BRONX COMMUNITY COLLEGE OF THE CITY UNIVERSITY OF NEW YORK
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
Review Problems for Math 23

1. For the following frequency distribution table,

class scores	f	class boundaries	class mark	relative frequency
$24-30$	6			
$31-37$	10			
$38-44$	18			
$45-51$	8			
$52-58$	3			

   (a) determine the class boundaries and the class marks,
   (b) construct the histogram labeling the class boundaries,
   (c) draw the frequency polygon, labeling the class marks,
   (d) draw the scale displaying the relative frequencies, and
   (e) construct the cumulative frequency table and draw the ogive.

2. A group of 25 people were observed regarding their TV habits and were found to spend the following number of hours per week watching television:

30	32	34	36	36
37	39	39	41	41
42	42	43	43	44
45	45	45	46	47
47	49	49	52	53

   In order to display the data in clearer form,
   (a) determine the class width for four (4) classes,
   (b) construct a frequency distribution showing the class limits for the four classes,
   (c) in the table, show the class boundaries and the class marks,
   (d) construct a histogram, labeling the class boundaries,
   (e) then draw the frequency polygon showing the class marks.

3. For the numbers

$$x = 3, 4, 6, 7, 7, 9, 9, 9, 10, 11$$

determine the mean, mode, median, midrange, and range.

4. Determine the range and the sample standard deviation of the following data:

x	f
10	7
20	12
40	5
44	2

5. Determine the sample standard deviation of the following grouped data:

class	f
14 – 22	7
23 – 31	9
32 – 40	3
41 – 49	1

6. Calculate by hand (without a calculator). Show all work:
   (a) $5!$,
   (b) ${}_8C_5$,
   (c) ${}_{10}P_3$.

7. A club is sending five of its twenty members to a convention. How many different groups can be chosen?

8. A dinner consists of a choice of one item from each of the following:

   - 3 appetizers,
   - 2 soups,
   - 5 main courses,
   - 4 desserts.

   How many different four-course dinners can be chosen?

9. Thirty applicants are competing for three jobs (editor, reporter and copy-reader) on a newspaper. In how many different ways can the applicants be selected for the three positions?

10. A box contains 15 light bulbs, four of which are defective. Three light bulbs are taken from the box at random. Describe a sample space with equally likely outcomes for this experiment and compute the following:
    (a) In how many different ways can groups of three light bulbs be taken from the fifteen?
    (b) In how many ways can exactly two good light bulbs be taken from the box?
    (c) Find the probability of obtaining exactly two good light bulbs.

11. Sixteen similar balls are numbered one through sixteen. The first five are red, the next seven are green, and the last four are yellow. They are placed in an urn and then three balls are drawn in random.
    (a) Describe a sample space S for equally likely outcomes. Then determine $\#S$, the total number of possible outcomes that would be listed in the sample space.

(b) Determine $\#(3G)$, the number of possible ways of drawing three green balls from the urn. Then determine $P(3G)$, the probability of drawing three green balls.

(c) Find $\#(2G, 1Y)$, the number of possible ways of drawing two green and one yellow ball from the urn. Then determine $P(2G, 1Y)$, the probability of drawing two green and one yellow ball.

12. Let z have the standard normal distribution. For each of the following probabilities, draw an appropriate diagram, shade the appropriate region and then determine the value:

    (a) $P(0 < z < 1.74)$

    (b) $P(0.62 \leq z \leq 2.48)$

    (c) $P(z \geq 2.1)$

    (d) $P(-1.31 < z < 1.07)$.

13. Let z have the standard normal distribution. For each of the following probabilities, draw an appropriate diagram, shade the appropriate region and then determine the value of z_c:

    (a) $P(0 < z < z_c) = 0.4573$

    (b) $P(z_c \leq z \leq 0) = 0.3790$

    (c) $P(z \leq z_c) = 0.1190$

    (d) $P(-z_c \leq z \leq z_c) = 0.8030$.

14. Let x be a normally distributed random variable with $\mu = 70$ and $\sigma = 8$. For each of the following probabilities, draw an appropriate diagram, shade the appropriate region and then determine the value:

    (a) $P(70 \leq x \leq 80.4)$

    (b) $P(61.2 \leq x \leq 85.2$

15. The lifetime of a certain type TV tube has a normal distribution with a mean of 80.0 and a standard deviation of 6.0 months. What portion of the tubes lasts between 62.0 and 95.0 months?

16. To determine the mileage of a new model automobile, a random sample of 36 cars was tested. A sample mean of 32.6 mpg with a standard deviation of 1.6 mpg was obtained. Construct the 90% confidence interval for the actual mpg mean of the population of this model automobile.

17. A teacher has developed a new technique for teaching which he wishes to check by statistical methods. If the mean of a class test turns out to be 60 (or less), the results will be considered unsuccessful. Alternatively, if the mean is greater than 60, the results will be considered successful. The results of the test with a class of 36 students had a mean $\bar{x} = 66.2$ with a standard deviation of $s = 24.0$. Test whether the results were successful at the $\alpha = 5\%$ level of significance. (Use 1-tail test.) State the null and the alternate hypothesis and include diagrams.

    Partial solution. $H_0 : \mu = 60$ (or $\mu \leq 60$), $H_\mathrm{a} : \mu > 60$. The critical z-value is $z_c = 1.645$. Then

$$z = \frac{66.2 - 60.0}{\frac{24.0}{\sqrt{36}}} = \frac{6.2}{4.0} = 1.55 < z_c$$

    Conclusion: do not reject H_0. The results were statistically unsuccessful at the 5% level of significance. (That is the results could not be distinguished from a random sample from a normal population with mean $\mu = 60$ and standard deviation $\sigma = 24.0$.) □