ELEMENTARY MATHEMATICS FOR BIOLOGISTS — 2010

# An Assessed Exercise Taster (Excel 2003 version)

To demonstrate your understanding of the course material so far, reproduce the Excel 2003 worksheet overleaf as closely as you can but with the missing values supplied. The only other differences should be the use of your own name and the current date. The problem for which the worksheet is a solution is described below…

**The Greenfly Problem**

Greenfly can reproduce asexually. After one week of life a female can produce eight offspring a day. Starting at the beginning of day 1 with a single mature female, how many greenfly could there be by day 28?

It may be assumed that there are no deaths and that all offspring are females which, in turn, start reproducing on day 8 of their lives.

**The Solution**

The worksheet represents a kind of daily inventory. Columns headed N1 to N7 show the numbers of greenfly which are in their first day of life, second day of life, and so on up to those in their seventh day of life.

For these immature greenfly, the general rule is that $N_{n+1,d+1} = N_{n,d}$ where $N_{n,d}$ is the number of greenfly in their $n$th day of life on day $d$. The special case is that, from day 1 onwards, $N_{1,d} = 8 * M_d$ where $M_d$ is the number of mature greenfly on day $d$.

The first two columns show the day number and the total number of greenfly. These two columns were selected prior to using the Chart Wizard tool to create an embedded chart which takes the form of a log plot.

There is no legend and no title. There are no tick marks on the vertical axis. Every seventh tick mark on the horizontal axis crosses that axis and has a label in 12-point font. The other tick marks do not cross the axis. All text on the chart is in 12-point font.

Print out the worksheet and show the hard-copy to a demonstrator.

**SOLUTION TO THE GREENFLY PROBLEM – A.B. Smith**

**18 October 2010**

| Day | Total | N1 | N2 | N3 | N4 | N5 | N6 | N7 | Mature |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1 | 9 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 2 | 17 | 8 | 8 | 0 | 0 | 0 | 0 | 0 | 1 |
| 3 | 25 | 8 | 8 | 8 | 0 | 0 | 0 | 0 | 1 |
| 4 | 33 | 8 | 8 | 8 | 8 | 0 | 0 | 0 | 1 |
| 5 | 41 | 8 | 8 | 8 | 8 | 8 | 0 | 0 | 1 |
| 6 | 49 | 8 | 8 | 8 | 8 | 8 | 8 | 0 | 1 |
| 7 | 57 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 1 |
| 8 | 129 | 72 | 8 | 8 | 8 | 8 | 8 | 8 | 9 |
| 9 | 265 | 136 | 72 | 8 | 8 | 8 | 8 | 8 | 17 |
| 10 | 465 | 200 | 136 | 72 | 8 | 8 | 8 | 8 | 25 |
| 11 | 729 | 264 | 200 | 136 | 72 | 8 | 8 | 8 | 33 |
| 12 | 1057 | 328 | 264 | 200 | 136 | 72 | 8 | 8 | 41 |
| 13 | 1449 | 392 | 328 | 264 | 200 | 136 | 72 | 8 | 49 |
| 14 | 1905 | 456 | 392 | 328 | 264 | 200 | 136 | 72 | 57 |
| 15 | 2937 | 1032 | 456 | 392 | 328 | 264 | 200 | 136 | 129 |
| 16 | 5057 | 2120 | 1032 | 456 | 392 | 328 | 264 | 200 | 265 |
| 17 | 8777 | 3720 | 2120 | 1032 | 456 | 392 | 328 | 264 | 465 |
| 18 | 14609 | 5832 | 3720 | 2120 | 1032 | 456 | 392 | 328 | 729 |
| 19 | 23065 | 8456 | 5832 | 3720 | 2120 | 1032 | 456 | 392 | 1057 |
| 20 | 34657 | 11592 | 8456 | 5832 | 3720 | 2120 | 1032 | 456 | 1449 |
| 21 | 49897 | 15240 | 11592 | 8456 | 5832 | 3720 | 2120 | 1032 | 1905 |
| 22 | 73393 | 23496 | 15240 | 11592 | 8456 | 5832 | 3720 | 2120 | 2937 |
| 23 | 113849 | 40456 | 23496 | 15240 | 11592 | 8456 | 5832 | 3720 | 5057 |
| 24 | 184065 | … | … | … | … | … | … | … | … |
| 25 | 300937 | … | … | … | … | … | … | … | … |
| 26 | 485457 | … | … | … | … | … | … | … | … |
| 27 | 762713 | … | … | … | … | … | … | … | … |
| 28 | 1161889 | … | … | … | … | … | … | … | … |