1. Find the area under the χ^2-curve with 5 degrees of freedom to the right of

   (a) 1.61
   (b) 9.24
   (c) 15.09

2. Find the area to the right of 15.09 under the χ^2-curve with 10 degrees of freedom.

3. Suppose a die is rolled 60 times with observed frequencies as below. Is the die fair?

Value	Observed frequency
1	5
2	7
3	17
4	16
5	8
6	7

4. Same as above only with the below table.

Value	Observed frequency
1	9
2	11
3	10
4	8
5	12
6	10

5. Suppose a die is rolled 600 times with observed frequencies as below. Is the die fair?

Value	Observed frequency
1	90
2	110
3	100
4	80
5	120
6	100

6. Suppose a die is rolled 60000 times with observed frequencis as below. Is the die fair?

Value	Observed frequency
1	10287
2	10056
3	9708
4	10080
5	9935
6	9934

7. One study of grand juries in Alameda County, California, compared the demographic characteristics of jurors with the general population, to see if the jury panels were representative. The results for age are shown below. The investigation wanted to know whether these 66 jurors were selected at random from the population of Alameda County. (Only persons 21 and over are considered; the county age distribution is known from Public Health Department data.)

(a) True or false: to answer the investigators question, you should make a z-test on each line in the table.

(b) Fill in the blank: the _____-test combines information from all the lines in the table into an overall measure between the observed frequencies and expected frequencies. Options: z, χ^2.

(c) True or false: the right-hand column in the tables gives the observed frequencies.

(d) Fill in the blank: to make the χ^2-test, you need to compute the _____ frequency in each age group. Options: observed, expected.

(e) Now answer the investigators question.

Age	County-wide percentage	Number of jurors
21-40	42	5
41-50	23	9
51-60	16	19
61 and over	19	33
Total	100	66

8. Another device tested by the California State Lottery has a set of 10 ping-pong balls, numbered 0 through 9. These balls are mixed in a glass bowl by an air jet, and one is forced out at random. In the trial runs described below, the mixing machine seems to be working well, but some of the ball sets may not have been behaving themselves. On each run, the machine made 120 draws from the bowl, with replacement.

(a) Suppose everything is going as it should. In 120 draws from the bowl, each ball is expected to be drawn _____ times.

(b) The table below shows the results of testing 4 sets of balls. Sets A and D seemed marginal and were retested. Set B was rejected outright. Set C was accepted. How do these decisions follow from the date?

(c) After retesting, what would you do with sets A and D?

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Ball number	A test	A retest	B	C	D test	D retest
0	13	19	22	12	16	8
1	11	9	8	10	7	15
2	16	10	7	14	12	22
3	11	12	8	10	14	11
4	5	7	19	11	15	15
5	12	15	20	10	5	8
6	12	19	10	20	10	17
7	19	10	11	12	21	9
8	5	12	6	12	11	8
9	16	7	9	9	9	7

(d) A statistician wants to test the null hypothesis that his data are like 100 draws made at random with replacement from the box

| 1 | 2 | 3 | 4 | 5 | 6 |

The alternative hypothesis: the data are like 100 draws made at random with replacement from the box

| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 6 |

Can the χ^2-test do the job?

(e) Same as above, but the boxes are

| 1 | 2 | 3 | 4 | 5 | 6 |

| 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |