In almost all problems, I have given the answers to four significant digits. If your answer is slightly different from one of mine, consider that to be roundoff error and mark the closely matching one. If your answer differs from the closest one of mine by more than one percent (meaning the ratio of yours to mine is less than 0.99 or greater than 1.01), then mark “J) None of the preceding”. The first fifteen problems are the ones randomly chosen from the homework exercises. If you do all of them correctly, you can breathe more easily (since you will have reached a passing level of D−) as you head into the ten non-homework questions.

1. An online poll at a popular Web site asked: A nationwide ban of the diet supplement ephedra went into effect recently. The herbal supplement has been linked to 155 deaths and many more heart attacks and strokes. Ephedra manufacturer NVE Pharmaceuticals claimed that the FDA lacked proof that ephedra is dangerous if used as directed. Do you think that ephedra should continue to be banned nationwide? 65% of 17,303 respondents said “yes.” Classify each of the following statements about this poll as true (T) or false (F):

• With a sample size that large, we can be pretty certain we know the true proportion of Americans who think ephedra should be banned.
• The sampling frame is a subset of all Internet users.
• This is a voluntary response survey, so the results can't be reliably generalized to any population of interest.
A) FFF  B) FFT  C) FTF  D) FTT  E) TFF  F) TFT  G) TTF  H) TTT

2. In another experiment to see if getting candy after a meal would induce customers to leave a bigger tip, a waitress randomly decided what to do with 80 dining parties, half with children and half without children. Some parties received no candy, some just one piece, and some two pieces. Others initially got just one piece of candy, and then the waitress suggested that they take another piece. These were balanced across the parties with and without children. How many treatment levels were there in this two-factor experiment?
A) 2  B) 3  C) 4  D) 5  E) 6  F) 7  G) 8  H) 9  I) 10  J) None of the preceding
3. A consumer organization estimates that over a 1-year period 18% of cars will need to be repaired once, 27% will need repairs twice, and 7% will require three or more repairs. What is the probability that a car chosen at random will need no more than one repair?
A) 0.66  B) 0.69  C) 0.72  D) 0.75  E) 0.78  F) 0.81  G) 0.84  H) 0.87  I) 0.90  J) None of the preceding

4. You are dealt a hand of three cards from a standard bridge or poker deck, one at a time. Find the probability that you have at least one ace.
A) 0.2174  B) 0.2302  C) 0.2430  D) 0.2558  E) 0.2686  F) 0.2814  G) 0.2942  H) 0.3070  I) 0.3198  J) None of the preceding
5. The hockey team's shirts have arrived in a big box, and people just start grabbing them, looking for the right size. The box contains 6 medium, 9 large, and 5 extra large shirts. A Hockey Mom wants a medium for you and one for your sister. Find the probability that the first two she grabs are the wrong sizes.

A) 0.3533  B) 0.369  C) 0.3847  D) 0.4004  E) 0.4161  F) 0.4318  G) 0.4475  H) 0.4632  I) 0.4789  J) None of the preceding

6. Lilith is flying from Boston to Denver with a connection in Chicago. The probability her first flight leaves on time is 0.35. If the flight is on time, the probability that her luggage will make the connecting flight in Chicago is 0.91, but if the first flight is delayed, the probability that the luggage will make it is only 0.52. What is the probability that her luggage arrives in Denver with her?

A) 0.6565  B) 0.6803  C) 0.7041  D) 0.7279  E) 0.7517  F) 0.7755  G) 0.7993  H) 0.8231  I) 0.8469  J) None of the preceding
7. An insurance company estimates that it should make an annual profit of $175 on each homeowner's policy written, with a standard deviation of $5500. If it writes 5349 of these policies, what is the standard deviation of the annual profit?
A) $305,680  B) $324,994  C) $344,308  D) $363,622  E) $382,936  F) $402,250  G) $421,564  H) $440,878  I) $460,192  J) None of the preceding

8. I am the only bank teller on duty at my local bank. I need to run out for 7 minutes, but I don't want to miss any customers. Suppose the arrival of customers can be modeled by a Poisson distribution with mean 8 customers per hour. What's the probability that no one will arrive in the next 7 minutes?
A) 0.3657  B) 0.3932  C) 0.4207  D) 0.4482  E) 0.4757  F) 0.5032  G) 0.5307  H) 0.5582  I) 0.5857  J) None of the preceding
9. Vitamin D is essential for strong, healthy bones. Our bodies produce vitamin D naturally when sunlight falls upon the skin, or it can be taken as a dietary supplement. Although the bone disease rickets was largely eliminated in the United States during the 1950s, some people there are concerned that this generation of children is at increased risk because they are more likely to watch TV or play computer games than spend time outdoors. Recent research indicated that about 10% of U.S. children are deficient in vitamin D. Suppose doctors test a group of elementary school children. They will test 450 students at the third grade level. Find the standard deviation of the number who may be deficient in vitamin D.

A) 4.596  B) 4.817  C) 5.038  D) 5.259  E) 5.48  F) 5.701  G) 5.922  H) 6.143  I) 6.364  J) None of the preceding

10. A multiple choice test has 40 questions, with 10 answer choices each. You must get at least 30 correct to pass the test, and the questions are very difficult. Suppose, after studying for a while, you believe you have raised your chances of getting each question right to 65%. How likely are you to pass?

A) 0.1097  B) 0.1215  C) 0.1333  D) 0.1451  E) 0.1569  F) 0.1687  G) 0.1805  H) 0.1923  I) 0.2041  J) None of the preceding
11. Two stores sell watermelons. At the first store the melons weigh an average of 29 pounds, with a standard deviation of 3.5 pounds. At the second store the melons are smaller, with a mean of 23 pounds and a standard deviation of 2.7 pounds. You select a melon at random at each store. What's the standard deviation of the difference in weights? 
A) 1.977  B) 2.326  C) 2.675  D) 3.024  E) 3.373  F) 3.722  G) 4.071  H) 4.420  I) 4.769  J) None of the preceding

12. Two stores sell watermelons. At the first store the melons weigh an average of 29 pounds, with a standard deviation of 3.5 pounds. At the second store the melons are smaller, with a mean of 23 pounds and a standard deviation of 2.7 pounds. You select a melon at random at each store. If a Normal model can be used to describe the difference in weights, what's the probability that the melon you got at the first store is lighter? 
A) 6.054%  B) 6.389%  C) 6.724%  D) 7.059%  E) 7.394%  F) 7.729%  G) 8.064%  H) 8.399%  I) 8.734%  J) None of the preceding
13. The first store in Problem 11 sells watermelons for 32 cents a pound. The second store is having a sale on watermelons – only 27 cents a pound. Rounding to the nearest cent, find the standard deviation of the difference in the price you may pay for melons randomly selected at each store.

A) $0.98  B) $1.07  C) $1.16  D) $1.25  E) $1.34  F) $1.43  G) $1.52  H) $1.61  I) $1.70  J) None of the preceding

14. Based on a 72% national retention rate, does a college where 425 of their 613 freshman returned the next year as sophomores have a right to brag that it has an unusually high retention rate? To answer this question, calculate the probability that at least 425 out of 613 freshmen return, given that the probability of each student returning is 0.72. Note: The exact probability is given in the answers below. If you choose to calculate the probability based on the normal approximation, just pick the answer closest to what you obtain, and you’ll be ok.

A) 0.5801  B) 0.6307  C) 0.6813  D) 0.7319  E) 0.7825  F) 0.8331  G) 0.8837  H) 0.9343  I) 0.9849  J) None of the preceding
15. A museum offers several levels of membership, as shown in the table:

<table>
<thead>
<tr>
<th>Member Category</th>
<th>Amount of Donation ($)</th>
<th>Percent of Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Family</td>
<td>100</td>
<td>35</td>
</tr>
<tr>
<td>Sponsor</td>
<td>250</td>
<td>15</td>
</tr>
<tr>
<td>Patron</td>
<td>500</td>
<td>7</td>
</tr>
<tr>
<td>Benefactor</td>
<td>1000</td>
<td>3</td>
</tr>
</tbody>
</table>

One of the museum’s phone volunteers sets a personal goal of getting an average donation of at least $150 from the new members she enrolls during the membership drive. If she gets 60 new members and they can be considered a random sample of all the members, what is the probability that she will achieve her goal?

A) 0.5436  B) 0.5815  C) 0.6194  D) 0.6573  E) 0.7331  G) 0.7710  H) 0.8089  I) 0.8468  J) None of the preceding

16. According to PePe Le Pew Research, the contact rate (probability of contacting a selected household) in 1997 was 69% and in 2003 was 76%. However, the cooperation rate (probability of someone at the contacted household agreeing to be interviewed) was 70% in 1997 and dropped to 48% in 2003.

a) What is the probability in 2003 of obtaining an interview with the next household on the sample list? Subtract this probability from the corresponding probability in 1997 and report the difference.

A) 0.1003  B) 0.1182  C) 0.1361  D) 0.154  E) 0.1719  F) 0.1898  G) 0.2077  H) 0.2256  I) 0.2435  J) None of the preceding
17. For a sales promotion, the manufacturer places winning symbols under the caps of 9% of all bottles of Moxie (once a major competitor of Coke and Pepsi). You buy a six-pack. What is the probability that you win something? 
A) 0.3433  B) 0.3581  C) 0.3729  D) 0.3877  E) 0.4025  F) 0.4173  G) 0.4321  H) 0.4469  I) 0.4617  J) None of the preceding 

18. Dan's Diner employs three dishwashers. Al washes 40% of the dishes and breaks only 1% of those he handles. Betty and Chuck each wash 30% of the dishes, and Betty breaks 2% of hers, but Chuck breaks 4% of the dishes he washes. (He, of course, will need a new job soon.) You go to Dan's for supper one night and hear a dish break at the sink. What's the probability that Chuck is on the job?  
A) 0.2703  B) 0.3047  C) 0.3391  D) 0.3735  E) 0.4079  F) 0.4423  G) 0.4767  H) 0.5111  I) 0.5455  J) None of the preceding
19. A farmer has 100 lb of apples and 50 lb of potatoes for sale. The market price for apples (per pound) each day is a random variable with a mean of $0.53 and a standard deviation of $0.15. Similarly, for a pound of potatoes, the mean price is $0.35 and the standard deviation is $0.12. It also costs him 10 dollars to bring all the apples and potatoes to the market. The market is busy with eager shoppers, so we can assume that he'll be able to sell all of each type of produce at that day's price. Find the mean of the farmer’s net income.
A) $35.50  B) $40.50  C) $45.50  D) $50.50  E) $55.50  F) $60.50  G) $65.50  H) $70.50  I) $75.50  J) None of the preceding

20. In your sock drawer you have 5 blue socks, 6 grey socks, and 4 black ones. Half asleep one morning, you grab 2 socks at random and put them on. Find the probability you end up wearing matching socks.
A) 0.1587  B) 0.186  C) 0.2133  D) 0.2406  E) 0.2679  F) 0.2952  G) 0.3225  H) 0.3498  I) 0.3771  J) None of the preceding
21. Suppose that 80% of the women who suspect they may be pregnant and purchase an in-home pregnancy test are actually pregnant. Further suppose that the test is 97% accurate. What's the probability that a woman whose test indicates that she is not pregnant actually is pregnant?

A) 0.1013  B) 0.1101  C) 0.1189  D) 0.1277  E) 0.1365  F) 0.1453  G) 0.1541  H) 0.1629  I) 0.1717  J) None of the preceding

22. In theory, a golfer playing a par-4 hole tees off hitting the ball in the fairway, then hits an approach shot onto the green. The first putt (usually long) probably won't go in, but the second putt (usually much shorter) should. Sounds simple enough, but how many strokes might it really take? Use the following assumptions to estimate the expected value of the number of strokes: The tee shot hits the fairway 70% of the time. A first approach shot lands on the green 80% of the time from the fairway, but only 40% of the time otherwise. A subsequent approach shot lands on the green 100% of the time. The first putt goes in 20% of the time, and a subsequent putt goes in 100% of the time.

A) 3.32  B) 3.42  C) 3.52  D) 3.62  E) 3.72  F) 3.82  G) 3.92  H) 4.02  I) 4.12  J) None of the preceding
23. The weight of potato chips in a medium size bag is stated to be 10 ounces. The amount that the packaging machine puts in these bags is believed to have a Normal model with mean 10.3 ounces and standard deviation 0.2 ounces. Some of the chips are sold in "bargain packs" of three bags. What's the probability that at least one of the three is underweight?
A) 0.1873  B) 0.2145  C) 0.2417  D) 0.2689  E) 0.2961  F) 0.3233  G) 0.3505  H) 0.3777  I) 0.4049  J) None of the preceding

24. Carbon monoxide (CO) emissions for a certain kind of car vary with mean 2.7 g/mi and standard deviation 0.4g/mi. A company has 25 of these cars in its fleet. Let $X$ represent the mean CO level for the company’s fleet. There is only a 5% chance that the fleet’s mean CO level is greater than what value?
A) 2.466  B) 2.649  C) 2.832  D) 3.015  E) 3.198  F) 3.381  G) 3.564  H) 3.747  I) 3.93  J) None of the preceding
25. Although most of us buy milk by the quart or gallon, farmers measure daily production in pounds. Ayrshire cows average 47 pounds of milk a day, with a standard deviation of 6 pounds. For Jersey cows, the mean daily production is 43 pounds, with a standard deviation of 5 pounds. Assume that Normal models describe milk production for these breeds. A farmer has 18 Jerseys, and a neighboring farmer has 11 Ayrshires. What’s the probability that the Ayrshire herd average is at least 5 pounds higher than the average for the Jersey herd?

A) 0.2666  B) 0.2941  C) 0.3216  D) 0.3491  E) 0.3766  F) 0.4041  G) 0.4316  H) 0.4591  I) 0.4866  J) None of the preceding