



Most family rooms (dens) are located in the basements of homes across the country. This is also the place where radon gas can collect over time. When inhaled over time, radon gas adds to your lifetime natural background radiation exposure, and is a significant risk factor for various forms of lung and respiratory cancer. This is why in many states, home buyers must have prospective homes tested before purchase. The typical, annual radiation exposure from all non-radon forms of natural exposure is about 200 milliRem per year.

The above figure shows the four radon zones based on a study by the US Environmental Protection Agency (<http://www.epa.gov/radon/zonemap.html>). By the way, you can also find maps for individual states at this website. The four zones correspond to radiation dosages of Zone 1: 4 picoCuries/liter Zone 2: 3 picoCuries/liter Zone 3: 2 picoCuries/Liter. Note: 4 picoCuries/liter for a full-year exposure is equal to about 3 Rems.

Problem 1: A typical family may only spend 4 hours a day in the basement room. What fraction of a full year does this represent?

Problem 2: In Zone-1, a full years exposure equals 3 Rem. From your answer to Problem 1, what would you predict as the total annual dosage, in milliRems, for a member of this family if they were living in A) Zone-1? B) Zone-2? C) Zone-3?

Problem 3: If a typical lifetime is 80 years, what would be the total lifetime radiation dosage from radon in Rem for the family members in Problem 1 if they lived in A) Zone-1; B) Zone-2; C) Zone-3?

Answer Key:

Problem 1: A typical family may only spend 4 hours a day in the basement room. What fraction of a full year does this represent?

Answer: $(4 / 24) = 1/6$ th of a year

Problem 2: In Zone-1, a full years exposure equals 3 Rem. From your answer to Problem 1, what would you predict as the total annual dosage, in milliRems, for a member of this family if they were living in:

A) Zone-1?

Answer: $3 \text{ Rem/year} \times 1/6 \text{ year} = 1/2 \text{ Rem} = 500 \text{ millirem}$

B) Zone-2?

Answer: $3/4 \times 3 \text{ Rem/year} \times 1/6 \text{ year} = 3/8 \text{ Rem} = 375 \text{ milliRem}$

C) Zone-3?

Answer: $2/4 \times 3 \text{ Rem/yr} \times 1/6 \text{ year} = 1/4 \text{ Rem} = 250 \text{ milliRem}$

Problem 3: If a typical lifetime is 80 years, what would be the total lifetime radiation dosage from radon in Rem for the family members in Problem 1 if they lived in

A) Zone-1; Answer = $80 \times 1/2 \text{ Rem} = 40 \text{ Rem}$

B) Zone-2; Answer = $80 \times 3/8 \text{ Rem} = 30 \text{ Rem}$

C) Zone-3? Answer = $80 \times 1/4 \text{ Rem} = 20 \text{ Rem}.$