

Questions from end of chapter 26

END OF CHAPTER PROBLEMS 26–I

1. In an electronics math quiz, the following scores were recorded: 85, 65, 90, 75, 60, 70, 75, 65, 80, 75, 85, 70, 75, 80, 75. Construct a frequency distribution table. From the table, construct a histogram.
2. In an electronics math quiz, the following scores were recorded: 80, 70, 75, 60, 70, 85, 70, 65, 60, 70, 80, 60, 70, 65, 75. Construct a frequency distribution table. From the table, construct a histogram.
3. In an electronics math quiz the following scores were recorded: 80, 62, 77, 98, 78, 75, 70, 60, 90, 85, 75, 83, 78, 72, 65, 82, 70, 76, 65, 80, 94, 75, 66, 73, 85. Construct a frequency distribution table. From the table, construct a histogram. Determine the range and interval midpoints.
4. In an electronics math quiz the following scores were recorded: 83, 64, 75, 72, 78, 85, 57, 73, 70, 79, 80, 76, 95, 88, 72, 81, 75, 73, 85, 74, 76, 70, 82, 65, 78, 91, 82, 80, 75, 68. Construct a frequency distribution table. From the table, construct a histogram. Determine the range and interval midpoints.

5. Twenty high-gain amplifiers were constructed in the lab using components off the shelf. The design called for a voltage gain of 400 dB. The voltage gains were measured to determine the actual gain of the amplifiers. The results (in dB) were: 409, 397, 403, 418, 413, 382, 370, 407, 392, 400, 416, 402, 394, 392, 407, 405, 384, 432, 426, 404. Construct a frequency distribution table and a histogram. Determine the range and interval midpoints.
7. In a manufacturing company, the following items were produced over a 25-day period: 312, 276, 295, 300, 325, 301, 280, 277, 290, 315, 306, 279, 320, 302, 288, 270, 260, 293, 315, 294, 340, 292, 298, 330, 310. Construct a frequency distribution table and histogram. Determine the range and interval midpoints.
9. From a bin of 200 $2\text{-k}\Omega \pm 5\%$ carbon resistors, 25 were selected to be measured in the laboratory. The results were: 1.98 k Ω , 2.00 k Ω , 1.96 k Ω , 2.02 k Ω , 2.00 k Ω , 1.93 k Ω , 2.03 k Ω , 2.00 k Ω , 1.98 k Ω , 1.96 k Ω , 1.90 k Ω , 2.05 k Ω , 2.02 k Ω , 2.00 k Ω , 1.98 k Ω , 2.04 k Ω , 1.98 k Ω , 2.04 k Ω , 2.00 k Ω , 2.03 k Ω , 2.09 k Ω , 2.04 k Ω , 2.06 k Ω , 2.05 k Ω , 2.08 k Ω . Construct a frequency distribution table. From the table, construct a histogram. Determine the range and interval midpoints.
11. In a production run, the number of defective parts per 100 were tallied over a 20-day period. The results were: day 1—3, day 2—4, day 3—3, day 4—2, day 5—6, day 6—4, day 7—3, day 8—5, day 9—2, day 10—1, day 11—3, day 12—5, day 13—4, day 14—3, day 15—1, day 16—3, day 17—5, day 18—2, day 19—4, day 20—3. Construct a frequency distribution table and a histogram.
6. Twenty high-gain amplifiers were constructed in the lab using components off the shelf. The design called for a voltage gain of 400 dB. The voltage gains were measured to determine the actual gain of the amplifiers. The results (in dB) were: 403, 402, 381, 417, 370, 397, 408, 388, 408, 415, 406, 398, 394, 411, 417, 405, 384, 434, 426, 404. Construct a frequency distribution table and histogram. Determine the range and interval midpoints.
8. In a manufacturing company, the following items were produced over a 25-day period: 125, 101, 113, 94, 78, 88, 94, 107, 112, 96, 102, 104, 96, 85, 89, 93, 98, 103, 119, 111, 102, 105, 98, 95, 104. Construct a frequency distribution table and histogram. Determine the range and interval midpoints.
10. From a bin of 100 $47\text{-k}\Omega \pm 5\%$ carbon resistors, 25 were selected to be measured in the laboratory. The results were: 46.5 k Ω , 45.5 k Ω , 48.7 k Ω , 47.2 k Ω , 49.8 k Ω , 47.1 k Ω , 46.7 k Ω , 47.0 k Ω , 46.8 k Ω , 45.3 k Ω , 46.8 k Ω , 49.0 k Ω , 47.3 k Ω , 46.9 k Ω , 46.2 k Ω , 47.8 k Ω , 46.0 k Ω , 48.5 k Ω , 47.0 k Ω , 48.1 k Ω , 46.8 k Ω , 44.5 k Ω , 47.6 k Ω , 47.5 k Ω , 46.5 k Ω . Construct a frequency distribution table. From the table, construct a histogram. Determine the range and interval midpoints.
12. In a production run, the number of defective parts per 100 was tallied over a 30-day period. The results were: day 1—4, day 2—3, day 3—6, day 4—3, day 5—2, day 6—5, day 7—3, day 8—5, day 9—2, day 10—3, day 11—1, day 12—4, day 13—5, day 14—2, day 15—6, day 16—3, day 17—4, day 18—5, day 19—4, day 20—3, day 21—4, day 22—5, day 23—4, day 24—5, day 25—6, day 26—2, day 27—4, day 28—3, day 29—2, day 30—4. Construct a frequency distribution table and a histogram.

END OF CHAPTER PROBLEMS 26-2

- Using the frequency distribution table developed for problem 1 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 3 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 5 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 7 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 9 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 2 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 4 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 6 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 8 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.
- Using the frequency distribution table developed for problem 10 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.

| <i>Scores</i> | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---------------|----|----|----|----|----|----|----|----|-----|
| Tally | 1 | 3 | 5 | 7 | 5 | 4 | 2 | 1 | 1 |
| | 1 | 3 | 5 | 7 | 5 | 4 | 2 | 1 | 1 |

FIGURE 26-31

| <i>Scores</i> | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|---------------|----|----|----|----|----|----|----|----|-----|
| Tally | 1 | 2 | 3 | 5 | 10 | 6 | 4 | 2 | 1 |
| | 1 | 2 | 3 | 5 | 10 | 6 | 4 | 2 | 1 |

FIGURE 26-32

11. Using the frequency distribution table developed for problem 11 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.

12. Using the frequency distribution table developed for problem 12 of End of Chapter Problems 26-1, find the mean, median, and mode for the data set.

END OF CHAPTER PROBLEMS 26-3

1. From the data set in Figure 26-31, find the mean, median, mode, range, and standard deviation.
3. From the data set in Figure 26-33, find the mean, median, mode, range, and standard deviation.
5. From the data set in Figure 26-35, find the mean, median, mode, range, and standard deviation.

2. From the data set in Figure 26-32, find the mean, median, mode, range, and standard deviation.
4. From the data set in Figure 26-34, find the mean, median, mode, range, and standard deviation.
6. From the data set in Figure 26-36, find the mean, median, mode, range, and standard deviation.

| <i>Scores</i> | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 |
|---------------|----|----|----|----|----|----|----|----|----|
| Tally | | | | | | | | | |
| | 2 | 1 | 4 | 3 | 6 | 10 | 5 | 4 | 2 |

FIGURE 26-33

| <i>Scores</i> | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|---------------|----|----|----|----|----|----|----|----|
| Tally | 1 | 0 | 3 | 6 | 7 | 9 | 5 | 2 |
| | 1 | 0 | 3 | 6 | 7 | 9 | 5 | 2 |

FIGURE 26-34

| <i>Score intervals</i> | 50-56 | 57-63 | 64-70 | 71-77 | 78-84 | 85-91 | 92-98 |
|------------------------|-------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | | |
| | 2 | 5 | 7 | 8 | 6 | 4 | 2 |

FIGURE 26-35

| <i>Score intervals</i> | 50-56 | 57-63 | 64-70 | 71-77 | 78-84 | 85-91 | 92-98 |
|------------------------|-------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | | |
| | 1 | 2 | 5 | 8 | 10 | 7 | 4 |

FIGURE 26-36

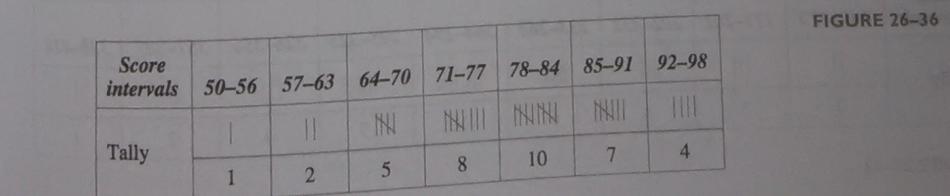


FIGURE 26-37

| Score intervals | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 | 75-79 | 80-84 | 85-89 | 90-94 |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | | | | |
| | 2 | 5 | 5 | 3 | 4 | 6 | 8 | 3 | 1 |

FIGURE 26-38

| Score intervals | 50-54 | 55-59 | 60-64 | 65-69 | 70-74 | 75-79 | 80-84 | 85-89 | 90-94 |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | | | | |
| | 1 | 4 | 7 | 4 | 3 | 4 | 10 | 5 | 2 |

| Item intervals | 300-340 | 341-381 | 382-422 | 423-463 | 464-504 | 505-545 | 546-586 | 587-627 |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Tally | | | | | | | | |
| | 1 | 3 | 5 | 8 | 12 | 6 | 4 | 2 |

FIGURE 26-39

| Item intervals | 710-760 | 761-811 | 812-862 | 863-913 | 914-964 | 965-1015 | 1016-1066 | 1067-1117 |
|----------------|---------|---------|---------|---------|---------|----------|-----------|-----------|
| Tally | | | | | | | | |
| | 2 | 3 | 7 | 11 | 7 | 5 | 3 | 1 |

FIGURE 26-40

| Item intervals | 500-520 | 521-541 | 542-562 | 563-583 | 584-604 | 605-625 | 626-646 |
|----------------|---------|---------|---------|---------|---------|---------|---------|
| Tally | | | | | | | |
| | 4 | 6 | 11 | 7 | 5 | 3 | 1 |

FIGURE 26-41

| Item intervals | 140-170 | 171-201 | 202-232 | 233-263 | 264-294 | 295-325 | 326-356 | 357-387 | 388-418 |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Tally | | | | | | | | | |
| | 2 | 3 | 4 | 6 | 10 | 7 | 4 | 2 | 1 |

7. From the data set in Figure 26–37, find the mean, median, mode, range, and standard deviation.
9. From the data set in Figure 26–39, find the mean, median, mode, range, and standard deviation.
11. From the data set in Figure 26–41, find the mean, median, mode, range, and standard deviation.

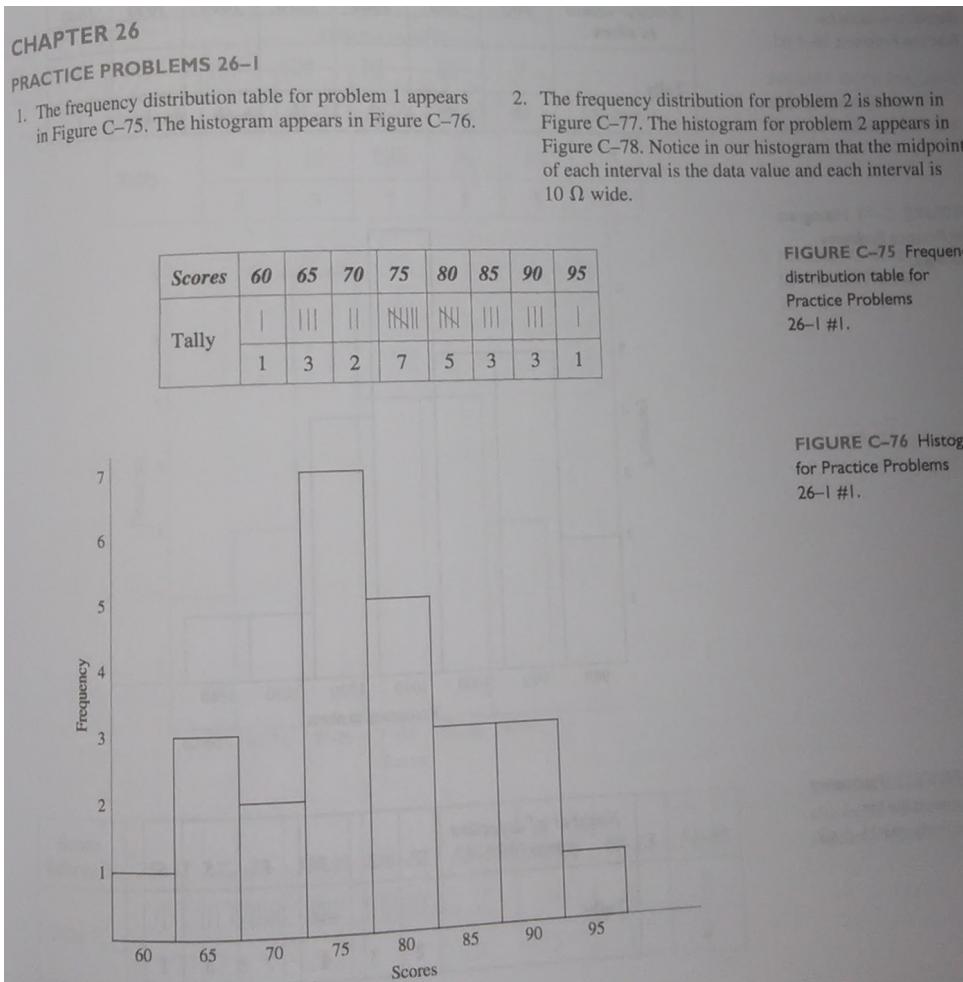
END OF CHAPTER PROBLEMS 26–4

1. 500 widgets were selected to be measured. The mean length was designed to be 40 mm. If the standard deviation was 1 mm, what would we expect a normal distribution to be?
3. The mean average of parts produced each day during the month of June was 600. If the standard deviation was 10, what would a normal distribution be for that 30-day period?
5. 5000 scores were reported on a standardized test. The mean score was 73, with a standard deviation of 5.6. What would be the normal distribution?

8. From the data set in Figure 26–38, find the mean, median, mode, range, and standard deviation.
10. From the data set in Figure 26–40, find the mean, median, mode, range, and standard deviation.
12. From the data set in Figure 26–42, find the mean, median, mode, range, and standard deviation.

2. 200 widgets were selected to be measured. The mean length was designed to be 200 mm. If the standard deviation was 1.5 mm, what would we expect a normal distribution to be?
4. The mean average of parts produced each day during the month of June was 400. If the standard deviation was 7.5, what would a normal distribution be for that 30-day period?
6. 4000 scores were reported on a standardized test. The mean score was 77.5, with a standard deviation of 6.3. What would be the normal distribution?

Solutions for end of chapter 26 questions



3. The frequency distribution table for Problem 3 is shown in Figure C-79. The histogram is shown in Figure C-80.
5. Let's use eight groups. $54 \div 8 = 6.75 \approx 7$. Each interval width is 7. Your groups should look like Figure C-83. The histogram for problem 5 appears in Figure C-84 (p. 700).
4. An examination of the scores shows that the highest score was 91 and the lowest score was 62.
 $\text{range} = 91 - 62 = 29$
- With a range of 29 we could conveniently choose six groups with an interval of 5. $29 \div 6 = 4.85 \approx 5$. Construct the frequency distribution table. Tally the number of data in each interval. The frequency distribution for problem 4 is shown in Figure C-81. The midpoints of the intervals are 64, 69, 74, 79, 84, and 89. The histogram is in Figure C-82.
6. Using 6 intervals, your frequency distribution table should look like the one in Figure C-85 (p. 700). The histogram is shown in Figure C-86 (p. 700).

FIGURE C-77 Frequency distribution table for Practice Problems 26-1 #2.

| Resistor values in ohms | 980 | 990 | 1000 | 1010 | 1020 | 1030 | 1040 |
|-------------------------|-----|-----|------|------|------|------|------|
| Tally | | | | | | | |
| | 2 | 5 | 5 | 7 | 4 | 1 | 1 |

FIGURE C-78 Histogram for Practice Problems 26-1 #2.

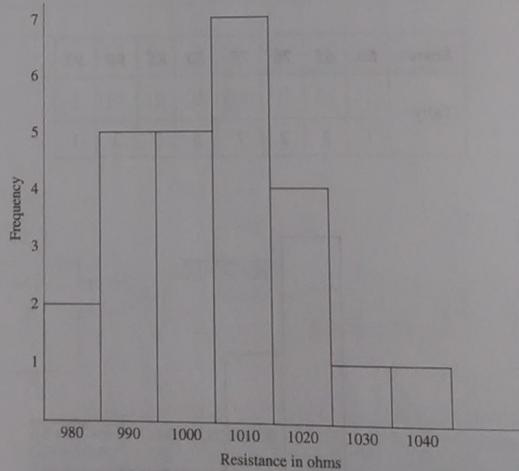


FIGURE C-79 Frequency distribution table for Practice Problems 26-1 #3.

| Number of defective parts/100 | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------------------|---|---|---|---|---|---|
| Tally | | | | | | |
| | 2 | 3 | 4 | 7 | 3 | 1 |

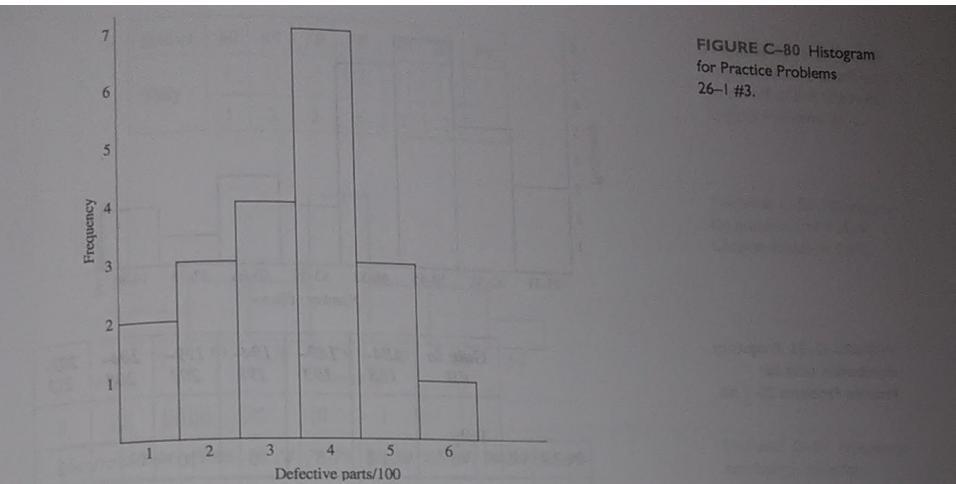


FIGURE C-80 Histogram
for Practice Problems
26-1 #3.

| Score intervals | 62-66 | 67-71 | 72-76 | 77-81 | 82-86 | 87-91 |
|-----------------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | |
| | 2 | 3 | 7 | 5 | 5 | 3 |

FIGURE C-81 Frequency
distribution table for
Practice Problems 26-1 #4.

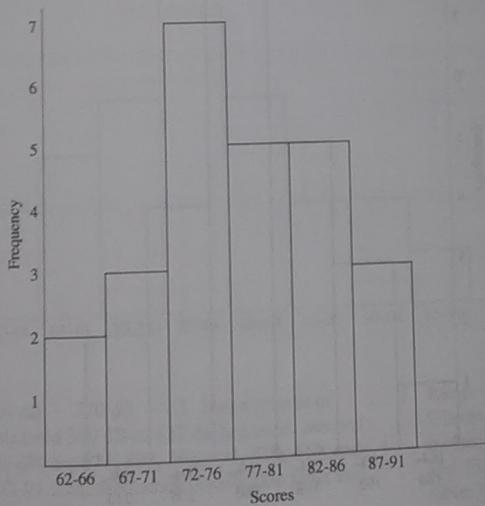


FIGURE C-82 Histogram
for Practice Problems
26-1 #4.

| Score intervals | 25-31 | 32-38 | 39-45 | 46-52 | 53-59 | 60-66 | 67-73 | 74-80 |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | | | |
| | 3 | 5 | 8 | 7 | 2 | 3 | 1 | 2 |

FIGURE C-83 Frequency
distribution table for
Practice Problems 26-1 #5.

FIGURE C-84 Histogram
for Practice Problems
26-1 #5.

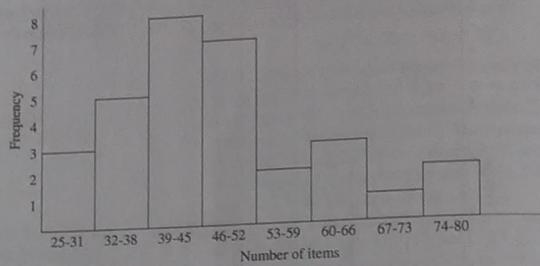
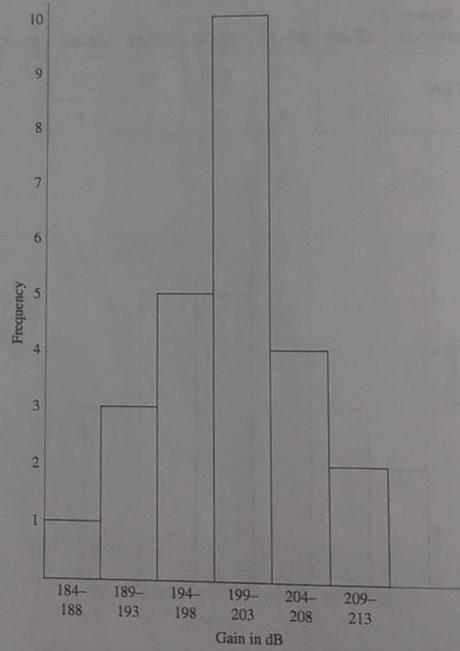


FIGURE C-85 Frequency
distribution table for
Practice Problems 26-1 #6.

| Gain in dB | 184–188 | 189–193 | 194–198 | 199–203 | 204–208 | 209–213 |
|------------|---------|---------|---------|---------|---------|---------|
| Tally | | | | | | |
| | 1 | 3 | 5 | 10 | 4 | 2 |

FIGURE C-86 Histogram
for Practice Problems
26-1 #6.



END OF CHAPTER PROBLEMS 26-1

1. Figure C-87 is the frequency distribution table. Figure C-88 is the histogram.
3. Figure C-89 is the frequency distribution table. Figure C-90 is the histogram. Range = 98 – 60 = 38. Eight groups of five starting at 60 and extending to 99 are used. Interval midpoints are 62, 67, 72, 77, 82, 87, 92, and 97.

| Scores | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|--------|----|----|----|----|----|----|----|
| Tally | | | | | | | |
| | 1 | 2 | 2 | 5 | 2 | 2 | 1 |

FIGURE C-87 Frequency distribution table for problem 1 of End of Chapter Problems 26-1.

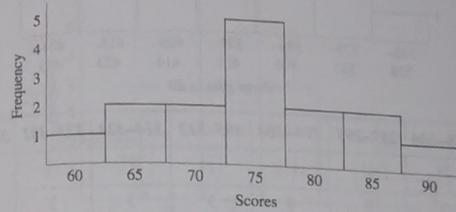


FIGURE C-88 Histogram for problem 1 of End of Chapter Problems 26-1.

| Scores | 60-64 | 65-69 | 70-74 | 75-79 | 80-84 | 85-89 | 90-94 | 95-99 |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| Tally | | | | | | | | |
| | 2 | 3 | 4 | 7 | 4 | 2 | 2 | 1 |

FIGURE C-89 Frequency distribution table for problem 3 of End of Chapter Problems 26-1.

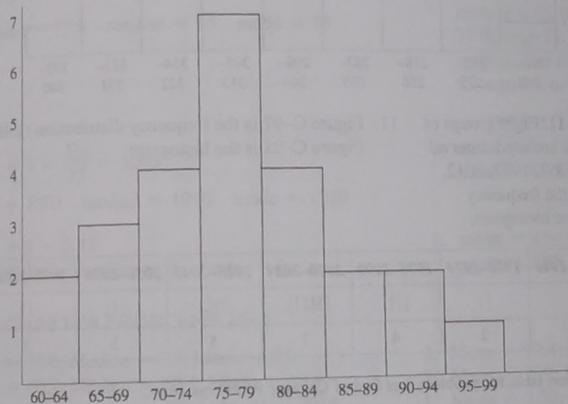


FIGURE C-90 Histogram for problem 3 of End of Chapter Problems 26-1.

5. Range = $432 \text{ dB} - 370 \text{ dB} = 62$. Seven groups of 9-dB intervals from 370 dB to 433 dB are used. Interval midpoints (in dB) are 374, 383, 392, 401, 410, 419, and 428. Figure C-91 is the frequency distribution table and Figure C-92 is the histogram.

7. Range = $340 - 260 = 80$ items. Nine groups of 9 items ranging from 260 to 341 are used. Interval midpoints are 264, 273, 282, 291, 300, 309, 318, 327, and 336. Figure C-93 is the frequency distribution table. Figure C-94 is the histogram.

| Gain | 370-378 | 379-387 | 388-396 | 397-405 | 406-414 | 415-423 | 424-432 |
|-------|---------|---------|---------|---------|---------|---------|---------|
| Tally | | | | | | | |
| | 1 | 2 | 3 | 6 | 4 | 2 | 2 |

FIGURE C-91 Frequency distribution table for problem 5 of End of Chapter Problems 26-1.

FIGURE C-92 Histogram for problem 5 of End of Chapter Problems 26-1.

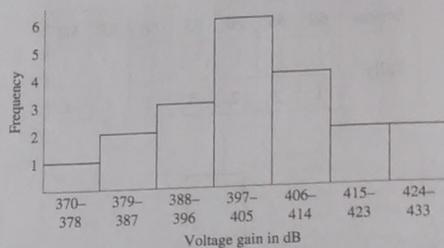
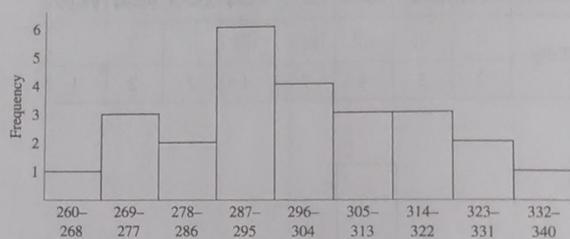


FIGURE C-93 Frequency distribution table for problem 7 of End of Chapter Problems 26-1.

FIGURE C-94 Histogram for problem 7 of End of Chapter Problems 26-1.

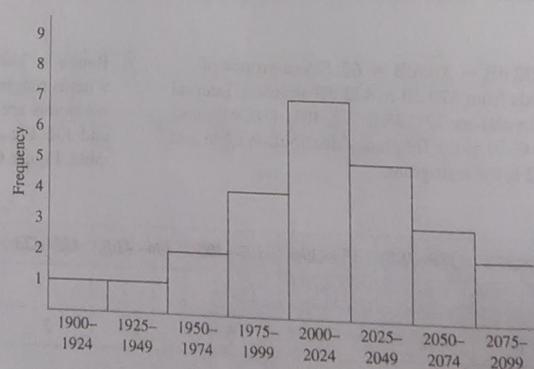


9. Range = $2090 \Omega - 1900 \Omega = 190 \Omega$. Eight groups of 25Ω ranging from 1900Ω to 2099Ω are used. Interval midpoints (in ohms) are 1912, 1937, 1962, 1987, 2012, 2037, 2062, and 2087. Figure C-95 is the frequency distribution table and Figure C-96 is the histogram.

| Resistor values | 1900–1924 | 1925–1949 | 1950–1974 | 1975–1999 | 2000–2024 | 2025–2049 | 2050–2074 | 2075–2099 |
|-----------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Tally | | | | | | | | |
| | 1 | 1 | 2 | 4 | 7 | 5 | 3 | 2 |

FIGURE C-95 Frequency distribution table for problem 9 of End of Chapter Problems 26-1.

FIGURE C-96 Histogram for problem 9 of End of Chapter Problems 26-1.



11. Figure C-97 is the frequency distribution table and Figure C-98 is the histogram.

| Defective parts/100 | | 1 | 2 | 3 | 4 | 5 | 6 |
|---------------------|--|---|---|---|---|---|---|
| Tally | | | | | | | |
| | | 2 | 3 | 7 | 4 | 3 | 1 |

FIGURE C-97 Frequency distribution table for problem 11 of End of Chapter Problems 26-1.

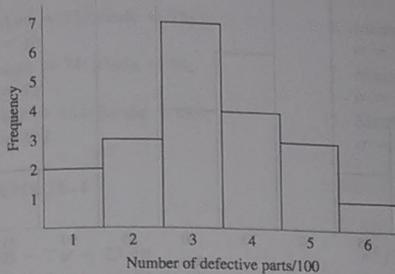


FIGURE C-98 Histogram for problem 11 of End of Chapter Problems 26-1.

PRACTICE PROBLEMS 26-2

$$1. \bar{x} = \frac{1940}{25} = 77.6$$

The median is the thirteenth value, which is 75. The mode is 75.

$$\text{mean} = 77.6 \quad \text{median} = 75 \quad \text{mode} = 75$$

$$2. \bar{x} = \frac{1935}{25} = 77.4$$

The mean is found by using the midpoints of each interval, which are 64, 69, 74, 79, 84, and 89. The median is the thirteenth value, which is in the interval 77 through 81. The midpoint of this interval, 79, is the median. The mode is the midpoint of the interval 72 through 76, or 74.

$$\text{mean} = 77.4 \quad \text{median} = 79 \quad \text{mode} = 74$$

$$4. \text{mean} = \bar{x} = 47.2 \\ \text{mean} = 47.2 \quad \text{median} = 42 \quad \text{mode} = 42$$

$$6. \text{mean} = \bar{x} = 200 \\ \text{mean} = 200 \quad \text{median} = 201 \quad \text{mode} = 201$$

$$3. \text{mean} = \bar{x} = \frac{\Sigma x}{25} = 1005$$

$$\text{mean} = 1005 \quad \text{median} = 1010 \quad \text{mode} = 1010$$

$$5. \text{mean} = \bar{x} = 3.45$$

$$\text{mean} = 3.45 \quad \text{median} = 4 \quad \text{mode} = 4$$

END OF CHAPTER PROBLEMS 26-2

$$1. \text{Mean} = 75.0; \text{Median} = 75; \text{Mode} = 75$$

$$5. \text{Mean} = 40.3; \text{Median} = 40.1; \text{Mode} = 40.1$$

$$9. \text{Mean} = 2014; \text{Median} = 2012; \text{Mode} = 2012$$

$$3. \text{Mean} = 77.4; \text{Median} = 77; \text{Mode} = 77$$

$$7. \text{Mean} = 299; \text{Median} = 300; \text{Mode} = 291$$

$$11. \text{Mean} = 3.30; \text{Median} = 3; \text{Mode} = 3$$

ANSWERS TO SELF-TEST 26-1 THROUGH 26-2

1. Figure C-99 is the frequency distribution.

Figure C-100 is the histogram.

$$\text{mean} = 75.8 \quad \text{median} = 75 \quad \text{mode} = 70$$

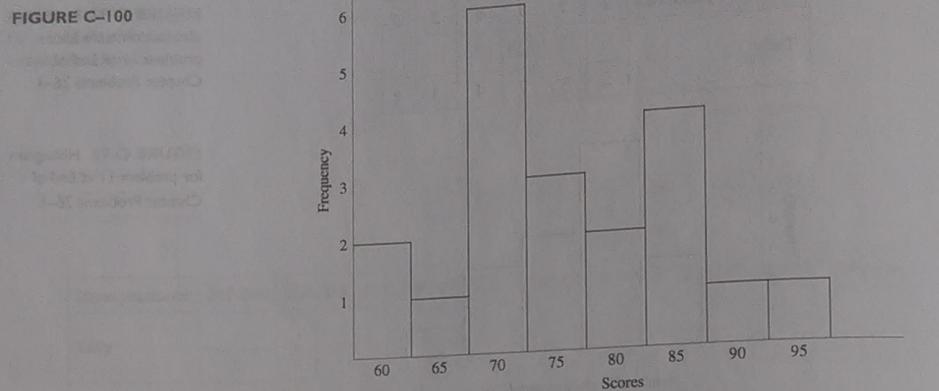
2. Figure C-101 is the frequency distribution.

Figure C-102 is the histogram. The midpoints of the intervals are 118, 127, 136, 145, 154, 163, 172, 181.

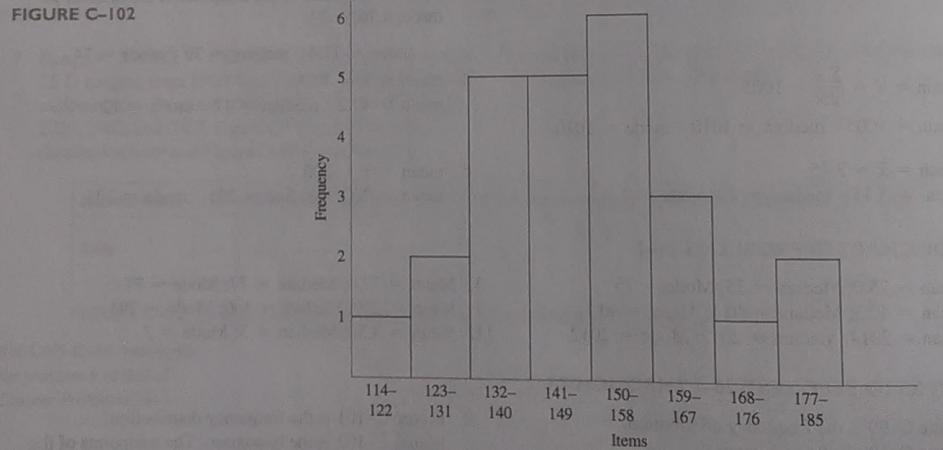
$$\text{mean} = 149 \quad \text{median} = 145 \quad \text{mode} = 154$$

| Scores | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 |
|--------|----|----|----|----|----|----|----|----|
| Tally | | | | | | | | |
| | 2 | 1 | 6 | 3 | 2 | 4 | 1 | 1 |

FIGURE C-99

FIGURE C-100**FIGURE C-101**

| Item intervals | 114–122 | 123–131 | 132–140 | 141–149 | 150–158 | 159–167 | 168–176 | 177–185 |
|----------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Tally | | | | | | | | |
| | 1 | 2 | 5 | 5 | 6 | 3 | 1 | 2 |

FIGURE C-102**PRACTICE PROBLEMS 26–3**

1. $\bar{x} = 78.1$ median = 80
mode = 80 range = 35
 $\sigma = 9.20$

3. Midpoints are 61, 66, 71, 76, 81, 86, and 91.
 $\bar{x} = 72.8$ median = 71
mode = 71 range = 34
 $\sigma = 7.59$

2. $\bar{x} = 632$ median = 630
mode = 630 range = 60
 $\sigma = 14.2$

4. Midpoints are 62, 67, 72, 77, 82, 87, 92, and 97.
 $\bar{x} = 77.3$ median = 77
mode = 72 range = 39
 $\sigma = 8.44$

5. Midpoints are 208, 225, 242, 259, 276, 293, 310, and 327.
 $\bar{x} = 272$ median = 276
mode = 259 range = 135
 $\sigma = 29.3$

END OF CHAPTER PROBLEMS 26-3

1. Mean = 77.4; Median = 75; Mode = 75;
 $\sigma = 9.41$. Range = 40
5. Mean = 73.4; Median = 74; Mode = 74;
 $\sigma = 11.2$. Range = 48
9. Mean = 473; Median = 484; Mode = 484;
 $\sigma = 67.4$. Range = 327

PRACTICE PROBLEMS 26-4

1. If $\sigma = 2$, then:

$$\begin{aligned} 25 \text{ dB} - 1\sigma &= 23 \text{ dB} \\ 25 \text{ dB} + 1\sigma &= 27 \text{ dB} \end{aligned}$$

68% of all the amplifiers have an output between 23 dB and 27 dB. $600 \times 0.34 = 204$. 34% or 204 amplifiers have an output between the mean (25 dB) and 23 dB. 34% or 204 amplifiers have an output between the mean and 27 dB. 95% of all amplifiers have an output between $\pm 2\sigma$ from the mean.

$$\begin{aligned} 25 \text{ dB} - 2\sigma &= 25 \text{ dB} - 4 \text{ dB} = 21 \text{ dB} \\ 25 \text{ dB} + 2\sigma &= 25 \text{ dB} + 4 \text{ dB} = 29 \text{ dB} \\ 600 \times 0.475 &= 285 \end{aligned}$$

47.5% of 600 amplifiers or 285 amplifiers will have outputs between 21 dB and 25 dB (-2σ).

47.5% of 600 amplifiers or 285 amplifiers will have outputs between 25 dB and 29 dB ($+2\sigma$). 99.7% of all amplifiers will have outputs between $\pm 3\sigma$ from the mean.

$$\begin{aligned} 25 \text{ dB} - 3\sigma &= 25 \text{ dB} - 6 \text{ dB} = 19 \text{ dB} \\ 25 \text{ dB} + 3\sigma &= 25 \text{ dB} + 6 \text{ dB} = 31 \text{ dB} \\ 600 \times 0.4985 &= 299 \end{aligned}$$

49.85% of the amplifiers or 299 amplifiers will have outputs between 19 dB and 25 dB.

49.85% of the amplifiers or 299 amplifiers will have outputs between 25 dB and 31 dB.

$299 + 299 = 598$. Two amplifiers will have outputs beyond $\pm 3\sigma$.

END OF CHAPTER PROBLEMS 26-4

1. 340 (68%) are between 39 mm and 41 mm long.
475 (95%) are between 38 mm and 42 mm long.
499 (99.7%) are between 37 mm and 43 mm long.
1 will be greater than 3σ from the mean.
5. 3400 of the scores will fall between 67.4 and 78.6.
4750 of the scores will fall between 61.8 and 84.2.
4985 of the scores will fall between 56.2 and 90.8.
15 of the scores will be less than 56.2 or greater than 90.8.

3. Mean = 77.4; Median = 80; Mode = 80;
 $\sigma = 10.2$. Range = 40
7. Mean = 71.9; Median = 72; Mode = 82;
 $\sigma = 11.2$. Range = 44
11. Mean = 561; Median = 552; Mode = 552;
 $\sigma = 32.3$. Range = 146

2. 1σ above 70 = $70 + 4 = 74$. 1σ below
 $70 = 70 - 4 = 66$.

$$1500 \times 34\% = 510$$

510 students scored between 66 and 70.
510 students scored between 70 and 74.
 2σ above 70 = $70 + 8 = 78$. 2σ below
 $70 = 70 - 8 = 62$.

$$1500 \times 47.5\% = 713$$

713 students scored between 62 and 70.
713 students scored between 70 and 78.
 3σ above 70 = $70 + 12 = 82$. 3σ below
 $70 = 70 - 12 = 58$.

$$1500 \times 49.85\% = 748$$

748 students scored between 58 and 70.
748 students scored between 70 and 82.
 $748 + 748 = 1496$

Two students had scores greater than 82.

Two students had scores less than 58.

3. During 20 days (68%), between 590 and 610 parts will be produced per day.
During 28 days (95% rounded down to a full day)
between 580 and 620 parts will be produced each
Between 570 and 630 parts will be produced each

ANSWERS TO SELF TEST 26-3 THROUGH 26-4

1. $\bar{x} = 77.8$ $\sigma = 9.26$ median = 75 mode = 75 range = 40
2. Midpoints are 620, 661, 702, 743, 784, 825, 866.
 $\bar{x} = 737$ $\sigma = 50.3$ median = 743 mode = 743 range = 286
3. If $\sigma = 6$, then:
 $70 - 1\sigma = 70 - 6 = 64$. $70 + 1\sigma = 70 + 6 = 76$.
68% of all the grades fall between 64 and 76.34% (half of 68%) fall between 64 and 70 and 34% fall between 70 and 76.
 $3000 \times 0.34 = 1020$
1020 of the students' scores were between 64 and 70.
1020 of the students' scores were between 70 and 76.
95% of all the scores fall $\pm 2\sigma$ from the mean.
 $70 - 2\sigma = 70 - 12 = 58$. $70 + 2\sigma = 70 + 12 = 82$.
47.5% of the scores (half of 95%) fall between 58 and 70.
47.5% are in the range from 70 to 82.
 $3000 \times 0.475 = 1425$
1425 of the students' scores were between 58 and 70.
1425 of the students' scores were between 70 and 82. $1425 + 1425 = 2850$
The normal curve shows that almost all the scores (99.7%) are $\pm 3\sigma$ or less from the mean.
 $3000 \times 0.4985 = 1496$ (rounded up from 1495.5).
 $70 - 3\sigma = 70 - 18 = 52$. $70 + 3\sigma = 70 + 18 = 88$.
1496 of the students' scores were between 52 and 70.
1496 of the students' scores were between 70 and 88.
Some scores were greater than $\pm 3\sigma$ from the mean. In this case, 9 (0.3% of 3000).

