Metric System -- Key

Exercise 1: The mass of a single iron atom is $9.3 \times 10^{-23}$ g. Determine the number of iron atoms in a regular cube that measures exactly 10 cm on an edge. The density of iron is 7.86 g/cm$^3$.

\[
(7.86 \text{ g/cm}^3)(10 \text{ cm})^3(1 \text{ mol Fe/55.847 g Fe})(6.022 \times 10^{23}) = 8.48 \times 10^{25} \text{ atoms}
\]

The information on the mass of a single atom of iron seems to be redundant. I think I had shown the answer with only two significant figures because the mass of an atom was given with only two. The answer with three significant figures is the preferred answer.

Answer: $8.5 \times 10^{25}$ atoms

Exercise 2: If the thickness of a 500 page pamphlet is 1.00 inch, what is the thickness of one page of the book, in units of meters? of nanometers?

\[
(1.00 \text{ in/500 pg})(2.54 \text{ cm/in})(1 \text{ m/100 cm}) = 5.08 \times 10^{-5} \text{ m}
\]

\[
(5.08 \times 10^{-5} \text{ m})(1 \text{ nm/10}^{-9}) = 5.08 \times 10^4 \text{ nm}
\]

Answer: $5.08 \times 10^{-5}$ m; 50,800 nm ( = $5.08 \times 10^4$ nm)