

Example Problem: Find the life-cycle cost of an automobile.

Green Purchasing Project The Math

Example Math Problem – Life-cycle cost of an Automobile

1. Factors:

- Purchase price
- Interest on purchase price if you take out a loan
- Repairs
- Gas consumption
- Disposal

2. Variables:

Let p = the purchase price of the automobile when you buy it new (in \$)

R = repair cost over the first 5 years of car ownership (in \$)

(We're assuming you only own the car for 5 years, then sell it.)

F = fuel consumption rate (in miles/gallon)

s = price you sell the car for to someone else (in \$)

3. Constants:

Cost of gas: 2.61 \$/gallon

Interest rate on a car loan: 5%/year

4. (a) Cost of each factor:

Factor:	Purchase Price	Interest	Repairs	Lifetime Gas Consumption	Disposal
Cost (in \$):	p	$.134p$	N/A see below	$\frac{156600}{F}$	$-s$

$$\text{Total gas cost} = \frac{2.61 \text{ \$}}{1 \text{ gallon}} \cdot \frac{1 \text{ gallon}}{F \text{ miles}} \cdot \frac{12,000 \text{ miles}}{1 \text{ year}} \cdot \frac{5 \text{ years}}{1} = \frac{156600}{F} \text{ \$}$$

4. (b) Judgments/Assumptions:

- We decided to assume that you bought the car new, owned it for 5 years, and then sold it to someone else. We debated about what a life-cycle was. Eventually we decided it was ok to assume that life-cycle meant "life-cycle" to you when you have ownership of it. So we didn't need to worry about what happened after 5 years. Since different people put different amounts of money into repairs before scrapping their cars, we figured it was best to look at new cars.

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- We assumed the cost of gas was constant at \$2.61/gallon. That was the price while we were doing the project.
- We discarded the use of repair cost in our calculations. While we thought that it was very important, we couldn't find any good data about what the repair cost would be. This made us sad. We wonder if our formula is accurate at all if we don't have this information. Restricting our life-cycle to the first 5 years of the car helps the accuracy, since the car will have few repairs during the first 5 years.
- We assumed that we were going to drive 12,000 miles/year. This is the national average that we found online.¹
- We assumed that you could get a car loan with a 5% annual rate. Apparently this means that you pay 13.4% interest over the whole loan. The math is a little complicated, and we're not sure we understand it all. But it works.
- When you sell a car, you get money back. That's why we made the cost of selling the car negative S .

5. Total Cost Formula:

Our total cost formula is

$$C = p + .134p + \frac{156600}{F} - s \quad \text{or}$$

$$C = 1.134p + \frac{156600}{F} - s$$

¹ [HTTP://AU.ANSWERS.YAHOO.COM/QUESTION/INDEX?QID=20080630175844AAEOfQJ](http://au.answers.yahoo.com/question/index?qid=20080630175844AAEOfQJ)

WE WOULD HAVE REFERENCED THE BUREAU OF TRANSPORTATION STATISTICS WEBSITE, BUT WE COULDN'T FIND THE DATA HE WAS TALKING ABOUT.