INTERNATIONAL STANDARD ISO 3

Preferred numbers — Series of preferred numbers

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, International Standard ISO 3 replaces ISO Recommendation R 3-1954 drawn up by Technical Committee ISO/TC 19, *Preferred numbers.*

The Member Bodies of the following countries approved the Recommendation :

Australia	India	Spain
Austria	Israel	Sweden
Belgium	Italy	Switzerland
Chile	Mexico	United Kingdom
Denmark	Netherlands	U.S.A.
Finland	New Zealand	U.S.S.R.
France	Norway	Yugoslavia
Germany	Portugal	
Hungary	South Africa, Rep. of	

No Member Body expressed disapproval of the Recommendation.

Preferred numbers — Series of preferred numbers

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies series of preferred numbers.

2 BASIC SERIES OF PREFERRED NUMBERS

Basic series				Serial number	Theoretical values		Percentage differences between basic series and calculated values %
					Mantissae of logarithms	Calculated values	
R 5	R 10	R 20	R 40				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1,00	1,00	1,00	1,00	0	000	1,0000	0
			1,06	1	025	1,0593	+ 0,07
		1,12	1,12	2	050	1,1220	− 0,18
			1,18	3	0,75	1,1885	− 0,71
	1,25	1,25	1,25	4	100	1,2589	− 0,71
			1,32	5	125	1,3335	− 1,01
		1,40	1,40	6	150	1,4125	− 0,88
			1,50	7	175	1,4962	+ 0,25
1,60	1,60	1,60	1,60	8	200	1,5849	+ 0,95
			1,70	9	225	1,6788	+ 1,26
		1,80	1,80	10	250	1,7783	+ 1,22
			1,90	11	275	1,8836	+ 0,87
	2,00	2,00	2,00	12	300	1,9953	+ 0,24
			2,12	13	325	2,1135	+ 0,31
		2,24	2,24	14	350	2,2387	+ 0,06
			2,36	15	375	2,3714	− 0,48
2,50	2,50	2,50	2,50	16	400	2,5119	− 0,47
			2,65	17	425	2,6607	− 0,40
		2,80	2,80	18	450	2,8184	− 0,65
			3,00	19	475	2,9854	+ 0,49
	3,15	3,15	3,15	20	500	3,1623	− 0,39
			3,35	21	525	3,3497	+ 0,01
		3,55	3,55	22	550	3,5481	+ 0,05
			3,75	23	575	3,7584	− 0,22
4,00	4,00	4,00	4,00	24	600	3,9811	+ 0,47
			4,25	25	625	4,2170	+ 0,78
		4,50	4,50	26	650	4,4668	+ 0,74
			4,75	27	675	4,7315	+ 0,39
	5,00	5,00	5,00	28	700	5,0119	− 0,24
			5,30	29	725	5,3088	− 0,17
		5,60	5,60	30	750	5,6234	− 0,42
			6,00	31	775	5,9566	+ 0,73
6,30	6,30	6,30	6,30	32	800	6,3096	− 0,15
			6,70	33	825	6,6834	+ 0,25
		7,10	7,10	34	850	7,0795	+ 0,29
			7,50	35	875	7,4989	+ 0,01
	8,00	8,00	8,00	36	900	7,9433	+ 0,71
			8,50	37	925	8,4140	+ 1,02
		9,00	9,00	38	950	8,9125	+ 0,98
			9,50	39	975	9,4406	+ 0,63
10,00	10,00	10,00	10,00	40	000	10,0000	0

3 EXCEPTIONAL R 80 SERIES

1,00	1,80	3,15	5,60
1,03	1,85	3,25	5,80
1,06	1,90	3,35	6,00
1,09	1,95	3,45	6,15
1,12	2,00	3,55	6,30
1,15	2,06	3,65	6,50
1,18	2,12	3,75	6,70
1,22	2,18	3,87	6,90
1,25	2,24	4,00	7,10
1,28	2,30	4,12	7,30
1,32	2,36	4,25	7,50
1,36	2,43	4,37	7,75
1,40	2,50	4,50	8,00
1,45	2,58	4,62	8,25
1,50	2,65	4,75	8,50
1,55	2,72	4,87	8,75
1,60	2,80	5,00	9,00
1,65	2,90	5,15	9,25
1,70	3,00	5,30	9,50
1,75	3,07	5,45	9,75

4 COMMENTARY

4.1 Definition of preferred numbers

Preferred numbers are the conventionally rounded off term values of geometrical series, including the integral powers of 10 and having as ratios the following factors :

$$\sqrt[5]{10} \quad \sqrt[10]{10} \quad \sqrt[20]{10} \quad \sqrt[40]{10} \quad \text{and} \quad \sqrt[80]{10}$$

in accordance with the tables in sections 2 and 3 set out for the 1 to 10 range. The series of preferred numbers being unlimited in both directions, the values of the terms in other decimal ranges are obtained by multiplying the values in the tables by positive or negative integral powers of 10.

4.2 Terminology

4.2.1 theoretical values : The extended term value of

$$\left(\sqrt[5]{10}\right)^N, \quad \left(\sqrt[10]{10}\right)^N, \quad \text{etc.}$$

4.2.2 calculated values (see section 2, column 7) : Values approximating to the theoretical values, expressed to 5 significant figures (the relative error in comparison with the theoretical values is less than 1/20 000).

4.2.3 preferred numbers : Values rounded off in accordance with columns R 5, R 10, R 20, R 40 and R 80 (see section 2, columns 1 to 4, and section 3).

4.2.4 serial numbers : An arithmetic series of consecutive numbers indicating the preferred numbers starting with 0 for the preferred number 1,00.

4.3 Designation of series

All series of preferred numbers have a designation commencing with the letter R.

4.4 Basic series

The series figuring in section 2 are those which shall be normally used. They are distinguished by the symbols :

$$R\ 5 \ - \ R\ 10 \ - \ R\ 20 \ - \ R\ 40$$

The values of the R 5 series are to be given preference over those of the R 10 series, these latter over the values of the R 20 series and finally these last over those of the R 40 series.

The above symbols suffice if the series is not limited in either direction. If this is not so, the following method of expression is used to indicate the limits :

R 10 (1,25 . . .) series limited to the term value 1,25 (inclusive) as the low limit.

R 20 (. . . 45) series limited to the term value 45 (inclusive) as the high limit.

R 40 (75 . . . 300) series limited between the term values 75 and 300 (both values inclusive).

4.5 Exceptional R 80 series

This is set out in section 3. The terms of the basic series shall be given preference over the terms of the R 80 series.

4.6 Derived series

4.6.1 *Series obtained by taking every second, third, fourth or p^{th} term of a basic series*

These are distinguished by the symbol of the corresponding basic series followed by the solidus division sign and the number 2, 3, 4 . . . or *p*. If the series is limited, the symbol shall include an indication of the limiting terms to be considered; if it is not limited, mention shall be made of at least one of the terms.

Examples :

R 5/2 (1 . . . 1 000 000) — *Series limited by the terms* 1 *and* 1 000 000 *and including both these terms.*

R 10/3 (. . . 80 . . .) — *Series unlimited in both directions and including the term* 80.

R 20/4 (112 . . .) — *Series limited in the lower direction to* 112 *inclusive.*

R 40/5 (. . . 60) — *Series limited in the upper direction to* 60 *inclusive.*

NOTE — The derived series R 10/3 (1 . . .), which is obtained, from 1, by taking every third term of the series R 10, comprises the following terms : 1, 2, 4, 8, 16, 31,5, ... Its ratio is about 2.

4.6.2 In general, if

r is the index of the basic series $r = 5, 10, 20$ or 40,

p is the pitch of the derived series, i.e. the number of steps in the basic series required to build up the derived series,

the ratio of the derived series is

$$10^{p/r}$$

On the other hand, if N is a positive integral number, the term of identification of the derived series is

$$10^{N/40}$$

and the derived series is designated by

$$R\, r/p\, (\ldots 10^{N/40} \ldots)$$

Lastly, if x is any integral number, positive, zero or negative, any term of the derived series is

$$10^{N/40} \times 10^{(p/r)\,x} = 10^{\left(\frac{N}{40} + \frac{px}{r}\right)}$$