The Case of the Rotten Apple

A Styrofoam case of 144 Tasmanian apples is packed in 6 layers, each with the fruit arranged in 4 rows of 6. Sensors show there is a rotten apple somewhere in the packed case.

As is well known, rot spreads by contact, so it is necessary to remove and replace that apple. It happens to be as near to the centre as is possible in such a configuration, in the fourth row from the top. (Murphy's Law!)

1. Assuming that the upper levels of apples are not stable, will roll around and bruise if the lower levels are not intact, necessitating each layer in turn to be entirely removed, how many apples need to be taken out in order to find and replace the rotten one?

2. Assuming that the upper levels *are* stable, how many apples need to be removed?

3. If nothing is done, and if the rot spreads at a rate of 1apple outwards from the source per day, how long will it take for the whole case to become rotten?

4. If you only have the information that there is one rotten apple in the case and do not know where it is, what is the least number of apples you might need to remove? And what is the greatest?

Read the problems and identify what is required. Cross out irrelevancies and redundancies – words and phrases which do not affect the sense in important ways. Highlight important words and phrases. Work the problems, using squared paper or MAB unit blocks if you want to. Try alternative methods if you need to.

ANSWERS

1.   73 (3 layers of 24 + 1 rotten apple)
2.   13 (3 layers of 4 central apples + 1 rotten apple)
3.   3 days (contagion radiating outwards from the centre at the rate of 1 apple per day – no apple is more than 3 from the edge)
4.   1 (if apple is on topmost layer), 121 (5 layers of 24 +1rotten apple if apple is on bottom layer and is last to be exposed)