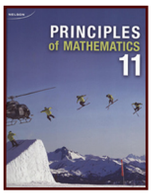
## Lesson 6.3: *Z*-Scores




Refer to *Principles of Mathematics 11* page 292 for more examples.

- Page 292, #1a, 1c, 2a, 2b, 3a, 3b, 7a, 9, 11, 14, 15 and 16

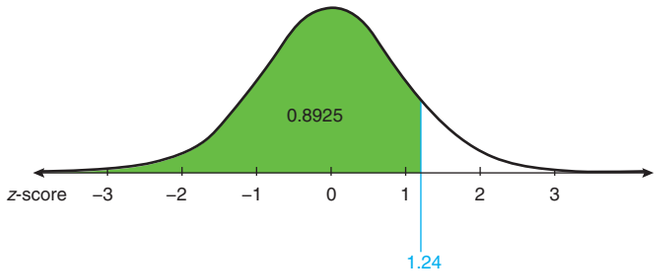
Question 1, page 292

a. $$z = \frac{x - \mu}{\sigma}$$
$$z = \frac{174 - 112}{15.5}$$
$$z = 4$$

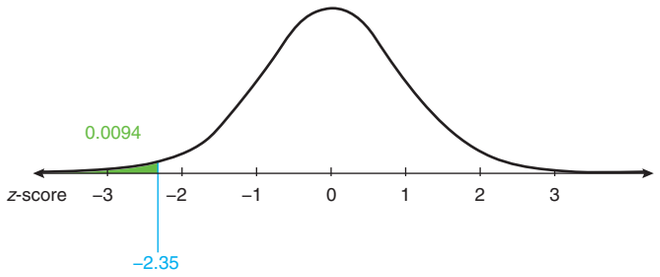
c. $$z = \frac{x - \mu}{\sigma}$$
$$z = \frac{58 - 82}{12.5}$$
$$z = -1.92$$

Question 2, page 292

a. 89.25%

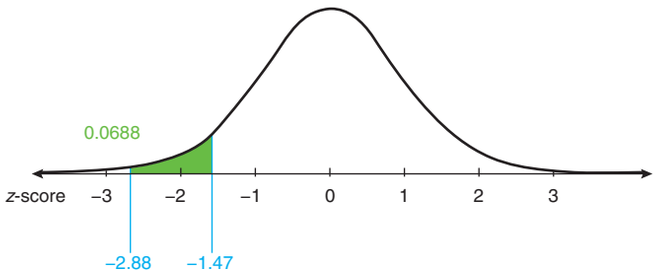



b. 0.94%



Question 3, page 292

a. 6.88%

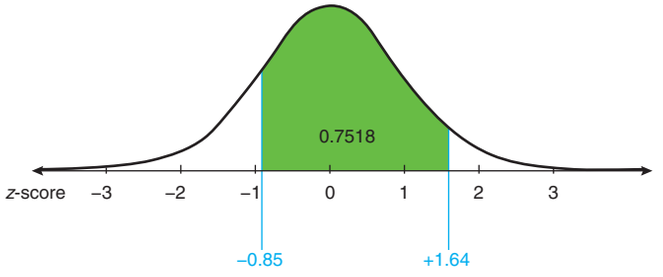



If a *z*-score table is used:

The area below $z = -2.88$ is 0.0020 and the area below $z = -1.47$ is 0.0708.

$0.0708 - 0.0020 = 0.0688$, so approximately 6.88% of normally distributed data lies between *z*-scores of –2.88 and –1.47.

b. 75.18%



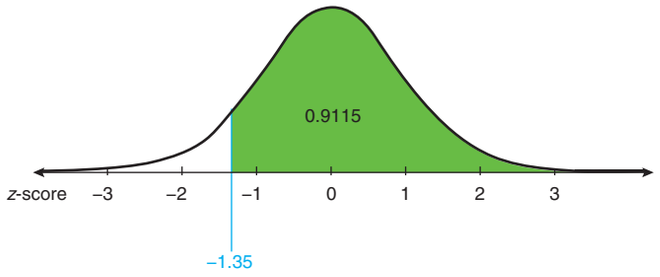

If a *z*-score table is used:

The area below $z = -0.85$ is 0.1977 and the area below $z = 1.64$ is 0.9595.

$0.9495 - 0.1977 = 0.7518$, so approximately 75.18% of normally distributed data lies between *z*-scores of –0.85 and 1.64.

Question 7a, page 292

91.15%

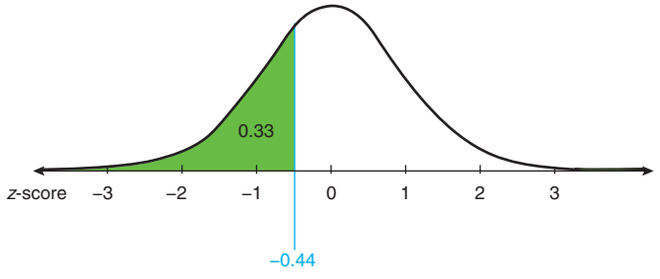



If a *z*-score table is used:

0.0885 lies below $z = -1.35$, so $1 - 0.0885 = 0.9115$ or 91.15% of normally distributed data lies above $z = -1.35$.

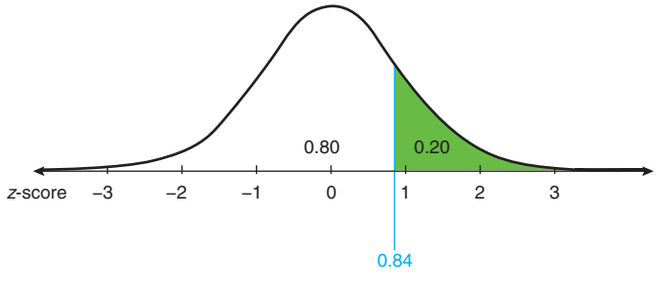
Question 9, page 292

a. $z = -0.44$



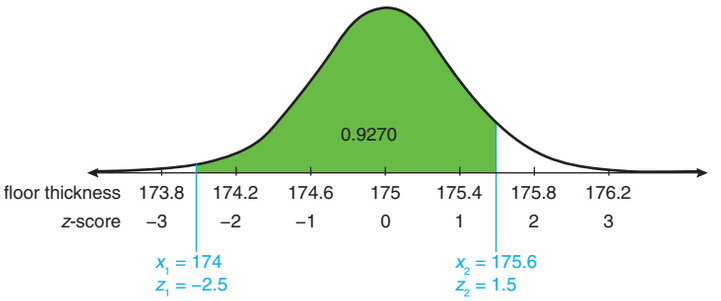

b. 0.2 lies above the *z*-score, so $1 - 0.2 = 0.8$ lies below it.

$z = 0.84$



Question 11 page 292

$$z_1 = \frac{x_1 - \mu}{\sigma} \qquad z_2 = \frac{x_2 - \mu}{\sigma}$$
$$z_1 = \frac{174 - 175}{0.4} \qquad z_2 = \frac{175.6 - 175}{0.4}$$
$$z_1 = -2.5 \qquad z_2 = 1.5$$




0.62% of the flooring has thickness less than 174 mm
93.32% of the flooring has thickness less than 175.6 mm
93.32% – 0.62% = 92.7%

Approximately 92.7% of the total production can be sold for premium-quality floors.

Question 14, page 293

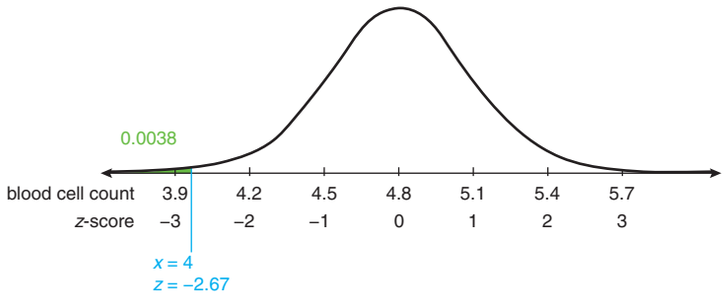
Assuming the population is normally distributed, half of the people would be taller than the mean so the mean is 180 cm. 10% will be above a *z*-score of 1.28 (or 90% will be below a *z*-score of 1.28).

$$z = \frac{x - \mu}{\sigma}$$
$$1.28 = \frac{200 - 180}{\sigma}$$
$$\sigma = \frac{200 - 180}{1.28}$$
$$\sigma = 15.625$$

The standard deviation is approximately 15.6.

Question 15, page 293

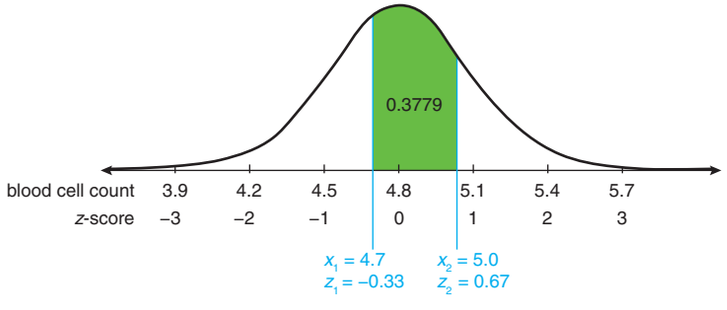
a. $$z = \frac{x - \mu}{\sigma}$$
$$z = \frac{4 - 4.8}{0.3}$$
$$z = -2.67$$



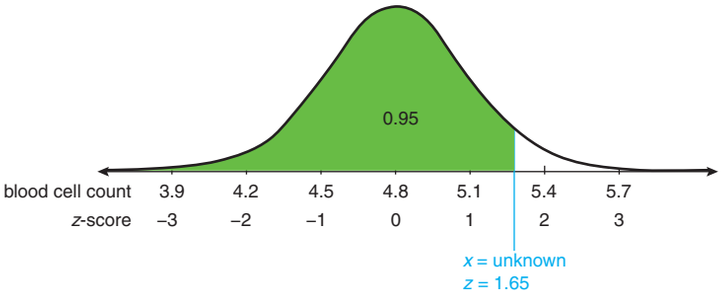

0.38% of people will have a red blood cell count below 4.

b. $$z_1 = \frac{x_1 - \mu}{\sigma} \qquad z_2 = \frac{x_2 - \mu}{\sigma}$$
$$z_1 = \frac{4.7 - 4.8}{0.3} \qquad z_2 = \frac{5 - 4.8}{0.3}$$
$$z_1 = -0.33 \qquad z_2 = 0.67$$

Using a $z$-score table, the area between $z = -0.33$ and 0.67 is 0.3779. This means approximately 37.79% of the population will have a red blood cell count between 4.7 and 5.0.



c. Use technology or a $z$-score table to determine the $z$-score below which 95% of the data lies.



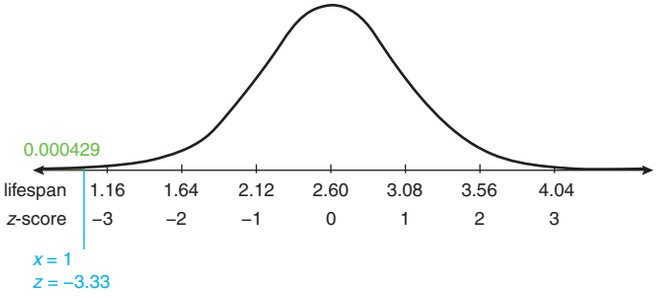

$$z = \frac{x - \mu}{\sigma}$$
$$1.65 = \frac{x - 4.8}{0.3}$$
$$0.495 = x - 4.8$$
$$5.295 = x$$

So 95% of people will have a red blood cell count below approximately 5.3.

Question 16, page 293

a. $$z = \frac{x - \mu}{\sigma}$$
$$z = \frac{1 - 2.6}{0.48}$$
$$z = -3.33$$

You will not be able to look up $z = -3.33$ on most $z$-score tables so you will need to use technology to determine the area.

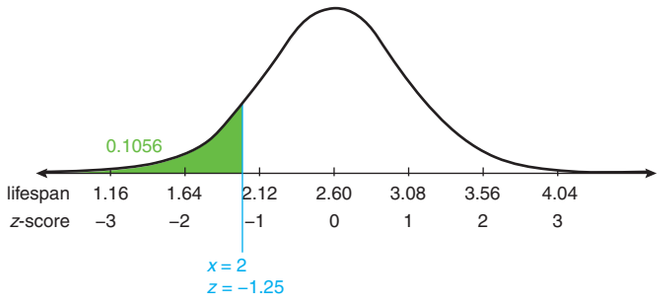



$0.000429 \times 4000 = 1.7$, so approximately 2 players will fail before the warranty expires.

b. $z = \dfrac{x - \mu}{\sigma}$

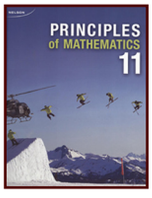
$z = \dfrac{2 - 2.6}{0.48}$

$z = -1.25$




There is approximately a 10.56% chance that Tyler's MP3 player will fail before his extended warranty would expire.

## Lesson 6.4: Confidence Intervals




Refer to *Principles of Mathematics 11* page 302 for more examples.

- Page 302, #1, 3, 4, 6, 9a, and 10.

Question 1, page 302

a. The confidence level is 19 times out of 20, or 95%.

b. 81% – 3.1% = 77.9% and 81% + 3.1% = 84.1%, so the confidence interval is from 77.9% to 84.1%.

c. $0.779 \times 33\,500\,000 = 26\,096\,500$ and $0.841 \times 33\,500\,000 = 28\,173\,500$, so there were likely between 26.1 million and 28.2 million people that knew climate change is affecting Inuit more than the rest of Canadians.