| EXAMEN : BACCALAURÉAT GÉNÉRAL | SESSION 2022 |
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| ÉPREUVE : ÉVALUATION SPÉCIFIQUE DE LANGUE EN SECTION EUROPÉENNE | |
| MATHÉMATIQUES EN LANGUE ANGLAISE | SUJET N° 331 |

# Logarithm Tables

John Napier of Merchiston (1 February 1550 – 4 April 1617), nicknamed Marvellous Merchiston, was a Scottish landowner known as a mathematician, physicist, and astronomer. He was the 8th Laird of Merchiston. His Latinized name was Ioannes Neper.

In the late 16th century, astronomers spent a large part of their working lives doing the complex and tedious calculations of spherical trigonometry needed to understand the movement of celestial bodies.
John Napier discovered a method of simplifying these calculations using logarithms, replacing the calculation of a multiplication by an addition. So effectively was Napier's method that it was said he effectively doubled the life of an astronomer by reducing the time required to do these calculations.

*Source: Wikipedia and IB Higher Math for the international student*

| N | ln(N) | N | ln(N) | N | ln(N) | N | ln(N) | N | ln(N) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 21 | 3,04 | 41 | 3,71 | 61 | 4,11 | 81 | 4,39 |
| 2 | 0,69 | 22 | 3,09 | 42 | 3,74 | 62 | 4,13 | 82 | 4,41 |
| 3 | 1,1 | 23 | 3,14 | 43 | 3,76 | 63 | 4,14 | 83 | 4,42 |
| 4 | 1,39 | 24 | 3,18 | 44 | 3,78 | 64 | 4,16 | 84 | 4,43 |
| 5 | 1,61 | 25 | 3,22 | 45 | 3,81 | 65 | 4,17 | 85 | 4,44 |
| 6 | 1,79 | 26 | 3,26 | 46 | 3,83 | 66 | 4,19 | 86 | 4,45 |
| 7 | 1,95 | 27 | 3,3 | 47 | 3,85 | 67 | 4,2 | 87 | 4,47 |
| 8 | 2,08 | 28 | 3,33 | 48 | 3,87 | 68 | 4,22 | 88 | 4,48 |
| 9 | 2,2 | 29 | 3,37 | 49 | 3,89 | 69 | 4,23 | 89 | 4,49 |
| **10** | 2,3 | **30** | 3,4 | **50** | 3,91 | **70** | 4,25 | **90** | 4,5 |
| 11 | 2,4 | 31 | 3,43 | 51 | 3,93 | 71 | 4,26 | 91 | 4,51 |
| 12 | 2,48 | 32 | 3,47 | 52 | 3,95 | 72 | 4,28 | 92 | 4,52 |
| 13 | 2,56 | 33 | 3,5 | 53 | 3,97 | 73 | 4,29 | 93 | 4,53 |
| 14 | 2,64 | 34 | 3,53 | 54 | 3,99 | 74 | 4,3 | 94 | 4,54 |
| 15 | 2,71 | 35 | 3,56 | 55 | 4,01 | 75 | 4,32 | 95 | 4,55 |
| 16 | 2,77 | 36 | 3,58 | 56 | 4,03 | 76 | 4,33 | 96 | 4,56 |
| 17 | 2,83 | 37 | 3,61 | 57 | 4,04 | 77 | 4,34 | 97 | 4,57 |
| 18 | 2,89 | 38 | 3,64 | 58 | 4,06 | 78 | 4,36 | 98 | 4,58 |
| 19 | 2,94 | 39 | 3,66 | 59 | 4,08 | 79 | 4,37 | 99 | 4,6 |
| **20** | 3 | **40** | 3,69 | **60** | 4,09 | **80** | 4,38 | **100** | 4,61 |

1) Knowing that the main property of the natural logarithm for 2 positive numbers $a$ and $b$ Napier used in his table to simplify calculations is ln(ab)=ln(a)+ln(b) show that :

$$\ln(2) + \ln(5) + \ln(0.1) = 0$$

2) Using the properties of the natural logarithm, show that :

$$5\ln(3) - \ln(27) = \ln(9)$$

3) Using the natural logarithm, find the lowest $n \in \mathbb{N}$ such that : $0.9^n < 0.04$