Radioactive Half Life

Stage 1 Physics Formative Practical

## Introduction:

Radioactive decay is a random process and cannot accurately be predicted when it will occur. However, a collection of radioactive nuclei can have their radioactivity statistically analysed and from there a half-life for radioactive materials can be found. Today, you will do the same, except with dice.

## Aim:

Use dice to simulate the half-life of two materials and use this information to calculate a half-life and decay constant for the dice.

## Materials Required

* 50 dice
* Graph paper and pens
* A calculator
* A group of 3 people.

## Procedure

Each die represents one unstable nucleus. As time passes (dice are rolled), each nucleus (die) has a chance of decaying (rolling a 6). Once it has decayed once (rolled a 6), it’s not eligible to decay in the same way again (the die is removed).

### Part 1:

1. In groups of 3, roll the 50 dice and remove the dice that rolled a 6. Count how many are left and record this data. Repeat this process about 10 times or until there are no dice left to roll.
2. Plot this data and remember to include that at roll 0 you had 50 dice!
3. Draw a line of best fit through your points.
4. Estimate the half life for your dice.
5. Calculate the decay constant of your dice as

### Part 2:

Repeat the same process for part 1 except this time remove the dice that roll a 1 or a 6.

### Analysis and Discussion

The decay constant is the proportion of nuclei that decay from the amount that is currently left. How does this value compare to the probability of rolling a 6? How does it compare to the probability of rolling a 6 or a 1?

If you were to do this experiment with a coin flips, what do you think the half-life would be?

### Conclusion

What, if any, connections are there between half-life and probability of decay? Summarise your findings.