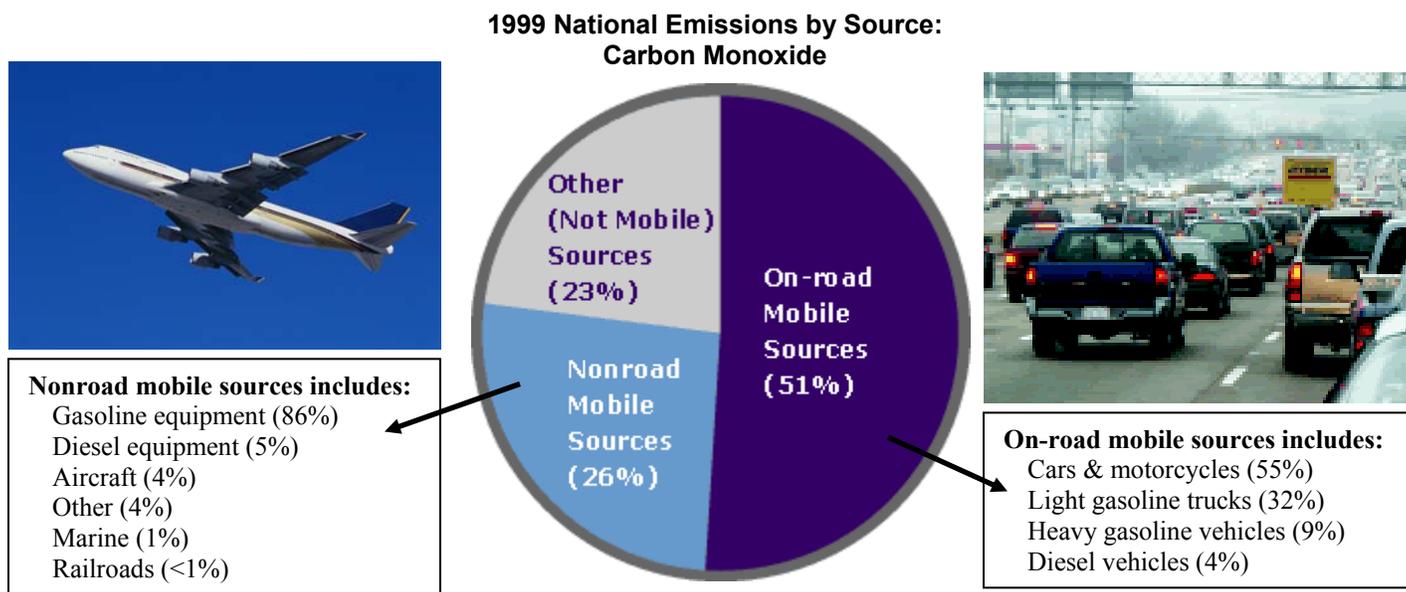


Carbon Monoxide Emissions Worksheet **Answers**

Refer to the pie chart below and answer the following questions. Show your calculations.



1. What percentage of carbon monoxide enters the atmosphere from transportation?

% On-Road Mobile Sources + % Non-road Mobile Sources = 51% + 26% = 77%

2. In 1999, 90 million tons of carbon monoxide were emitted by the U.S. How much carbon monoxide was emitted into the atmosphere from automobiles (on-road vehicles) by the U.S.?

Total automobile emissions = % automobiles emissions * Total carbon monoxide emissions

Total automobile emissions = 0.51 * 90 million tons CO = 45.9 million tons CO

3. What types of transportation and equipment do you and your family use that pollute the air with carbon monoxide emissions?

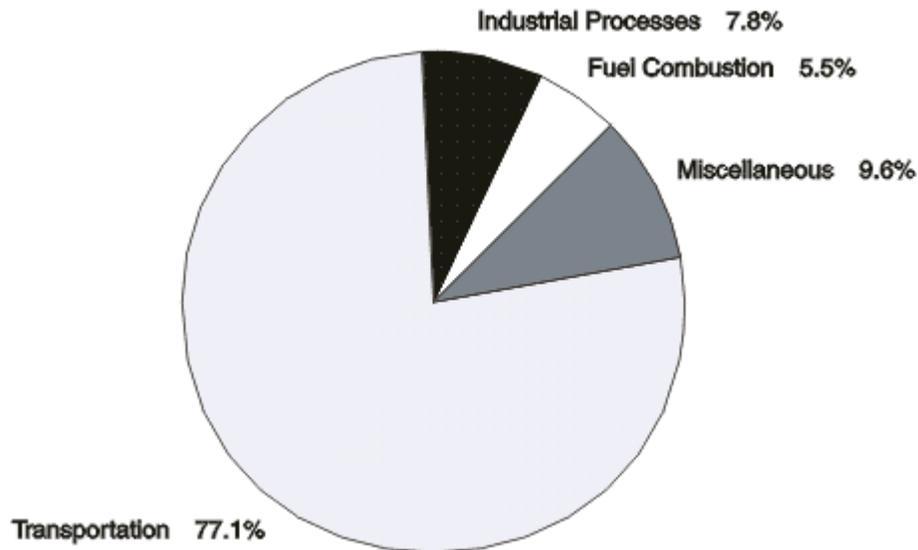
Possible transportation answers: Cars, SUVs, trucks, mopeds, scooters, motorcycles, buses, tractors, snowmobiles, dirt bikes, ATVs, trains, boats, jet skis, airplanes, etc.

Possible equipment answers: Lawn mowers, leaf blowers, weed cutters, chain saws (and other garden power tools), bob cats, generators, etc.

Source of graph on this page: Mobile Source Emissions - Past, Present and Future, U.S. Environmental Protection Agency, <http://www.epa.gov/otaq/inventory/overview/pollutants/carbonmon.htm#>. Accessed November 2, 2004.

Refer to the pie chart below and answer the following questions. Show your calculations.

National CO Emissions by Source Category, 1999



4. What percentage of carbon monoxide enters the atmosphere from industrial plants?

7.8%

5. In 1999, 90 million tons of carbon monoxide were emitted by the U.S. How much carbon monoxide enters the atmosphere from fuel combustion?

Total fuel combustion emissions = % fuel emissions * Total carbon monoxide emissions

Total fuel combustion emissions = 0.055 * 90 million tons CO = 4.95 million tons CO

6. In what ways do engineers help to reduce the carbon monoxide emissions from vehicles?

By 1975, most new cars were equipped with catalytic converters designed by engineers to convert carbon monoxide to carbon dioxide. Catalysts typically reduce carbon monoxide emissions by at least 80%. In the early 1980s, automakers introduced more sophisticated converters, plus onboard computers and oxygen sensors designed by engineers to help optimize the efficiency of the catalytic converter.

Another strategy to reduce carbon monoxide emissions from motor vehicles is to add oxygen-containing compounds to gasoline. This has the effect of “leaning out” the air-to-fuel ratio, thereby promoting complete fuel combustion. The most common oxygen additives are alcohols or their derivatives.

Source of graph on this page: Air Trends – 1999 Report on National Air Quality and Emissions Trends, Figure 2-4, U.S. Environmental Protection Agency, <http://www.epa.gov/air/airtrends/aqtrnd99/>. Accessed November 2, 2004.