2. [12 points] A local grocery store sells dry goods in bulk, and one of the goods it sells is quinoa. It costs the store \$110.50 per month (for the space, employee time, etc.) to be able to stock and sell quinoa and \$1.25 per pound to purchase its supply of quinoa. The store charges customers \$4.50 per pound for quinoa.

a. [3 points] Let $C(q)$ be the monthly cost, in dollars, for the store to stock and sell q pounds of quinoa per month. Find a formula for $C(q)$.

Solution: Based on the given information, the average rate of change of the cost is constant (\$1.25 per pound), so $C(q)$ is linear with slope \$1.25/lb.
The fixed cost is \$110.50, so $C(q) = 110.50 + 1.25q$.

Answer: $C(q) =$ $110.50 + 1.25q$

b. [2 points] Let $R(q)$ be the store's monthly revenue from quinoa, in dollars, if it sells q pounds of quinoa that month. Find a formula for $R(q)$. *Recall that revenue is the total amount of money that the store brings in, i.e. how much money customers pay.*

Solution: The price for customers is \$4.50 per pound, so the revenue from selling q pounds is $R(q) = 4.50q$.

Answer: $R(q) =$ $4.50q$

c. [4 points] Assume that the store sells all of the quinoa that it buys each month. How many pounds of quinoa must the store sell in a month in order to not lose money from selling quinoa? (That is, how many pounds of quinoa must the store sell in order to break even on quinoa?) *Remember to show your work.*

Solution: The store will break even when $R(q) = C(q)$. Solving for q, we have

$$\begin{aligned} R(q) &= C(q) \\ 4.50q &= 110.50 + 1.25q \\ 3.25q &= 110.50 \\ q &= 110.50/3.25 \\ q &= 34 \end{aligned}$$

So the store breaks even when $q = 34$ (and makes a profit if $q > 34$). The store must sell at least 34 pounds of quinoa in order to not lose money from selling quinoa.

Answer: 34 **pounds**

d. [3 points] The store also sells almonds. Suppose it sells, on average, a_0 pounds of almonds per month. Let $P(a)$ be the profit, in dollars, that the store earns each month from selling a pounds of almonds. Give a practical interpretation of the quantity $P(a_0 + 100) - P(a_0)$. (*Include units. Your interpretation should not include any math symbols or variables.*)

Solution: The quantity $P(a_0 + 100) - P(a_0)$ is the additional monthly profit, in dollars, that the store earns from selling 100 more pounds of almonds in a month than they sell on average.