MATHS APPLIED INVESTIGATION

RADIOACTIVE DECAY SIMULATION USING M AND Ms



In this investigation the process of radioactive decay is simulated using M & Ms. Each M & M represents a radioactive atom. A cup of M & M’s is thrown onto the table. When an M & M lands on its ‘blank’ side it is deemed to have ‘decayed’- or changed into another atom.

Please dispose of your ‘decayed’ M and Ms thoughtfully!

* For this investigation, you and a partner will need a cup and a bag of M and Ms. Make sure that you have close to 50 in total.
* Along with the rest of the class throw your M&M’s onto your desk to simulate radioactive decay.
* Count your ‘living M&M’s each throw and contribute your results to a class set.

|  |  |  |
| --- | --- | --- |
| Throw number | Group results  Living M and Ms | Class results  Living M and Ms |
| 0 |  |  |
|  |  |  |
|  |  |  |
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1 Using your calculator plot a scatter plot for the number of M & Ms remaining.

2 Make a freehand copy of your screen plot.

3 Choose an appropriate algebraic model and find the relationship between the class living

M & Ms and the number of throws.

4 Describe the graph in terms of the variables in the investigation.

5 The half-life of a radioisotope (radioactive atom type of an element) is defined as the time it takes for half the sample to have decayed to another atom type. Determine the half-life (in throws) for the M & Ms.

6 Radioactive decay can also be simulated using a large number of dice. In this case rolling a ’6’ represents a decayed atom. If 50 dice were to be used in such a simulation how would you expect the decay graph and algebraic model be different from the M & M simulation? What would you expect the half-life to be?

7 Radioisotopes have many applications in everyday life in fields such as medicine, industry and even in the household! Find out the half-lives of the following radioisotopes:

1. Americium-241 (as used in smoke detectors)
2. Carbon-14 (as used for radiocarbon dating)
3. Barium-137m

(d) Another radioisotope

8 Find out how radiocarbon dating works in practice.

**TEACHER NOTES**

**RADIOACTIVE DECAY SIMULATION USING M AND Ms**

This is an investigation that students really enjoy!.

* Polystyrene cups work well for this.
* Whilst there are about 50 M & Ms in a single bag it is cheaper to buy bulk and distribute in cups of 50 or so.
* I’ve used this investigation as a way of introducing exponential decay or starting work with graphs of the form y = abx without the “ask for a model, etc.”
* An alternative to this investigation involves starting with one dice for each class member. Set the scene of your typical reality TV household/ TV survivor scenario. A ‘6’ represents the person voted out. (But dice don’t taste as nice as M&M’s.)

When making a ‘freehand copy’ of a screen plot students should be encouraged to label axes and give an indication of the scaling of the graph