17-230 Distributions Worksheet 1

Each of the following questions has only ONE correct response. Circle the letter corresponding to the correct distribution and fill in the values of the parameters.

1. A secretary is supposed to send 3 of 8 letters by special delivery. Suppose she gets them all mixed up and randomly puts special delivery stamps on 3 of them. Let X = # of letters correctly receiving special delivery stamps. The distribution of X is

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = _3_ , M = _3_ , and N = _8_ .
   D. Poisson with λ = ____ .

2. A social scientist claims that only 60% of all high school seniors who are capable of college work actually go on to college. Suppose that we acquire a list of 200 capable seniors from a high school. Assume that the scientist is correct. Let X = "# students out of the 200 who go on to college". The distribution of X is

   A. Binomial with n = _200_ and p = _0.6_ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .

3. Suppose that flaws in a certain type of drapery material appear on the average of one flaw in 150 square feet. Let X represent the number of flaws in 225 square feet. What is the distribution of X?

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = _1.5_ .

4. Suppose that a polling company places an average of 1000 calls during an 8-hour shift, and that on the average 55% of the people called refuse to take part in the survey, 22% identify themselves as Democrats, 18% identify themselves as Republicans, and the rest are Independents. Let X = # people who are identified as Independents in a given 2-hour period. The distribution of X is

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = _12.5_ .

5. Suppose that a polling company places an average of 1000 calls during an 8-hour shift, and that on the average 55% of the people called refuse to take part in the survey, 22% identify themselves as Democrats, 18% identify themselves as Republicans, and the rest are Independents. Let X = # people who take part in the survey in the next 200 calls. The distribution of X is

   A. Binomial with n = _200_ and p = _0.45_ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .

6. A can of a certain brand of coffee has a label weight of 48 ounces. A store has 20 such cans on the display shelf. Suppose that the packaging process is such that 40% of such cans of coffee actually contain more than 50 ounces. Let X represent the number of cans that the store has on its shelf which weigh more than 50 ounces. What is the distribution of X?

   A. Binomial with n = _20_ and p = _0.4_ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .

17-230 Distributions Worksheet 2

1. A lot, consisting of 100 fuses, is to be inspected by drawing a sample of five fuses at random from the lot and testing them. The lot is to be accepted if all five of the fuses tested "blow" at the correct amperage.

   Suppose the lot contains 20 defective fuses.

   How many defective fuses do we expect to find in our sample?

   1

   What is the probability that the lot will be accepted?

   0.3193

   Suppose the lot contains 10 defective fuses.

   How many defective fuses do we expect to find in our sample?

   0.5

   What is the probability that the lot will be accepted?

   0.5838

2. A certain type of aluminum screen that is 2 feet wide has on the average one flaw in a 100 ft. roll.

   What is the probability that there are no flaws in a 50 ft. sample cut from such a roll?

   0.607

   What is the probability that a purchase of five 100 ft. rolls will contain at most 3 flaws?

   0.265

Each of the following questions has only ONE correct response. Circle the letter corresponding to the correct distribution and fill in the values of the parameters.

3. A jar contains 25 pieces of candy. Eleven are peppermints, and the rest are butterscotch. A child selects 7 pieces of candy at random, one at a time, and eats them. Let X represent the number of peppermints the child ate. What is the distribution of X?

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = __7__, M = _11_ , and N = _25_ .
   D. Poisson with λ = ____ .

4. Suppose that 15% of all income tax returns with itemized deductions contain illegitimate deductions. An IRS auditor is going to randomly select 10 returns with itemized deductions. Let X = # returns with illegitimate deductions from this sample. The distribution of X is

   A. Binomial with n = _10_ and p = _0.15_ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .

5. Suppose that 10% of all income tax returns with itemized deductions contain illegitimate deductions. An IRS auditor is going to randomly review returns with itemized deductions until he finds 5 with illegitimate deductions. Let X = # returns selected with legitimate deductions. The distribution of X is

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = _5_ and p = _0.10_ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .

17-230 Distributions Worksheet 3

1. If X ~ N(650,625) find

   a. P[600 ≤ X ≤ 660]. 0.6326

   b. P[X ≤ 675]. 0.8413

   c. the 95th percentile of the distibution of X. 691.125

   d. If X ~ N(3,16) and is known to be measured to the nearest integer, find P[1 < X ≤ 4]. 0.2960

2. Suppose X~GAM(α,β) with mean 20 and variance 80.

   a. What are the values of α and β?
   $\alpha = 5,\ \beta = 4$

   b. What is the probability that X is at most 24? 0.715

   c. What is the probability that X is between 20 and 40? 0.411

3. Suppose that the life of a certain type of electronic component has an exponential distribution with a mean life of 500 hours. Let X denote the time to failure for this component.

a. What is the probability that the component will last more than 600 hours?
0.3012

b. Suppose that the component has been in use for 300 hours. What is the probability that it will last an additional 600 hours?
0.3012

Each of the following questions has only ONE correct response. Circle the letter corresponding to the correct distribution and fill in the values of the parameters.

4. Suppose calls are received at a 24-hour "suicide hotline" at an average rate of 2 calls per day. Let X = # calls received in an 8-hour shift. The distribution of X is

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = _2/3_ .
   E. Exponential with λ = ____ .
   F. Gamma with α = ____ and β = ____.

5. Suppose calls are received at a 24-hour "suicide hotline" at an average rate of 2 calls per day. Let X = time in hours between calls. The distribution of X is

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .
   E. Exponential with λ = _1/12_ .
   F. Gamma with α = ____ and β = ____.

6. Suppose that hits at a particular website occur according to a Poisson process, and that the average number of hits per hour is 360. Let W denote the waiting time in minutes till the 100^{th} hit. What is the distribution of W?

   A. Binomial with n = ____ and p = ____ .
   B. Negative binomial with r = ____ and p = ____ .
   C. Hypergeometric with n = ____ , M = ____ , and N = ____ .
   D. Poisson with λ = ____ .
   E. Exponential with λ = ____ .
   F. Gamma with α = _100_ and β = _1/6_.