Unit title	Investigating Radioactive decay
Topic	Atomic and Nuclear
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Aims of Unit	This simulation of Radioactive decay using dice. The mathematics of the decay process is likened to the probability of dice being rolled. Graphical methods are used to analyse the data, and students are required to explain why this is a good model for radioactivity.
Indicative content	Radioactive decay, the mathematics of random processes, half-life.
Resources needed	30 Dice
Teachers notes	An excellent main activity for 14 – 16 year olds. Time approx. 40 minutes, All pupils must gain an insight into probability and know the odds which determine the occurrence of a 6 when rolling a dice. Most pupils will be able to plot a table of results and produce a suitable line graph to illustrate these findings. Some pupils will be able to relate the graph to the half-life of a radioactive element and calculate the half-life of the graph.

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Lesson plan for the main activity Investigating radio-active decay

Date:	Topic: Investigating Radio-active decay	Time: 40 minutes	Class: Key stage 4

SEN pupils	Gifted and Talented	Class Room Support

Equipment needed for this activity:

For this experiment pupils will require access to 30 dice, this for obvious reasons may be done as a class demonstration, however this may be modified by using coins and removing those which are heads or tails

Health and Safety:

There are no health and safety issues involved in this activity.

Learning outcomes for this activity

All pupils must gain an insight into probability and know the odds which determine the occurrence of a 6 when rolling a dice.

Most pupils will be able to plot a table of results and produce a suitable line graph to illustrate these findings.

Some pupils will be able to relate the graph to the half-life of a radioactive element and calculate the half-life of the graph.

Lesson plan for the main activity Investigating radio-active decay

Starter Activity
Main Activity Each group of students should have access to the instruction sheet provided, this of course may be projected onto a screen. Students follow the simple step by step instructions. Time 40 minutes
Plenary Activity

Reflections on the lesson

Investigating Radioactive Decay

You will be familiar with the idea that radioactive materials spontaneously emit radiation from the nuclei of their atoms. The three main types of emission are called α,β and γ radiation. How radioactive a sample is is measured by it's activity. As time passes, the activity of a sample decreases as fewer atoms in the source remain radioactive. As the activity depends only on the number of radioactive atoms left, it is a process similar to that of spinning coins or throwing dice. If you throw dice and remove all those that land with the 6 up, then the number falling 6 up on subsequent throws gets less. This model is used in this exercise to simulate the mathematics of radioactive decay.

You need 30 dice (or failing that, 30 plastic cubes with a single dot on one face only will do). You need some graph paper.

1. Copy this table into your book. The number of throws should go up to 15.

Throw	Dice (or cubes) remaining
0	30
1	

2. Shake the dice or cubes and throw them on the desk.

3. Remove the dice that land 6 up (if using cubes remove the ones with the spot up).

4. Record the number left in the table.

5. Repeat the procedure a further 14 times so you complete the table.

6. Plot a graph of dice (or cubes remaining) on the vertical axis and the number of throws on the horizontal one.

7. Describe the shape of the graph.

8. How many throws does it take for the number of dice (cubes) remaining to halve (ie, become 15).

9. Does this rule work every time the number of dice (cubes) halve, eg from 20 to 10?

10. Explain, in your own words, why this model is a good one for radioactive decay.