

Making simple calculations

CHRIS Remind me, why is this necessary?

SOPHIE I told you. My Ada app keeps turning on every time I say something. It's literally taking over my life.

CHRIS I swear I've been in this queue for half my life.

ADA Downloading 'half-life calculation'.

SOPHIE See. Thanks Chris.

ADA Half-life is the time taken for a radioactive substance to decay by roughly half its original value on average.

Take this queue for example. There's roughly 200 people here. Every hour, half of the queue is served.

Now the shop is more full, only half the people in the current queue can go into the shop to get served.

That makes the half-life of the queue one hour. Using this information, how many people will be left in the queue after three hours?

CHRIS So half of 200 is 100, which is the first hour. Then half of 100 is 50, which is the second hour. So...there'd be 25 people left over by the third hour.

ADA Exactly. The same calculation is used when looking at the decay of radioactive materials. Instead of the amount of people in a queue halving, it's the number of radioactive isotopes that are present halving instead. So, what about the radioactive isotope francium-223?

There are 120 nuclei of francium-223 and after an hour there's only 15 left. What is the half-life?

Bitesize

CHRIS So if we halve 120, it makes 60. Then half of 60 is 30, and half of 30 is 15. We've halved... three times. So if we divide that hour, 60 minutes, by the number of times we've halved, which is three...that makes the half-life...20 minutes.

ADA Correct. Half-life is used to calculate the age of organic remains in a process called carbon dating. Carbon dating can be used to age organic remains up to 50,000 years old. Organic remains contain a radioactive isotope called carbon-14 which has a half-life of 5,730 years.

This fossil has 12.5% of its carbon-14 left. So how old is it? We can measure that after 5,730 years it has 50% of carbon-14 left. After another 5,730 years it has 25%. And after another 5,730 years it has just 12.5% left. So we can calculate that our fossil is 17,190 years old.

DYLAN Can I assist you Sir or Madam?

SOPHIE Hi, I'm exchanging my old phone for a new one. The Ada app...she's out of control.

ADA Searching control... A scientific control is an experiment designed to minimize the effects of variables other than the independent variable. This increases the reliability of the results, often through a comparison between controlled measurements and the other measurements.

DYLAN You're not the only one.