Exercise 1.
\[ x = \text{old score} \quad z = \text{new score} \]
(a) \[ z = x + 5 \]
(b) \[ 1 \text{ lbs} = \frac{1}{2.2} \text{ kg} \]
\[ 80 \text{ lbs} = \frac{80}{2.2} \text{ kg} \]
\[ z = \frac{1}{2.2} x = \frac{1}{2.2} \times 80 = 36.36 \text{ kg} \]

Exercise 2.
(a) \[ z = \frac{70 - 69.1}{2.9} = 0.31 \]
(b) \[ z = \frac{64 - 69.1}{2.9} = -1.76 \]
(c) \[ z = \frac{64 - 63.7}{2.7} = 0.11 \]

Exercise 3.
\[ x = \text{old score} \quad z = \text{new score} \]
(a) \[ z = 100 + 2.5x \quad a = 100, \quad b = 2.5 \]
(b) \[ z = 100 + 2.5 \times 36 = 190 \]
(c) \[ \bar{x} = 30, \quad s_x = 4 \quad \bar{z} = a + b \bar{x} = 100 + 2.5 \times 30 = 175 \]
\[ s_z = 16 \quad s_x = 2.5 \times 4 = 10 \]
Exercise 1. (a) 95% of the scores fall within \( \pm 2\sigma \) of the mean.

\[
70 \pm 2 \times 13 = 70 \pm 26 \quad \text{or} \quad (44, 96)
\]

(b) 5% of the scores fall outside of the range \((44, 96)\). 2.5% fall below 44 and 2.5% fall above 96 due to symmetry.

\[
\boxed{96}
\]

Exercise 2: Men's heights follow a \( N(69.1, 2.9) \) model.

(a) \( N(69.1, 2.9) \) \( \iff \) \( N(0, 1) \)

Convert to a \( N(0, 1) \) model,

\[
Z = \frac{70 - 69.1}{2.9} = 0.31
\]

According to Table 2: Area\((Z < 0.31) = 0.6217\)

62.17% of U.S. males are shorter than 70 inches.
(b) \[
\frac{1.00}{70} - \frac{0.6217}{70} = 0.3783
\]
37.83% of U.S. males are taller than 70 inches.

(c) \[
\frac{67 - 69.1}{2.9} = -0.72
\]
\[N(69.1, 2.9) \quad \Leftrightarrow \quad N(0,1)\]
Table 2: Area (\(z < -0.72\)) = 0.2358
23.58% of U.S. males are shorter than 67 inches.

(d) \[
0.6217 - 0.2358 = 0.3859
\]
38.59% of U.S. males are between 67 and 70 inches.
Find the z-score for which 85% of the area lies to the left.

Table \( z \): \( z = 1.04 \)

You have to be 1.04 standard deviations above the mean to be considered tall.

\[
\frac{x - 69.1}{2.9} = 1.04 \quad \Rightarrow \quad x = 69.1 + 1.04 \times 2.9 = \underline{72.12 \text{ inches}}
\]
Normal Model Drill

Suppose the results of an exam, taken by a class with a large number of students, follow a normal model with mean 60 and standard deviation 8.

Answer the following questions regarding the exam:

- What proportion of the class had scores between 52 and 68?
  \[ (52, 68) \Rightarrow \mu \pm 1\sigma \Rightarrow 68\% \]

- What proportion of the class had scores between 36 and 84?
  \[ (36, 84) \Rightarrow \mu \pm 3\sigma \Rightarrow 99.7\% \]

- What proportion of the class had scores below 36?
  \[ 1 - 0.997 = 0.003 \]

- What proportion of the class had scores above 76?
  \[ 95\% \text{ of scores are between 44 and 76} \Rightarrow 0.025 \]

- What score do you need to ensure that you are in the top 2.5% of the class?
  \[ 76 \]

- What score do you need to ensure that you are not in the bottom 2.5% of the class?
  \[ 44 \]

- What proportion of the class had scores between 50 and 70?
  \[ \frac{50 - 60}{8} = -1.25 \quad \frac{70 - 60}{8} = 1.25 \quad \frac{0.8944 - 0.1056}{0.7788} = 0.7788 \]

- What proportion of the class had scores between 70 and 80?
  \[ \frac{80 - 60}{8} = 2.5 \quad \frac{0.9938 - 0.8944}{0.0994} = 0.0994 \]

- Suppose you scored a 72 on the test. How many percent of the students had better scores? How many percent had worse scores?
  \[ \frac{72 - 60}{8} = 1.5 \quad N(0,1) \quad 93.32\% \text{ had worse scores} \quad 6.68\% \text{ had better scores} \]

- Suppose you scored a 25 on the test. How many percent of the students had better scores? How many percent had worse scores?
  \[ \frac{25 - 60}{8} = -4.375 \quad \text{Area}(Z \leq -4.375) \approx 0 \quad \approx 100\% \text{ had better scores} \]

- What score do you need to ensure that you are in the top 10% of the class?
  \[ \frac{90\%}{3} = 1.28 \quad x = \mu + 3\sigma = 60 + 1.28 \times 8 \approx 70.24 \]

- What score do you need to ensure that you are in the top 20% of the class?
  \[ \frac{80\%}{3} + 0.84 \quad x = 60 + 0.84 \times 8 = 66.72 \]