Give your answer in the scantron provided. Each question is worth 2 points.

1) Five juniors and four seniors have applied for two open student council positions. School administrators have decided to pick the two new members randomly. What is the probability they are both juniors or both seniors?
A) 0.569  B) 0.506  C) 0.722  D) 0.395  E) 0.444

2) According to the Economics and Statistics Administration, 76.7% of U.S. households owned a computer in 2010. What is the probability that of three randomly selected U.S. households at least one owned a computer in 2001?
A) 76.7%  B) 98.7%  C) 1.27%  D) 54.9%  E) 23.3%

3) Which of these has a Binomial model?
A) the number of people we survey until we find two people who have taken Statistics
B) the number of aces in a well-shuffled deck of cards.
C) the number of people we survey until we find someone who has taken Statistics
D) the number of people in a class of 25 who have taken Statistics
E) the number of sodas students drink per day

4. Let $Z$ be a standard normal random variable. Find $P(-2.5 < Z < 2.5)$.
A) 0.05  B) 0.01  C) 0.90  D) 0.006  E) 0.9876

5. The amount of time it takes to take an exam has a skewed-to-left distribution with a mean of 65 minutes and a standard deviation of 8 minutes. A sample will be selected at random from the entire population. If we decide to choose a random sample of 9 students, which of the following properly describes the sampling distribution of the sample mean for 9 students?
A) It is the distribution of a data set of 9 student's time.
B) It is normally distributed with mean 65 minutes and s.d. of mean is 8/3 minutes.
C) Its distribution has a mean of 65 minutes and standard deviation of 8/3 minutes, but the shape of the distribution is still skewed-t-left.
D) Its distribution has a mean of 65 minutes and standard deviation of 8 minutes, but the shape of the distribution is still skewed-t-left.

6. A physical fitness association is including the mile run in its secondary-school fitness test. The time for this event for boys in secondary school is known to possess a normal distribution with a mean of 470 seconds and a standard deviation of 60 seconds. The fitness association wants to recognize the fastest 10% of the boys with certificates of recognition. What time would the boys need to beat in order to earn a certificate of recognition from the fitness association?
A) 393.2 seconds  B) 546.8 seconds  C) 371.3 seconds  D) 568.7 seconds

7. Let $f(x) = \frac{1+3x^2}{10}$, $0 < x < 2$. be the density of a continuous random variable $X$. What is the mean of $X$?
A) 1  B) 1.5  C) 1/10  D) 1.4  E) 2
The amount of time it takes to take an exam has a skewed-to-left distribution with a mean of 65 minutes and a standard deviation of 8 minutes. Two different random samples will be selected. One is \( n = 9 \) and the other is \( n = 64 \). When compare the distributions of two sample means (one from \( n = 9 \) and one from \( n = 64 \)), which of the following is correct:

A) The variation of the distribution of sample mean from \( n = 9 \) is smaller than that of the distribution of sample mean from \( n = 64 \).
B) The variation of the distribution of sample mean from \( n = 9 \) is larger than that of the distribution of sample mean from \( n = 64 \).
C) The variation of the distribution of sample mean from \( n = 9 \) is equal to that of the distribution of sample mean from \( n = 64 \).
D) None of the above.

Use the following to answer questions 9-11: The scores of individual students on the American College Testing (ACT) Program composite college entrance examination have a normal distribution with mean 18.6 and standard deviation 6.0. At Northside High, 36 seniors take the test. Assume the scores at this school have the same distribution as national scores.

9. What is the mean of the sampling distribution of the sample mean score for a random sample of 36 students?
   A) 1.0    B) 3.1    C) 6.0    D) 18.6

10. What is the standard deviation of the sampling distribution of the sample mean score for a random sample of 36 students?
    A) 1.0    B) 3.1    C) 6.0    D) 18.6

11. What is the sampling distribution of the sample mean score for a random sample of 36 students?
    A) Approximately normal, but the approximation is poor.
    B) Approximately normal, and the approximation is good.
    C) Exactly normal.
    D) Neither normal nor non-normal. It depends on the particular 36 students selected.

Use the following to answer questions 12-14: The amount of money undergraduate students spend on books for a term has a distribution that is slightly right skewed, with a mean of $400 and a standard deviation of $80.

12. If a student is selected at random, what is the probability that this student spends more than $425 on books?
    A) 0.1125    B) 0.3773    C) 0.6227    D) This cannot be determined from the information given.

13. In a simple random sample of 100 undergraduate students, what is the expected value of the sample mean amount of money spent on books?
    A) $400    B) Anywhere between $320 and $480.
    C) Anywhere between $392 and $408.
    D) This cannot be determined from the information given.
14. If a simple random sample of 100 undergraduate students is selected, what is the probability that these students spend more than $425 on books, on average?
   A) 0.00089  
   B) 0.2353  
   C) 0.3773  
   D) This cannot be determined from the information given.

15) A certain population is bimodal. We want to estimate its mean, so we will collect a sample. Which should be true if we use a large sample rather than a small one?
   I. The distribution of our sample data will be more clearly bimodal.  
   II. The sampling distribution of the sample means will be approximately normal.  
   III. The variability of the sample means will be smaller.  
   A) I only  
   B) II only  
   C) I, II, and III  
   D) II and III  
   E) III only

16. The weight of apples in a farm is normally distributed, with a mean of 110 grams, and a standard deviation of 15 grams. Find the probability that an apple selected at random will weigh between 95 and 115 grams.
   A) 0.84  
   B) 0.53  
   C) 0.16  
   D) 0.47

17. IQ scores are normally distributed with mean 100 and a standard deviation of 12. If a university offers scholarships for first year students whose IQ score is in the top 3%, what is the minimum IQ score that a student must have to qualify for these scholarships?
   A) 77  
   B) 123  
   C) 120  
   D) 110

18. The length of time for one individual to be served at a cafeteria is a random variable having an exponential distribution with a mean of 4 minutes. What is the probability that a person is served in less than 3 minutes?
   A) 0.999  
   B) 0.25  
   C) 0.47  
   D) 0.53  
   E) 0.75

19. Which of the following random variables has a symmetric density graph?
   A) The standard normal random variable  
   B) The exponential random variable  
   C) The uniform random variable  
   D) All but B  
   E) All
20. Find the probability that a standard normal random variable has a value greater than -1.75
   A) 0.96  B) 0.04  C) 0.92  D) 0.08

21. In a box, there are 10 red balls and 10 green balls. You select three balls without replacement. To calculate the probability of getting at least two red balls, we can use the hypergeometric model.
   A) True  B) False

22. Which of the following is true in a binomial distribution?
   A) Each outcome is dependent on the previous outcome.
   B) There are only two outcomes in each trial.
   C) The probability of success changes from trial to trial.
   D) The outcome of a trial depends on the number of trials.
   E) Both A and C are true.

23. A new medicine has an 85% success rate. Twenty patients are treated with it. What is the probability that exactly eighteen are cured with this new medicine?
   A) 0.054  B) 0.7707  C) 0.2293  D) 0.0012  E) none of these numbers

24. We select a jury of 12 from 15 potential jurors (9 women and 6 men). What is the probability of having 7 women in this jury?
   A) 0.00131  B) 0.99869  C) 0.4747  D) 1  E) 0.5

25. A new medicine has an 85% success rate. Five patients are treated with it. Each patient’s conditions improves/worsens independent of the other patients. You want to compute the probability that exactly four of the five patients are cured. What probability model will you use for this?
   A) The exponential probability model
   B) The uniform probability model
   C) The hypergeometric probability model
   D) The capture-recapture model
   E) The binomial probability model

Use the following to answer questions 26 & 27. Suppose that a college determines the following distribution for X = number of courses taken by a full-time student this semester.

<table>
<thead>
<tr>
<th>Value of X</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of X</td>
<td>0.07</td>
<td>0.4</td>
<td>0.25</td>
<td>0.28</td>
</tr>
</tbody>
</table>

26. What is the average number of courses full-time students at this college take this semester?
   A) 4 classes  B) 4.26 classes  C) 4.74 classes  D) 5 classes
27. What is the standard deviation of the number of courses full-time students at this college take this semester?
A) 0.89 classes  
B) 0.94 classes  
C) 1 class  
D) 23.36 classes

28. Let $Y$ be a random variable that takes values -1, 0, 1, 2 with probabilities $3C$, 0.4, $2C$ and 0.1 respectively. If the table is a probability distribution table, find the value of $C$

<table>
<thead>
<tr>
<th>$Y$</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(Y)$</td>
<td>$3C$</td>
<td>0.4</td>
<td>$2C$</td>
<td>0.1</td>
</tr>
</tbody>
</table>

A) 0.10  
B) 0.15  
C) 0.20  
D) 0.25

29. Let $X$ be a random variable with probability distribution table given below:

<table>
<thead>
<tr>
<th>$X$</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P(X)$</td>
<td>0.36</td>
<td>0.04</td>
<td>0.3</td>
<td>0.16</td>
<td>0.14</td>
</tr>
</tbody>
</table>

What is the probability that $X$ takes a positive value?
A) 0.60  
B) 0.15  
C) 0.20  
D) 0.3

30. The function $f(x) = 3x^2, -1 < x < 2$ is a density function.
A) True  
B) False