.
    B) 28.5 years.
    C) 77 years.
    D) 86.5 years.

TABLES AND FORMULAS FOR MOORE
Basic Practice of Statistics

Exploring Data: Distributions

- Look for overall pattern (shape, center, spread) and deviations (outliers).

- Mean (use a calculator):

$$\overline{x} = \frac{x_1 + x_2 + \cdots + x_n}{n} = \frac{1}{n}\sum x_i$$

- Standard deviation (use a calculator):

$$s = \sqrt{\frac{1}{n-1}\sum(x_i - \overline{x})^2}$$

- Median: Arrange all observations from smallest to largest. The median M is located $(n+1)/2$ observations from the beginning of this list.

- Quartiles: The first quartile Q_1 is the median of the observations whose position in the ordered list is to the left of the location of the overall median. The third quartile Q_3 is the median of the observations to the right of the location of the overall median.

- Five-number summary:

$$\text{Minimum,} \ \ Q_1, \ \ M, \ \ Q_3, \ \ \text{Maximum}$$

- Standardized value of x:

$$z = \frac{x - \mu}{\sigma}$$

Exploring Data: Relationships

- Look for overall pattern (form, direction, strength) and deviations (outliers, influential observations).

- Correlation (use a calculator):

$$r = \frac{1}{n-1}\sum\left(\frac{x_i - \overline{x}}{s_x}\right)\left(\frac{y_i - \overline{y}}{s_y}\right)$$

- Least-squares regression line (use a calculator): $\hat{y} = a + bx$ with slope $b = rs_y/s_x$ and intercept $a = \overline{y} - b\overline{x}$

- Residuals:

$$\text{residual} = \text{observed } y - \text{predicted } y = y - \hat{y}$$

TABLE A   **Standard Normal probabilities**

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998