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# TABLES OF NEMATODE-PATHOGENICITY

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**Summary**. "*Tables of nematode-pathogenicity*" were calculated on the basis of the relation between nematode density and damage to plants as characterized by the Seinhorst's equation $y = m + (1 - m)\ Z^{(P-T)}$. This equation was transformed by a logaritmic manipulation, as $y = m + (1 - m)\ 1.05\hat{}\ [(P/-T) + 1]$ and solved considering values of $T$ and $m$ from the literature. These Tables allow an easy and quick evaluation of yield losses for each known crop-nematode relation.

Yield losses caused by phytoparasitic nematodes to annual plants are correlated with the nematode population densities in the soil at sowing or transplanting. The prediction of yield losses is a prerequisite for a proper management of these plant pathogens.

Seinhorst (1965; 1979) found that the relation between nematode population density at sowing or planting and damage to plants is characterized by the equation $y = m + (1 - m)\ z^{P-T}$ (1), in which $y$ (relative yield) is the ratio between the yield at $Pi$ and that at $P < T$, $m$ = the minimum relative yield ($y$ at very large $Pi$), $z$ a constant < 1 with $z^{-T} = 1.05$ ($z$ variable for each nematode species and for each crop), $T$ = the tolerance limit ($Pi$ above which yield loss is expected), and $P$ = initial population density.

Based on this model many studies have been undertaken to ascertain this relation for several nematode species on many crops (Lamberti and Greco, 1989) and to estimate values of $T$ and $m$. However, data on yield losses caused by nematodes to different crops are not available in a synthetic and ready to consult form.

The purpose of this paper is to provide synthetic tables (Tables of nematode-pathogenicity) on the base of data derived from the literature, by which an easy and quick indication of yield losses for each known crop-nematode relation is provided.

## Methods

The fundmental parameters of the Seinhorst's equation (1) $T$ and $m$, determined for a number of annual crops and for different phytoparasitic nematodes, are reported in Table I.

The derivation of Tables of nematode-pathogenicity is based on the consideration that in the equation (1)

$$z^{-T} = 1.05 \quad (2) \text{ (Seinhorst, 1965).}$$

Applying $Log_{1.05}$ to the first and second term of (2) resulted in:

$$-T\ Log_{1.05}\ z = 1 \qquad (3)$$

$$Log_{1.05}\ z = 1/-T \qquad (4)$$

$$z = 1.05^{(1/-T)} \qquad (5).$$

The expression $z^{(P-T)}$ can also be reported in eq. (1)

$[1.05^{(1,\ \ T)(P-T)}]$ from which $1.05^{(P/-T)}$ and consequently

$$y = m + (1\ \ m)^{\ 1.05(P/-T)+} \qquad (6).$$

In eq. (6) the estimation of $y$ does not require knowledge of $z$ that would impose a specific table of pathogenicity for each crop-nematode relation or knowledge of the relative pathogenicity curve.

The parameters needed to solve eq. (6) are, therefore, limited to $m$ and $T$, as determined in the previous pathogenicity tests (Table I), and to $Pi$ as it can be estimated from the analysis of soil samples.

## Results and discussion

Applying eq. (6), resulted in the calculation of data reported in the "Tables of nematode-pathogenicity". In the first column the value of the ratio $Pi/T$ is reported. The fol-

TABLE I - *Fundmental parameters* m *and* T *of Seinhorst's equation for different known crop-nematode relations.*

| Nematode | Crop | *T* (eggs and J/cm$^3$ or g soil) | *m* | Authors |
|---|---|---|---|---|
| *Globodera pallida* | Potato | 1.70 | 0.03 | Greco *et al.*, 1982b |
| *Globodera rostochiensis* | Potato | 1.90 | 0.13 | Greco *et al.*, 1982b |
| *Heterodera avenae* | Wheat | 1 | 0.60 | Greco and Brandonisio, 1987 |
| *Heterodera carotae* | Carrot | 0.80 | 0 | Greco and Brandonisio, 1980 |
| *Heterodera ciceri* | Chickpea | 1.15 | 0 | Greco *et al.*, 1988 |
| | Lentil | 2.51 | 0.50 | Greco *et al.*, 1988 |
| *Heterodera goettingiana* | Broad Bean | 0.80 | 0.1 | Greco *et al.*, 1991 |
| | Pea | 0.50 | 0 | Greco *et al.*, 1991 |
| | Vetch | 2 | 0.4 | Greco *et al.*, 1991 |
| *Heterodera schachtii* | Sugarbeet | 1.80 | 0.05 | Greco *et al.*, 1982a |
| *Meloidogyne artiellia* | Chickpea (spring) | 0.02 | 0.18 | Di Vito and Greco, 1988a |
| | Chickpea (winter) | 0.14 | 0.1 | Di Vito and Greco, 1988a |
| | Wheat | 0.43 | 0.1 | Di Vito and Greco, 1988b |
| *Meloidogyne hapla* | Alfa-alfa | 1.60 | 0.1 | Inserra *et al.*, 1983b |
| *Meloidogyne incognita* | Artichoke | 1.10 | 0 | Di Vito and Zaccheo, 1991 |
| | Cabbage | 0.50 | 0.05 | Sasanelli *et al.*, 1992a |
| | Cantaloupe | 0.19 | 0 | Di Vito *et al.*, 1983 |
| | Corn | 10 | 0.1 | Di Vito *et al.*, 1980 |
| | Eggplant | 0.054 | 0.05 | Di Vito *et al.*, 1986 |
| | Pepper | 0.165 | 0.2 | Di Vito *et al.*, 1985 |
| | Sugarbeet | 1.19 | 0.1 | Di Vito *et al.*, 1981 |
| | Sunflower | 1.85 | 0.25 | Sasanelli and Di Vito, 1992 |
| | Tobacco | 2 | 0 | Di Vito *et al.*, 1983 |
| | Tomato | 3.3 | 0 | Di Vito and Ekanayake, 1983 |
| *Meloidogyne javanica* | Sunflower | 3.03 | 0.3 | Sasanelli *et al.*, 1992b |
| *Paratrichodorus* sp. | Wheat | 1.40 | 0.25 | Inserra *et al.*, 1983a |
| *Pratylenchus thornei* | Chickpea | 0.03 | 0.42 | Di Vito *et al.*, 1992 |

lowing columns, indicated as (1 - *m*), identify the expected relative yield *y*. At the top of these last columns (1 - *m*) are reported the values of 1, 0.95 ... 0.05 corresponding to a range of *m* from 0, 0.05 ... to 0.95. The intersection between row and column directly gives the relative yield *y* corresponding to *P/T* and *m* values. The per cent yield loss (*Yl* %) is obtained by the difference to 1,

$$Yl\,\% = (1 - y)\,100.$$

In these tables a maximum *P/T* ratio of 80 was considered as generally the minimum yield *m* occuring at $P/T \geq 64$ (Seinhorst, 1986).

If *P/T* is not an entire number or (1 - *m*) is not an entire multiple of 0.05 (as reported in the Tables of nematode-pathogenicity) the required estimation of the yield can be obtained by interpolation between preceeding and following values of *y* corresponding to entire values of *P/T* or (1 - *m*).

## Tables of Nematode-Pathogenicity

Tables relating crop yield to nematode population densities on the base of *P* (population density at sowing or planting) and *T* (tolerance limit of the host crop expressed as eggs or nematode specimens/g or $cm^3$ soil) and *m* (minimum relative yield) as reported in Table I.

| P/T | 1-m | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.95 | 0.9 | 0.85 | 0.8 | 0.75 | 0.7 | 0.65 | 0.6 | 0.55 | 0.5 | 0.45 | 0.4 | 0.35 | 0.3 | 0.25 | 0.2 | 0.15 | 0.1 | 0.05 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 0.952 | 0.955 | 0.959 | 0.965 | 0.972 | 0.979 | 0.985 | 0.991 | 0.994 | 0.997 | 0.998 | 0.999 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 0.907 | 0.912 | 0.916 | 0.921 | 0.926 | 0.930 | 0.935 | 0.940 | 0.944 | 0.949 | 0.954 | 0.958 | 0.963 | 0.967 | 0.972 | 0.977 | 0.981 | 0.986 | 0.991 | 0.995 |
| 4 | 0.864 | 0.871 | 0.877 | 0.884 | 0.891 | 0.898 | 0.905 | 0.911 | 0.918 | 0.925 | 0.932 | 0.939 | 0.946 | 0.952 | 0.959 | 0.966 | 0.973 | 0.980 | 0.986 | 0.993 |
| 5 | 0.823 | 0.832 | 0.840 | 0.849 | 0.858 | 0.867 | 0.876 | 0.885 | 0.894 | 0.902 | 0.911 | 0.920 | 0.929 | 0.938 | 0.947 | 0.956 | 0.965 | 0.973 | 0.982 | 0.991 |
| 6 | 0.784 | 0.794 | 0.805 | 0.816 | 0.827 | 0.838 | 0.848 | 0.859 | 0.870 | 0.881 | 0.892 | 0.903 | 0.913 | 0.924 | 0.935 | 0.946 | 0.957 | 0.968 | 0.978 | 0.989 |
| 7 | 0.746 | 0.759 | 0.772 | 0.784 | 0.797 | 0.810 | 0.822 | 0.835 | 0.848 | 0.860 | 0.873 | 0.886 | 0.898 | 0.911 | 0.924 | 0.937 | 0.949 | 0.962 | 0.975 | 0.987 |
| 8 | 0.711 | 0.725 | 0.740 | 0.754 | 0.769 | 0.783 | 0.797 | 0.812 | 0.826 | 0.841 | 0.855 | 0.870 | 0.884 | 0.899 | 0.913 | 0.928 | 0.942 | 0.957 | 0.971 | 0.986 |
| 9 | 0.677 | 0.693 | 0.709 | 0.725 | 0.741 | 0.758 | 0.774 | 0.790 | 0.806 | 0.822 | 0.838 | 0.855 | 0.871 | 0.887 | 0.903 | 0.919 | 0.935 | 0.952 | 0.968 | 0.984 |
| 10 | 0.645 | 0.662 | 0.680 | 0.698 | 0.716 | 0.733 | 0.751 | 0.769 | 0.787 | 0.805 | 0.822 | 0.840 | 0.858 | 0.876 | 0.893 | 0.911 | 0.929 | 0.947 | 0.964 | 0.982 |
| 11 | 0.614 | 0.633 | 0.653 | 0.672 | 0.691 | 0.710 | 0.730 | 0.749 | 0.768 | 0.788 | 0.807 | 0.826 | 0.846 | 0.865 | 0.884 | 0.903 | 0.923 | 0.942 | 0.961 | 0.981 |
| 12 | 0.585 | 0.605 | 0.626 | 0.647 | 0.668 | 0.689 | 0.709 | 0.730 | 0.751 | 0.772 | 0.792 | 0.813 | 0.834 | 0.855 | 0.875 | 0.896 | 0.917 | 0.938 | 0.958 | 0.979 |
| 13 | 0.557 | 0.579 | 0.601 | 0.623 | 0.645 | 0.668 | 0.690 | 0.712 | 0.734 | 0.756 | 0.778 | 0.801 | 0.823 | 0.845 | 0.867 | 0.889 | 0.911 | 0.934 | 0.956 | 0.978 |
| 14 | 0.530 | 0.554 | 0.577 | 0.601 | 0.624 | 0.648 | 0.671 | 0.695 | 0.718 | 0.742 | 0.765 | 0.789 | 0.812 | 0.836 | 0.859 | 0.883 | 0.906 | 0.930 | 0.953 | 0.977 |
| 15 | 0.505 | 0.530 | 0.555 | 0.579 | 0.604 | 0.629 | 0.654 | 0.678 | 0.703 | 0.728 | 0.753 | 0.777 | 0.802 | 0.827 | 0.852 | 0.876 | 0.901 | 0.926 | 0.951 | 0.975 |
| 16 | 0.481 | 0.507 | 0.533 | 0.559 | 0.585 | 0.611 | 0.637 | 0.663 | 0.689 | 0.715 | 0.741 | 0.766 | 0.792 | 0.818 | 0.844 | 0.870 | 0.896 | 0.922 | 0.948 | 0.974 |
| 17 | 0.458 | 0.485 | 0.512 | 0.539 | 0.566 | 0.594 | 0.621 | 0.648 | 0.675 | 0.702 | 0.729 | 0.756 | 0.783 | 0.810 | 0.837 | 0.865 | 0.892 | 0.919 | 0.946 | 0.973 |
| 18 | 0.436 | 0.464 | 0.493 | 0.521 | 0.549 | 0.577 | 0.605 | 0.634 | 0.662 | 0.690 | 0.718 | 0.746 | 0.775 | 0.803 | 0.831 | 0.859 | 0.887 | 0.915 | 0.944 | 0.972 |
| 19 | 0.416 | 0.445 | 0.474 | 0.503 | 0.532 | 0.562 | 0.591 | 0.620 | 0.649 | 0.679 | 0.708 | 0.737 | 0.766 | 0.795 | 0.825 | 0.854 | 0.883 | 0.912 | 0.942 | 0.971 |
| 20 | 0.396 | 0.426 | 0.456 | 0.486 | 0.517 | 0.547 | 0.577 | 0.607 | 0.637 | 0.668 | 0.698 | 0.728 | 0.758 | 0.789 | 0.819 | 0.849 | 0.879 | 0.909 | 0.940 | 0.970 |
| 21 | 0.377 | 0.408 | 0.439 | 0.470 | 0.502 | 0.533 | 0.564 | 0.595 | 0.626 | 0.657 | 0.688 | 0.720 | 0.751 | 0.782 | 0.813 | 0.844 | 0.875 | 0.907 | 0.938 | 0.969 |
| 22 | 0.359 | 0.391 | 0.423 | 0.455 | 0.487 | 0.519 | 0.551 | 0.583 | 0.615 | 0.647 | 0.679 | 0.712 | 0.744 | 0.776 | 0.808 | 0.840 | 0.872 | 0.904 | 0.936 | 0.968 |
| 23 | 0.342 | 0.375 | 0.408 | 0.441 | 0.473 | 0.506 | 0.539 | 0.572 | 0.605 | 0.638 | 0.671 | 0.704 | 0.737 | 0.770 | 0.803 | 0.835 | 0.868 | 0.901 | 0.934 | 0.967 |
| 24 | 0.326 | 0.359 | 0.393 | 0.427 | 0.460 | 0.494 | 0.528 | 0.562 | 0.595 | 0.629 | 0.663 | 0.697 | 0.730 | 0.764 | 0.798 | 0.831 | 0.865 | 0.899 | 0.933 | 0.966 |
| 25 | 0.310 | 0.345 | 0.379 | 0.414 | 0.448 | 0.483 | 0.517 | 0.552 | 0.586 | 0.621 | 0.655 | 0.690 | 0.724 | 0.759 | 0.793 | 0.828 | 0.862 | 0.897 | 0.931 | 0.966 |
| 26 | 0.295 | 0.331 | 0.366 | 0.401 | 0.436 | 0.471 | 0.507 | 0.542 | 0.577 | 0.612 | 0.648 | 0.683 | 0.718 | 0.753 | 0.789 | 0.824 | 0.859 | 0.894 | 0.930 | 0.965 |
| 27 | 0.281 | 0.317 | 0.353 | 0.389 | 0.425 | 0.461 | 0.497 | 0.533 | 0.569 | 0.605 | 0.641 | 0.677 | 0.712 | 0.748 | 0.784 | 0.820 | 0.856 | 0.892 | 0.928 | 0.964 |
| 28 | 0.268 | 0.304 | 0.341 | 0.378 | 0.414 | 0.451 | 0.487 | 0.524 | 0.561 | 0.597 | 0.634 | 0.671 | 0.707 | 0.744 | 0.780 | 0.817 | 0.854 | 0.890 | 0.927 | 0.963 |
| 29 | 0.255 | 0.292 | 0.330 | 0.367 | 0.404 | 0.441 | 0.479 | 0.516 | 0.553 | 0.590 | 0.628 | 0.665 | 0.702 | 0.739 | 0.777 | 0.814 | 0.851 | 0.888 | 0.926 | 0.963 |
| 30 | 0.243 | 0.281 | 0.319 | 0.357 | 0.394 | 0.432 | 0.470 | 0.508 | 0.546 | 0.584 | 0.621 | 0.659 | 0.697 | 0.735 | 0.773 | 0.811 | 0.849 | 0.886 | 0.924 | 0.962 |
| 31 | 0.231 | 0.270 | 0.308 | 0.347 | 0.385 | 0.424 | 0.462 | 0.500 | 0.539 | 0.577 | 0.616 | 0.654 | 0.693 | 0.731 | 0.769 | 0.808 | 0.846 | 0.885 | 0.923 | 0.962 |
| 32 | 0.220 | 0.259 | 0.298 | 0.337 | 0.376 | 0.415 | 0.454 | 0.493 | 0.532 | 0.571 | 0.610 | 0.649 | 0.688 | 0.727 | 0.766 | 0.805 | 0.844 | 0.883 | 0.922 | 0.961 |
| 33 | 0.210 | 0.249 | 0.289 | 0.328 | 0.368 | 0.407 | 0.447 | 0.486 | 0.526 | 0.565 | 0.605 | 0.644 | 0.684 | 0.723 | 0.763 | 0.802 | 0.842 | 0.881 | 0.921 | 0.960 |
| 34 | 0.200 | 0.240 | 0.280 | 0.320 | 0.360 | 0.400 | 0.440 | 0.480 | 0.520 | 0.560 | 0.600 | 0.640 | 0.680 | 0.720 | 0.760 | 0.800 | 0.840 | 0.880 | 0.920 | 0.960 |
| 35 | 0.190 | 0.231 | 0.271 | 0.312 | 0.352 | 0.393 | 0.433 | 0.474 | 0.514 | 0.555 | 0.595 | 0.636 | 0.676 | 0.717 | 0.757 | 0.798 | 0.838 | 0.879 | 0.919 | 0.960 |
| 36 | 0.181 | 0.222 | 0.263 | 0.304 | 0.345 | 0.386 | 0.427 | 0.468 | 0.509 | 0.550 | 0.591 | 0.632 | 0.673 | 0.713 | 0.754 | 0.795 | 0.836 | 0.877 | 0.918 | 0.959 |
| 37 | 0.173 | 0.214 | 0.255 | 0.297 | 0.338 | 0.379 | 0.421 | 0.462 | 0.504 | 0.545 | 0.586 | 0.628 | 0.669 | 0.710 | 0.752 | 0.793 | 0.835 | 0.876 | 0.917 | 0.959 |
| 38 | 0.164 | 0.206 | 0.248 | 0.290 | 0.332 | 0.373 | 0.415 | 0.457 | 0.499 | 0.540 | 0.582 | 0.624 | 0.666 | 0.708 | 0.749 | 0.791 | 0.833 | 0.875 | 0.916 | 0.958 |
| 39 | 0.157 | 0.199 | 0.241 | 0.283 | 0.325 | 0.367 | 0.410 | 0.452 | 0.494 | 0.536 | 0.578 | 0.620 | 0.663 | 0.705 | 0.747 | 0.789 | 0.831 | 0.873 | 0.916 | 0.958 |
| 40 | 0.149 | 0.192 | 0.234 | 0.277 | 0.319 | 0.362 | 0.404 | 0.447 | 0.489 | 0.532 | 0.575 | 0.617 | 0.660 | 0.702 | 0.745 | 0.787 | 0.830 | 0.872 | 0.915 | 0.957 |
| 41 | 0.142 | 0.185 | 0.228 | 0.271 | 0.314 | 0.357 | 0.399 | 0.442 | 0.485 | 0.528 | 0.571 | 0.614 | 0.657 | 0.700 | 0.743 | 0.786 | 0.828 | 0.871 | 0.914 | 0.957 |
| 42 | 0.135 | 0.179 | 0.222 | 0.265 | 0.308 | 0.351 | 0.395 | 0.438 | 0.481 | 0.524 | 0.568 | 0.611 | 0.654 | 0.697 | 0.741 | 0.784 | 0.827 | 0.870 | 0.914 | 0.957 |
| 43 | 0.129 | 0.172 | 0.216 | 0.260 | 0.303 | 0.347 | 0.390 | 0.434 | 0.477 | 0.521 | 0.564 | 0.608 | 0.652 | 0.695 | 0.739 | 0.782 | 0.826 | 0.869 | 0.913 | 0.956 |
| 44 | 0.123 | 0.167 | 0.210 | 0.254 | 0.298 | 0.342 | 0.386 | 0.430 | 0.474 | 0.517 | 0.561 | 0.605 | 0.649 | 0.693 | 0.737 | 0.781 | 0.825 | 0.868 | 0.912 | 0.956 |
| 45 | 0.117 | 0.161 | 0.205 | 0.249 | 0.293 | 0.338 | 0.382 | 0.426 | 0.470 | 0.514 | 0.558 | 0.603 | 0.647 | 0.691 | 0.735 | 0.779 | 0.823 | 0.868 | 0.912 | 0.956 |
| 46 | 0.111 | 0.156 | 0.200 | 0.245 | 0.289 | 0.333 | 0.378 | 0.422 | 0.467 | 0.511 | 0.556 | 0.600 | 0.645 | 0.689 | 0.733 | 0.778 | 0.822 | 0.867 | 0.911 | 0.956 |
| 47 | 0.106 | 0.151 | 0.195 | 0.240 | 0.285 | 0.329 | 0.374 | 0.419 | 0.464 | 0.508 | 0.553 | 0.598 | 0.642 | 0.687 | 0.732 | 0.776 | 0.821 | 0.866 | 0.911 | 0.955 |
| 48 | 0.101 | 0.146 | 0.191 | 0.236 | 0.281 | 0.326 | 0.371 | 0.416 | 0.461 | 0.506 | 0.550 | 0.595 | 0.640 | 0.685 | 0.730 | 0.775 | 0.820 | 0.865 | 0.910 | 0.955 |
| 49 | 0.096 | 0.141 | 0.187 | 0.232 | 0.277 | 0.322 | 0.367 | 0.412 | 0.458 | 0.503 | 0.548 | 0.593 | 0.638 | 0.684 | 0.729 | 0.774 | 0.819 | 0.864 | 0.910 | 0.955 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 0.092 | 0.137 | 0.182 | 0.228 | 0.273 | 0.319 | 0.364 | 0.410 | 0.455 | 0.500 | 0.546 | 0.591 | 0.637 | 0.682 | 0.727 | 0.773 | 0.818 | 0.864 | 0.909 | 0.955 |
| 51 | 0.087 | 0.133 | 0.178 | 0.224 | 0.270 | 0.315 | 0.361 | 0.407 | 0.452 | 0.498 | 0.544 | 0.589 | 0.635 | 0.681 | 0.726 | 0.772 | 0.817 | 0.863 | 0.909 | 0.954 |
| 52 | 0.083 | 0.129 | 0.175 | 0.221 | 0.266 | 0.312 | 0.358 | 0.404 | 0.450 | 0.496 | 0.542 | 0.587 | 0.633 | 0.679 | 0.725 | 0.771 | 0.817 | 0.862 | 0.908 | 0.954 |
| 53 | 0.079 | 0.125 | 0.171 | 0.217 | 0.263 | 0.309 | 0.355 | 0.401 | 0.447 | 0.494 | 0.540 | 0.586 | 0.632 | 0.678 | 0.724 | 0.770 | 0.816 | 0.862 | 0.908 | 0.954 |
| 54 | 0.075 | 0.122 | 0.168 | 0.214 | 0.260 | 0.306 | 0.353 | 0.399 | 0.445 | 0.491 | 0.538 | 0.584 | 0.630 | 0.676 | 0.723 | 0.769 | 0.815 | 0.861 | 0.908 | 0.954 |
| 55 | 0.072 | 0.118 | 0.165 | 0.211 | 0.257 | 0.304 | 0.350 | 0.397 | 0.443 | 0.489 | 0.536 | 0.582 | 0.629 | 0.675 | 0.722 | 0.768 | 0.814 | 0.861 | 0.907 | 0.954 |
| 56 | 0.068 | 0.115 | 0.161 | 0.208 | 0.255 | 0.301 | 0.348 | 0.394 | 0.441 | 0.488 | 0.534 | 0.581 | 0.627 | 0.674 | 0.720 | 0.767 | 0.814 | 0.860 | 0.907 | 0.953 |
| 57 | 0.065 | 0.112 | 0.159 | 0.205 | 0.252 | 0.299 | 0.346 | 0.392 | 0.439 | 0.486 | 0.533 | 0.579 | 0.626 | 0.673 | 0.720 | 0.766 | 0.813 | 0.860 | 0.907 | 0.953 |
| 58 | 0.062 | 0.109 | 0.156 | 0.203 | 0.250 | 0.296 | 0.343 | 0.390 | 0.437 | 0.484 | 0.531 | 0.578 | 0.625 | 0.672 | 0.719 | 0.765 | 0.812 | 0.859 | 0.906 | 0.953 |
| 59 | 0.059 | 0.106 | 0.153 | 0.200 | 0.247 | 0.294 | 0.341 | 0.388 | 0.435 | 0.482 | 0.530 | 0.577 | 0.624 | 0.671 | 0.718 | 0.765 | 0.812 | 0.859 | 0.906 | 0.953 |
| 60 | 0.056 | 0.103 | 0.151 | 0.198 | 0.245 | 0.292 | 0.339 | 0.387 | 0.434 | 0.481 | 0.528 | 0.575 | 0.622 | 0.670 | 0.717 | 0.764 | 0.811 | 0.858 | 0.906 | 0.953 |
| 61 | 0.054 | 0.101 | 0.148 | 0.196 | 0.243 | 0.290 | 0.337 | 0.385 | 0.432 | 0.479 | 0.527 | 0.574 | 0.621 | 0.669 | 0.716 | 0.763 | 0.811 | 0.858 | 0.905 | 0.953 |
| 62 | 0.051 | 0.098 | 0.146 | 0.193 | 0.241 | 0.288 | 0.336 | 0.383 | 0.431 | 0.478 | 0.525 | 0.573 | 0.620 | 0.668 | 0.715 | 0.763 | 0.810 | 0.858 | 0.905 | 0.953 |
| 63 | 0.049 | 0.096 | 0.144 | 0.191 | 0.239 | 0.286 | 0.334 | 0.382 | 0.429 | 0.477 | 0.524 | 0.572 | 0.619 | 0.667 | 0.715 | 0.762 | 0.810 | 0.857 | 0.905 | 0.952 |
| 64 | 0.046 | 0.094 | 0.142 | 0.189 | 0.237 | 0.285 | 0.332 | 0.380 | 0.428 | 0.475 | 0.523 | 0.571 | 0.618 | 0.666 | 0.714 | 0.762 | 0.809 | 0.857 | 0.905 | 0.952 |
| 65 | 0.044 | 0.092 | 0.140 | 0.187 | 0.235 | 0.283 | 0.331 | 0.379 | 0.426 | 0.474 | 0.522 | 0.570 | 0.618 | 0.665 | 0.713 | 0.761 | 0.809 | 0.857 | 0.904 | 0.952 |
| 66 | 0.042 | 0.090 | 0.138 | 0.186 | 0.234 | 0.281 | 0.329 | 0.377 | 0.425 | 0.473 | 0.521 | 0.569 | 0.617 | 0.665 | 0.713 | 0.760 | 0.808 | 0.856 | 0.904 | 0.952 |
| 67 | 0.040 | 0.088 | 0.136 | 0.184 | 0.232 | 0.280 | 0.328 | 0.376 | 0.424 | 0.472 | 0.520 | 0.568 | 0.616 | 0.664 | 0.712 | 0.760 | 0.808 | 0.856 | 0.904 | 0.952 |
| 68 | 0.038 | 0.086 | 0.134 | 0.182 | 0.230 | 0.279 | 0.327 | 0.375 | 0.423 | 0.471 | 0.519 | 0.567 | 0.615 | 0.663 | 0.711 | 0.760 | 0.808 | 0.856 | 0.904 | 0.952 |
| 69 | 0.036 | 0.084 | 0.133 | 0.181 | 0.229 | 0.277 | 0.325 | 0.374 | 0.422 | 0.470 | 0.518 | 0.566 | 0.614 | 0.663 | 0.711 | 0.759 | 0.807 | 0.855 | 0.904 | 0.952 |
| 70 | 0.035 | 0.083 | 0.131 | 0.179 | 0.228 | 0.276 | 0.324 | 0.372 | 0.421 | 0.469 | 0.517 | 0.566 | 0.614 | 0.662 | 0.710 | 0.759 | 0.807 | 0.855 | 0.903 | 0.952 |
| 71 | 0.033 | 0.081 | 0.130 | 0.178 | 0.226 | 0.275 | 0.323 | 0.371 | 0.420 | 0.468 | 0.516 | 0.565 | 0.613 | 0.662 | 0.710 | 0.758 | 0.807 | 0.855 | 0.903 | 0.952 |
| 72 | 0.031 | 0.080 | 0.128 | 0.177 | 0.225 | 0.273 | 0.322 | 0.370 | 0.419 | 0.467 | 0.516 | 0.564 | 0.613 | 0.661 | 0.709 | 0.758 | 0.806 | 0.855 | 0.903 | 0.952 |
| 73 | 0.030 | 0.078 | 0.127 | 0.175 | 0.224 | 0.272 | 0.321 | 0.369 | 0.418 | 0.466 | 0.515 | 0.563 | 0.612 | 0.660 | 0.709 | 0.757 | 0.806 | 0.854 | 0.903 | 0.951 |
| 74 | 0.028 | 0.077 | 0.126 | 0.174 | 0.223 | 0.271 | 0.320 | 0.368 | 0.417 | 0.466 | 0.514 | 0.563 | 0.611 | 0.660 | 0.709 | 0.757 | 0.806 | 0.854 | 0.903 | 0.951 |
| 75 | 0.027 | 0.076 | 0.124 | 0.173 | 0.222 | 0.270 | 0.319 | 0.368 | 0.416 | 0.465 | 0.514 | 0.562 | 0.611 | 0.659 | 0.708 | 0.757 | 0.805 | 0.854 | 0.903 | 0.951 |
| 76 | 0.026 | 0.074 | 0.123 | 0.172 | 0.221 | 0.269 | 0.318 | 0.367 | 0.415 | 0.464 | 0.513 | 0.562 | 0.610 | 0.659 | 0.708 | 0.756 | 0.805 | 0.854 | 0.903 | 0.951 |
| 77 | 0.025 | 0.073 | 0.122 | 0.171 | 0.220 | 0.268 | 0.317 | 0.366 | 0.415 | 0.463 | 0.512 | 0.561 | 0.610 | 0.659 | 0.707 | 0.756 | 0.805 | 0.854 | 0.902 | 0.951 |
| 78 | 0.023 | 0.072 | 0.121 | 0.170 | 0.219 | 0.268 | 0.316 | 0.365 | 0.414 | 0.463 | 0.512 | 0.561 | 0.609 | 0.658 | 0.707 | 0.756 | 0.805 | 0.854 | 0.902 | 0.951 |
| 79 | 0.022 | 0.071 | 0.120 | 0.169 | 0.218 | 0.267 | 0.316 | 0.364 | 0.413 | 0.462 | 0.511 | 0.560 | 0.609 | 0.658 | 0.707 | 0.756 | 0.804 | 0.853 | 0.902 | 0.951 |
| 80 | 0.021 | 0.070 | 0.119 | 0.168 | 0.217 | 0.266 | 0.315 | 0.364 | 0.413 | 0.462 | 0.511 | 0.560 | 0.608 | 0.657 | 0.706 | 0.755 | 0.804 | 0.853 | 0.902 | 0.951 |

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