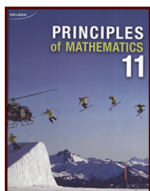


Lesson 6.2: The Normal Distribution

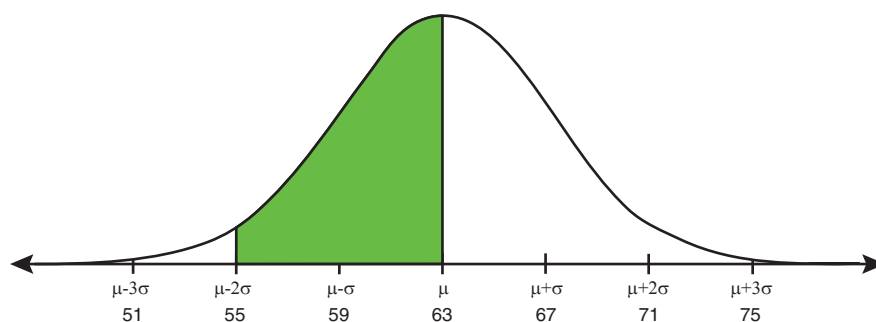


Refer to *Principles of Mathematics 11* page 279 for more examples.

- Page 279, #1, 3, 4, 6, 8, 10, 11, 13b, and 14

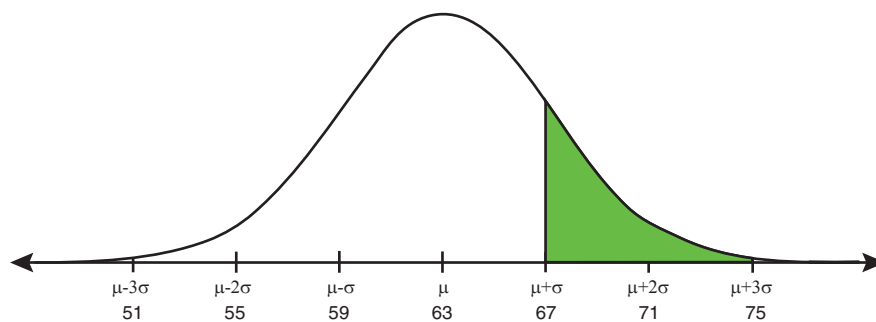
Question 1, page 279

- a. 63 is at the mean and 55 is two standard deviations below the mean.



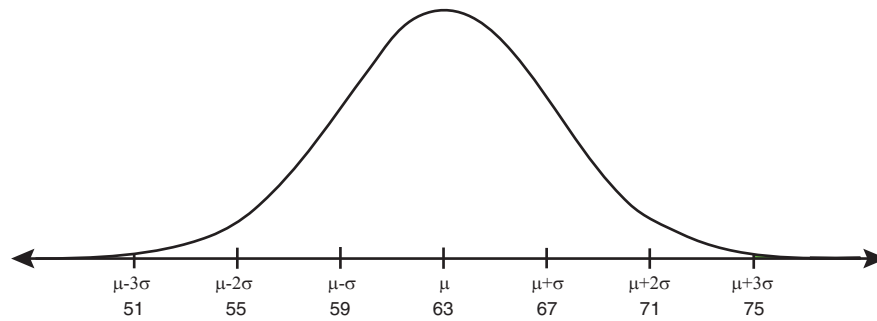
The area is $13.6\% + 34.1\% = 47.7\%$, so approximately 47.7% of the curlers are between 55 and 63.

- b. 67 is one standard deviation above the mean and 75 is three standard deviations above the mean.



The area is $13.6\% + 2.1\% = 15.7\%$, so approximately 15.7% of the curlers are between 67 and 75.

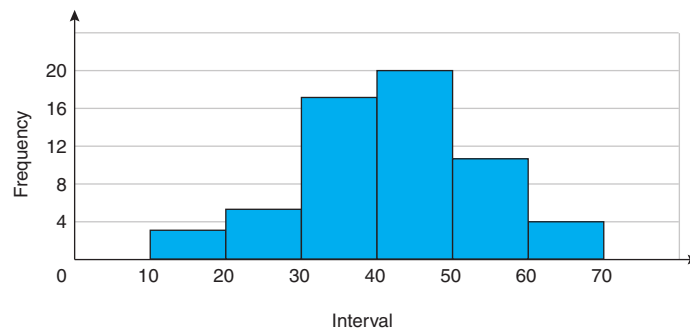
- c. 75 is three standard deviations above the mean.



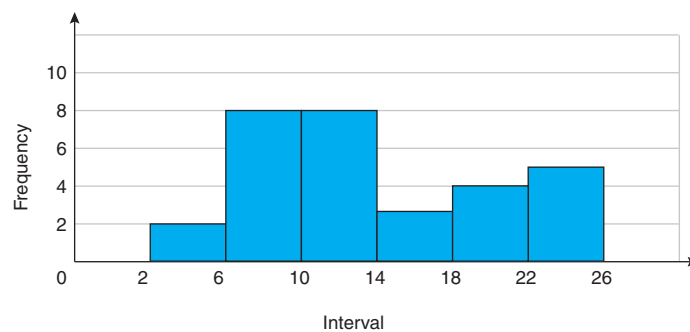
The area is approximately 0.13%, so about 0.13% of the curlers will be over 75.

Question 3, page 279

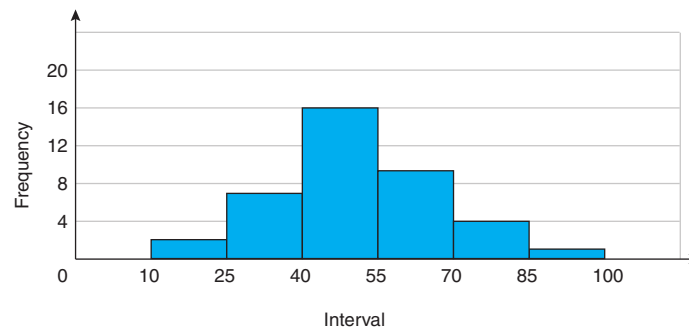
- a. The data is roughly bell shaped and so it is fairly normal.



- b. The data does not form a bell shape and so it is not normally distributed.



- c. The data is roughly bell shaped and so it is fairly normal.



Question 4, page 279

- a. $\mu = 104.5$
 $\sigma = 22.3$

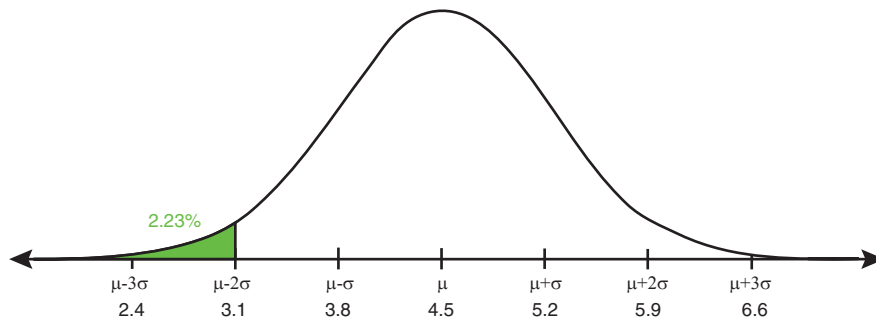
b.

Movie Length	Frequency
59.9 – 82.2	3
82.2 – 104.5	33
104.5 – 126.8	7
126.8 – 149.1	3
149.1 – 171.4	3
171.4 – 193.7	1

- c. No, Tiegan's movie lengths are not normally distributed. The data is not symmetrical and 80% of the data lies within one standard deviation of the mean.

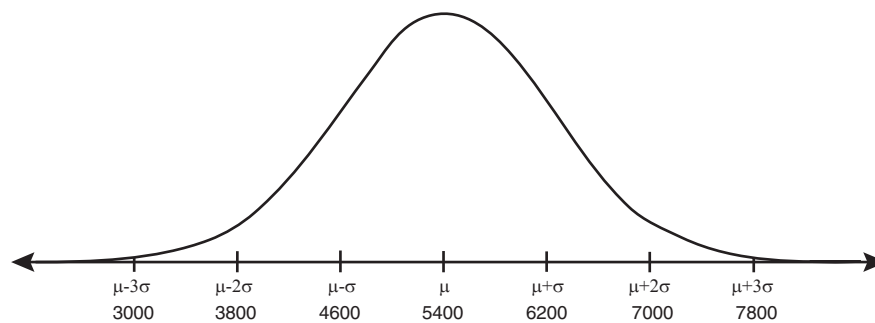
Question 6, page 280

Less than 2.5% of normally distributed data will fall more than two standard deviations below the mean. If the warranty is set to 3.1 years, less than 2.5% of coffee makers will require repair.

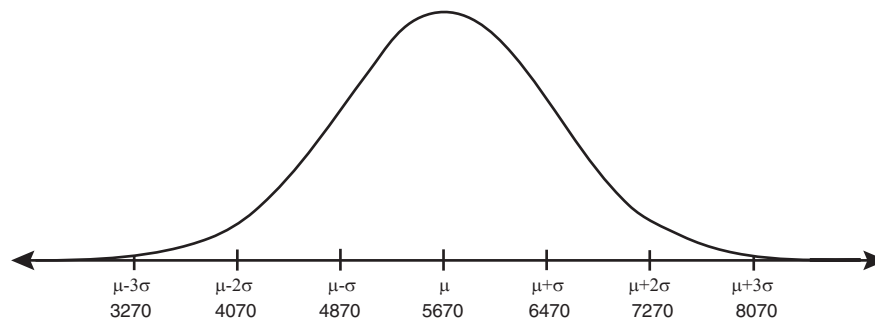


Question 8, p. 280

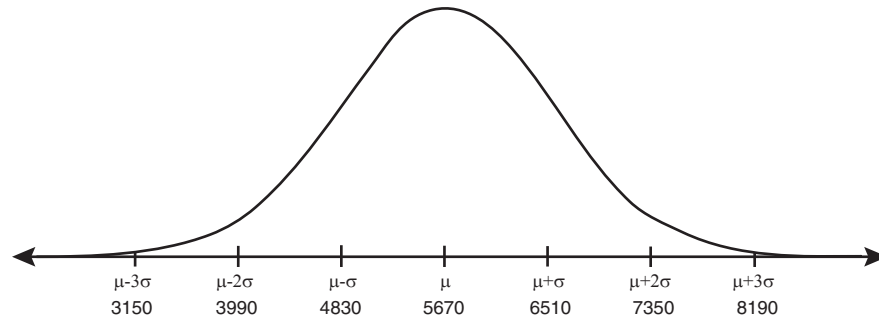
a.



- b. If each person receives an extra \$270, the mean will increase by \$270, but the standard deviation will not change.

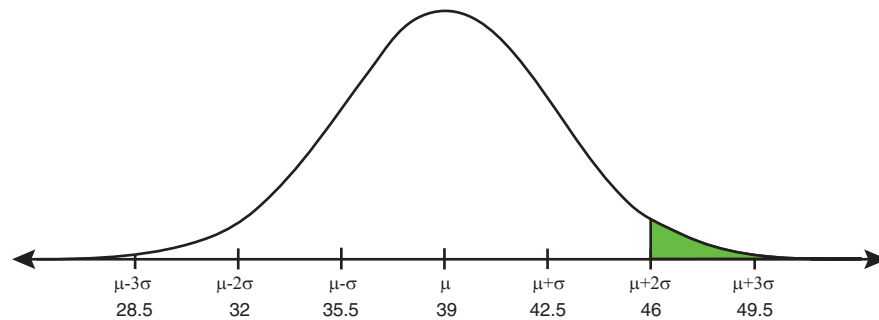


- c. If each person receives an extra 5%, the mean will increase by 5% to \$5670 and the standard deviation will also increase by 5% to \$840. The increase in standard deviation is because a person making \$3000 will receive a smaller increase than a person making \$7800.



Question 10, page 281

Age 46 is two standard deviations above the mean. Approximately $2.1\% + 0.13\% = 2.23\%$ of the data lies above two standard deviations above the mean. $130 \times 0.023 = 2.99$, so approximately 3 of the 130 dolphins will live for more than 46 years.



Question 11, page 281

- a. Approximately 95% of the population will be within two standard deviations of the mean.

$71.8 - 2(13.6) = 44.6$ and $71.8 + 2(13.6) = 99.0$, so 95% of the population will weigh between 44.6 kg and 99.0 kg. Julie should consider masses between 44.6 kg and 99.0 kg in her design.

- b. Approximately 99.7% of the population will be within three standard deviations of the mean.

$71.8 - 3(13.6) = 31.0$ and $71.8 + 3(13.6) = 112.6$, so 99.7% of the population will weigh between 31.0 kg and 112.6 kg. Julie should consider masses between 31.0 kg and 112.6 kg in her design.

- c. The previous values were calculated assuming that peoples' weights are normally distributed. Weights of adults are not normally distributed because men and women will have different mean weights. As a result, the distribution of weights may be "flatter" or even bimodal.

Question 13b, page 281

5.6 kg is two standard deviations below the mean and 16.8 kg is two standard deviations above the mean. Approximately 95% of data lies within two standard deviations of the mean and $0.95 \times 60 = 57$, so approximately 57 of the dogs will weigh between 5.6 kg and 16.8 kg.

Question 14, page 281

Normal data is symmetrical with the mean at the centre. This means the mean mass should be halfway between the typical values.

$$\frac{431 + 533}{2} = 482$$

The mean value is approximately 482 kg.

Almost all data values will fit within three standard deviations of the mean, which means the given range will be spread across 6 standard deviations altogether (3 above and 3 below the mean).

$$\frac{533 - 431}{6} = 17$$

The standard deviation is approximately 17.