The half-life of strontium-90 is 28 years.

a) Obtain an exponential decay model for strontium-90 in the form $Q(t) = Q_0 e^{-kt}$.

Solution: Use the formula $k = \frac{\ln(2)}{\text{half-life}}$ to find $k$: $k = \frac{\ln(2)}{28} \approx 0.0248$. The formula is

$$Q(t) = Q_0 e^{-0.0248t}.$$ 

b) Use the model to predict, to the nearest year, the time it takes three-fifths of a sample of strontium-90 to decay.

Solution: If three-fifths of the sample decays, then two-fifths remain. We would like to find the amount of time it take for there to be two-fifths of the original sample left. To do this, solve $\frac{2}{5} Q_0 = Q_0 e^{-0.0248t}$ for $t$. Divide both sides by $Q_0$ to get $\frac{2}{5} = e^{-0.0248t}$. Take the natural log of both sides to get $\ln\left(\frac{2}{5}\right) = -0.0248t$. Divide both sides by $-0.0248$ to get

$$t = \frac{\ln\left(\frac{2}{5}\right)}{-0.0248} \approx 36.9$$

It takes about 37 years for three-fifths of a sample to decay.