

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. In Chapter 11's example, 20% of the cereal boxes contained a picture of Tiger Woods, 30% Lance Armstrong, and the rest Serena Williams. Suppose you buy five boxes of cereal. Use the ten sets of five numbers from the following line in the TABLE OF RANDOM DIGITS to simulate ten runs of buying five boxes of cereal:

77007 26962 55466 12521 48125 12280 54985 26239 76044 54398

Assign the digits 0 and 1 to Tiger; 2, 3, and 4 to Lance; and the remaining digits to Serena. Based on this simulation, estimate the probability that you end up with a complete set of their pictures.

A) 0 B) 0.1 C) 0.2 D) 0.3 E) 0.4 F) 0.5 G) 0.6 H) 0.7 I) 0.8 J) None of the preceding

2. In a large city school system with 20 elementary schools, the school board is considering the adoption of a new policy that would require elementary students to pass a test in order to be promoted to the next grade. The PTA wants to find out whether parents agree with this plan. Listed below are three ideas proposed for gathering data. For each plan, indicate what sampling strategy is involved.

Plan 1: Randomly select 25 parents from each school. Send them a survey, and follow up with a phone call if they do not return the survey within a week.

Plan 2: Randomly select one class at each elementary school and contact each of those parents.

Plan 3: Go through the district's enrollment records, selecting every 35th parent following a random start. PTA volunteers will go to those homes to interview the people chosen.

A) 1=Convenience, 2=Multistage, 3=Systematic

B) 1=Convenience, 2=Cluster, 3=Systematic

C) 1=Stratified, 2=Multistage, 3=Systematic

D) 1=Stratified, 2=Cluster, 3=Systematic

E) 1=Stratified, 2=Multistage, 3=Convenience

F) 1=Stratified, 2=Cluster, 3=Convenience

G) 1=Volunteer, 2=Multistage, 3=Systematic

H) 1=Volunteer, 2=Cluster, 3=Systematic

I) 1=Stratified, 2=Multistage, 3=Volunteer

J) 1=Stratified, 2=Cluster, 3=Volunteer

3. What kind of study is the following? Among a group of disabled women aged 65 and older who were tracked for several years, those who had a vitamin B₁₂ deficiency were twice as likely to suffer severe depression as those who were not.

A) Completely randomized design B) Randomized block design C) Observational and retrospective D) Observational and prospective E) Latin square F) Graeco-Latin square G) Split-plot design H) Balanced incomplete block design I) Plackett-Burman design J) Fractional factorial design

4. What kind of study is the following? To research the effects of “dietary patterns” on blood pressure in 459 subjects, subjects were randomly assigned to three groups and had their meals prepared by dieticians. Those who were fed a diet low in fat and cholesterol and high in fruits, vegetables, and low-fat dairy foods (known as the DASH diet) lowered their systolic blood pressure by an average of 6.7 points when compared with subjects fed a control diet.

A) Completely randomized design B) Randomized block design C) Observational and retrospective D) Observational and prospective E) Latin square F) Graeco-Latin square G) Split-plot design H) Balanced incomplete block design I) Plackett-Burman design J) Fractional factorial design

5. A company that manufactures rivets believes the shear strength of the rivets they manufacture follows a Normal model with mean breaking strength of 800 pounds and standard deviation of 35 pounds. What percentage of rivets selected at random will break when tested under a 750 pound load?

A) 7.656% B) 7.877% C) 8.098% D) 8.319% E) 8.540% F) 8.761% G) 8.982% H) 9.203% I) 9.424% J) None of the preceding

6. Among thirty airline passengers, six are from the Middle East. Two passengers of the thirty will be selected at random for a complete search. What is the probability that both passengers selected are from the Middle East?

A) 0.02365 B) 0.02726 C) 0.03087 D) 0.03448 E) 0.04170 F) 0.04531 G) 0.04892 H) 0.05253 I) 0.05614 J) None of the preceding

7. In a large Introductory Statistics lecture hall, the professor reports that 15% of the students have never taken a Calculus course, 72% have taken only one semester of Calculus, and the rest have taken two or more semesters of Calculus. The professor randomly assigns students to groups of four to work on a project for the course. What is the probability that, of your other three groupmates, at least one has had more than one semester of Calculus?
 A) 0.2887 B) 0.3019 C) 0.3151 D) 0.3283 E) 0.3415 F) 0.3547 G) 0.3679 H) 0.3811 I) 0.3943 J) None of the preceding

8. A Nosey Polls survey in 2004 asked 1000 U.S. Adults how likely they were to read Hillary Clinton's autobiography *Living History*. Here's how they responded:

Response	Number
Will definitely read it	110
Will probably read it	195
Will probably not read it	299
Will definitely not read it	396

Let's call someone who responded that they would definitely or probably read it as a "likely reader" and the other two categories, "unlikely reader." If we select two people at random from this sample, what is the probability that one is a likely reader and one isn't? (Although I have given the exact value below, you may use the "reasonable" assumption talked about in parts (d) and (e) of the problem in the book. The exact and approximate values are well within one percent of each other.)

A) 0.3440 B) 0.3574 C) 0.3708 D) 0.3842 E) 0.3976 F) 0.4110 G) 0.4244 H) 0.4378 I) 0.4512 J) None of the preceding

9. In its monthly report, the local animal shelter states that it currently has 20 dogs and 28 cats available for adoption. Seven of the dogs and 20 of the cats are male. If an animal is selected at random, find the conditional probability that the animal is a cat given that it is a female.
A) 0.2862 B) 0.3020 C) 0.3178 D) 0.3336 E) 0.3494 F) 0.3652 G) 0.3810 H) 0.3968 I) 0.4126 J) None of the preceding

10. A private college report contains these statistics: 65% of incoming freshmen attended public schools. 80% of public high school students who enroll as freshmen eventually graduate. 90% of other freshmen graduate. What percent of freshmen do not eventually graduate?
A) 15% B) 15.5% C) 16% D) 16.5% E) 17% F) 17.5% G) 18% H) 18.5% I) 19% J) None of the preceding

11. A man buys a racehorse for \$25,000 and enters it in two races. He plans to sell the horse afterward, hoping to make a profit. If the horse wins both races, its value will jump to \$150,000. If it wins one of the races, it will be worth \$60,000. If it loses both races, it will be worth \$5,000. The man believes there's a 15% chance that the horse will win the first race and a 25% chance it will win the second one. Assuming the two races are independent events, find the man's expected profit.

- A) \$2,112.50 B) \$2,412.50 C) \$2,712.50 D) \$3,012.50 E) \$3,312.50 F) \$3,612.50 G) \$3,912.50 H) \$4,212.50
I) \$4,512.50 J) None of the preceding

12. The amount of cereal that can be poured into a small bowl varies with a mean of 2.0 ounces and a standard deviation of 0.25 ounces. A large bowl holds a mean of 3.0 ounces with a standard deviation of 0.3 ounces. You open a new box of cereal and pour one large and one small bowl. Suppose the amount of cereal that the manufacturer puts in the boxes is a random variable with mean 16.3 ounces and standard deviation 0.15 ounces. If the weight of the remaining cereal can be described by a normal model, what's the probability the box contains more than 12 ounces?

- A) 0.04017 B) 0.04191 C) 0.04365 D) 0.04539 E) 0.04713 F) 0.04887 G) 0.05061 H) 0.05235 I) 0.05409 J) None of the preceding

13. 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 England during the 1950's, 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 out doors. Recent research indicated that 20% of British children are deficient in vitamin D. Suppose doctors test a group of randomly selected elementary school children. Answer two questions and then sum their answers to match one of the multiple choices. What's the probability that the first Vitamin D-deficient child is the 6th one tested? Of the first 12 children tested, what's the probability that no more than two of them have Vitamin D deficiency?
A) 0.5415 B) 0.5621 C) 0.5827 D) 0.6033 E) 0.6239 F) 0.6445 G) 0.6651 H) 0.6857 I) 0.7063 J) None of the preceding

14. Almost every year, there is some incidence of volcanic activity on the islands of Japan. In 2002 there were 5 volcanic episodes, defined as either eruptions or sizable seismic activity. Suppose the mean number of episodes is 3.1 per year. Let X be the number of episodes in the 3-year period 2008-2010. Assuming these episodes are independent of each other, what is the probability that $X = 12$?
A) 0.1742 B) 0.1808 C) 0.1874 D) 0.1940 E) 0.2006 F) 0.2072 G) 0.2138 H) 0.2204 I) 0.2270 J) None of the preceding

15. A museum offers several levels of membership, as shown in the table:

Member Category	Amount of Donation (\$)	Percent of Members
Individual	50	40
Family	100	35
Sponsor	250	15
Patron	500	8
Benefactor	1000	2

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 50 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) 0.5402 B) 0.5591 C) 0.5780 D) 0.5969 E) 0.6158 F) 0.6347 G) 0.6536 H) 0.6725 I) 0.6914 J) None of the preceding

16. The Masterfoods company says that before the introduction of purple, yellow candies made up 20% of their plain M&M's, red another 20%, and orange, blue, and green each made up 10%. The rest were brown. If you pick four M&M's in a row from this distribution, what is the probability that they are all brown?

A) 0.0061 B) 0.0065 C) 0.0069 D) 0.0073 E) 0.0077 F) 0.0081 G) 0.0085 H) 0.0089 I) 0.0093 J) None of the preceding

17. The Masterfoods company says that before the introduction of purple, yellow candies made up 20% of their plain M&M's, red another 20%, and orange, blue, and green each made up 10%. The rest were brown. If you pick four M&M's in a row from this distribution, what is the probability that at least one of them is red or orange?
A) 0.5499 B) 0.5799 C) 0.6099 D) 0.6399 E) 0.6699 F) 0.6999 G) 0.7299 H) 0.7599 I) 0.7899 J) None of the preceding

18. A junk box in your room contains a dozen old batteries, four of which are dead. You start picking batteries one at a time and testing them. Find the probability that you have to pick five batteries in order to find one that works.
A) 0.002020 B) 0.002070 C) 0.002120 D) 0.002170 E) 0.002220 F) 0.002270 G) 0.002320 H) 0.002370
I) 0.002420 J) None of the preceding

19. Late-breaking news: An article in the most recent issue of *The New England Journal of Medicine* (October 18, 2007) found that a new test for cervical cancer has 94.6% sensitivity and 94.1% specificity, as compared with 54.4% sensitivity and 96.8% specificity for the Papanicolaou (“Pap”) test. If a woman belongs to a group with 1% prevalence of cervical cancer, what is the probability she has cervical cancer, given that the new test says she does?
A) 0.1319 B) 0.1394 C) 0.1469 D) 0.1544 E) 0.1619 F) 0.1694 G) 0.1769 H) 0.1844 I) 0.1919 J) None of the preceding

20. For a woman belonging to a group with 1% prevalence of cervical cancer, what is the probability that she has cervical cancer if the Papanicolaou test says she does not?
A) 0.003906 B) 0.004072 C) 0.004238 D) 0.004404 E) 0.004570 F) 0.004736 G) 0.004902 H) 0.005068
I) 0.005234 J) None of the preceding

21. Based on concerns raised by her preliminary research, a wildlife biologist decides to collect and examine 120 frogs. She found the genetic trait in 15 of the 120 frogs. If the frequency of the trait is still 1 in 8, what is the exact (not the normal approximation) probability of it occurring in 15 or more frogs out of 120?
A) 0.4258 B) 0.4489 C) 0.4720 D) 0.4951 E) 0.5182 F) 0.5413 G) 0.5644 H) 0.5875 I) 0.6106 J) None of the preceding

22. Suppose that 92% of teens in your area use the Internet. You want to interview a few who do not, so you start contacting teenagers at random. What is the probability that it takes you exactly six interviews until you find the first person who does not use the Internet?
A) 0.04592 B) 0.04807 C) 0.05022 D) 0.05273 E) 0.05452 F) 0.05667 G) 0.05882 H) 0.06097 I) 0.06312 J) None of the preceding

23. Two stores sell watermelons. At the first store the melons weigh 21 pounds with a standard deviation of 3 pounds. At the second store, the melons are smaller, with a mean weight of 19 pounds and a standard deviation of 2 pounds. The first store sells watermelons for 30 cents a pound, and the second store sells them for 26 cents a pound. You select at random a watermelon from each store. If a Normal model can be used to describe the difference in prices, what's the probability that the watermelon from the first store costs less than the watermelon from the second store?
A) 0.06401 B) 0.06793 C) 0.07185 D) 0.07577 E) 0.07969 F) 0.08361 G) 0.08753 H) 0.09145 I) 0.09537 J) None of the preceding

24. When a truckload of apples arrives at a packing plant, a random sample of 140 is selected and examined for bruises, discoloration, and other defects. The whole truckload will be rejected if more than 5% of the sample is unsatisfactory. Suppose in fact that 7% of the apples on the truck do not meet the desired standard. What's the exact (not the normal approximation) probability that the shipment will be accepted anyway?
A) 0.1121 B) 0.1316 C) 0.1511 D) 0.1706 E) 0.1901 F) 0.2096 G) 0.2291 H) 0.2486 I) 0.2681 J) None of the preceding

25. Assume that the duration of human pregnancies can be described by a Normal model with mean 268 days and standard deviation 17 days. Suppose a certain obstetrician is currently providing care to 45 pregnant women. What's the probability that the mean duration of these patients' pregnancies will be less than 265 days?
A) 0.1005 B) 0.1064 C) 0.1123 D) 0.1182 E) 0.1241 F) 0.1300 G) 0.1359 H) 0.1418 I) 0.1477 J) None of the preceding