Try Your

THE HARDEST MATH PROBLEM

GRADE 8

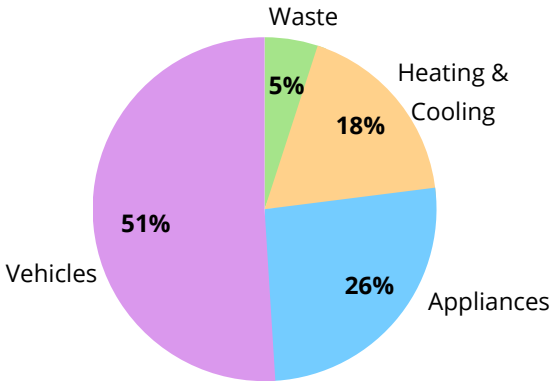
At Sunny Middle School, Ms. Addison's class is investigating how greenhouse gases (GHGs) contribute to global climate change. They wrote their research on note cards:

- Greenhouse gases cause climate change by trapping heat on the planet.
- Greenhouse gases contribute to smog and air pollution, which can cause respiratory diseases, like asthma.
- Extreme weather, disruptions to the food supply, and increased wildfires are also caused by greenhouse gases.

"Where do greenhouse gases come from?" Mia asked.

"One of the most common greenhouse gases is carbon dioxide, also known as CO2. People release CO2 into the atmosphere when we burn fossil fuels (like coal and natural gas) for energy and transportation," Ms. Addison answered.

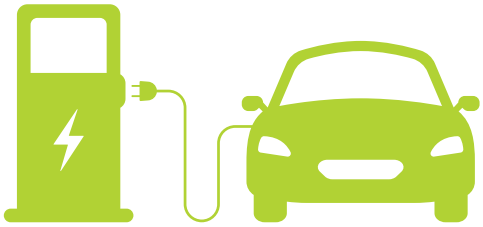
Sources for CO_2 Emissions for a Typical Household



The class examined the graph. The source for the largest percentage of CO2 emissions for a typical household was vehicles. The students conducted some research and found:

- Highway vehicles release about 1.7 billion tons of GHGs each year.
- Each gallon of gasoline burned creates 20 pounds of GHG.
- A typical vehicle releases 6 to 9 tons of GHG into the atmosphere each year.

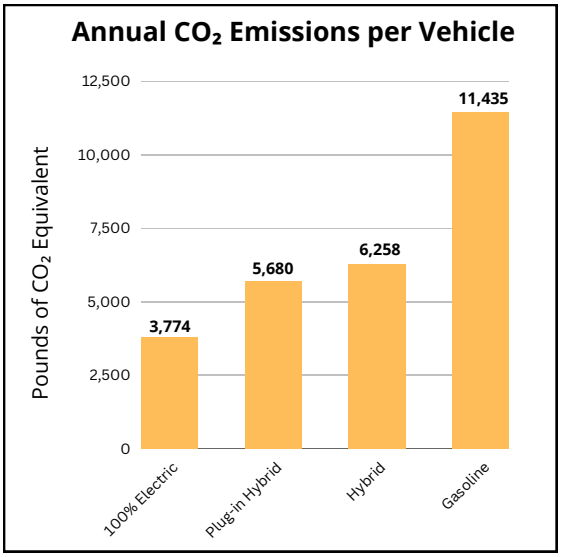
Solve the Problem



While researching, Ichiro found that a gasoline car can drive 210,000 miles on average over its lifetime (period of time a car can operate). A plug-in hybrid car can drive a lifetime of 300,000 miles.

Consider two families that each drive 15,000 miles a year for the lifetime of the car—one with a gasoline car and the other with a plug-in hybrid.

Annual CO_2 Emissions per Vehicle



What is the percent decrease for the pounds of CO2 that the plug-in hybrid car would emit over its lifetime as opposed to the gasoline car? Round your final percentage to the nearest integer.

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CHALLENGE 1 ANSWER KEY – GRADE 8

Although each problem has one correct numeric solution, there are multiple pathways students can take to arrive at the answer. Students who answered Challenge 1 correctly are invited to enter Challenge 2!

Sample Solution

Step 1: The data in the graph is annual data. I need to figure out how many years it will take each car to reach its life span.

Gasoline Car: 210,000/15,000 = 14 years
Plug-In Hybrid Car: 300,000/15,000 = 20 years

Step 2: Once we know the number of years each car will be driven, we can figure out the total pounds of CO_2 emitted.

Gasoline Car: 14 yrs x 11,435 lbs = 160,090 lbs
Plug-In Hybrid Car: 20 yrs x 5,680 lbs = 113,600 lbs

Step 3: Before I can find the percent decrease between the two vehicles, I first need to find the difference between the two cars' pounds of CO_2 emissions. I set up this equation:

160,090 lbs (gasoline car) – 113,600 lbs (hybrid car) = 46,490 lbs of difference in emissions

Step 4: Next, following the formula for percent change, I divide the difference of 46,490 lbs by the amount of emissions from the higher-emitting car, the gasoline car. I need to use the gasoline car's emissions here, as opposed to the hybrid, in order to find how much emissions have decreased from the car that emits more.

46,490 / 160,090 = 0.290399....

Step 5: Since the question asked for the answer to be provided as a percentage to the nearest integer, I multiply the decimal by 100 to convert it to a percentage and round it to 29%.

Final Answer: Final Answer: The percent decrease for the pounds of CO2 that the plug-in hybrid car would emit in contrast to the gasoline car is **29% (or -29% change)**.