

Proposal to Encode North Indic Number Forms in ISO/IEC 10646

Anshuman Pandey
University of Michigan
Ann Arbor, Michigan, U.S.A.
pandey@umich.edu

October 7, 2007

Contents

Proposal Summary Form	i
1 Introduction	1
2 Acknowledgments	2
3 Proposal History	2
4 Characters Proposed	2
4.1 Basis for Character Shapes	3
5 Overview of the Number Forms and Unit Marks	3
5.1 Fraction Signs	3
5.2 Quarter Mark	5
5.3 Placeholder Mark	6
5.4 Currency Mark	6
5.5 Quantity Mark	8
6 Characters Not Proposed	9
6.1 Marks for Units of Weight	10
6.2 Marks for Units of Measure	10
7 Relationship to Other Indic Numeric Notation Systems	11
7.1 Gujarati Fraction Signs	11
7.2 Bengali Currency and Fraction Numeration Marks	11
7.3 Malayalam Fractions and Letter-Numerals	12
7.4 Raqm Rupee Mark and Fraction Signs	13
8 References	13

List of Tables

1	Character names and properties for the north Indic number forms.	15
---	--------------------------------------------------------------------------	----

List of Figures

1	Currency, weights, and measures marks found in Kaithi documents	16
2	Method of writing currency values in Kaithi using fractions and the rupee mark	17
3	Excerpt showing the forms of regular and independent fractions in Gujarati	17
4	Excerpt from a Gujarati grammar showing the writing of fractions after a zero	17
5	Use of fractions and the rupee mark in the Mahajani script	18
6	Pricelist for books showing the use of the rupee mark	19
7	Pricelist for books showing the use of the rupee mark	19
8	Title page showing the use of fractions to denote price	20
9	Title page showing the use of the rupee mark and fractions to denote price	20
10	The use of the rupee mark in Devanagari text	20
11	Title page showing the rupee mark and fraction signs in Gurmukhi	21
12	The use of the rupee mark in Gurmukhi text	21
13	Excerpt from Green's Hindi grammar showing the method of writing currencies	22
14	Excerpt from Greaves's Hindi grammar showing variant forms of the angled fractions	22
15	Excerpt from Vajpeyee's Hindi grammar showing the method of writing currencies	23
16	Excerpt from Bhide's Marathi grammar showing the writing of fractions	23
17	Excerpt from Navalkar's Marathi grammar showing variants of the independent fractions	23
18	Excerpt from a Marathi grammar showing the writing of the placeholder mark	24
19	Excerpt from a Marathi dictionary showing historical variants of the placeholder mark	24
20	Excerpt from Kellogg's Hindi grammar showing the method of writing currencies	24
21	Method of writing measures and currency notation in Maithili	25
22	Method of writing currency in Maithili	25
23	Excerpt from Pořízka's Hindi grammar showing fractions used for time notation	26
24	Excerpt from Pořízka's Hindi grammar showing the method of writing currencies	26
25	Excerpt from Scholberg's Hindi grammar showing currency and weight notation	27
26	Excerpt from Peshwa records showing the use of the placeholder mark	28
27	Number forms from the Nirnaya-Sagar Devanagari font	29
28	Number forms and unit marks from the Monotype Devanagari font	30
29	Excerpt from the Government of India's proposal for Gujarati fractions	31
30	Use of fraction signs and the rupee mark in the Takri script	32
31	Method of writing fractions and currency in the Bengali script	33
32	Method of writing numerals in Malayalam	33
33	Method of writing fractions in Malayalam	33

ISO/IEC JTC 1/SC 2/WG 2
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646¹

Please fill all the sections A, B and C below. Please read Principles and Procedures Document (P & P) from
<http://www.dkuug.dk/JTC1/SC2/WG2/docs/principles.html> for guidelines and details before filling this form.
Please ensure you are using the latest Form from <http://www.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html>.
See also <http://www.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html> for latest Roadmaps.

A. Administrative

1. Title: **Proposal to Encode North Indic Number Forms in ISO/IEC 10646**
2. Requester's name: **University of California, Berkeley Script Encoding Initiative (Universal Scripts Project); author: Anshuman Pandey (pandey@umich.edu)**
3. Requester type (Member Body/Liaison/Individual contribution): **Liaison contribution**
4. Submission date: **October 7, 2007**
5. Requester's reference (if applicable): **N/A**
6. Choose one of the following:
 - (a) This is a complete proposal: **Yes**
 - (b) or, More information will be provided later: **No**

B. Technical - General

1. Choose one of the following:
 - (a) This proposal is for a new script (set of characters): **Yes**
 - i. Proposed name of script: **Common Indic Number Forms**
 - (b) The proposal is for addition of character(s) to an existing block: **No**
 - i. Name of the existing block: **N/A**
2. Number of characters in proposal: **10**
3. Proposed category: **A - Contemporary**
4. Is a repertoire including character names provided?: **Yes**
 - (a) If Yes, are the names in accordance with the "character naming guidelines" in Annex L of P&P document?: **Yes**
 - (b) Are the character shapes attached in a legible form suitable for review?: **Yes**
5. Who will provide the appropriate computerized font (ordered preference: True Type, or PostScript format) for publishing the standard?: **Anshuman Pandey; True Type**
 - (a) If available now, identify source(s) for the font and indicate the tools used: **The font contains normalized forms of characters found in hand-written and printed documents. It was drawn by Anshuman Pandey using Metafont and converted to True Type format using FontForge.**
6. References:
 - (a) Are references (to other character sets, dictionaries, descriptive texts etc.) provided?: **Yes**
 - (b) Are published examples of use (such as samples from newspapers, magazines, or other sources) of proposed characters attached?: **Yes**
7. Special encoding issues:
 - (a) Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)? **Yes; see text of the proposal.**
8. Additional Information: Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at <http://www.unicode.org> for such information on other scripts. Also see <http://www.unicode.org/Public/UNIDATA/UCD.html> and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard. **Character properties, numeric information, and currency information are included.**

¹ Form number: N3102-F (Original 1994-10-14; Revised 1995-01, 1995-04, 1996-04, 1996-08, 1999-03, 2001-05, 2001-09, 2003-11, 2005-01, 2005-09, 2005-10, 2007-03)

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before?: **Yes. This proposal is a revision of “Proposal to Encode North Indian Accounting Signs in Plane 1 of ISO/IEC 10646” (ISO/IEC JTC1/SC2/WG2 N3312 L2/07-139R).**
2. Has contact been made to members of the user community (for example: National Body, user groups of the script or characters, other experts, etc.)? **No**
 - (a) If Yes, with whom?: **N/A**
 - i. If Yes, available relevant documents: **N/A**
3. Information on the user community for the proposed characters (for example: size, demographics, information technology use, or publishing use) is included? **Yes**
 - (a) Reference: **The proposed characters were in common use through northern South Asia. See text of the proposal for further details.**
4. The context of use for the proposed characters (type of use; common or rare): **Common**
 - (a) Reference: **The characters were used for writing currency, weight, measurement, time, and notations of other quantities in several contemporary and historical north Indic scripts.**
5. Are the proposed characters in current use by the user community?: **Yes.**
 - (a) If Yes, where? Reference: **Although the use of the characters have diminished since the 1950s, they are attested in written and printed materials through at least the 1970s, and appear in newspapers as late as 2004.**
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely in the BMP?: **No**
 - (a) If Yes, is a rationale provided?: **N/A**
 - i. If Yes, reference: **N/A**
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)? **Yes. The characters constitute a specialized set.**
8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence? **No**
 - (a) If Yes, is a rationale for its inclusion provided?: **N/A**
 - i. If Yes, reference: **N/A**
9. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters? **No**
 - (a) If Yes, is a rationale provided?: **N/A**
 - i. If Yes, reference: **N/A**
10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character? **Yes**
 - (a) If Yes, is a rationale for its inclusion provided? **Yes**
 - i. If Yes, reference: **See the paragraphs labeled “Homoglyphs” in the description of each character.**
11. Does the proposal include use of combining characters and/or use of composite sequences (see clauses 4.12 and 4.14 in ISO/IEC 10646-1: 2000)? **No**
 - (a) If Yes, is a rationale for such use provided? **N/A**
 - i. If Yes, reference: **N/A**
 - (b) Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided? **N/A**
 - i. If Yes, reference: **N/A**
12. Does the proposal contain characters with any special properties such as control function or similar semantics? **No**
 - (a) If Yes, describe in detail (include attachment if necessary): **N/A**
13. Does the proposal contain any Ideographic compatibility character(s)? **No**
 - (a) If Yes, is the equivalent corresponding unified ideographic character(s) identified? **N/A**
 - i. If Yes, reference: **N/A**

1 Introduction

Purpose This is a proposal to encode number forms and unit marks found in north Indic scripts in the Universal Character Set (UCS) (ISO/IEC 10646). The intent is to provide a set of characters commonly used for writing fractions and currency, weight, measure, time, and notations of other quantities in contemporary and historical north Indic scripts.

Description The number forms and unit marks belong to a numeric notation system used in the area of modern north India and Pakistan, or the region encompassing Sindh to the west, Bihar to the east, Kashmir to the north, and Maharashtra to the south. The characters are also attested in some areas of Nepal.¹ The numeric notation system to which the characters belong is orthographically distinct from other systems found in South Asia. The characters were used with the Devanagari, Gujarati, Gurmukhi, Kaithi, Landa, Mahajani, Maithili, Modi, and Takri scripts, as well as with various commercial short-hands and minor regional scripts. Although the characters were included in the repertoires of several scripts across a wide geographic expanse, their forms, meanings, and usage remained consistent. The orthography of the numeric notation system also remained uniform across scripts.

Name On account of the common typology and semantics of the north Indic number forms and unit marks, they are proposed for inclusion in the UCS as a single set to be encoded in an independent block. The block is named “Common Indic Number Forms” and the descriptive name of the proposed characters is “North Indic”.² The name “North Indic” is a technical descriptor that affirms the genetic affiliation of the number forms with scripts descended from the northern styles of Brahmi, or the north Indic scripts.

Allocation The north Indic number forms are to be encoded in the “Common Indic Number Forms” block, which is allocated in the Basic Multilingual Plane (BMP) (Plane 0) at the range U+A830..U+A83F.³ This single column (16 code-points) is sufficient for encoding the characters, and offers space to accommodate the inclusion of additional characters.

Classification The north Indic number forms may be categorized as elements of a “Category A” (contemporary) or a “Category B.1” (specialized) script, as per the criteria specified in ISO/IEC JTC 1/SC 2/WG 2 N3002.⁴

Justification An encoding for north Indic number forms and unit marks in the UCS will benefit users who require the ability to accurately represent numeric notation and number forms found in materials written and printed in north Indic scripts. Based on the ubiquity of the number forms and unit marks in historical and contemporary scripts, it is necessary to identify the characters in electronic plain-text for the purpose of preserving source materials and reproducing and representing such materials in digital media.

The north Indic number forms and unit marks constitute a specialized set of characters. Unlike the fraction signs, currency marks, and other unit marks encoded within specific Indic script blocks, the north Indic characters are not associated with any single script. Rather, the number forms and unit marks were added to the repertoire of various scripts and the shapes of the forms were maintained. For this reason, the characters are to be allocated in an independent block, not within existing script or number-forms blocks.

An independent allocation of the number forms in the “Common Indic Number Forms” block will distinguish the characters as part of a specialized set, reflective of a particular orthographic system. Such an allocation will facilitate identification of the characters and indicate that they are a general supplement to the

¹ Money, 1942: viii. ² A previous version of this proposal suggested the name “North Indian Accounting Signs.” The term “Number Forms” is more technically appropriate and is conformant with the naming conventions for similar characters already encoded in the UCS, such as the “Number Forms” supplement for Latin (U+2150..U+218F). ³ Unicode Roadmap Committee, 2007. ⁴ International Organization for Standardization, 2005: 4.

north Indic scripts. The unified encoding of the north Indic number forms within an independent block will facilitate their use across writing systems in a manner reflective of historical and contemporary practices.

2 Acknowledgments

This project was made possible in part by a grant from the United States National Endowment for the Humanities (NEH), which funded the Universal Scripts Project (part of the Script Encoding Initiative at the University of California, Berkeley).

3 Proposal History

Many of the north Indic number forms and unit marks were initially proposed for inclusion in the UCS as part of the Kaithi script block in L2/05-343.⁵ Additional research indicated that, in addition to Kaithi, these signs were also used with regularity in other north Indic scripts. For this reason, the relevant characters were removed from the Kaithi proposal and proposed for separate encoding.

This proposal (ISO/IEC JTC1/SC2/WG2 N3367 L2/07-354) is a revision of the document submitted to the Unicode Technical Committee (UTC), titled “Proposal to Encode North Indian Accounting Signs in Plane 1 of ISO/IEC 10646” (ISO/IEC JTC1/SC2/WG2 N3312 L2/07-139R). The UTC accepted L2/07-139R on May 18, 2007, except for three independent fractions, which were determined to be composite characters (see section 5.1). The characters were tentatively allocated to the existing “Number Forms” block (U+2150). The present author made a recommendation for re-allocation in an independent block in “Towards an Encoding for North Indic Number Forms in the UCS” (ISO/IEC JTC1/SC2/WG2 N3334 L2/07-238). The UTC accepted the recommendations made in L2/07-238 on August 9, 2007 and allocated the characters in a new block to be named “Common Indic Number Forms” at U+A830 in the BMP.⁶

4 Characters Proposed

There are ten characters proposed as part of the “Common Indic Number Forms block.” Included in this set are six fraction signs, one quarter mark, one placeholder mark, one currency mark, and one quantity mark:

- I U+A830 NORTH INDIC FRACTION ONE QUARTER
- II U+A831 NORTH INDIC FRACTION ONE HALF
- III U+A832 NORTH INDIC FRACTION THREE QUARTERS
- ¼ U+A833 NORTH INDIC FRACTION ONE SIXTEENTH
- ⅛ U+A834 NORTH INDIC FRACTION ONE EIGHTH
- ⅙ U+A835 NORTH INDIC FRACTION THREE SIXTEENTHS
- U+A836 NORTH INDIC QUARTER MARK
- ↵ U+A837 NORTH INDIC PLACEHOLDER MARK
- ₹ U+A838 NORTH INDIC RUPEE MARK
- ₪ U+A839 NORTH INDIC QUANTITY MARK

The signs and their properties are discussed throughout the proposal and given in the Unicode Character Database format in Table 1.

Other signs for denoting weights and measures have been identified and are discussed in section 6. As there is insufficient information regarding the use of these signs, they are not presently proposed for inclusion in the “Common Indic Number Forms” block. If and when information about these signs becomes available

⁵ Pandey, 2005. ⁶ Everson, 2007; United States National Body, ISO, 2007: 2.

and if additional signs are later identified, proposals for their inclusion in the block will be submitted for formal review. The characters proposed here are sufficient for the encoding and processing of numeric notation in Indic documents.

4.1 Basis for Character Shapes

All of the north Indic number forms proposed here are found in both written and printed materials. The font for the number forms was drawn by Anshuman Pandey. The digitized letterforms were designed to express fidelity to the forms of characters as found in metal fonts.

5 Overview of the Number Forms and Unit Marks

The ubiquity of the north Indic number forms and unit marks is evidenced from their presence in documents ranging from newspapers to product catalogues; from legal documents to accounting records; from school primers to scribal handbooks; and personal records and correspondence. Moreover, the characters were described in grammar texts, which suggests that they and the numeric notation system of which they were part were considered a rudimentary part of the orthography of the given languages.

The use of the number forms, unit marks, and the associated numeric notation system diminished in the latter half of the 20th century when India changed its currency system. On April 1, 1957, India introduced a new coinage system called “Naya Paisa” (नया पैसा), which is based on the decimal system.⁷ The adoption of the metric system of weights and measures on October 1, 1958 also reduced the use of the historical number forms.⁸ The change of the currency from base-16 to base-10 and the adoption of the metric system rendered the number forms and unit marks obsolete. The use of the number forms and unit marks in writing and print continued through the 1970s. The fraction signs are still used today in a limited capacity in advertisements and in other specialized contexts.

5.1 Fraction Signs

Description The fraction signs were used to write currency, weight, measure, time, and other units. The signs represent fraction values of a base-16 notation system. The fraction signs appear in both written and printed materials. Their use in written documents is attested to at least the 16th century CE and in texts printed as late as 1970. The signs are still used in a limited capacity; for example, they were used in a Gujarati newspaper from 2004 to write time notations (see Figure 29). The fraction signs are part of the glyph set of metal fonts such as Nirnaya-Sagar Pica No. 1 (see Figure 27) and Monotype Devanagari (see Figure 28).

The fractions are written as follows:

𑂀	$\frac{1}{16}$	𑂁	$\frac{5}{16}$ [= $\frac{1}{4} + \frac{1}{16}$]	𑂂	$\frac{9}{16}$ [= $\frac{1}{2} + \frac{1}{16}$]	𑂃	$\frac{13}{16}$ [= $\frac{3}{4} + \frac{1}{16}$]
𑂄	$\frac{1}{8}$ ($\frac{2}{16}$)	𑂅	$\frac{6}{16}$ [= $\frac{1}{4} + \frac{1}{8}$]	𑂆	$\frac{5}{8}$ ($\frac{10}{16}$) [= $\frac{1}{2} + \frac{1}{8}$]	𑂇	$\frac{7}{8}$ ($\frac{14}{16}$) [= $\frac{3}{4} + \frac{1}{8}$]
𑂈	$\frac{3}{16}$	𑂉	$\frac{7}{16}$ [= $\frac{1}{4} + \frac{3}{16}$]	𑂊	$\frac{11}{16}$ [= $\frac{1}{2} + \frac{3}{16}$]	𑂋	$\frac{15}{16}$ [= $\frac{3}{4} + \frac{3}{16}$]
𑂌	$\frac{1}{4}$ ($\frac{4}{16}$)	𑂍	$\frac{1}{2}$ ($\frac{8}{16}$)	𑂎	$\frac{3}{4}$ ($\frac{12}{16}$)	𑂏	1

Typology The writing of fractions is governed by the additive principle. All fractions of the base-16 system can be expressed using six elemental fraction signs. Therefore, only these six characters are proposed for encoding:

⁷ Pořízka, 1972: 513. ⁸ Pořízka, 1972: 304.

- Ⅰ U+A830 NORTH INDIC FRACTION ONE QUARTER
- Ⅱ U+A831 NORTH INDIC FRACTION ONE HALF
- Ⅲ U+A832 NORTH INDIC FRACTION THREE QUARTERS
- ¼ U+A833 NORTH INDIC FRACTION ONE SIXTEENTH
- ⅕ U+A834 NORTH INDIC FRACTION ONE EIGHTH
- ⅙ U+A835 NORTH INDIC FRACTION THREE SIXTEENTHS

Theoretically, even these six forms can be reduced to the two primitives ¼ NORTH INDIC FRACTION ONE SIXTEENTH and Ⅰ NORTH INDIC FRACTION ONE QUARTER. The four other elemental forms may be considered as composite characters created from sequences of these primitives. For example, Ⅱ NORTH INDIC FRACTION ONE HALF may be composed by writing NORTH INDIC FRACTION ONE QUARTER twice as Ⅰ + Ⅰ = Ⅱ. Similarly, ⅙ NORTH INDIC FRACTION THREE SIXTEENTHS may be composed by writing NORTH INDIC FRACTION ONE SIXTEENTH three times as ¼ + ¼ + ¼ = ⅙. The traditional practice, however, is to consider these six elemental fraction signs as precomposed signs, and they appear as such in the metal fonts of various scripts. The forms of the fractions are uniform across north Indic scripts.

Names The fraction signs one-quarter (Ⅰ), one-half (Ⅱ), and three-quarters (Ⅲ) have unique names in north Indic languages. In Hindi, the names are *pāo* (पाओ) or *pāv* (पाव), *ādhā* (आधा), and *paune* (पौने), respectively. In Gujarati, the names are *pā* (પા) or *pāo* (પાઓ), *ādhō* (આધો) or *ardho* (અર્ધો), and *pono* (પોણો) (see section 7.1 for further details).

Properties The fraction signs belong to the Unicode general category “Number, Other” (No). The appropriate numeric value is assigned to each sign: “ $\frac{1}{16}$ ” for NORTH INDIC FRACTION ONE SIXTEENTH, “ $\frac{1}{2}$ ” for NORTH INDIC FRACTION ONE HALF, etc. The fraction signs are always written left-to-right and have bidirectional values of “Left-to-Right” (L).

Orthography The vertical fraction signs are always written before the angled fraction signs. For example, the fraction $\frac{3}{8}$ is correctly written as Ⅲ⅕, not as ⅕Ⅲ. The vertical alignment of the angled fraction signs vary in written and printed texts. In some texts they are vertically centered along the x-height, in other texts they are aligned at the top. The latter practice is followed here.

Variants Variant forms exist for NORTH INDIC FRACTION ONE SIXTEENTH, NORTH INDIC FRACTION ONE EIGHTH, and NORTH INDIC FRACTION THREE SIXTEENTHS. These fractions are also written horizontally instead of at an angle: ¼ may be written as ¼; ⅕ as =; and ⅙ as ≡ (see Figure 13).

Homoglyphs The form of Ⅰ NORTH INDIC FRACTION ONE QUARTER and Ⅱ NORTH INDIC FRACTION ONE HALF resemble the signs *daṇḍā* and double *daṇḍā*. Sequences consisting of a digit followed by a *daṇḍā* are used as labels in enumerated lists in Devanagari similar to the practice in Latin of writing digit + period; for example ‘२।’ (U+0968 DEVANAGARI DIGIT TWO + U+0964 DEVANAGARI DANDA) represents “item No 2.” In isolation, such a sequence might also represent the fraction $2\frac{1}{4}$, written as ‘२।’ (U+0968 DEVANAGARI DIGIT TWO + NORTH INDIC FRACTION ONE QUARTER). The proper meaning of such sequences, however, is apparent from context. Among signs used in other Indic systems of numeric notation, NORTH INDIC FRACTION ONE QUARTER resembles Ⅰ U+09F7 BENGALI CURRENCY NUMERATOR FOUR.

Independent Forms The signs for the fractions $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ some times take different forms when they are written independently. These independent forms were used more generally in Maharashtra and Gujarat, and they appear in materials written and printed in the Devanagari (Figure 16) and Gujarati (Figure 3) scripts. The independent fraction signs are created by writing mid-point dots to the left and right of the regular fraction signs. One-quarter is represented as ¼̣; one-half is represented as ½̣; and three-quarters is represented as ¾̣. The independent fraction signs are not used for writing mixed fractions and are not

written with currency or quantity marks. For example, “4 *ānās*” may be written as ५ and as ५, but never as ५; “3 *rupayā* and 8 *ānās*” is written as ३५ and as ३५ (using the NORTH INDIC QUARTER MARK), never as ३५ or as ३५.

There are variant methods of writing the independent fraction signs. One is to write the regular fraction signs after the digit zero with no dots, as ०, ०॥, and ०॥॥ (see Figure 4). The other is to write the dots at the baseline instead of at the middle of the sign, as ०., ०.॥, and ०.॥॥ (see Figure 17). The latter method appears to be a substitute for the lack of appropriate glyphs for independent fraction signs in a font. A third method might be to write the signs as composite characters with the NORTH INDIC QUARTER MARK: ०◦, ०◦॥, and ०◦॥॥. The independent fractions signs are not proposed for encoding because they could be considered composite characters that may be formed from the above fraction signs and dot characters already encoded in UCS.

5.2 Quarter Mark

- U+A836 NORTH INDIC QUARTER MARK

Description The quarter mark is used for explicitly indicating the fraction signs for $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ in cases where ambiguity might arise. For instance, the weight value १५◦ would typically denote “15 *chaṭāmk*.” However, in some regional orthographies the weight units *ser* and *chaṭāmk* are not separated by the quantity mark. Thus, the form १५◦ could represent three different values: १ + १५◦ (“ten *ser* and eleven *chaṭāmk*”); १५ + १◦ (“twenty *ser* and seven *chaṭāmk*”); and १५ + ३◦ (“thirty *ser* and three *chaṭāmk*”). In such cases the quarter mark would be written after the *ser* unit to indicate the specific value of the quantity. Thus, १५◦◦, १५◦◦, and १५◦◦ for the above forms, respectively. See section 5.5 for additional information.

Properties The NORTH INDIC QUARTER MARK belongs to the Unicode general category “Symbol, Other” (No). It has a bidirectional value of “Left-to-Right” (L).

Orthography The quarter mark is written after NORTH INDIC FRACTION ONE QUARTER, NORTH INDIC FRACTION ONE HALF, OR NORTH INDIC FRACTION THREE QUARTERS. Grierson shows the use of the quarter mark to denote quarter units of the *chaṭāmk* weight unit:⁹

Chātāmk १, २, ३, ४, ५, ६, ७, ८, ९, १०, ११, १२

The same practice is used for writing *kaṭṭhā* measurement values:¹⁰

Kaṭṭhā १, २, ३, ४, ५, ६, ७, ८, ९, १०, ११, १२

The use of the quarter mark is not mandatory. In illustrating the writing of *ser* values, Grierson shows the quarter mark used for writing the quantity “10 *ser*,” but not for “20 *ser*” and “30 *ser*”:¹¹

Ser १, २, ३, ४, ५, ६, ७, ८, ९, १०, ११, १२, १३, १४, १५, १६, १७, १८, १९, २०, २१, २२, २३, २४, २५, २६, २७, २८, २९, ३०

Homoglyphs The quarter mark resembles the digit zero as found in Indic scripts and ◦ U+0970 DEVANAGARI ABBREVIATION SIGN. Among other signs used in different Indic numeric notation systems, it resembles ◦ U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN. The rules for the use of NORTH INDIC QUARTER MARK are different from that of U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN. Figure 31 shows U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN used as a mark for writing *ānā* currency values. The NORTH INDIC QUARTER MARK does not have such a function. Moreover, unlike the dot used in writing

⁹ Grierson, 1899: Plate IV. ¹⁰ Grierson, 1899: Plate IV. ¹¹ Grierson, 1899: Plate IV.

independent fraction signs, the quarter mark is a contextually and semantically distinct character in that it is written only with the signs that represent the fractions $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$.

Variants The quarter mark may also be written as a closed dot, as is done with the independent fraction signs. The following example of Kaithi text shows the use of fraction signs to write *rupayā* and *ānā* values.¹² The circled portion indicates the value १७॥० “17 *rupayā*, 8 *ānā*.”

5.3 Placeholder Mark

↵ U+A837 NORTH INDIC PLACEHOLDER MARK

Description The placeholder mark is used to indicate the absence of a unit. It appears in written and printed texts, primarily in Maharashtra, where it is known as *ālī* (आळी) or *alī* (अळी), and in Gujarati¹³ It was a common sign in the Modi script and appears in Peshwa records of the Maratha dynasty from at least the 16th century CE (see Figure 26). The placeholder mark appears in metal fonts such as Nirnaya-Sagar Pica No. 1 (Figure 27), Monotype Devanagari (Figure 28), and Vijapure Devanagari.¹⁴

Properties The placeholder mark belongs to the Unicode general category “Symbol, Other” (So). It has a bidirectional value of “Left-to-Right” (L).

Orthography The placeholder mark is reserved for marking the absence of intermediate units, such as the *pavalī* unit of the Maharashtran currency system. For example, the notation २८= represents the value “2 *rupayā* and 2 *ānā*,” where the placeholder mark indicates “0 *pavalī*” (see Figure 18). If a quantity contains *pavalī*, but no *rupayā*, then the placeholder mark is written after a zero: ०८२ “0 *rupayā* and 2 *pavalī*.”

Variants The placeholder mark has historical variants in Maharashtra and Gujarat, which may reflect forms used in Modi (see Figure 19). The form that appears in Devanagari metal fonts is proposed here as the modern standard form.

5.4 Currency Mark

⌋ U+A838 NORTH INDIC RUPEE MARK

Description The NORTH INDIC RUPEE MARK was used for writing currency notations. The sign appears in both written and printed materials. The use of the quantity mark was not mandatory. When the sign was not used, the different currency units were still distinguishable by the method of writing the units. The semantics of the north Indic rupee mark are similar to the Bengali rupee mark, which is encoded in the Bengali block as ⌋ U+09F2 BENGALI RUPEE MARK.

Properties The NORTH INDIC RUPEE MARK belongs to the Unicode general category “Symbol, Currency” (Sc). It is a non-combining sign. The mark has a bidirectional value of “European Number Terminator” (ET), similar to other currency marks encoded in the UCS.

¹² Grierson, 1899: Plate X. ¹³ Molesworth, 1857: 58. ¹⁴ Naik, 1971: 330.

Typology The NORTH INDIC RUPEE MARK is not a subtending character; that is, its left-ward downstroke does not extend beneath the entire width of the numeric sequence that is it written after. It typically extends beneath the digit it is immediately written after: ५३६) not ५३६). In written materials, the length of the left-ward stroke may vary and may extend to the right margin of the numeric sequence with which the mark is written. This is a swash feature. The mark has a fixed-length in printed documents.

Currency Notation The north Indic currency system is traditionally based on the unit of the *rupayā* (रुपया), anglicized as “rupee.” The *rupayā* is comprised of smaller units called the *ānā* (आना), anglicized as “anna”; there are 16 *ānā* in 1 *rupayā*. The *ānā* consists of smaller units called the *pāī* (पाई), anglicized as “pie” (plural “pies”); there are 12 *pāī* in 1 *ānā*.

The manner of writing *ānā* and *pāī* differ by region. The conventional method is to use fraction signs for writing both units (see Figure 13, Figure 14, Figure 15, Figure 20, and Figure 24). Another method uses a combination of fractions and digits. This method is less common and appears to be a regional preference (see Figure 18 and Figure 21).

- The *rupayā* is indicated with digits and is written before the rupee mark: ३) “3 *rupayā*.”
- The *ānā* is typically written using fraction signs and is placed before the rupee mark (see Figure 2):

1 <i>ānā</i>	ॐ	5 <i>ānā</i>	॑ॐ	9 <i>ānā</i>	॑॑ॐ	13 <i>ānā</i>	॑॑॑ॐ
2 <i>ānā</i>	ॐ॑	6 <i>ānā</i>	॑॑॑	10 <i>ānā</i>	॑॑॑॑	14 <i>ānā</i>	॑॑॑॑॑
3 <i>ānā</i>	ॐ॑॑	7 <i>ānā</i>	॑॑॑॑	11 <i>ānā</i>	॑॑॑॑॑	15 <i>ānā</i>	॑॑॑॑॑॑
4 <i>ānā</i>	॑	8 <i>ānā</i>	॑॑	12 <i>ānā</i>	॑॑॑	1 <i>rupayā</i>	३)

- The *pāī* is typically written using fraction signs and is written after the rupee mark:

1 <i>pāī</i>	॑-	4 <i>pāī</i>	॑॑-	7 <i>pāī</i>	॑॑॑-	10 <i>pāī</i>	॑॑॑॑-
2 <i>pāī</i>	॑=	5 <i>pāī</i>	॑॑=	8 <i>pāī</i>	॑॑॑=	11 <i>pāī</i>	॑॑॑॑=
3 <i>pāī</i>	॑।	6 <i>pāī</i>	॑॑॑	9 <i>pāī</i>	॑॑॑॑	1 <i>ānā</i>	ॐ

Another method uses a combination of fraction signs and digits:

1 <i>pāī</i>	॑१	4 <i>pāī</i>	॑॑१	7 <i>pāī</i>	॑॑॑१	10 <i>pāī</i>	॑॑॑॑१
2 <i>pāī</i>	॑२	5 <i>pāī</i>	॑॑२	8 <i>pāī</i>	॑॑॑२	11 <i>pāī</i>	॑॑॑॑२
3 <i>pāī</i>	॑।	6 <i>pāī</i>	॑॑॑	9 <i>pāī</i>	॑॑॑॑	1 <i>ānā</i>	ॐ

- There are regional methods of grouping *ānā* and *pāī* into intermediate units. Throughout north India, there is a unit called the *paisā* (पैसे), anglicized as “pice,” which is equal to four *pāī*. Thus, ॑। 3 *pāī* = 1 *paisā*; ॑॑ 6 *pāī* = 2 *paisā*; ॑॑॑ 9 *pāī* = 3 *paisā*; and 4 *paisā* = 1 *ānā*. The quantity ॑॑= represents both “8 *pāī*” and “2 *paisā*, 2 *pāī*.”

In Maharashtra, there is an intermediate unit called the *pavalī* (पवली), which comprises 4 *ānā*. There are 4 *pavalī* in 1 *rupayā*.¹⁵ Thus, the quantity ॑॑॑) represents both “13 *ānā*” and “3 *pavalī*, 1 *ānā*.”

Variants The NORTH INDIC RUPEE MARK appears in several printed texts as a mark resembling the Latin) U+0029 RIGHT PARENTHESIS. In many cases, the mark actually is the right-parenthesis, which is used as a substitute for the rupee mark when the appropriate character is absent from a given font. This mark is a variant form of the NORTH INDIC RUPEE MARK, not an independent or script-specific mark. The use of the right-parenthesis is evidenced in texts printed in Devanagari (Figure 6) and Gurmukhi (Figure 7). In these figures, the right-parentheses represents both its original function as well as the rupee mark. A comparison of the dual use of the right-parenthesis within a single specimen indicates that the right-parenthesis used in both contexts is the same character. Figure 25 shows the rupee mark in typeset Devanagari text as it should appear and as it is proposed here.

¹⁵ Darby, 1915: 105.

Modern Notation India converted its currency system to a decimal system in 1957. The system is based on the two units, *paisā* and *rupayā*. There are 100 *paisā* in 1 *rupayā*, instead of the previous 16 *ānā* and 64 *pāī*. Since decimalization, the use of the NORTH INDIC RUPEE MARK and fraction signs has diminished. Currency is now written using digits and the rupee mark has been replaced with the abbreviation ‘Rs.’ U+20A8 RUPEE SIGN (‘Re.’ is used for a single rupee). Rupee is now indicated in Indic scripts as the syllable *ru*, which is an abbreviation for *rupayā*; for example, Devanagari रुपय is abbreviated रु°. Script-specific rupee signs for Bengali, Gujarati, and Tamil are already encoded in the UCS: 𑂣 U+09F3 BENGALI RUPEE SIGN, ૨૦ U+0AF1 GUJARATI RUPEE SIGN, and 𑌞 U+0BF9 TAMIL RUPEE SIGN. The rupee signs are generally written before the currency value. The rupee signs are not mandatory and there is great variation in separating currency units, eg. using a solidus, dash, period, and other Latin punctuation (see Figure 24).

5.5 Quantity Mark

𑌵 U+A839 NORTH INDIC QUANTITY MARK

Description The NORTH INDIC QUANTITY MARK was used for writing quantities of weights and measures. This sign appears in both written and printed materials. The use of the quantity mark is not standard. Quantities of Weights and measures are also written without the sign, and constituent units of the quantities are distinguished through orthography. The quantity mark is part of the glyph sets of metal fonts such as Nirnaya-Sagar Pica No. 1 (see Figure 27) and Monotype Devanagari (see Figure 28). An example of the mark in printed Devanagari text is given in Figure 25.

Properties The NORTH INDIC QUANTITY MARK belongs to the Unicode general category “Symbol, Other” (So). It is a non-combining character. Although used for writing weights and measures, it functions like a currency mark. It has the bidirectional value of “European Number Terminator” (ET).

Typology The NORTH INDIC QUANTITY MARK is not a subtending character; that is, its left-ward down-stroke does not extend beneath the entire width of the numeric sequence that is it written after. It typically extends beneath the digit it is immediately written after: ५३६𑌵 not ५३६𑌵. In written materials, the length of the left-ward stroke may vary and may extend to the right margin of the numeric sequence with which the mark is written. This is a swash feature. The mark has a fixed-length in printed documents.

Notation of Weights The traditional north Indic system of weights is based on the *man* (मन), which is equal to roughly 40 kilograms. One *man* is equal to 40 *ser* (सेर), and one *ser* is equal to 16 *chaṭāṅk* (छटांक). The manner of writing these units is as follows:

- The *man* is indicated using digits and is written to the left of the NORTH INDIC QUANTITY MARK: ५ “5 *man*.”
- The *ser* is written with a combination of digits and fractions, and is placed to the left of the quantity mark (see Figure 25):

1 <i>ser</i>	𑌵१	11 <i>ser</i>	𑌵१	21 <i>ser</i>	𑌵१	31 <i>ser</i>	𑌵१
2 <i>ser</i>	𑌵२	12 <i>ser</i>	𑌵२	22 <i>ser</i>	𑌵२	32 <i>ser</i>	𑌵२
3 <i>ser</i>	𑌵३	13 <i>ser</i>	𑌵३	23 <i>ser</i>	𑌵३	32 <i>ser</i>	𑌵३
4 <i>ser</i>	𑌵४	14 <i>ser</i>	𑌵४	24 <i>ser</i>	𑌵४	32 <i>ser</i>	𑌵४
5 <i>ser</i>	𑌵५	15 <i>ser</i>	𑌵५	25 <i>ser</i>	𑌵५	32 <i>ser</i>	𑌵५
6 <i>ser</i>	𑌵६	16 <i>ser</i>	𑌵६	26 <i>ser</i>	𑌵६	32 <i>ser</i>	𑌵६
7 <i>ser</i>	𑌵७	17 <i>ser</i>	𑌵७	27 <i>ser</i>	𑌵७	32 <i>ser</i>	𑌵७
8 <i>ser</i>	𑌵८	18 <i>ser</i>	𑌵८	28 <i>ser</i>	𑌵८	32 <i>ser</i>	𑌵८
9 <i>ser</i>	𑌵९	19 <i>ser</i>	𑌵९	29 <i>ser</i>	𑌵९	39 <i>ser</i>	𑌵९
10 <i>ser</i>	𑌵	20 <i>ser</i>	𑌵	30 <i>ser</i>	𑌵	1 <i>man</i>	𑌵

- The *chaṭām̃k* unit is written with fraction signs and is placed to the right of the quantity mark:

1 <i>chaṭām̃k</i> ॡ	5 <i>chaṭām̃k</i> ॡ	9 <i>chaṭām̃k</i> ॡ	13 <i>chaṭām̃k</i> ॡ
2 <i>chaṭām̃k</i> ॡ	6 <i>chaṭām̃k</i> ॡ	10 <i>chaṭām̃k</i> ॡ	14 <i>chaṭām̃k</i> ॡ
3 <i>chaṭām̃k</i> ॡ	7 <i>chaṭām̃k</i> ॡ	11 <i>chaṭām̃k</i> ॡ	15 <i>chaṭām̃k</i> ॡ
4 <i>chaṭām̃k</i> ॡ	8 <i>chaṭām̃k</i> ॡ	12 <i>chaṭām̃k</i> ॡ	1 <i>ser</i> ॡ

- There is regional variation in the positioning of the NORTH INDIC QUANTITY MARK in the writing of *ser* notation. In addition to the method shown above, another method is to write the entire *ser* value to right of the quantity mark: ॡ (1 *ser*), ॡ (10 *ser*), ॡ (15 *ser*), ॡ (20 *ser*), ॡ (25 *ser*), ॡ (30 *ser*), ॡ (35 *ser*), etc. When *ser* is written like this, quarter units of *chaṭām̃k* are written with the NORTH INDIC QUARTER MARK in order to distinguish ॡ (10 *ser*) from ॡ (4 *chaṭām̃k*), ॡ (20 *ser*) from ॡ (8 *chaṭām̃k*), etc.
- There are regional methods of grouping *chaṭām̃k* into intermediate units. Throughout north India, there is a unit called the *pāo* (पाओ) or *pāv* (पाव), which is equal to ¼ of the unit, or in this case, “4 *chaṭām̃k*.” Thus, the quantity ॡ represents both the values “11 *chaṭām̃k*” and “2 *pāo*, 3 *chaṭām̃k*.”

Notation of Measures The system of measure is based on the *bīghā* (बीघा). One *bīghā* is equal to 20 *kaṭṭhā* (कट्टा), and one *kaṭṭhā* is equal to 20 *dhūr* (धूर).

- The *bīghā* is indicated using digits.
- The *kaṭṭhā* is written with a combination of digits and fraction signs, and is placed to the left of the quantity mark:

1 <i>kaṭṭhā</i> ॡ	6 <i>kaṭṭhā</i> ॡ	11 <i>kaṭṭhā</i> ॡ	16 <i>kaṭṭhā</i> ॡ
2 <i>kaṭṭhā</i> ॡ	7 <i>kaṭṭhā</i> ॡ	12 <i>kaṭṭhā</i> ॡ	17 <i>kaṭṭhā</i> ॡ
3 <i>kaṭṭhā</i> ॡ	8 <i>kaṭṭhā</i> ॡ	13 <i>kaṭṭhā</i> ॡ	18 <i>kaṭṭhā</i> ॡ
4 <i>kaṭṭhā</i> ॡ	9 <i>kaṭṭhā</i> ॡ	14 <i>kaṭṭhā</i> ॡ	19 <i>kaṭṭhā</i> ॡ
5 <i>kaṭṭhā</i> ॡ	10 <i>kaṭṭhā</i> ॡ	15 <i>kaṭṭhā</i> ॡ	1 <i>bīghā</i> ॡ

- The *dhūr* is also written with a combination of digits and fractions, and is placed to the right of the quantity mark:

1 <i>dhūr</i> ॡ	6 <i>dhūr</i> ॡ	11 <i>dhūr</i> ॡ	16 <i>dhūr</i> ॡ
2 <i>dhūr</i> ॡ	7 <i>dhūr</i> ॡ	12 <i>dhūr</i> ॡ	17 <i>dhūr</i> ॡ
3 <i>dhūr</i> ॡ	8 <i>dhūr</i> ॡ	13 <i>dhūr</i> ॡ	18 <i>dhūr</i> ॡ
4 <i>dhūr</i> ॡ	9 <i>dhūr</i> ॡ	14 <i>dhūr</i> ॡ	19 <i>dhūr</i> ॡ
5 <i>dhūr</i> ॡ	10 <i>dhūr</i> ॡ	15 <i>dhūr</i> ॡ	1 <i>kaṭṭhā</i> ॡ

Variants The proposed shape of ॡ is based on the metal type shown in Figure 28 and the example of the sign shown in Figure 25. Other texts show stylistic variation in the shape of the quantity mark (see section 6 for further discussion).

Homoglyphs The quantity mark resembles U+093D DEVANAGARI SIGN AVAGRAHA. It is sometimes indicated by the *avagraha* in printed texts when the correct glyph is absent from the font (see Figure 21). The quantity mark, however, is distinct from *avagraha*, as indicated in Figure 28, which shows both the quantity mark and the *avagraha* as glyphs in the Monotype Devanagari font.

6 Characters Not Proposed

George Grierson’s *A Handbook to the Kaithi Character* shows other marks used for writing quantities for weights and measures. However, it is unclear whether these marks are independent characters or if they are

variants of the NORTH INDIC QUANTITY MARK. The contexts in which these signs occur strongly suggest that they are graphical or regional variants of the NORTH INDIC QUANTITY MARK and, therefore, do not require separate encodings.

6.1 Marks for Units of Weight

In his Hindi grammar, H. C. Scholberg shows the use of NORTH INDIC QUANTITY MARK to write both *chaṭāṃk* and *ser*.¹⁶ However, Grierson shows the use of seemingly distinct signs for writing these quantities. The *chaṭāṃk* values are written with the sign \mathcal{S} :¹⁷

Chhatāṃks \mathcal{S} 1, \mathcal{S} 2, \mathcal{S} 3, \mathcal{S} 4, \mathcal{S} 6, \mathcal{S} 7, \mathcal{S} 8, \mathcal{S} 9, \mathcal{S} 12.

The *ser* values are written with the sign \mathcal{C} :¹⁸

Sers \mathcal{C} 1, \mathcal{C} 2, \mathcal{C} 3, \mathcal{C} 4, \mathcal{C} 5, \mathcal{C} 6, \mathcal{C} 7, \mathcal{C} 8, \mathcal{C} 9, 10, 11, 20, 30.

While Grierson's sign \mathcal{S} is identical to \mathcal{S} NORTH INDIC QUANTITY MARK, Grierson's \mathcal{C} is visually distinct from the \mathcal{S} quantity mark. The use of different signs to write *chaṭāṃk* and *ser* in Grierson's example is problematic. The use of such distinct signs within a single specimen suggests that *chaṭāṃk* and *ser* may indeed have specific unit signs. Other specimens show consistent use of the quantity mark for writing various units of weight. Scholberg's use of NORTH INDIC QUANTITY MARK in print indicates a degree of standardization of the quantity sign (see Figure 25). Jīvanātha Rāya's example of weight notation in the Maithili script shows the use of the NORTH INDIC QUANTITY MARK for writing *kanamā* and *ser* values in a manner consistent with that in Scholberg (see Figure 22). Such consistency across a variety of specimens suggests that Grierson's sign \mathcal{C} is idiosyncratic. It is most likely a swash variant of \mathcal{S} , in which the left-bound stroke curves upwards and over the body of the sign instead of terminating at the foot of the left bearing. Although there is insufficient information to confirm the status of \mathcal{C} as either a unique sign or variant of \mathcal{S} , the manner of writing *ser* in Grierson's example indicates that the \mathcal{C} sign is semantically identical to \mathcal{S} NORTH INDIC QUANTITY MARK. As such, a separate encoding for \mathcal{C} is unnecessary and it can be unified with NORTH INDIC QUANTITY MARK.

6.2 Marks for Units of Measure

Several specimens describe the notation used for writing units of measure. The system of notation in some specimens suggests that marks used for indicating units of measures are variant forms of the NORTH INDIC QUANTITY MARK. Other specimens show what might be considered to be independent signs for units of measure. There is insufficient information to determine if these signs are distinct signs or if they are variant forms of the NORTH INDIC QUANTITY MARK.

Grierson shows two marks used for writing the *kaṭṭhā* and *dhūr* units of measure. The manner of writing *kaṭṭhā* values in Grierson is:¹⁹

Katthās \mathcal{K} 1, \mathcal{K} 2, \mathcal{K} 3, \mathcal{K} 4, 5, 6, 10, 15.

The notation for the *dhūr* unit is:²⁰

Dhurs \mathcal{D} 1, \mathcal{D} 2, \mathcal{D} 3, \mathcal{D} 4, \mathcal{D} 5, \mathcal{D} 6, \mathcal{D} 7, \mathcal{D} 10, \mathcal{D} 11, \mathcal{D} 15.

¹⁶ Scholberg, 1940: 90–91. ¹⁷ Grierson, 1899: Plate IV. ¹⁸ Grierson, 1899: Plate IV. ¹⁹ Grierson, 1899: Plate IV. ²⁰ Grierson, 1899: Plate IV.

The form of the mark for *kaṭṭhā*, ॡ, is similar to the mark used for writing *chaṭāṃk* in the same specimen:²¹

Chhatāṅks ॡ 1, ॡ 2, ॡ 3, ॡ 4, ॡ 5, ॡ 6, ॡ 7, ॡ 8, ॡ 9, ॡ 12.

Govinda Jhā’s example in Figure 21 corroborates the assertion that the signs for *kaṭṭhā* and *chaṭāṃk* in Grierson are identical. Jhā shows the writing of measures using the quantity mark (represented by the Devanagari *avagraha*), which is similar to the use of the same sign in Rāya, as shown in Figure 22. Based on such use, it is highly likely that Grierson’s sign for *kaṭṭhā* is either variant of NORTH INDIC QUANTITY MARK or identical to it. Thus, the *kaṭṭhā* sign may be unified with the quantity mark.

Grierson’s sign ॡ used for writing the *dhūr* unit is entirely distinct from the NORTH INDIC QUANTITY MARK. However, it is unclear whether ॡ is an independent sign or a composite character created by writing the *kaṭṭhā* sign ॡ twice. Grierson is the only source in which the *dhūr* unit is written in this manner. Jhā shows the use of the quantity mark (represented as *avagraha*) for writing the *dhūr* unit (Figure 21). On account of insufficient information for Grierson’s *dhūr* sign, it is not being proposed for encoding at present. Given the use of the quantity sign in the available specimens to write both weights and measures, the *dhūr* unit may be adequately represented by the NORTH INDIC QUANTITY MARK. Grierson’s *dhūr* sign ॡ be produced, if necessary, by writing the NORTH INDIC QUANTITY MARK twice as ॡ.

7 Relationship to Other Indic Numeric Notation Systems

There are several historical and contemporary regional numeric notation systems associated with Indic writing systems. A brief description of the method of writing fractions and unit marks in these systems is given here for the purpose of illustrating the distinctiveness of the north Indic numeric notation system.

7.1 Gujarati Fraction Signs

In 2004, the Government of India presented a proposal (L2/04-358) to encode the fractions one-quarter (I), one-half (II), and three-quarters (III) as part of the Gujarati block under the names GUJARATI SIGN PAO, GUJARATI SIGN AADHO, and GUJARATI SIGN PONO, respectively. The proposal provided an excerpt from a Gujarati newspaper that illustrated the use of fractions in modern Gujarati orthography to denote time (see Figure 29). In his response to the proposal, Eric Muller wrote that the fractions are also used to write quantities than other time.²² Indeed, as is shown here, the fractions are used to write currency, weight, measure, and time values. The use of fraction signs to denote time is not a practice unique to Gujarati; they are also used to denote time in Hindi written in the Devanagari script (see Figure 23).

The signs proposed by the Government of India — GUJARATI SIGN PAO, GUJARATI SIGN AADHO, and GUJARATI SIGN PONO — are identical to those proposed here — NORTH INDIC FRACTION ONE QUARTER, NORTH INDIC FRACTION ONE QUARTER, and NORTH INDIC FRACTION THREE QUARTERS. Therefore, the three Gujarati fractions should not be encoded separately in the Gujarati block, but should be unified with the signs proposed here (and the code charts commented to reference the regional equivalents). The uniform structure and semantics of fraction signs in the Devanagari and Gujarati scripts further support the recommendation that such number forms be encoded in a script-independent block suitable for use in all scripts.

7.2 Bengali Currency and Fraction Numeration Marks

There existed in Bengal a numeric notation system as complete as the one used in north India. Bengali has several script-specific signs for currency notation, which are already encoded in the UCS:

²¹ Grierson, 1899: Plate IV. ²² Muller, 2004.

↘	U+09F2 BENGALI RUPEE MARK
↵	U+09F3 BENGALI RUPEE SIGN
/	U+09F4 BENGALI CURRENCY NUMERATOR ONE
✓	U+09F5 BENGALI CURRENCY NUMERATOR TWO
∅	U+09F6 BENGALI CURRENCY NUMERATOR THREE
l	U+09F7 BENGALI CURRENCY NUMERATOR FOUR
⌋	U+09F8 BENGALI CURRENCY NUMERATOR ONE LESS THAN THE DENOMINATOR
◦	U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN

In writing currency values and other quantities, the Bengali system uses a combination of digits and “currency numerators,” or fraction signs (see Figure 31).²³ But, similar to the north Indic currency system, the Bengali system has the units *rupayā* (রুপয) [or *ṭākā* (টাকা)], *ānā* (আনা), and *pāī* (পাঁই). The *rupayā* unit is written with digits and is marked with ↘ U+09F2 BENGALI RUPEE MARK, which is written after the unit: ৭↘ “7 *rupayā*.” The *ānā* unit is written with currency numerators and is marked with ◦ U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN, which is placed after the unit: 11∅ “11 *ānā*.” Only one currency mark is used when multiple units are written. This sign is typically the sign for the smallest unit. When *rupayā* and *ānā* values are written together, the Bengali rupee mark is dropped and only the *ānā* mark is used: “15 *rupayā* and 3 *ānā*” is written as ১৫∅, not as ১৫↘∅ or as ১৫↘∅. In the north Indic system, the value “15 *rupayā* and 3 *ānā*” is written as १५॥३.

Although both are based on the additive principle, the major difference between the Bengali and north Indic systems is the method of representing fractions. The Bengali system uses numerators, while the north Indic system uses hash-like signs. Nevertheless, the conversion between the two is relatively systematic:

↘	NORTH INDIC FRACTION ONE SIXTEENTH
/	U+09F4 BENGALI CURRENCY NUMERATOR ONE
↘	NORTH INDIC FRACTION ONE EIGHTH
✓	U+09F5 BENGALI CURRENCY NUMERATOR TWO
↘	NORTH INDIC FRACTION THREE SIXTEENTHS
∅	U+09F6 BENGALI CURRENCY NUMERATOR THREE
l	NORTH INDIC FRACTION ONE QUARTER
l	U+09F7 BENGALI CURRENCY NUMERATOR FOUR
ll	NORTH INDIC FRACTION ONE HALF
ll	U+09F7 BENGALI CURRENCY NUMERATOR FOUR (written twice)
lll	NORTH INDIC FRACTION THREE QUARTERS
⌋	U+09F8 BENGALI CURRENCY NUMERATOR ONE LESS THAN THE DENOMINATOR

7.3 Malayalam Fractions and Letter-Numerals

Numeric notation in South Indic scripts is represented through the the decimal system (*aṅgapalli*) and an alphabetic system (*akṣarapalli*). The decimal system corresponds to the Arabic digits, while the alphabetic system uses the letters of a script to represent numbers. N. Ganesan submitted a proposal (L2/06-260) to encode Malayalam fractions and letter-numerals in the UCS within a block named “South Indian Supplement.”

The manner of representing numeric notation in Malayalam differs significantly from the north Indic scripts. For example, ൩ U+0D28 MALAYALAM LETTER NA represents “1” (Figure 32). Malayalam fractions are also

²³ The use of the term “currency numerators” for these signs is incorrect because they are used for writing other quantities as well.

written in a fashion entirely distinct from the north Indic method (Figure 33).

7.4 Raqm Rupee Mark and Fraction Signs

The رقم *raqm* numerals (also known as سیاق *siyāq*) are an extension of the Perso-Arabic script used for numeric notation in South Asia. These numerals were used mostly commonly in commercial and legal documents. Unlike the Arabic-Indic and Eastern Arabic-Indic digits, Raqm numerals are written right-to-left.

Raqm has four signs for writing fractions. It also has a currency mark. The fraction $\frac{1}{4}$ is indicated by the sign ¼; the fraction $\frac{1}{2}$ by the sign ½; the fraction $\frac{3}{4}$ by the sign ¾; and a whole by the sign ۱. The currency mark has the shape / and is used to write rupee values. The currency mark appears after the fraction sign when currency values are written: ۱۰ / ۸ “10 *rupayā* and 8 *ānā*.” The *pāī* value is also written with the currency mark, and in some cases the word “پائی” *pāī* is written after the mark: ۱ / پائی “one *ānā* and 6 *pāī*.” In the north Indic system, the value “one *ānā* and 6 *pāī*” would be written as ॥.

8 References

- Bhide, Ganesh Hari. 1889. *Marathi English Primer*. Bombay: Education Society’s Steam Press, Byculla.
- Darby, Alfred. 1915. *A Primer of the Marathi Language*. Ahmednagar: Mission Press.
- Dharmadhikari, S. J. 1967. *Gujarātī-Marāṭhī Śabdakośa*. Āntarabhāratī, series 1. Mumbaī: Mahārāṣṭra Rajya Sahityā Aṇi Saṃskṛti Maṇḍala.
- Everson, Michael. 2007. “Result of Repertoire Review for PDAMx of ISO/IEC 10646:2003 and future amendments.” ISO/IEC JTC1/SC2/WG2/N3321 L2/07-286. August 26, 2007. <http://std.dkuug.dk/JTC1/SC2/WG2/docs/n3316.pdf>.
- Government of India; Ministry of Communications and Information Technology. 2004. “Encoding of Gujarati Signs Pao, Addho & Pono in Gujarati code block” (L2/04-358). September 2004. <http://www.unicode.org/~emuller/iwg/p20/04358-gujarati.pdf>
- Greaves, Edwin. 1921. *Hindi Grammar*. Allahabad: Indian Press.
- Green, Arthur O. 1895. *A Practical Hindūstānī Grammer*. Oxford: Clarendon Press.
- Grierson, George. A. 1899. *A Handbook to the Kaithi Character*. 2nd rev. ed. of the title *A Kaithi Handbook*, 1881. Calcutta: Thacker, Spink & Co.
- . 1903a. *The Linguistic Survey of India*. Vol. V. Indo-Aryan Family. Eastern Group. Part I. Specimens of the Bengali and Assamese languages. Calcutta: Office of the Superintendent of Government Printing, India.
- . 1903b. *The Linguistic Survey of India*. Vol. V. Indo-Aryan Family. Eastern Group. Part II. Specimens of the Bihārī and Orīyā languages. Calcutta: Office of the Superintendent of Government Printing, India.
- International Organization for Standardization. 2005. “Principles and Procedures for Allocation of New Characters and Scripts.” ISO/IEC JTC 1/SC 2/WG 2 N3002. October 5, 2005. <http://std.dkuug.dk/JTC1/SC2/WG2/docs/n3002.pdf>.
- Jhā, Govinda [ed]. 1999. कल्याणी-कोश [= *Kalyāṇī-kośa* (Maithilī-Aṃgrejī Śabda Kośa)]. Kāmeśvara Siṃha Bihāra Heriṭeja Sirīja 4. 1st ed. Darbhāṅgā: Mahārājādhirāja Kāmeśvara Siṃha Kalyāṇī Phāundeśana.
- Kellogg, Samuel H. 1893. *A grammar of the Hindī language: in which are treated the High Hindī, Braj, and the Eastern Hindī of the Rāmāyan of Tulsī Dās, also the colloquial dialects of Rājputānā, Kumāon, Avadh, Rīwā, Bhojpūr, Magadha, Maithila, etc., with copious philological notes*. 2nd ed., rev. and enl. London: K. Paul, Trench, Trubner and Co.

- Leitner, Gottlieb William. undated [1883?]. *A Collection of Specimens of Commercial and Other Alphabets and Handwritings as also of Multiplication Tables Current in Various Parts of the Panjab, Sind and the North West Provinces*. Lahore: Anjuman-i-Punjab Press.
- महाजनीसारहिस्साअव्वलवदोयम [Mahājanīsārahissāavvalavadoyama = Primer of the Mahajani alphabet for writing Hindi]. 18-?. Dehalī: Lālā Gaṅgādāsa Muṃśī Lāla.
- Molesworth, J. T. 1857. *Marathi and English Dictionary*. 2nd ed. rev. and enl. Bombay: Bombay Education Society's Press.
- Money, G. W. P. 1942. *Gurkhali Manual*. 3rd ed. Bombay: Thacker & Co.
- Muller, Eric. 2004. "Clarifications on L2/04-358, Gujarati fractions." November 7, 2004. <http://www.unicode.org/~emuller/iwg/p20/utcdoc.html>.
- N. Ganesan. 2006. "Malayalam Fractions and Letter-Numerals" (L2/06-260).
- Naik, Bapurao S. 1971. *Typography of Devanagari*. 1st rev. ed. vol. 2. Bombay: Directorate of Languages, Government. of Maharashtra.
- Nārā, Īsara Siṃgha. 1973. *Rājā Jogī: Itihāsa Bābā Sāhiba Siṃgha Bedī, Ūnām (pahilām Pañjāba huṅa Himācala Pradeśa vica)*. Dillī: Nārā Pabalikeśana.
- Navalkar, Ganpatrao R. 1925. *The Student's Marāṭhī Grammar*. 4th ed. Poona: Scottish Mission Press.
- Pandey, Anshuman. 2005. "Proposal to Encode the Kaithi Script in Plane 1 of ISO/IEC 10646" (L2/05-343). October 2005. <http://www-personal.umich.edu/~pandey/kaithi.pdf>
- Pandey, Anshuman. 2007a. "Proposal to Encode North Indian Accounting Signs in Plane 1 of ISO/IEC 10646." ISO/IEC JTC1/SC2/WG2 N3312 L2/07-139R. May 15, 2007. <http://std.dkuug.dk/jtc1/sc2/wg2/docs/n3312.pdf>
- Pandey, Anshuman. 2007b. "Towards an Encoding for North Indic Number Forms in the UCS." ISO/IEC JTC1/SC2/WG2 N3334 L2/07-238. July 31, 2007. <http://std.dkuug.dk/jtc1/sc2/wg2/docs/n3334.pdf>
- Pořízka, Vincenc. 1972. *Hindština*. [Hindī Language Course = हिन्दी भाषा का पाठ्यक्रम]. Čast I [Part I]. Praha: Státní pedagogické nakladatelství.
- Rāya, Jīvanātha. 2003 [1970?]. मैथिली प्रथम खसक [Maithilī Prathama Pustaka = Maithili Primer]. Reprint of edition published by Pustaka Bhaṅḍāra, Laheriyāsārāya, Bihāra; (1970?). Mithilākṣara Puraskāra Kośa: Ekarahiyā, Mahottarī, Nepal.
- Sardesai, G. S. [ed]. 1932. *Selections from the Peshwa Daftar*. v. 22 – Extracts from the Peshwas' Diaries. Bombay: Government Central Press.
- Scholberg, H. C. 1940. *Concise Grammar of the Hindi Language*. London: Oxford University Press.
- Tisdall, William St. Clair. 1961. *A Simplified Grammar of the Gujarati Language, together with a short reading book and vocabulary*. New York, F. Ungar Publishing Co.
- Unicode Roadmap Committee, The Unicode Consortium. 2007. "Roadmap to the SMP." Authored by Michael Everson, Rick McGowan, and Ken Whistler. Revision 5.0.5 (August 29, 2007). <http://www.unicode.org/roadmaps/smp/smp-5-0-5.html>.
- United States National Body, International Organization for Standardization. 2007. "Proposed additions to ISO/IEC 10646:2003." ISO/IEC JTC1/SC2/WG2/N3321. September 7, 2007. <http://std.dkuug.dk/JTC1/SC2/WG2/docs/n3321.pdf>.
- Vajpeyee, Pratap Narayan. 1946. *The quintessence of Hindi* [हिन्दी का हीर]. Madrāsa: Dakṣiṇa Bhārata Hindī Pracāra Sabhā.

A83		Common Indic Number Forms
0	।	A830;NORTH INDIC FRACTION ONE QUARTER;No;0;L;;;1/4;N;;;; A831;NORTH INDIC FRACTION ONE HALF;No;0;L;;;1/2;N;;;; A832;NORTH INDIC FRACTION THREE QUARTERS;No;0;L;;;3/4;N;;;;
1	॥	A833;NORTH INDIC FRACTION ONE SIXTEENTH;No;0;L;;;1/16;N;;;; A834;NORTH INDIC FRACTION ONE EIGHTH;No;0;L;;;1/8;N;;;; A835;NORTH INDIC FRACTION THREE SIXTEENTHS;No;0;L;;;3/16;N;;;;
2	॥	A836;NORTH INDIC QUARTER MARK;So;0;L;;;N;;;; A837;NORTH INDIC PLACEHOLDER MARK;So;0;L;;;N;;;; A838;NORTH INDIC RUPEE MARK;Sc;0;ET;;;N;;;;
3	।	A839;NORTH INDIC QUANTITY MARK;So;0;ET;;;N;;;;
4	॥	A83A;<reserved> A83B;<reserved> A83C;<reserved> A83D;<reserved> A83E;<reserved> A83F;<reserved>
5	॥	
6	०	
7	०	
8	०	
9	०	
A		
B		
C		
D		
E		
F		

Table 1: Character names and properties for the north Indic number forms.

PLATE IV.

NUMERALS &C.

The following are the more usual forms of the Numerals.

१ 1, २ 2, ३ 3, ४ 4, ५ 5, ६ 6, ७ 7, ८, ९, or ८ 8, ० (०), or ० 9, १० 10.

MONEY.

३ 3 pies (One pie), ६ 6 pies, ९ 9 pies, १ 1áná, २ 2ánás, ३ 3ánás, ४ 4ánás, ५ 5ánás,

६ 6ánás, ७ 7ánás, ८ 8ánás, ९ 9ánás, १२ 12ánás, १ R.1. १२ R.10.4

The modes of writing pies differ in different districts.

WEIGHT.

Chhatārkas १ 1, २ 2, ३ 3, ४ 4, ५ 5, ६ 6, ७ 7, ८ 8, ९ 9, १० 10.

Sers. १ 1, २ 2, ३ 3, ४ 4, ५ 5, ६ 6, ७ 7, ८ 8, ९ 9, १० 10, ११ 11, १२ 12, १३ 13.

१०२२ = 1M^a 10S^{rs} 10Chhtks.

AREA.

Dhurs. १ 1, २ 2, ३ 3, ४ 4, ५ 5, ६ 6, ७ 7, ८ 8, ९ 9, १० 10, ११ 11, १२ 12.

Katthás. १ 1, २ 2, ३ 3, ४ 4, ५ 5, ६ 6, ७ 7, ८ 8, ९ 9, १० 10, ११ 11.

१०२२११ 10 Bighás. 16 Kts. 6 Dhurs.

Figure 1: Currency, weights, and measures marks found in Kaithi documents (from Grierson, 1899: Plate IV).

The leading feature in Indian arithmetic being the division by four, the signs for fractions are adapted thereto. The rupee is divided into $4 \times 4 = 16$, parts called *ānā*, which are thus designated (units of all kinds are also thus divided) —

1 <i>ānā</i> or $\frac{1}{16}$	↷	9 <i>ānās</i>	↷↷
2 <i>ānās</i>	↷↷	10 <i>ānās</i>	↷↷↷
3 <i>ānās</i>	↷↷↷	11 <i>ānās</i>	↷↷↷↷
4 <i>ānās</i>	↷↷↷↷	12 <i>ānās</i>	↷↷↷↷↷
5 <i>ānās</i>	↷↷↷↷↷	13 <i>ānās</i>	↷↷↷↷↷↷
6 <i>ānās</i>	↷↷↷↷↷↷	14 <i>ānās</i>	↷↷↷↷↷↷↷
7 <i>ānās</i>	↷↷↷↷↷↷↷	15 <i>ānās</i>	↷↷↷↷↷↷↷↷
8 <i>ānās</i>	↷↷↷↷↷↷↷↷	One rupee	₹

Figure 2: Method of writing currency values in Kaithi using fractions and the rupee mark (from Grierson, 1903b: 9).

पाठे म्हणण्याची रीत		निमकी (अर्धाना आंक)			
२ × १ = २	अे अेक अे	वे एके वे	१ × ॥० = ॥०	अेक अर्धे अर्धे	एक निम्मे निम्मे
२ × २ = ४	अे दु आर	वे दुणे चार	२ × ॥० = १	अे अर्धे अेक	वे निम्मे एक
२ × ३ = ६	अे तरी ७	वे त्रीक सहा	३ × ॥० = १॥	तीन अर्धे दीड	तीन निम्मे दीड
२ × ४ = ८	अे चौक आड	वे चोक आठ	४ × ॥० = २	चार अर्धे अे	चार निम्मे दोन
२ × ५ = १०	अे पंचा दस	वे पंचे दहा	५ × ॥० = २॥	पांच अर्धे अदी	पांच निम्मे अडीच
२ × ६ = १२	अे छक आर	वे सक बारा	६ × ॥० = ३	७ अर्धे त्रय	सहा निम्मे तीन
२ × ७ = १४	अे सात चौद	वे साते चौदा	७ × ॥० = ३॥	सात अर्धे साडात्रय	सात निम्मे साडेतीन
२ × ८ = १६	अे आठ सोण	वे आठे सोळा	८ × ॥० = ४	आड अर्धे चार	आठ निम्मे चार
२ × ९ = १८	अे नव अदार	वे नवे अठरा	९ × ॥० = ४॥	नव अर्धे साडाचार	नऊ निम्मे साडेचार
२ × १० = २०	अे दान वीस	वे दाहे वीस	१० × ॥० = ५	दसे अर्धे पांच	दहा निम्मे पांच

व्यवहारांतील पूर्णांक-अपूर्णांक

०.	५।	पाव	१।	सवा	सव्वा	२।	सवाअे	सव्वादोन
०.॥	अर्धे	अर्धा, निम्मा	१॥	दीड	दीड	२॥	अदी	अडीच
०.॥॥	पोषु	पाऊण	१॥॥	पोषुअे	पावणेदोन	२॥॥	पोषुत्रय	पावणेतीन

Figure 3: Excerpt from a Gujarati-Marathi dictionary showing the forms of regular and independent fractions in Gujarati and Devanagari (from Dharmadhikari, 1967: 436).

The numerical signs in Gujarātī are : १, २, ३, ४, ५, ६, ७, ८, ९, १०, = 1, 2, 3, &c. Fractions are written thus:— $\frac{1}{4} = ०।$; $\frac{1}{2} = ०॥$; $\frac{3}{4} = ०॥॥$; as $1\frac{1}{2} = १॥॥$; $3\frac{3}{4} = ३॥॥॥$.

Figure 4: An excerpt from a Gujarati grammar showing the writing of fractions after a zero (from Tisdall, 1961: 86).

स्वाध्याय के लिए चुनी हुई पुस्तकें वैदिक साहित्य

वैदिक विनय १, २, ३ भाग	श्री अभय २।।), २।।), २।।)
वैदिक ब्रह्मचर्य-गीत	श्री अभय २)
ब्राह्मण की गी	श्री अभय ॥।।)
वैदिक अध्यात्म विद्या	श्री भगवद्दत्त १।)
वैदिक स्वप्न-विज्ञान	श्री भगवद्दत्त २)
वेद गीताञ्जली [वैदिक गीतियां]	श्री वेदव्रत २)
वैदिक सूक्तियां	श्री रामनाथ १।।।)
वरुण की नौका [दो भाग]	श्री मियत्रत ६)
सोम-सरोवर, सजिल्द, अजिल्द	श्री चमूपति २), १।।)
अथर्ववेदीय मन्त्र-विद्या	श्री मियत्र १।।)

धार्मिक साहित्य

सन्ध्या रहस्य	श्री विश्वनाथ २)
धर्मोपदेश १, २, ३ भाग	श्री स्वामी श्रद्धानन्द १।), १।), १।।)
आत्ममीमांसा	श्री नन्दलाल २)
प्रार्थनावली [प्रेरणा देने वाली प्रार्थनाएं व गीतियां]	१)
आर्यसमाज और विचार-संसार	श्री चमूपति १)
कविता, मंजरी	१-)
कविता कुसुमाञ्जली	१)

प्रकाशन, मन्दिर, गुरुकुल कांगड़ी विश्वविद्यालय, हरिद्वार ।

Figure 6: Pricelist for books showing the use of the rupee mark. Digits and fractions are used to denote rupee and *ānā* values.

'पण्डित-पुस्तकालय काशी' के शुद्ध सुन्दर और सस्ते संस्कृत महाग्रन्थ—

श्रीमद्भागवत भा० टी० (पत्राकार) २४)	मनुस्मृति भा० टी० ३)
श्रीमद्भागवत भा० टी० (सजिल्द) १५)	रुद्री १-)
श्रीमद्भागवत 'श्रीधरी' संस्कृत टीका २४)	उपनयनपद्धति भा० टी० (बड़ी) ॥।।)
श्रीमद्भागवत 'चूणिका' संस्कृत टीका २४)	अमरकोष संक्षिप्त भा० टी० १)
भागवत दशमस्कन्ध भा० टी० ८)	(बाणभट्टकृत) कादम्बरी भा० टी० (सम्पूर्ण) ७)
श्रीमद्देवीभागवत भा० टी० पत्राकार ३२)	दुर्गासप्तशती भा० टी० १)
योगवासिष्ठ भा० टी० सम्पूर्ण ३६)	गरुडपुराण मूल (सम्पूर्ण) ४)
श्रीमद्वाल्मीकीय रामायण भा० टी० २४)	गरुडपुराण 'प्रेतकल्प' भा० टी० १।।)
वाल्मीकीय सुन्दरकाण्ड भा० टी० ३)	पञ्चतन्त्र भा० टी० ४)
श्रीमद्वाल्मीकीय रामायण मूल ८)	हितोपदेश भा० टी० १।।)
श्रीमद्देवीभागवत मूल ८)	कालिदासप्रन्थावली भा० टी० ८)
शिवपुराण मूल १०)	अभिज्ञानशाकुन्तल भा० टी० २)
आनन्दरामायण भा० टी० १६)	रघुवंश (मल्लिनार्थी टीका) सम्पूर्ण ३)
महाकवि कल्हणकृत राजतरङ्गिणी भाषा टीका २०)	रघुवंश भा० टी० सम्पूर्ण ३)
कौटिलीय अर्थशास्त्र भा० टी० ८)	मेघदूत मल्लिनार्थी तथा भा० टी० सम्पूर्ण ॥।।)
बृहत्स्तोत्ररत्नाकर (स्तोत्र-संख्या ४००) ३)	कुमारसम्भव भा० टी० सम्पूर्ण २)
भैषज्यरत्नावली मूल ४)	रामचरितमानस ३)
शाङ्गधरसंहिता भा० टी० ४)	दृष्टान्तदीपक २)
रसेन्द्रसारसंग्रह भा० टी० ३)	गाँवकी कहानियाँ (लेखक-राहगीर) १)
माधवनिदान भा० टी० २।।)	जन्मपत्रफार्म रङ्गीन ५)
भावप्रकाशनिघण्टु सटिप्पण १।।)	नाड़ीज्ञानदर्पण भा० टी० १।।)
नाड़ीज्ञानदर्पण भा० टी० १।।)	लघुपत्रिका (बड़ी) १०) सै० ।

(सर्वत्र मिलते हैं)

Figure 7: Pricelist for books showing the use of the rupee mark. Digits and fractions are used to denote rupee and *ānā* values.

भट्टोजी दीक्षितकृत

प्रौढ मनोरमा

व

त्या ग्रंथावरील शब्दरत्ननामक टीका

यांचें स्त्रीप्रत्ययान्त

मराठींत विस्तृत विवरणासह व प्रक्रियेसह

सुबोध भाषांतर

★

विवरणकर्ता

कै० रावबहादुर ना. दा. वाडेगांवकर, एम्. ए.
सेवानिवृत्त डिस्ट्रिक्ट व सेवान्स जज्ज, नागपूर.

★

किंमत ७।। रु.

20

Figure 8: Title page showing the use of fractions to denote price. The abbreviation for the word *rupayā* in Devanagari is used in place of the rupee mark.



श्रीपण्डित-प्रवर-वरदराज-प्रणीता

मध्यसिद्धान्तकौमुदी

प्रभाकरौ-विद्युति-सहिता परमोपयोगि-परिशिष्ट-विशिष्टा च
हिन्दीभाषानुवाद-संवलितान्ते प्रश्नोत्तरावलि-सहिता च

सम्पादको विद्युतिकारश्च—

पण्डित-श्रीरामनारायणशर्म-तनूजन्मा

श्रीविश्वनाथशास्त्री 'प्रभाकरः'

(विंशतिपल, श्रीसरस्वती-संस्कृत-कालेज खन्ना पञ्जाब)

उपसम्पादकः परिशिष्टकारश्च—

कविकान्तः श्रीनिगमानन्दशास्त्री हिन्दीप्रभाकरो विद्यालङ्कारः

प्रकाशकः

मोतीलाल बनारसदास

पो० न० ७५ वाराणसी

(बनारस)

सन् १९५६

द्वितीयं संस्करणम्
२०००

{ मूल्यम् ५।। }

Figure 9: Title page showing the use of the rupee mark and fractions to denote price.

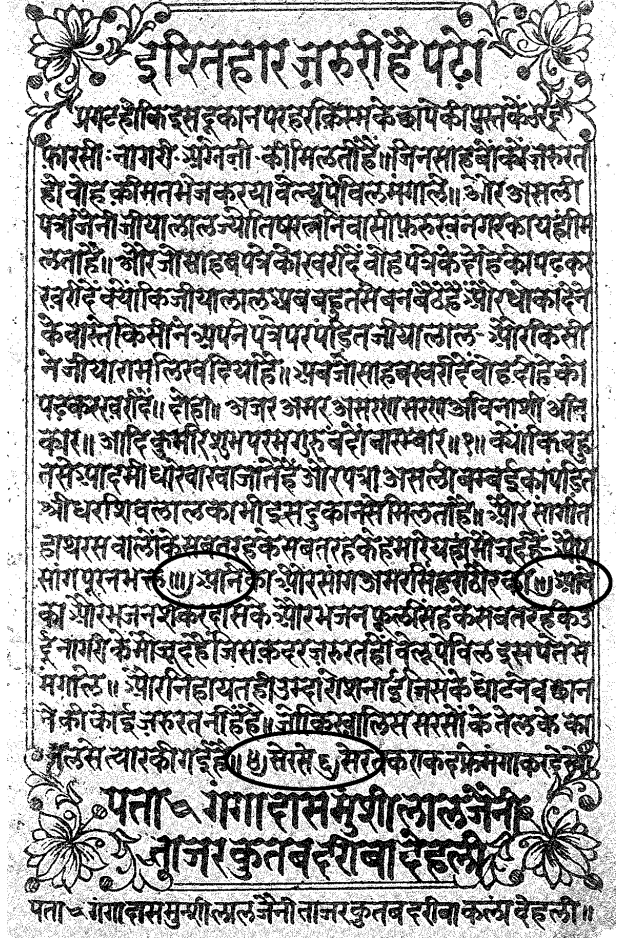


Figure 10: The use of the rupee mark in Devanagari text (*Mahājanīsārahissā-avvalavadoyama*, 18-?: 49).

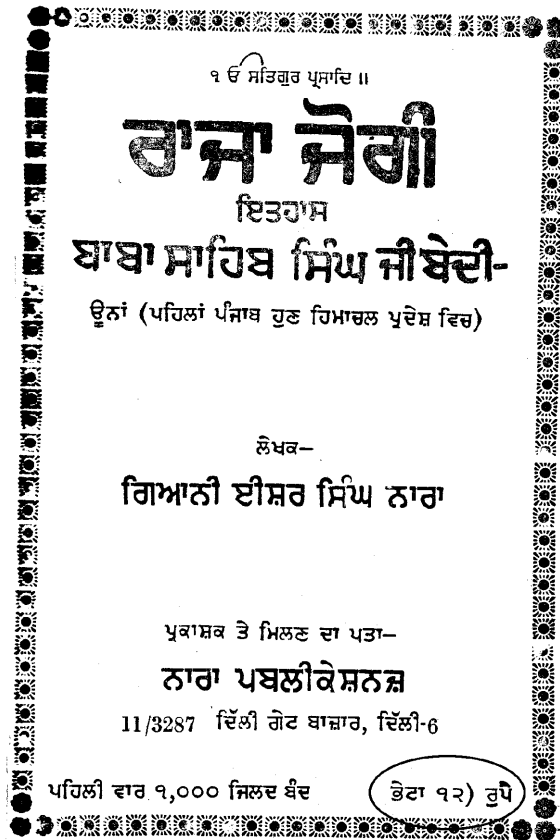


Figure 11: Title page showing the use of the rupee mark and fraction signs to denote price in the Gurmukhi script. The Latin right-parenthesis is used for the rupee mark.

ਖੁਦਾਈ ਹੋ ਰਹੀ ਸੀ। ਤਾਂ ੨੫ ਜੂਨ ੧੯੫੪ ਨੂੰ ਸ਼ਾਮ ਦੇ ਪੰਜ ਵਜੇ ਕੁਝ ਮਜ਼ਦੂਰਾਂ ਨੂੰ ਚਮਕ-ਚਮਕ ਕਰਦਾ ਸੋਨੇ ਦੀਆਂ ਕੋਲੀਆਂ ਦਾ ਇਕ ਤੁੱਗਸ (ਸਿੱਟ) ਮਿਲਿਆ। ਜੋ ਕੁਝ ਸਾਬਤ ਤੇ ਇਕ ਦੋ ਤੋੜ ਕੇ ਵੰਡੀਆਂ ਪਾ ਲੀਤੀਆਂ। ਪਰ ਹਿੱਸਾ ਵੱਧ ਘਟ ਮਿਲਣ ਦੇ ਕਾਰਣ ਇਹ ਆਪੋ ਵਿਚ ਸਾਬਤ ਨਾ ਰਹੇ, ਤੇ ੪ ਦਿਨਾਂ ਪਿਛੋਂ ਇਕ ਨੇ ਸਾਰੀ ਗੱਲ ਬਾਤ ਉਨ੍ਹਾਂ ਦੇ ਸਹੀ ਮਾਲਕ ਬਾਬਾ ਦੇਵਿੰਦਰ ਸਿੰਘ ਜੀ ਦੇ ਸਾਹਿਬਜ਼ਾਦੇ ਬਾਬਾ ਮਧੂਦਨ ਸਿੰਘ ਜੀ ਨੂੰ ਜਾ ਸੁਣਾਈ। ਜਿਨ੍ਹਾਂ ਨੇ ਬੜੀ ਸਿਆਣਪ ਤੇ ਸੁਚੱਜਤਾ ਨਾਲ ਪੁਲਸ ਦੀ ਸਹਾਇਤਾ ਪਾ ਕੇ ੧੯੩ ਤੋਲੇ ਵਜ਼ਨ ਦੀਆਂ ਨੌਂ (੯) ਕੋਲੀਆਂ ਬਰਾਮਦ ਕਰਾ ਲੀਤੀਆਂ। ਜੋ ਉਸ ਵੇਲੇ ਦੇ ਬਾਜ਼ਾਰੀ ਨਿਰਖ ਨਾਲ ਵੀ ਲਗਭਗ (੧੮੦੦੦) ਅਣਮੁੱਲਾ ਰੁਪੈ ਦੀਆਂ ਸਨ ਤੇ ਅਜ ਦੇ ਨਿਰਖ ਮੁਤਾਬਕ ਕਰੀਬਨ ੯੦,੦੦੦) ਰੁਪੈ ਚੀਆਂ ਹਨ। ਜਿਨ੍ਹਾਂ ਵਿਚ ੧ ਉਤੇ “ਸਾਹਿਬ ਸਿੰਘ ਬਾਬਾ” ਅਤੇ ੪ ਉਤੇ “ਬਾਬਾ ਸਾਹਿਬ ਸਿੰਘ” ਗੁਰਮੁਖੀ ਅੱਖਰਾਂ ਵਿਚ ਨਾਮ ਲਿਖਿਆ ਹੈ ਬਾਕੀ ਚਾਰ ਬੇ-ਨਾਂਵੀਆਂ ਹੀ ਹਨ* ਇਹ ਸ੍ਰੀ ਬਾਬਾ ਸਾਹਿਬ ਸਿੰਘ ਜੀ ਦੀ ਸ਼ਾਹੀ ਸ਼ਾਨ ਦੀ ਧਰਤੀ ਵਲੋਂ ਵੀ ਗਵਾਹੀ ਹੈ।

ਅੰਤਮ ਬੇਨਤੀ ਤੇ ਸ੍ਰੀ ਅਕਾਲ ਪੁਰਖ ਦਾ ਧੰਨਵਾਦ

ਸ੍ਰੀ ਬਾਬਾ ਸਾਹਿਬ ਸਿੰਘ ਜੀ ਬੇਦੀ, ਚੇਤ ਸੁਕਲਾ ਪੱਖ ਦੀ ਪੰਚਮੀ ਸੰਮਤ ੧੮੧੩ ਨੂੰ ਸੰਸਾਰ ਵਿਚ ਆਏ, ਅਤੇ ਹਾੜ ਸੁਦੀ ਤ੍ਰਯੋਦਸ਼ ਸੰਮਤ ੧੮੯੧ ਨੂੰ ਜੋਤੀ ਜੋਤ ਸਮਾ ਗਏ। ਇਨ੍ਹਾਂ ਨੇ ੭੮ ਬਰਸ

*ਇਕ ਮਜ਼ਦੂਰ ਅਜੇ ਤੀਕ ਨਹੀਂ ਮਿਲਿਆ ਵਰਾਰ ਹੈ ਪਤਾ ਨਹੀਂ ਉਹਦੇ ਪਾਸ ਹੋਰ ਕਿਤਨਾ ਤੇ ਕੀ ਕੁਝ ਮਾਲ ਸੀ। ਮੁਕਾਮੀ ਅਫਸਰਾਂ ਦਾ ਖਿਆਲ ਹੈ ਕਿ ਇਨ੍ਹਾਂ ਕੋਲੀਆਂ ਦੇ ਨਾਲ ਦੇ ਥਾਲ ਅਤੇ ਗਲਾਸ ਗਫਵੀਆਂ ਭੀ ਹੋਣੀਆਂ ਚਾਹੀਦੀਆਂ ਹਨ। ਅਤੇ ਪੁਲੀਸ ਅਫਸਰ ਬੜੀ ਸਰਗਰਮੀ ਨਾਲ ਨੌਂ ਹੋਰ ਮਜ਼ਦੂਰ ਦੀ ਵਲਾਸ ਦੀ ਕੋਸ਼ਿਸ਼ ਵਿਚ ਰਹੇ। ਅਤੇ ਅੱਜੋਂ ਕਿਲ੍ਹੇ ਦੀ ਹੱਦ ਅੰਦਰ ਖੁਦਾਈ ਭੀ ਬਾਬਾ ਜੀ ਦੇ ਸਾਹਮਣੇ ਹੋਇਆ ਕਰੇਗੀ।

Figure 12: The use of Latin right-parenthesis for the rupee mark in Gurmukhi text (from Nārā, 1973: 512).

170. In bookkeeping the following symbols are made use of by the Bunneahs to represent pice, annas, and rupees (3 pices=1 pice, 4 pice=1 anna, 16 annas=1 rupee).

— one pice, — two pice, — three pice; — one anna, — two annas, — three annas, — four annas, — eight annas, — twelve annas, — five annas and one pice, — six annas and two pice, — fifteen annas and three pice; — one rupee, — fifty rupees and eight annas; — six hundred and thirty-four rupees ten annas and nine pices.

Figure 13: Excerpt from a Hindi grammar showing the conventional method of writing currency values (from Green, 1895: 153).

The following illustrate the method of writing down rupees, annas, and pice :—

For rupees, the number is written with this mark ₹ after it. $₹5 = 5$ Rs. $₹2 = 2$ Rs.

For annas, a small horizontal or oblique stroke signifies 1 anna, a perpendicular stroke 4 annas, written in the same way before the mark ₹ .

Thus — ₹ or ₹ is 1 anna, — ₹ or ₹ is 3 annas, ₹ is 4 annas, ₹ is 6 annas, ₹ is 15 annas, etc.

Pice are indicated by similar horizontal strokes written to the right hand of this ₹ . Thus $\text{₹}||$ is 2 pice. $\text{₹}|$ is 1 pice. $\text{₹}|||$ is Rs. 2-8-0. $\text{₹}|||$ is Rs. 4-10-9.

It should be noticed that, in expressing Indian money in English, the number of pice is never written, but the number of pice. Rs. 5-4-3 means 5 rupees, four annas, 3 pices (i.e., 1 pice), not 3 pice.

Figure 14: Excerpt from a Hindi grammar showing variant forms of the angled fractions (from Greaves, 1921: 423–424).

रुपया rupee; आना anna; पैसा pice (- 3 pies). १)=Re. 1; 1)= 4 annas; -) = 1 anna,)|= 1 pice.

४(=)॥ = Rs. 4-7.6; १२॥-)॥ = Rs. 12-9-9
॥(=)। = Re. 0-14-3.

1 tola (तोला) = 1 rupee weight; 5 tolas = chhatak (छटाक); 16 chhataks = 1 seer (सेर); 40 seers = 1 maund (मन) ।

Figure 15: Excerpt from a Hindi grammar showing the conventional method of writing currency values (from Vajpeyee, 1946: 24).

<i>Fractions.</i>					
$\frac{1}{4}$	।. पाव.	$2\frac{3}{4}$	२॥ पावणेतीन.	$\frac{1}{2}$	३. एकद्वितीयांश.
$\frac{1}{2}$	।।. अर्धा.	$3\frac{1}{4}$	३। सवातीन.	$\frac{1}{3}$	४. एकतृतीयांश.
$\frac{3}{4}$	।।।. पाऊण.	$3\frac{1}{2}$	३॥ साडेतीन.	$\frac{1}{4}$	५. एकचतुर्थीयांश.
$1\frac{1}{4}$	१। सव्वा.	$3\frac{3}{4}$	३॥ पावणेचार.	$\frac{1}{5}$	६. एकपंचमांश.
$1\frac{1}{2}$	१॥ दीड.	$4\frac{1}{4}$	४। सवाचार.	$\frac{1}{6}$	७. एकषष्ठांश.
$1\frac{3}{4}$	१॥ पावणेदोन.	$4\frac{1}{2}$	४॥ साडेचार.	$\frac{1}{7}$	८. एकसप्तमांश.
$2\frac{1}{4}$	२। सव्वादोन.	$4\frac{3}{4}$	४॥ पावणेपांच.	$\frac{1}{8}$	९. एकअष्टमांश.
$2\frac{1}{2}$	२॥ अडीच.			$\frac{1}{10}$	१०. एकदशांश.

Figure 16: An excerpt from a Marathi grammar showing the writing of fractions (from Bhide, 1889: 80).

<i>Fractional Numbers.</i>	
$\frac{1}{4}$	।. पाव.
$\frac{1}{2}$	।।. अर्धा-धर्मी-धें, &c.
$\frac{3}{4}$	।।।. पाऊण
$1\frac{1}{4}$	१। सव्वा.
$1\frac{1}{2}$	१॥ दीड.
$1\frac{3}{4}$	१॥।. पावणेदोन, पाउणेदोन.
$2\frac{1}{4}$	२। सव्वादोन.
$2\frac{1}{2}$	२॥. अडीच.
$2\frac{3}{4}$	२॥।. पावणेतीन, पाउणेतीन.
$3\frac{1}{4}$	३। सव्वातीन.
$3\frac{1}{2}$	३॥. साडेतीन.
$3\frac{3}{4}$	३॥।. पावणेचार, पाउणेचार.

Figure 17: An excerpt from a Marathi grammar showing variant forms of the independent fractions (from Navalkar, 1925: 80). Compare the use of base-line dots to the mid-point dots used in Figure 16.

Then rupees are written full, pavalis with vertical strokes, annas with horizontal strokes, pice with vertical, and any remaining pies are written fully; *e.g.* 3 Rupees 10 annas 11 pies is equal to 3 Rupees 2 pavalis, 2 annas, 3 pice and 2 pies and is written ३॥=॥१२. If any item is omitted, the sign ४ (अळी) is inserted, as २ Rupees २ annas is २४= and the sign ४ means 'no pavalis;' But when no rupees are to be written, a zero is put before the pavali stroke.

In reading these figures only rupees, annas, and pies are enunciated, the pavalis being counted in the annas and the pice in the pies, thus ३॥=॥१२ is read ती रुपये पावणे अकरा आणे दोन पै.

Figure 18: An excerpt from a Marathi grammar showing the writing of the placeholder mark (from Darby, 1915: 106).

अळी ४ (अलि S) A maggot which infests grain and fruit: also a little caterpillar-like creature found upon leaves. 2 A lane, an alley, a row. 3 The mark ४ (or, among the Gujaráthís, ५) placed in papers of accounts before any fractional item (of money, measures &c.) indicating the absence of the integral sum or quantity: corresponding, therefore, with our (||). 4 A cavity

Figure 19: An excerpt from a Marathi dictionary for the entry अळी (*alī*), whose third definition describes the placeholder mark and shows its historical variants (from Molesworth, 1857: 58).

213. A special notation is employed to denote the subdivisions of the rupee. It is to be observed that the rupee is subdivided into sixteen *áne*, and each *ána* again into four *paise*. These are denoted as follows:—One *paisá*, ॠ; two *paise*, ॠॠ; three *paise*, ॠॠॠ; one *ána*, ॠ; two *áne*, ॠॠ; three *áne*, ॠॠॠ; four *áne*, ॠॠॠॠ; eight *áne*, ॠॠॠॠॠॠ; twelve *áne*, ॠॠॠॠॠॠ. These, again, are combined, after the following manner:—Five *áne* and one *paisá*, ॠॠॠॠॠॠ; six *áne* and two *paise*, ॠॠॠॠॠॠॠॠ; eleven *áne* and three *paise*, ॠॠॠॠॠॠॠॠॠॠ; fourteen *áne* and one *paisá*, ॠॠॠॠॠॠॠॠॠॠॠॠ; one rupee, ॠॠ; thirty rupees and four *áne*, ३०ॠॠ; two hundred and thirty-five rupees, seven *áne* and two *paise*, २३५ॠॠॠॠ.

Figure 20: Excerpt from a Hindi grammar showing the conventional method of writing currency values (from Kellogg, 1893: 147).

सारणी VII : TABLE VII

वर्ग-मान : Measures

स्थानीय : Local		दाशमिक : Metric		ब्रिटिश : British	
एकक	वर्ग गज	वर्ग मीटर	हेक्टर	वर्ग फुट	एकड़
बिगहा/कुरबा = 20 कट्टा	3600	3010.058	.301	32400	.7438
कट्टा = 20 धूर	180	150.494	.01505	1619.9	.03719
धूर = 16 कनमा	9	7.525	.0008	81	.0019
कनमा	0.5625	.4703	.00005	5.0625	.00012
हेक्टर	11960	10000	—	10769	2.471
एकड़	4840	4047	.4046	43559.93	—

A लेखन—१।५।।३ = एक बिगहा पाँच कट्टा तेरह धूर। २।।२५।२ = दू बिगहा बारह कट्टा सात धूर।

सारणी VIII : TABLE VIII

मुद्रा : Money

नवीन मुद्रा (Current coin)— टाका/रुपैआ = 100 पाइ/पैसा।

प्राचीन मुद्रा (Obsolate coins)— टाका = 16 आना आना = 4 पाइ। दाम = 20 कौड़ी।
सुक्का = 4 आना। पाइ = 5 दाम। कौड़ी = 16 दन्ति।

B लेखन—१।।)२।। = एक टाका दस आना दू पाइ। १।)३।।। = एक टाका सात आना तीन पाइ।

Figure 21: A table showing the method of writing measures and currency notation in the Maithili script (from Jhā, 1999: 691). Example (A) shows notation for measures using *avagraha* to represent the NORTH INDIC QUANTITY MARK. Example (B) shows currency notation using the Latin right-parenthesis to represent the NORTH INDIC RUPEE MARK.

पाइ	आना	टाका	कनमा	सेर		
)।	)न।	।/	।।।/	५/	५।।५	
)॥	)न॥	।न.	।।।न	*	५न	।।।०
)॥।	)न॥।	।५	।।।५	*	५५	५।।।/
)।/	)५	॥)	५)	*	५।०	५।।।न
)।/	)५।	॥/	५)/	*	५।/	५।।५
)।/॥	)५॥	॥न	५)न	*	५।न	५५
)।/॥।	)५॥।	॥५	५)५	*	५।५	५५/
)न	)।	।।)	५।)		५।।०	५५न
					५।/	५५५
					५।न	५५।०

Figure 22: A method of writing currency — *pāi* (पाइ), *ānā* (आना), and *ṭākā* (टाका) — and weight — *kanamā* (कनमा) and *ser* (सेर) — in the Maithili script (from Raya, 1970?: 39). The rupee mark used here resembles the right-parenthesis. The BENGALI CURRENCY NUMERATOR ONE, BENGALI CURRENCY NUMERATOR TWO, and the Maithili form of BENGALI CURRENCY NUMERATOR THREE, ५, are used to write the quarter units of currency.

11. V devanāgarském písmě piše se čtvrt značkou । (pro čtvrt hodiny, čtvrt rupie ap., srov. § 157, 2), půl ॥, tři čtvrti ॥॥. Např.: १।, 1¼, १॥, 1½, १॥॥, 1¾ atd.

11. In the Devanāgarī script, a quarter is denoted by the sign । (for a quarter of an hour or of a rupee, etc., cf. § 157, 2), half by ॥, three quarters by ॥॥. E. g.: १। '1¼', १॥ '1½', १॥॥ '1¾', etc.

Figure 23: Excerpt from a Hindi grammar indicating the use of fractions to write time notation (Pořízka, 1972: 162).

V údajích ceny se piše např.:	Price is written, e.g.:
रु. ५,०० (रु० ५-००) ५ रु. } ,pět rupií	'five rupees'
रु. ५,३० ,pět rupií 30 nových paisů	'five rupees 30 naye paise'.
2. Stará měnová soustava:	2. The old coinage system:
1 rupie (रुपया rup(a)yā m.) = 16 ánū	1 rupee (रुपया rup(a)yā m.) = 16 annas
1 án (आना ānā m.) = 4 paisy	1 anna (आना ānā m.) = 4 pice
1 pais (पैसा paisā m.) = 3 páí	1 pice (पैसा paisā m.) = 3 pies
पाई pāī f. ,pái'	पाई pāī f. 'pie'.
Značky, kterých se užívá v devanāgarském písmě:	Signs used in the Devanāgarī Script:
। ,jedna rupie'	'one rupee'
।। ,čtvrt rupie' (srov. § 61, 11)	'a quarter of a rupee' (cf. § 61, 11)
।।। ,jeden án'	'one anna'
।।।। ,čtvrt ánu' (tj. jeden pais)	'a quarter of an anna' (i.e., one pice)
।।।।। ,jedna páí'	'one pie'.
V anglických textech píší se číslicemi jen rupie, ány a páí:	In English texts, figures are only used to denote rupees, annas and pies:
४ ॥।। } ,4 rupie 8 ánū'	'4 rupees 8 annas'
Rs 4—8—0 (= Rs 4/8/0)	
५ ॥।।।।। } ,5 rupií 14 ánū 8 páí'	'5 rupees 14 annas 8 pies'.
Rs 5—14—8 (= Rs 5/14/8)	

Figure 24: Excerpt from a Hindi grammar showing the conventional method of writing currency values (from Pořízka, 1972: 514).

१४३

प्रांती सरकार कामास होते त्यांनी राहाहून घेतले. पुढे मदगिरी नजीक टिपूचा छापा पडला. लोक जखमी झाले. घोडी पाडाव गेली. जखमी वगैरे लोक लष्करांत आले त्यांची गणती वगैरे घेऊन रोजमुरे दिले.

बळवंतराव बापूजी यास जखमा भारी याजकरिता निरोप घेऊन घरी गेले बदल २०० रु.

No. 252]

[23-5-1796

छ १९ जिल्काद

१७४०॥= श्रीमंत माहाराज राजश्री छत्रपति स्वामी याजकडे सातारियास राजश्री चिमणाजी माधवराव यास पेशवाईचे पदाची वस्त्रे आणावयास त्रिंबकराव अमृतेश्वर पेठ्ये पाठविले होते त्यास तेथे खर्च जाहाला तो गुा सिदोजी कांब्या खिजमतगार.

९४०॥= नजर करावयास

१०८४=	माहाराज यांस
१०८४=	मातोश्री आईसो यांस
१०८४=	राजश्री प्रतापराव पुत्र यांस
१०८४=	वाडा पहिला
१०८४=	वाडा दुसरा

१२०० इनाम माहाराज याज-
कडील शागीर्दपेशा
वगैरे यांस नव्हत.

No. 253]

[23-5-1796

छ १९ जिल्काद

राजश्री चिमणाजी माधवराव यांस पेशवाईची वस्त्रे सातारियाहून आणली;
सबब दिला हजारत सनग येकून आंख.

श्रीमंत माहाराज राजश्री छत्रपती यांजकडील मंडळी.

३३४ निळकंठ बाबूराव मजमदार यांस सनगे

2549

Figure 26: An excerpt from Peshwa records in Devanagari transliteration from Modi script showing the use of the placeholder mark (from Sardesai, 1932: 143). The currency notation १०८४= indicates “108 rupayā, 0 pavalī, and 2 ānā.”

DEVANAGARI TYPE SETTING		337																														
13	Characters for <i>Mātrā</i> Combinations (8/4 body).	<table style="border: none; width: 100%;"> <tr> <td style="width: 50%;">क ख ग घ ङ च छ ज झ</td> <td style="width: 50%;"></td> </tr> <tr> <td>ट ठ ड ढ ण त थ द ध न</td> <td></td> </tr> <tr> <td>प फ ब भ म</td> <td></td> </tr> <tr> <td>य र ल व श ष स ह ळ क्ष ञ</td> <td style="text-align: right;">} 34</td> </tr> </table>	क ख ग घ ङ च छ ज झ		ट ठ ड ढ ण त थ द ध न		प फ ब भ म		य र ल व श ष स ह ळ क्ष ञ	} 34																						
क ख ग घ ङ च छ ज झ																																
ट ठ ड ढ ण त थ द ध न																																
प फ ब भ म																																
य र ल व श ष स ह ळ क्ष ञ	} 34																															
14	Half letters (a) Consonants.	<table style="border: none; width: 100%;"> <tr> <td style="width: 50%;">व रू र छ ङ छ उ ङ ङ ङ ङ ङ</td> <td style="width: 50%;"></td> </tr> <tr> <td>ट प ठ ङ ङ ङ ङ ङ ङ ङ ङ ङ</td> <td></td> </tr> <tr> <td>क ख ग घ ङ च छ ज झ ङ</td> <td></td> </tr> <tr> <td>द ध न त थ द ध न त थ द ध न</td> <td style="text-align: right;">} 49</td> </tr> </table>	व रू र छ ङ छ उ ङ ङ ङ ङ ङ		ट प ठ ङ ङ ङ ङ ङ ङ ङ ङ ङ		क ख ग घ ङ च छ ज झ ङ		द ध न त थ द ध न त थ द ध न	} 49																						
व रू र छ ङ छ उ ङ ङ ङ ङ ङ																																
ट प ठ ङ ङ ङ ङ ङ ङ ङ ङ ङ																																
क ख ग घ ङ च छ ज झ ङ																																
द ध न त थ द ध न त थ द ध न	} 49																															
15	Vowel Symbols full body.	<table style="border: none; width: 100%;"> <tr> <td>। ि ि ि ि ि ि ि ि</td> <td style="text-align: right;">} 11</td> </tr> </table>	। ि ि ि ि ि ि ि ि	} 11																												
। ि ि ि ि ि ि ि ि	} 11																															
16	Vowel Symbols (a) <i>Mātrā</i> Degree.	<table style="border: none; width: 100%;"> <tr> <td>ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ</td> <td style="text-align: right;">} 22</td> </tr> </table>	ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ	} 22																												
ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ	} 22																															
17	Vowel Symbols (b) <i>Ukār</i> Degree.	<table style="border: none; width: 100%;"> <tr> <td>ˆ ˆ ˆ ˆ ˆ ˆ</td> <td style="text-align: right;">} 6</td> </tr> </table>	ˆ ˆ ˆ ˆ ˆ ˆ	} 6																												
ˆ ˆ ˆ ˆ ˆ ˆ	} 6																															
18	Letters *for conjuncts on <i>Ukār</i> degree.	<table style="border: none; width: 100%;"> <tr> <td style="width: 50%;">उ क ङ क ङ ग ङ ङ</td> <td style="width: 50%;"></td> </tr> <tr> <td>त न म र ल ङ व</td> <td style="text-align: right;">} 16</td> </tr> </table>	उ क ङ क ङ ग ङ ङ		त न म र ल ङ व	} 16																										
उ क ङ क ङ ग ङ ङ																																
त न म र ल ङ व	} 16																															
19	Conjunct letters Full body.	<table style="border: none; width: 100%;"> <tr> <td style="width: 50%;">कु क्क क्क क्क क्क क्क</td> <td style="width: 50%;"></td> </tr> <tr> <td>ख गू गू गू गू गू गू गू</td> <td></td> </tr> <tr> <td>ङ्ग ङ्ग ङ्ग ङ्ग ङ्ग ङ्ग</td> <td></td> </tr> <tr> <td>ञ ञ्ज ञ्ज ञ्ज ञ्ज ञ्ज ञ्ज</td> <td></td> </tr> <tr> <td>ह ह्य ह्य ह्य ह्य ह्य ह्य</td> <td></td> </tr> <tr> <td>तृ तृ तृ तृ तृ तृ तृ</td> <td></td> </tr> <tr> <td>दृ दृ दृ दृ दृ दृ दृ</td> <td></td> </tr> <tr> <td>झ झ झ झ झ झ झ</td> <td></td> </tr> <tr> <td>धृ धृ धृ धृ धृ धृ धृ</td> <td></td> </tr> <tr> <td>पृ पृ पृ पृ पृ पृ पृ</td> <td></td> </tr> <tr> <td>भृ भृ भृ भृ भृ भृ भृ</td> <td></td> </tr> <tr> <td>लृ लृ लृ लृ लृ लृ लृ</td> <td></td> </tr> <tr> <td>शृ शृ शृ शृ शृ शृ शृ</td> <td></td> </tr> <tr> <td>सृ सृ सृ सृ सृ सृ सृ</td> <td></td> </tr> <tr> <td>हृ हृ हृ हृ हृ हृ हृ</td> <td style="text-align: right;">} 115</td> </tr> </table>	कु क्क क्क क्क क्क क्क		ख गू गू गू गू गू गू गू		ङ्ग ङ्ग ङ्ग ङ्ग ङ्ग ङ्ग		ञ ञ्ज ञ्ज ञ्ज ञ्ज ञ्ज ञ्ज		ह ह्य ह्य ह्य ह्य ह्य ह्य		तृ तृ तृ तृ तृ तृ तृ		दृ दृ दृ दृ दृ दृ दृ		झ झ झ झ झ झ झ		धृ धृ धृ धृ धृ धृ धृ		पृ पृ पृ पृ पृ पृ पृ		भृ भृ भृ भृ भृ भृ भृ		लृ लृ लृ लृ लृ लृ लृ		शृ शृ शृ शृ शृ शृ शृ		सृ सृ सृ सृ सृ सृ सृ		हृ हृ हृ हृ हृ हृ हृ	} 115
कु क्क क्क क्क क्क क्क																																
ख गू गू गू गू गू गू गू																																
ङ्ग ङ्ग ङ्ग ङ्ग ङ्ग ङ्ग																																
ञ ञ्ज ञ्ज ञ्ज ञ्ज ञ्ज ञ्ज																																
ह ह्य ह्य ह्य ह्य ह्य ह्य																																
तृ तृ तृ तृ तृ तृ तृ																																
दृ दृ दृ दृ दृ दृ दृ																																
झ झ झ झ झ झ झ																																
धृ धृ धृ धृ धृ धृ धृ																																
पृ पृ पृ पृ पृ पृ पृ																																
भृ भृ भृ भृ भृ भृ भृ																																
लृ लृ लृ लृ लृ लृ लृ																																
शृ शृ शृ शृ शृ शृ शृ																																
सृ सृ सृ सृ सृ सृ सृ																																
हृ हृ हृ हृ हृ हृ हृ	} 115																															
20	Figures.	<table style="border: none; width: 100%;"> <tr> <td>१ २ ३ ४ ५ ६ ७ ८ ९ ०</td> <td style="text-align: right;">} 10</td> </tr> </table>	१ २ ३ ४ ५ ६ ७ ८ ९ ०	} 10																												
१ २ ३ ४ ५ ६ ७ ८ ९ ०	} 10																															
21	Punctuation marks & signs.	<table style="border: none; width: 100%;"> <tr> <td style="width: 50%;"> <div style="display: flex; justify-content: space-between;"> ○ / = ≡ </div> <div style="display: flex; justify-content: space-between;"> S * † ‡ </div> </td> <td style="width: 50%; text-align: right;"> ; ? ! ([/ ... + × = ÷ { } § ¶ √ — — </td> <td style="text-align: right; vertical-align: middle;">} 33</td> </tr> </table>	<div style="display: flex; justify-content: space-between;"> ○ / = ≡ </div> <div style="display: flex; justify-content: space-between;"> S * † ‡ </div>	; ? ! ([/ ... + × = ÷ { } § ¶ √ — —	} 33																											
<div style="display: flex; justify-content: space-between;"> ○ / = ≡ </div> <div style="display: flex; justify-content: space-between;"> S * † ‡ </div>	; ? ! ([/ ... + × = ÷ { } § ¶ √ — —	} 33																														
22	Spaces.	<table style="border: none; width: 100%;"> <tr> <td>3 to Pica, 4 to Pica, 6 to Pica, Quad ems 2, 3, 4, 1½.</td> <td style="text-align: right;">} 8</td> </tr> </table>	3 to Pica, 4 to Pica, 6 to Pica, Quad ems 2, 3, 4, 1½.	} 8																												
3 to Pica, 4 to Pica, 6 to Pica, Quad ems 2, 3, 4, 1½.	} 8																															
23	<i>Degrees</i> .	<table style="border: none; width: 100%;"> <tr> <td>6, 5, 4, 3, 2½, 2, 1½, 1¼, 1, ¾</td> <td style="text-align: right;">} 10</td> </tr> </table>	6, 5, 4, 3, 2½, 2, 1½, 1¼, 1, ¾	} 10																												
6, 5, 4, 3, 2½, 2, 1½, 1¼, 1, ¾	} 10																															
Total ...		609																														

* Inferior letters for use as *ukār* degrees for conjuncts.

Figure 27: A specimen from the Nirnaya-Sagar Devanagari font showing the placeholder mark and the six fractions signs (from Naik, 1971: Table 57, after p.337). It is likely that the signs for the fractions ¼ and ½ were also used to represent *dandā* and double *dandā*, or vice versa.

Vowel-signs, Figures and Conjuncts									
ॠ	ॡ	ॢ	ॣ	।	॥	०	१	२	३
6/224	6/225	6/147	6/148	7/220	6/149	6/150	6/258	5/261*	5/262*
5/165	5/169	5/173*	5/166	5/170	5/167	5/171*	5/265	5/128	5/238*
5/156	5/157	5/160	5/161	5/158	5/159	5/162	5/163	11/472*	
5/151	5/153	5/152	11/472*	5/154	5/155				
5/164	5/168	5/259*	5/260*	6/310	5/311	5/175	5/172	5/314*	5/174
7/219	7/124	6/125	5/119	12/120	5/121	12/123	12/122	12/130	12/131
12/127	6/126								
४	५	६	७	८	९	०	१	२	३
12/502	/108	12/109	11/110	11/111	12/235	/112	12/113	12/114	[/115 12/236]
४	५	६	७	८	९	०	१	२	३
12/237	12/116*	12/117	12/118*	12/25	12/267	12/268	12/270	5/264	/351
कृ	कृ	ञ्च	ट्ट	ट्ट	ट्ट	ट्ट	ट्ट	ट्ट	ट्ट
13/91	11/466*	12/462	10/221	10/254	11/233	11/222*	11/257		
८	९	०	१	२	३	४	५	६	७
9/72	/73	8/556	11/467*	11/468*	12/93	6/226	6/239*		
Space	5/U	6/U	8/U	12/U.					

351. Monotype Devnagari design in 12 pt. (9 set) is based on Nirnaya-sagar Pica No. 1 and is not much distinguishable to a common reader. The larger versions 14 pt. and 16pt. are the enlargements of 12 pt. design and have no relation to the original Nirnayasagar design of 14 pt. Great face. In all the three cases the Monotype face is wider as compared to the height of the letters. Following deficiencies are inherent in the Monotype Devanagari currently in use :

- (1) The *Velānti* ॠ ॡ and *Velānti-rāfār* ॢ ॣ overhang. They do not meet the vertibar of the letter i.e. (मार्मिक).
- (2) The *Ukārs* cast on high-speces do not fit properly, distorting the look of the letter (कुणबी).
- (3) The *Mātrās* and *Ukārs* do not touch the headline and the Vertibar (सेबर, नूतन).
- (4) The double *mātrās* are too small (मैने).
- (5) Letter हृ is disproportionate in height.
- (6) Letter ऋ, and conjuncts of हृ, ड, द are disproportionate. ञ, झ, ञ are wide in set. Letters like ख are not available.

Figure 28: A specimen showing the placeholder mark, quantity mark, and three fraction signs as available in the Monotype Devanagari font for the Monotype machine (from Naik, 1971: Table 61, after p.396). The star after the matrix number indicates outside-characters. The Monotype Devanagari design is based on Nirnaya-Sagar Pica No. 1. The glyph labeled “7/265” is the NORTH INDIC QUANTITY MARK; “12/118” is the NORTH INDIC PLACEHOLDER MARK; and “12/266,” “12/267,” and “12/268” are NORTH INDIC FRACTION ONE SIXTEENTH, NORTH INDIC FRACTION ONE EIGHTH, and NORTH INDIC FRACTION THREE SIXTEENTHS, respectively. Glyphs for the fractions one quarter, one half, and three quarters are absent, but presumably, might be created through additive application of the *dandā*. Note the distinct between the NORTH INDIC QUANTITY MARK and the *avagraha*, which appears as glyph “7/219.”



Figure 29: Annexure II from the proposal submitted by the Government of India to encode Gujarati fractions (from Government of India, 2004). The fraction signs appear in an advertisement for movie theaters printed in the *Vadodra Sandesh* from August 24, 2004. They represent 15 (I), 30 (II), or 45 (III) minutes of an hour. The times shown for the PAO examples are 12:15, 3:15, 7:15, and 9:15. The times shown for the ADDHO examples are 3:30, 7:30, and 9:30. The times shown for the PONO examples are 12:45, 3:45, 7:45, and 9:45.

VII Multiplication by 1, 1½, 1½, 2½, 3½, 4½
 ११११११ = ६ ५३५४

$\times 1$	$\times 1\frac{1}{2}$	$\times 1\frac{1}{2}$
१ १ १ २ २ २ ३ ३ ३ ४ ४ ४ ५ ५ ५ ६ ६ ६ ७ ७ ७ ८ ८ ८ ९ ९ ९ १० १० १०	१ २ १ २ १ २ २ १ २ १ १ ३ २ १ ३ १ १ १ ४ २ १ ४ ५ २ १ ५ १ ६ २ १ ६ १ १ ७ २ १ ७ १ १ १ ८ २ १ ८ १ १ १ ९ २ १ ९ १ १ १ १० २ १ १० १ १ १	१ २ १ १ २ १ १ २ २ १ २ ३ ३ २ १ ३ ४ १ १ ४ २ १ ५ ५ २ १ ६ १ ६ २ १ ७ १ १ ७ २ १ ८ १ १ १ ८ २ १ ९ १ १ १ ९ २ १ १० १ १ १ १० २ १ ११ १ १ १
$\times 2\frac{1}{2}$	$\times 3\frac{1}{2}$	$\times 4\frac{1}{2}$
१ २ १ १ २ १ १ २ २ १ २ ३ १ १ ३ २ १ ३ ४ १ १ ४ २ १ ४ ५ १ १ ५ २ १ ५ ६ १ १ ६ २ १ ६ ७ १ १ ७ २ १ ७ ८ १ १ १ ८ २ १ ८ ९ १ १ १ ९ २ १ ९ १० १ १ १ १० २ १ १० ११ १ १ १	१ ३ १ ३ १ ३ १ २ ३ १ ४ ३ ३ १ ५ १ १ १ ४ ३ १ ६ १ १ १ ५ ३ १ ७ १ १ १ ६ ३ १ ८ १ १ १ ७ ३ १ ९ १ १ १ ८ ३ १ १० १ १ १ ९ ३ १ ११ १ १ १ १० ३ १ १२ १ १ १	१ ४ १ ४ १ २ ४ १ ५ १ ३ ४ १ ६ १ १ १ ४ ४ १ ७ १ १ १ ५ ४ १ ८ १ १ १ ६ ४ १ ९ १ १ १ ७ ४ १ १० १ १ १ ८ ४ १ ११ १ १ १ ९ ४ १ १२ १ १ १ १० ४ १ १३ १ १ १

VIII Rate Table

५४८६२३११११११ = ५ २३ ३ १११ ५८२
 ११०९३०९५११११११११ = १० ३० ९ १११ ३० ९

Figure 30: Use of fraction signs and the rupee mark in the Takri script (from Leitner, 1883?: Set 4, Table 7 and Table 8).

'The leading feature in Indian arithmetic being the division by four, the signs for fractions are adapted thereto. The rupee is divided into $4 \times 4 = 16$ parts, called *ānā* which are thus designated (units of all kinds are also thus divided) :—

1 ānā or $\frac{1}{8}$	✓	5 ānās	✓	9 ānās	✓	13 ānās	✓
2 ānās	✓	6 ānās	✓	10 ānās	✓	14 ānās	✓
3 ānās	✓	7 ānās	✓	11 ānās	✓	15 ānās	✓
4 ānās or $\frac{1}{2}$	✓	8 ānās or $\frac{1}{2}$	✓	12 ānās or $\frac{3}{4}$	✓		

Figure 31: Method of writing fractions and currency in the Bengali script (from Grierson, 1903a: 29).

ന	ന്ന	ന്യ	ഷ്ക്ര	ജ്ഹ്ര	ഹാ	ഗ്ര	പ്ര	ദ്രെ
na	nna	nya	ṣkra	jhra	hā	gra	pra	dre
1	2	3	4	5	6	7	8	9
മ	ഥ	ല	പ്ത	ബ	ത്ര	രൂ	ച	ണ
ma	tha	la	pta	ba	tra	rū	cha	ṇa
10	20	30	40	50	60	70	80	90
൩൦								
ña								
100								

Figure 32: Method of writing numerals in Malayalam (from Ganesan, 2006).

ആയിരം നൂ = 1000	നൂറ് നൂ = 100	പത്തു പ = 10	ഒന്ന് ഒ = 1
രണ്ടു ര = 2	മൂന്നു മ = 3	നാലു ന = 4	അഞ്ച് അ = 5
ആറു ആ = 6	ഏഴു ഏ = 7	ഏട്ടു ഏ = 8	ഒമ്പതു ഒമ്പ = 9
മുക്കാൽ മ = $\frac{3}{4}$	അര അ = $\frac{1}{2}$	ഏകാൽ ഏ = $\frac{1}{4}$	അരക്കാൽ അ = $\frac{1}{8}$
രണ്ടു മാ ര = $\frac{1}{10}$	മാ കാണി മാ = $\frac{1}{16}$	ഒരു മാ ര = $\frac{1}{20}$	അര മാ ര = $\frac{1}{40}$
കാണി ക = $\frac{1}{80}$	അരക്കാണി ക = $\frac{1}{160}$	മുന്തിരി ക = $\frac{1}{320}$	കീഴ് കാലു $\frac{1}{320}$ ($\frac{1}{4}$)
മൂന്നു കാണി ക = $\frac{3}{80}$	നാലു മാ ക = $\frac{1}{5}$	മൂന്നു മാ ക = $\frac{3}{20}$	അരക്കാണി മുന്തിരി ക = $\frac{1}{160} + \frac{1}{320} = \frac{3}{320}$

Figure 33: Method of writing fractions in Malayalam (from Ganesan, 2006).