Workers' Pay and the Cost of Living: challenge problem solution

On this page, we posed a problem about how long a factory worker in 1890 had to work to afford basic groceries. Here's the solution. No one piece of the problem is especially hard, but it's a big problem, and it takes some organization.

The Solution

First, we need to figure out what a week's worth of groceries actually cost. But before we can do that, we need to figure out what the worker actually needed to buy in a week.

- The worker needed 1 lb. 6 oz. flour per day. Let's keep this simple and work with decimals. Since there are 16 ounces in a pound, 1 lb. 6 oz. is 1 + 6/16 pounds, or 1.375 pounds. That's per *day*, so we multiply by 7 days in a week to get 9.625 pounds of flour per week.
- 6 ounces of bacon per day is 6/16 = 0.375 pounds per day, and 0.375×7=2.625 pounds per week.
- 4 ounces of round steak per day is 4/16 = 0.25 pounds per day, and 0.25×7=1.75 pounds per week.

We also need a dozen eggs, 10 pounds of potatoes, a half-gallon of milk per week, and a pound of sugar per week. (That part was easy.)

The rest of the worker's needs are given per week, so let's look at prices.

- Flour costs $0.15 per 6 pounds, or $0.15/6 = $0.025 per pound. We need 9.625 pounds, and 9.625×$0.025=$0.24. (We're rounding to the nearest penny.)
- Bacon costs 13 cents a pound, and we need 2.625 pounds, so our cost is 2.625×$0.13=$0.34.
- Round steak costs 12 cents a pound, and we need 1.75 pounds, so our cost is 1.75×$0.12 =$0.21.
- A dozen eggs costs $0.21.
- A half-gallon of milk costs $0.14.
- 10 pounds of potatoes cost $0.16.
- 5 pounds of sugar cost $0.35, so sugar was $0.35/5=$0.07 per pound, and we need a pound.

If we add up the prices for our grocery list, we get:

flour	$0.24
bacon	$0.34
round steak	$0.21
eggs	$0.21
milk	$0.14
potatoes	$0.16
sugar	$0.07
total	**$1.30**

So our weekly grocery bill is $1.37. (Coffee is extra.)

Now, how long would the worker have to work to earn $1.30? He earns $1.50 per 12 hours, so that's $0.125 per hour. $1.30 divided by $0.125/hour is 10.4 hours. So there's our answer: Our factory worker had to work 10.4 hours to buy a week's groceries.

Food as a percentage of income

A more common to look at this is to ask what percentage of a worker's income would go to pay for food. Since he/she worked 6 days a week, 12 hours a day, that's 72 hous per week, and 10.4/72 = about 15 percent of the workweek. So about 15 percent of the worker's income would have gone for food.

That's assuming, of course, no coffee or tea, no beans, no fruit or vegetables — so that's 15 percent of income for a very basic and not very healthy diet. And remember we assumed a wage of $1.50 a day. Many workers didn't make that much. At $1 a day, he'd earn $7 a week, of which $1.30 — 19 percent — would go to those basic groceries.

Then consider that a factory worker might be feeding kids as well, and you can see that he or she would be spending a good bit more that of income on food. In fact, people a hundred years ago spent more than 25 percent of their incomes on food. Today, Americans spend less than 10 percent of their disposable incomes — their incomes after taxes — on food.