Exercise 1.22

How many times does a human heart beat during a lifetime? How many gallons of blood does it pump? (Estimate that the heart pumps 50 cm^3 of blood with each beat.)

Solution

Let's say the average heart rate is 1 heartbeat per second and that the average lifetime is 70 years.

$$1\ \frac{\text{heartbeat}}{\cancel{s}} \times \frac{60\ \cancel{s}}{1\ \cancel{\text{min}}} \times \frac{60\ \cancel{\text{min}}}{1\ \cancel{\text{hour}}} \times \frac{24\ \cancel{\text{hours}}}{1\ \cancel{\text{day}}} \times \frac{365\ \cancel{\text{days}}}{1\ \cancel{\text{year}}} \times \frac{70\ \cancel{\text{years}}}{1\ \text{lifetime}} \approx 2.2 \times 10^9\ \frac{\text{heartbeats}}{\text{lifetime}}$$

Now the volume of blood pumped in gallons will be estimated. Use the conversion factors for volume in Appendix E.

$$2.2 \times 10^9\ \frac{\cancel{\text{heartbeats}}}{\text{lifetime}} \times \frac{50\ \cancel{\text{cm}^3}}{1\ \cancel{\text{heartbeat}}} \times \frac{1\ \cancel{\text{L}}}{1000\ \cancel{\text{cm}^3}} \times \frac{1\ \text{gallon}}{3.788\ \cancel{\text{L}}} \approx 3 \times 10^7\ \frac{\text{gallons}}{\text{lifetime}}$$