

The mass of a radioactive substance follows an exponential decay model, with a decay rate of 5% per day. Find the half-life of this substance (that is, the time it takes for one-half the original amount in a given sample of this substance to decay).

Do not round any intermediate computations, and round your answer to the nearest hundredth.

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Decay makes percent of change negative:  $-5\% = -0.05$  .

Formula for exponential growth/decay:  $A = Pe^{rt}$

Half-life:  $A = \frac{1}{2}P$  or  $\frac{P}{2}$  .

$$\frac{P}{2} = Pe^{rt} \rightarrow \text{Divide both sides by } P. \rightarrow \frac{1}{2} = e^{rt} .$$

Find the natural log of both sides.

$$\ln \frac{1}{2} = (e^{(-0.05)t}) \ln \rightarrow$$

$$-0.6931471806(\text{rounded}) = (-0.05)t \rightarrow$$

Divide both sides by  $-0.05$  and round answer to nearest the hundredth: **13.86 days**.