

# Proposal to Encode North Indian Accounting Signs in Plane 1 of ISO/IEC 10646

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ISO/IEC JTC 1/SC 2/WG 2  
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS  
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646<sup>1</sup>

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.

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**A. Administrative**

1. Title: **Proposal to Encode North Indian Accounting Signs in Plane 1 of 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: **May 15, 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: **North Indian Accounting Signs**
  - (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: **13**
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 signs 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.**

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<sup>1</sup> 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?: **No**
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.)? **Yes**
  - (a) If Yes, with whom?: **Madhav Deshpande (Professor, University of Michigan, mmdesh@umich.edu)**
    - 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 signs in this proposal were used by the general populace of north India.**
4. The context of use for the proposed characters (type of use; common or rare): **Common**
  - (a) Reference: **These signs were used to write currency, weight, measurement, and time notations in several contemporary and historical scripts of north India.**
5. Are the proposed characters in current use by the user community?: **No.**
  - (a) If Yes, where? Reference: **The signs are not commonly used at present. They are attested in written and printed materials through at least the 1970s.**
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**
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 text of proposal**
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? **No**
    - 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

This is a proposal to encode North Indian accounting signs in the Universal Character Set (UCS) (ISO/IEC 10646). The intention is to provide a set of signs used to write fractions, currency, weight, measures, and time notations in major contemporary and historical scripts of north India. Many of these signs were initially proposed for inclusion in the UCS as part of the Kaithi script block in L2/05-343.<sup>1</sup> Additional research indicated that, in addition to Kaithi, these signs were also used with regularity in the Devanagari, Gujarati, Gurmukhi, Mahajani, Maithili, and Modi scripts, as well as in minor regional scripts. Although the signs were used in several scripts, they retained consistency in form, meaning, and usage.

On account of the common typology and semantics of these signs, they are proposed for inclusion in the UCS as a single block to be named “North Indian Accounting Signs.” The block is recommended for allocation in the Supplementary Multilingual Plane (SMP) (Plane 1) of the UCS. The signs 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.<sup>2</sup> The unified encoding of these signs within a generic block, instead of as part of the repertoire of individual scripts or within an existing block, will facilitate their use across writing systems in a manner that reflects historical and contemporary practices.

The name “North Indian” is a geographical descriptor that refers to the region in which these signs were used. This region encompasses the modern Indian states of Bihar, Gujarat, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, and Uttar Pradesh. The signs were also used in some areas of Nepal.<sup>3</sup> The signs may be considered as belonging to an accounting and numerical notation system used in north India that is distinct from systems used in other regions of South Asia. The differences of writing digits, fractions, and various quantities is influenced by the manner in which numerical notation is represented in regional scripts and script families. For instance, the method of representing fractions in Malayalam and Tamil is distinct from that in Devanagari, and all three are different from the method used in Bengali. Therefore, the intent of the “North Indian Accounting Signs” block is to provide a set of signs that reflect a particular regional orthography, similar to the “South Indian Supplement,” which was proposed for the purpose of including fraction and other numerical signs used in south Indian scripts.

The ubiquity of these signs is evidenced from their presence in documents ranging from newspaper media to product catalogues; from legal documents to accounting records; from school primers to scribal handbooks; and personal records and correspondence. Moreover, the signs were described in grammar texts, suggesting that these signs and the numerical information they represented were considered a rudimentary part of Hindi, Gujarati, and other languages.

The use of the accounting signs and its associated numerical notation diminished in the latter half of the 20th century when India changed its currency and system of measurement. On April 1, 1957, India introduced a new coinage system called “Naya Paisa” (नया पैसा), which is based on the decimal system.<sup>4</sup> On October 1, 1958, the metric system of weights and measures was introduced in India.<sup>5</sup> The change of the currency base from hexadecimal to decimal and the adoption of the metric system rendered the old accounting signs obsolete. The fraction signs and currency and quantity marks continued to be used in writing and in print through the 1970s. The fraction signs are still used today in a limited capacity in advertisements and for other specialized purposes.

An encoding for North Indian Accounting Signs in the UCS is necessary for the complete encoding of written and printed materials in north Indian scripts. As these signs accompanied a variety of historical and contemporary scripts, it is necessary to identify them uniquely so that they may supplement such scripts in electronic plain-text. Such an encoding is important to users who require the ability to accurately represent

<sup>1</sup> Pandey, 2005. <sup>2</sup> International Organization for Standardization, 2005: 4. <sup>3</sup> Money, 1942: viii. <sup>4</sup> Pořízka, 1972: 513.

<sup>5</sup> Pořízka, 1972: 304.

numerical notation and accounting signs in order to preserve source materials and in order to reproduce and represent such materials in digital media.

## 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 Characters Proposed

There are thirteen characters proposed as part of the North Indian Accounting Signs block. Included in this set are six fraction signs, three independent fraction signs, one quarter mark, one placeholder mark, one currency mark, and one quantity mark:

—	NORTH INDIAN FRACTION ONE SIXTEENTH
=	NORTH INDIAN FRACTION ONE EIGHTH
≡	NORTH INDIAN FRACTION THREE SIXTEENTHS
	NORTH INDIAN FRACTION ONE QUARTER
	NORTH INDIAN FRACTION ONE HALF
	NORTH INDIAN FRACTION THREE QUARTERS
· ·	NORTH INDIAN INDEPENDENT FRACTION ONE QUARTER
·  ·	NORTH INDIAN INDEPENDENT FRACTION ONE HALF
·   ·	NORTH INDIAN INDEPENDENT FRACTION THREE QUARTERS
◦	NORTH INDIAN QUARTER MARK
↻	NORTH INDIAN PLACEHOLDER MARK
₹	NORTH INDIAN RUPEE MARK
₹	NORTH INDIAN QUANTITY MARK

The signs and their properties are discussed throughout the proposal and given in the Unicode Character Database format in Table 1. Although the signs proposed here require only a single row in the SMP, it is requested that the North Indian Accounting Signs block be allocated two rows (16 code-points) to accommodate the possible addition of signs in the future.

Other signs for denoting weights and measures have been identified and are discussed in section 5. There is insufficient information regarding the use of these signs. Therefore, they are not presently proposed for encoding. If and when information about these signs becomes available and if additional signs are later identified, proposals for their inclusion in the set will be submitted for formal review. The signs proposed here are sufficient for the encoding and processing of accounting and numerical notation in Indian language documents.

### 3.1 Basis for Character Shapes

All of the North Indian Accounting Signs proposed here are found in both written and printed materials. The font for the signs was drawn by Anshuman Pandey. The digitized letterforms were designed to express fidelity to the forms of the signs as found in metal fonts.

## 4 Overview of the Accounting Signs

### 4.1 Fraction Signs

**Description** The fraction signs proposed here were used throughout north India to indicate currency, weights, measures, time, and other units. The signs represent fraction values of a base-16 (hexadecimal) notation system. They were adapted for writing fractions of other base systems (see section 4.5). The fraction signs appear in both written and printed materials in several north Indian scripts. 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 (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 use of fraction signs diminished after 1957, when India adopted the metric system and changed its currency to decimal notation.

The fractions are written as follows:

┐	$\frac{1}{16}$	┐	$\frac{5}{16} [= \frac{1}{4} + \frac{1}{16}]$	┐	$\frac{9}{16} [= \frac{1}{2} + \frac{1}{16}]$	┐	$\frac{13}{16} [= \frac{3}{4} + \frac{1}{16}]$
=	$\frac{1}{8} (\frac{2}{16})$	┐	$\frac{5}{16} [= \frac{1}{4} + \frac{1}{8}]$	=	$\frac{5}{8} (\frac{10}{16}) [= \frac{1}{2} + \frac{1}{8}]$	=	$\frac{7}{8} (\frac{14}{16}) [= \frac{3}{4} + \frac{1}{8}]$
≡	$\frac{3}{16}$	=	$\frac{7}{16} [= \frac{1}{4} + \frac{3}{16}]$	≡	$\frac{11}{16} [= \frac{1}{2} + \frac{3}{16}]$	≡	$\frac{15}{16} [= \frac{3}{4} + \frac{3}{16}]$
	$\frac{1}{4} (\frac{4}{16})$		$\frac{1}{2} (\frac{8}{16})$		$\frac{3}{4} (\frac{12}{16})$	?	1

**Typology** The 15 fractions are written using six elemental forms. All fractions can be created from these six through an additive process. Only these six elemental forms are proposed for encoding in the UCS:

┐	NORTH INDIAN FRACTION ONE SIXTEENTH
=	NORTH INDIAN FRACTION ONE EIGHTH
≡	NORTH INDIAN FRACTION THREE SIXTEENTHS
	NORTH INDIAN FRACTION ONE QUARTER
	NORTH INDIAN FRACTION ONE HALF
	NORTH INDIAN FRACTION THREE QUARTERS

Theoretically, even these six forms can be reduced to the two primitives ┐ NORTH INDIAN FRACTION ONE SIXTEENTH and | NORTH INDIAN FRACTION ONE QUARTER. The four other elemental forms may be considered as composite characters created from sequences of these primitives. For example, || NORTH INDIAN FRACTION ONE HALF may be composed by writing NORTH INDIAN FRACTION ONE QUARTER twice as | + | = ||. Similarly, ≡ NORTH INDIAN FRACTION THREE SIXTEENTHS may be composed by writing NORTH INDIAN FRACTION ONE SIXTEENTH three times as ┐ + ┐ + ┐ = ≡. 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 Indian scripts.

**Names** The fraction signs one-quarter (|), one-half (||), and three-quarters (|||) have unique names in north Indian 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* (અધો) or *ardho* (અર્ધો), and *poṇo* (પોણો) (see section 6.1 for further details).

**Properties** The fraction signs belong to the Unicode general category “Number, Other” (No). The appropriate numeric value should assigned to each fraction: “ $\frac{1}{16}$ ” for NORTH INDIAN FRACTION ONE SIXTEENTH,

“½” for NORTH INDIAN FRACTION ONE HALF, etc. The fraction signs are always written left-to-right and should be assigned 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  $\frac{3}{8}$ , not as  $\frac{3}{8}$ . 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 INDIAN FRACTION ONE SIXTEENTH, NORTH INDIAN FRACTION ONE EIGHTH, and NORTH INDIAN FRACTION THREE SIXTEENTHS. These fractions are also written horizontally instead of at an angle:  $\frac{1}{16}$  may be written as  $\frac{1}{16}$ ;  $\frac{1}{8}$  as  $\frac{1}{8}$ ; and  $\frac{3}{16}$  as  $\frac{3}{16}$  (see Figure 13).

**Homoglyphs** The form of  $\frac{1}{4}$  NORTH INDIAN FRACTION ONE QUARTER and  $\frac{1}{2}$  NORTH INDIAN 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 N<sup>o</sup> 2.” In isolation, such a sequence might also represent the fraction  $2\frac{1}{4}$ , written as ‘२।’ (U+0968 DEVANAGARI DIGIT TWO + NORTH INDIAN FRACTION ONE QUARTER). The proper meaning of such sequences, however, is apparent from context. Among signs used in other Indian systems of accounting notation, NORTH INDIAN FRACTION ONE QUARTER resembles  $\frac{1}{4}$  U+09F7 BENGALI CURRENCY NUMERATOR FOUR.

## 4.2 Independent Fraction Signs

- ¼ NORTH INDIAN INDEPENDENT FRACTION ONE QUARTER
- ½ NORTH INDIAN INDEPENDENT FRACTION ONE HALF
- ¾ NORTH INDIAN INDEPENDENT FRACTION THREE QUARTERS

**Description** The signs for the fractions  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  have 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.

**Typology** 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 ¼; one-half is represented as ½; and three-quarters is represented as ¾.

**Properties** The independent fraction signs belong to the Unicode general category “Number, Other” (No). They are pre-composed characters. The appropriate numeric value should assigned to each independent fraction: “¼” for NORTH INDIAN INDEPENDENT FRACTION ONE QUARTER, etc. Each sign has the bidirectional value of “Left-to-Right” (L).

**Orthography** The independent fraction signs are not used for writing mixed fractions and are not written with currency or quantity marks. For example, “4 ānās” is written as 4 and as 4, but never as 4; “3 rupayā and 8 ānās” is written as 3 and as 3 (using the NORTH INDIAN QUARTER MARK), never as 3 or as 3.

**Variants** 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 0¼, 0½, and 0¾ (see Figure 4). The other is to write the dots at the baseline instead of at the middle of the sign, as .¼, .½, and .¾. (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 INDIAN QUARTER MARK: ◌॥, ◌॥◌, and ◌॥◌◌. However, the independent signs are considered to be precomposed forms.

### 4.3 Quarter Mark

- NORTH INDIAN QUARTER MARK

**Description** The quarter mark is used to denote 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  $\text{JIII}\equiv$  would typically denote “15 *chaṭām̄k*.” However, in some regional forms, when the weight units *ser* and *chaṭām̄k* are written together without the quantity mark, the form  $\text{JIII}\equiv$  might represent three different values:  $\text{I} + \text{II}\equiv$  (“ten *ser* and eleven *chaṭām̄k*”);  $\text{II} + \text{I}\equiv$  (“twenty *ser* and seven *chaṭām̄k*”); and  $\text{III} + \equiv$  (“thirty *ser* and three *chaṭām̄k*”). In such cases the quarter mark would be written after the *ser* unit to indicate the specific value of the quantity. Thus,  $\text{J I} \circ \text{II} \equiv$ ,  $\text{J II} \circ \text{I} \equiv$ , and  $\text{J III} \circ \equiv$  for the above forms, respectively. See section 4.6 for additional information.

**Properties** The NORTH INDIAN 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 INDIAN FRACTION ONE QUARTER, NORTH INDIAN FRACTION ONE HALF, or NORTH INDIAN FRACTION THREE QUARTERS. Grierson shows the use of the quarter mark to denote quarter units of the *chatāmk* weight unit.<sup>6</sup>

*Chhatāñks* 1, 2, 3, 4, 6, 7, 8, 9, 12.

The same practice is used for writing *katthā* measurement values:<sup>7</sup>

Katthias 59 1, 52 2, 53 3, 58 4, 20 5, 29 6, 110 10, 111 15.

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*”:<sup>8</sup>

Sers. ၆၇ ၁, ၆၈ ၂, ၆၉ ၃, ၇၀ ၄, ၇၁ ၅, ၇၂ ၆, ၇၃ ၇, ၇၄ ၈, ၇၅ ၉, ၇၆ ၁၀, ၇၇ ၁၁, ၇၈ ၁၂, ၇၉ ၁၃.

**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 Indian accounting notation systems, it resembles ° U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN. The rules for the use of NORTH INDIAN QUARTER MARK are different from that of U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN. Figure 30 shows U+09F9 BENGALI CURRENCY DENOMINATOR SIXTEEN used as a mark for writing *ānā* currency values. The NORTH INDIAN QUARTER MARK does not have such a function. It is reserved specifically for marking the fractions signs for  $\frac{1}{4}$ ,  $\frac{1}{2}$ , 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.<sup>9</sup> The circled portion indicates the value १७॥ “17 *rupayā*, 8 *ānā*.”

<sup>6</sup> Grierson, 1899: Plate IV. <sup>7</sup> Grierson, 1899: Plate IV. <sup>8</sup> Grierson, 1899: Plate IV. <sup>9</sup> Grierson, 1899: Plate X.

वॉसीवदीस्त्रीउ८ मधुवनीथानावेनीपद्यउईआगे६ममोवकीगपैना  
 लउपैमा उ५ उईमाधा उसकासन१६उपैमाभाभाभाभा(१६॥१०॥)

#### 4.4 Placeholder Mark

ॠ NORTH INDIAN 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 *ālī* (अळी), and in Gujarati<sup>10</sup> 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.<sup>11</sup>

**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 २ॠ= 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: ०ॠ “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.

#### 4.5 Currency Mark

ॡ NORTH INDIAN RUPEE MARK

**Description** The NORTH INDIAN RUPEE MARK was a 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 Indian 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 INDIAN 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.

**Typology** The NORTH INDIAN 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: ५३६ॡ not ५३६ ॡ. In written materials, the length of the

<sup>10</sup> Molesworth, 1857: 58. <sup>11</sup> Naik, 1971: 330.

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 Indian currency system is traditionally based on the unit of the *rupayā* (रुपया), normally Anglicized as “rupee.” The *rupayā* is comprised of smaller units called the *ānā* (आना); there are 16 *ānā* in 1 *rupayā*. The *ānā* consists of smaller units called the *pāī* (पाई); 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>	ॐ	6 <i>ānā</i>	॥ॐ	10 <i>ānā</i>	॥ॐ	14 <i>ānā</i>	॥ॐ
3 <i>ānā</i>	ॐ	7 <i>ānā</i>	॥ॐ	11 <i>ānā</i>	॥ॐ	15 <i>ānā</i>	॥ॐ
4 <i>ānā</i>	ॐ	8 <i>ānā</i>	॥ॐ	12 <i>ānā</i>	॥ॐ	1 <i>rupayā</i>	३

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

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

Another method uses a combination of fraction signs and digits:

1 <i>pāī</i>	ॐ	4 <i>pāī</i>	ॐ	7 <i>pāī</i>	ॐ	10 <i>pāī</i>	ॐ
2 <i>pāī</i>	ॐ	5 <i>pāī</i>	ॐ	8 <i>pāī</i>	ॐ	11 <i>pāī</i>	ॐ
3 <i>pāī</i>	ॐ	6 <i>pāī</i>	ॐ	9 <i>pāī</i>	ॐ	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), which is equal to four *pāī*.<sup>12</sup> Thus, ॐ 3 *pāī* = 1 *paisā*; ॐ 6 *pāī* = 2 *paisā*; ॐ 9 *pāī* = 3 *paisā*; and 4 *paisā* = 1 *ānā*. The quantity ॐ 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*.<sup>13</sup> Thus, the quantity ॥ॐ represents both “13 *ānā*” and “3 *pavalī*, 1 *ānā*.”

**Variants** The NORTH INDIAN RUPEE MARK appears in several printed texts as a mark similar to 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 because the appropriate character is absent from the font. This mark is a variant form of the NORTH INDIAN RUPEE MARK, not an independent or script-specific mark. The practice of using the right-parenthesis is evidenced in texts printed in Devanagari (Figure 6) and Gurmukhi (Figure 7). These figures show the use of parentheses for the intended purpose as well as the use of the right-parenthesis to denote the rupee mark. A comparison of the dual use of the right-parenthesis within a single specimen

<sup>12</sup> In British grammars, *pāī* is called ‘pie’ (and its plural ‘pies’) and *paisā* is referred to as ‘pice.’ <sup>13</sup> Darby, 1915: 105.

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.

**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 *pāṛ*. Since decimalization, the use of the NORTH INDIAN 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). It appears in Indic scripts as the syllable *ru*, which is an abbreviation for *rupayā*; for example, Devanagari रुपया is abbreviated रु०. Rupee signs for Bengali, Gujarati, and Tamil are already encoded in the UCS: ৳ U+09F3 BENGALI RUPEE SIGN, રૂ U+0AF1 GUJARATI RUPEE SIGN, and ரூ 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).

## 4.6 Quantity Mark

₹ NORTH INDIAN QUANTITY MARK

**Description** The NORTH INDIAN 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 INDIAN 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 INDIAN 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: 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.

**Notation of Weights** The traditional north Indian 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 *chaṭāṃk* (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 INDIAN 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 ser	१	11 ser	११	21 ser	२१	31 ser	३१
2 ser	२	12 ser	१२	22 ser	२२	32 ser	३२
3 ser	३	13 ser	१३	23 ser	२३	32 ser	३२
4 ser	४	14 ser	१४	24 ser	२४	32 ser	३२
5 ser	५	15 ser	१५	25 ser	२५	32 ser	३२
6 ser	६	16 ser	१६	26 ser	२६	32 ser	३२
7 ser	७	17 ser	१७	27 ser	२७	32 ser	३२
8 ser	८	18 ser	१८	28 ser	२८	32 ser	३२
9 ser	९	19 ser	१९	29 ser	२९	39 ser	३९
10 ser	१०	20 ser	२०	30 ser	३०	1 man	१

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

1 <i>chaṭāṃk</i>	१	5 <i>chaṭāṃk</i>	५	9 <i>chaṭāṃk</i>	९	13 <i>chaṭāṃk</i>	१३
2 <i>chaṭāṃk</i>	२	6 <i>chaṭāṃk</i>	६	10 <i>chaṭāṃk</i>	१०	14 <i>chaṭāṃk</i>	१४
3 <i>chaṭāṃk</i>	३	7 <i>chaṭāṃk</i>	७	11 <i>chaṭāṃk</i>	११	15 <i>chaṭāṃk</i>	१५
4 <i>chaṭāṃk</i>	४	8 <i>chaṭāṃk</i>	८	12 <i>chaṭāṃk</i>	१२	1 ser	१

- There is regional variation in the positioning of the NORTH INDIAN 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: १ (1 *ser*), १० (10 *ser*), १५ (15 *ser*), २० (20 *ser*), २५ (25 *ser*), ३० (30 *ser*), ३५ (35 *ser*), etc. When *ser* is written like this, quarter units of *chaṭāṃk* are written with the NORTH INDIAN QUARTER MARK in order to distinguish १० (10 *ser*) from १० (4 *chaṭāṃk*), १० (10 *ser*) from १० (8 *chaṭāṃk*), etc.
- There are regional methods of grouping *chaṭāṃk* 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 *chaṭāṃk*.” Thus, the quantity ११ represents both the values “11 *chaṭāṃk*” and “2 *pāo*, 3 *chaṭāṃk*.”

**Notation of Measures** The system of measure is based on the *bīghā* (बीघा). One *bīghā* is equal to 20 *kaṭṭhā* (कट्ठा), 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>	१	6 <i>kaṭṭhā</i>	६	11 <i>kaṭṭhā</i>	११	16 <i>kaṭṭhā</i>	१६
2 <i>kaṭṭhā</i>	२	7 <i>kaṭṭhā</i>	७	12 <i>kaṭṭhā</i>	१२	17 <i>kaṭṭhā</i>	१७
3 <i>kaṭṭhā</i>	३	8 <i>kaṭṭhā</i>	८	13 <i>kaṭṭhā</i>	१३	18 <i>kaṭṭhā</i>	१८
4 <i>kaṭṭhā</i>	४	9 <i>kaṭṭhā</i>	९	14 <i>kaṭṭhā</i>	१४	19 <i>kaṭṭhā</i>	१९
5 <i>kaṭṭhā</i>	५	10 <i>kaṭṭhā</i>	१०	15 <i>kaṭṭhā</i>	१५	1 <i>bīghā</i>	१

- 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>	१	6 <i>dhūr</i>	६	11 <i>dhūr</i>	११	16 <i>dhūr</i>	१६
2 <i>dhūr</i>	२	7 <i>dhūr</i>	७	12 <i>dhūr</i>	१२	17 <i>dhūr</i>	१७
3 <i>dhūr</i>	३	8 <i>dhūr</i>	८	13 <i>dhūr</i>	१३	18 <i>dhūr</i>	१८
4 <i>dhūr</i>	४	9 <i>dhūr</i>	९	14 <i>dhūr</i>	१४	19 <i>dhūr</i>	१९
5 <i>dhūr</i>	५	10 <i>dhūr</i>	१०	15 <i>dhūr</i>	१५	1 <i>kaṭṭhā</i>	१

**Variants** The proposed shape of  $\int$  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 5 for further discussion).

**Homoglyphs** The quantity mark resembles  $\text{ऽ}$  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.

## 5 Signs Not Proposed

The specimens show other signs used for writing quantities for weights and measures. However, it is unclear whether these signs are independent signs or if they are variants of the NORTH INDIAN QUANTITY MARK. The contexts in which these signs occur strongly suggest that they are graphical or regional variants of the NORTH INDIAN QUANTITY MARK and, therefore, do not require separate encodings.

### 5.1 Signs for Units of Weight

Scholberg shows the use of NORTH INDIAN QUANTITY MARK to write both *chaṭāṃk* and *ser*.<sup>14</sup> However, Grierson shows the use of seemingly distinct signs for writing these quantities. The *chaṭāṃk* values are written with the sign  $\int$ :<sup>15</sup>

*Chhatāṃks*  $\int$  1,  $\int$  2,  $\int$  3,  $\int$  4,  $\int$  5,  $\int$  6,  $\int$  7,  $\int$  8,  $\int$  9,  $\int$  12.

The *ser* values are written with the sign  $\text{᳚}$ :<sup>16</sup>

*Sers*  $\text{᳚}$  1,  $\text{᳚}$  2,  $\text{᳚}$  3,  $\text{᳚}$  4,  $\text{᳚}$  5,  $\text{᳚}$  6,  $\text{᳚}$  7,  $\text{᳚}$  8,  $\text{᳚}$  9,  $\text{᳚}$  10,  $\text{᳚}$  11,  $\text{᳚}$  20,  $\text{᳚}$  30.

While Grierson's sign  $\int$  is identical to  $\int$  NORTH INDIAN QUANTITY MARK, Grierson's  $\text{᳚}$  is visually distinct from the  $\int$  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 INDIAN QUANTITY MARK in print indicates a degree of standardization of the quantity sign (see Figure 25). Raya's example of weight notation in the Maithili script shows the use of the NORTH INDIAN 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  $\text{᳚}$  is idiosyncratic. It is most likely a swash variant of  $\int$ , 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  $\text{᳚}$  as either a unique sign or variant of  $\int$ , the manner of writing *ser* in Grierson's example indicates that the  $\text{᳚}$  sign is semantically identical to  $\int$  NORTH INDIAN QUANTITY MARK. As such, a separate encoding for  $\text{᳚}$  is unnecessary and it can be unified with NORTH INDIAN QUANTITY MARK.

<sup>14</sup> Scholberg, 1940: 90–91. <sup>15</sup> Grierson, 1899: Plate IV. <sup>16</sup> Grierson, 1899: Plate IV.

## 5.2 Signs for Units of Measure

Several specimens describe the notation used for units of measure. The system of notation in some specimens suggests that signs used for marking units of measures are variant forms of the NORTH INDIAN 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 INDIAN QUANTITY MARK.

Grierson shows two signs used for writing the *kaṭṭhā* and *dhūr* units of measure. The manner of writing *kaṭṭhā* values in Grierson is:<sup>17</sup>

*Kaṭṭhās* १ १, २ २, ३ ३, ४ ४, ५ ५, ६ ६, ७ ७, ८ ८, ९ ९, १० १०, ११ ११.

The notation for the *dhūr* unit is:<sup>18</sup>

*Dhurs* १ १, २ २, ३ ३, ४ ४, ५ ५, ६ ६, ७ ७, ८ ८, ९ ९, १० १०, ११ ११, १२ १२.

The form of the sign for *kaṭṭhā*, १, is similar to the sign used for writing *chaṭāṃk* in the same specimen:<sup>19</sup>

*Chaṭāṃks* १ १, २ २, ३ ३, ४ ४, ५ ५, ६ ६, ७ ७, ८ ८, ९ ९, १० १०, ११ ११, १२ १२.

Jha's example in Figure 21 corroborates the assertion that the signs for *kaṭṭhā* and *chaṭāṃk* in Grierson are identical. Jha 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 Raya, as shown in Figure 22. Based on such use, it is highly likely that Grierson's sign for *kaṭṭhā* is either variant of NORTH INDIAN QUANTITY MARK or identical to it. Thus, the *kaṭṭhā* sign may be unified with the quantity mark.

Grierson's sign ॥ used for writing the *dhūr* unit is entirely distinct from the NORTH INDIAN QUANTITY MARK. However, it is unclear whether ॥ is an independent sign or a composite character created by writing the *kaṭṭhā* sign १ twice. Grierson is the only source in which the *dhūr* unit is written in this manner. Jha 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 INDIAN QUANTITY MARK. Grierson's *dhūr* sign ॥ be produced, if necessary, by writing the NORTH INDIAN QUANTITY MARK twice as ॥.

## 6 Relationship to Other Indian Notation Systems

There are several historical and contemporary regional accounting and numerical notation systems associated within Indic writing systems. A brief description of method of writing fractions and unit marks in these systems is given here for the purpose of illustrating the differences between them and the north Indian accounting and numerical notation signs.

<sup>17</sup> Grierson, 1899: Plate IV. <sup>18</sup> Grierson, 1899: Plate IV. <sup>19</sup> Grierson, 1899: Plate IV.

## 6.1 Gujarati Fractions

In 2004, the Government of India presented a proposal (L2/04-358) to encode the fractions one-quarter (¼), one-half (½), and three-quarters (¾) 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.<sup>20</sup> Indeed, as is shown in the present proposal, the fractions are used to write currency, weight, measure, and time values. The use of fractions to denote time is not a practice unique to Gujarati; fractions 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 INDIAN FRACTION ONE QUARTER, NORTH INDIAN FRACTION ONE HALF, and NORTH INDIAN 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 fractions in the Devanagari and Gujarati scripts further support the recommendation that such accounting signs be encoded in a script-independent block suitable for use in all scripts.

## 6.2 Bengali Currency Marks and Fractions

There existed in Bengal an accounting 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:

↵	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
¼	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 (see Figure 30). The major difference between the Bengali and north Indian systems is the method of representing fractions. The Bengali system uses “currency numerators,”<sup>21</sup> while the north Indian system uses additive fraction signs; for example / U+09F4 BENGALI CURRENCY NUMERATOR ONE may be used to represent ¼ NORTH INDIAN FRACTION ONE SIXTEENTH, etc.

Similar to the north Indian currency system, the Bengali system has the units *rupayā* (রপয়) [or *ṭākā* (টাকা)], *ānā* (আনা), and *pāi* (পাই). 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 Indian system, the value “15 *rupayā* and 3 *ānā*” is written as १५ ॐ.

<sup>20</sup> Muller, 2004. <sup>21</sup> The use of the term “currency numerators” for these signs is incorrect. They are also used for writing quantities besides currency.

### 6.3 Malayalam Fractions and Letter-Numerals

Numerical notation in South Indian scripts is represented through 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 numerical notation in Malayalam differs significantly from the north Indian scripts. For example,  $\text{൬}$  U+0D28 MALAYALAM LETTER NA represents “1” (Figure 31). Malayalam fractions are also written in a fashion entirely distinct from the north Indian method (Figure 32).

### 6.4 Raqm Fractions and Rupee Mark

The رقم *raqm* digits are an extension of the Perso-Arabic script used for the keeping of accounts in South Asia. Unlike the Arabic-Indic and Eastern Arabic-Indic digits, Raqm digits are written right-to-left. Raqm has four signs for writing fractions. It also has a rupee mark. The fraction  $\frac{1}{4}$  is indicated by the sign  $\text{¼}$ ; the fraction  $\frac{1}{2}$  by the sign  $\text{½}$ ; the fraction  $\frac{3}{4}$  by the sign  $\text{¾}$ ; and a whole by the sign  $\text{۱}$ . The rupee mark is  $\text{₹}$ . The rupee mark appears after the fraction when currency values are written:  $\text{₹} \frac{10}{4}$  “10 *rupayā* and  $\frac{1}{2}$  *ānā*.” The *pāi* value is also written with the rupee mark, and in some cases the word “پائی” *pāi* is written after the mark:  $\text{₹} \frac{1}{4}$  “one *ānā* and 6 *pāi*.” In the north Indian system, the value “one *ānā* and 6 *pāi*” would be written as  $\text{॥}$ .

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











xx00		
0		xx00;NORTH INDIAN FRACTION ONE SIXTEENTH;No;0;L;;;1/16;N;;;;;
		xx01;NORTH INDIAN FRACTION ONE EIGHTH;No;0;L;;;1/8;N;;;;;
		xx02;NORTH INDIAN FRACTION THREE SIXTEENTHS;No;0;L;;;3/16;N;;;;;
		xx03;NORTH INDIAN FRACTION ONE QUARTER;No;0;L;;;1/4;N;;;;;
		xx04;NORTH INDIAN FRACTION ONE HALF;No;0;L;;;1/2;N;;;;;
1		xx05;NORTH INDIAN FRACTION THREE QUARTERS;No;0;L;;;3/4;N;;;;;
		xx06;NORTH INDIAN INDEPENDENT FRACTION ONE QUARTER;No;0;L;;;1/4;N;;;;;
		xx07;NORTH INDIAN INDEPENDENT FRACTION ONE HALF;No;0;L;;;1/2;N;;;;;
2		xx08;NORTH INDIAN INDEPENDENT FRACTION THREE QUARTERS;No;0;L;;;3/4;N;;;;;
		xx09;NORTH INDIAN QUARTER MARK;So;0;L;;;N;;;;;
		xx0A;NORTH INDIAN PLACEHOLDER MARK;So;0;L;;;N;;;;;
3		xx0B;NORTH INDIAN RUPEE MARK;Sc;0;ET;;;N;;;;;
		xx0C;NORTH INDIAN QUANTITY MARK;So;0;ET;;;N;;;;;
4		
5		
6		
7		
8		
9		
A		
B		
C		
D		
E		
F		

Table 1: Glyph chart and character names and properties for the North Indian Accounting Signs.



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: System of notating currency in Kaithi using fractions and the currency mark (from Grierson, 1903b: 9).

પાઠે મ્હળણ્યાચી રીત			નિમકી (અર્ધાના આંક)		
૨ × ૧ = ૨	એ એકા એ	બે એકે બે	૧ × ૧૧ = ૧૧	એક અર્ધે અર્ધો	એક નિમ્મે નિમ્મે
૨ × ૨ = ૪	એ દુ ચાર	બે દુળે ચાર	૨ × ૧૧ = ૨૨	એ અર્ધે એક	બે નિમ્મે એક
૨ × ૩ = ૬	એ તરી છ	બે ત્રીક સહા	૩ × ૧૧ = ૩૩	ત્રીન અર્ધે દોઢ	ત્રીન નિમ્મે દોઢ
૨ × ૪ = ૮	એ ચોક આઠ	બે ચોક આઠ	૪ × ૧૧ = ૪૪	ચાર અર્ધે એ	ચાર નિમ્મે દોન
૨ × ૫ = ૧૦	એ પંચા દસ	બે પંચે દહા	૫ × ૧૧ = ૫૫	પાંચ અર્ધે અઢી	પાંચ નિમ્મે અઢીચ
૨ × ૬ = ૧૨	એ છક ચાર	બે સક વારા	૬ × ૧૧ = ૬૬	છ અર્ધે ત્રણ	સહા નિમ્મે ત્રીન
૨ × ૭ = ૧૪	એ સાતા ચૌદ	બે સાતે ચૌદા	૭ × ૧૧ = ૭૭	સાત અર્ધે સાડાત્રણ	સાત નિમ્મે સાડેત્રીન
૨ × ૮ = ૧૬	એ અઠા સોળ	બે આઠે સોળા	૮ × ૧૧ = ૮૮	આઠ અર્ધે ચાર	આઠ નિમ્મે ચાર
૨ × ૯ = ૧૮	એ નવા અઠાર	બે નવે અઠરા	૯ × ૧૧ = ૯૯	નવ અર્ધે સાડાચાર	નઠ નિમ્મે સાડેચાર
૨ × ૧૦ = ૨૦	એ દાન વીસ	બે દાહે વીસ	૧૦ × ૧૧ = ૧૧૦	દસે અર્ધે પાંચ	દહા નિમ્મે પાંચ

#### વ્યવહારાંતીલ પૂર્ણાંક-અપૂર્ણાંક

૦૧	પા	પાવ	૧૧	સવા	સવા	૨૧	સવાએ	સવાદોન
૦૨	અર્ધો	અર્ધા, નિમ્મા	૧૨	દોઢ	દોઢ	૨૨	અઢી	અઢીચ
૦૩	પોણો	પાઝળ	૧૩	પોણાએ	પાવળેદોન	૨૩	પોણાત્રણ	પાવળેત્રીન

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: ૧, ૨, ૩, ૪, ૫, ૬, ૭, ૮, ૯, ૧૦, = 1, 2, 3, &c. Fractions are written thus:— $\frac{1}{4}$  = ૦૧;  $\frac{1}{2}$  = ૦૨;  $\frac{3}{4}$  = ૦૩; as  $1\frac{1}{2}$  = ૧૨;  $3\frac{3}{4}$  = ૩૩.

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

बहिष्कृतमाग १२

क०००००००	नामसि	उ०००००००	नामसि
३३३३३३३३३३	क	००००००००००	र
९९९९९९९९९९	ख	००००००००००	ल
००००००००००००	ग	५५५५५५५५५५	व
६६६६६६६६६६	घ	६६६६६६६६६६	स
००००००००००००	ज	००००००००००००	ह
५५५५५५५५५५	ब	३३३३३३३३३३	अ
७७७७७७७७७७	ळ	६६६६६६६६६६	ई
९९९९९९९९९९	ज	७७७७७७७७७७	उ
७७७७७७७७७७	झ	९९९९९९९९९९	ड
८८८८८८८८८८	ट	आनापाई आनाप	
८८८८८८८८८८	ठ	१	१।
९९९९९९९९९९	ड	२	२।
७७७७७७७७७७	ढ	३	३।
५५५५५५५५५५	त	४	४।
००००००००००००	थ	५	५।
९९९९९९९९९९	द	६	६।
५५५५५५५५५५	ध	७	७।
००००००००००००	न	८	८।
५५५५५५५५५५	प	९	९।
००००००००००००	फ	१०	१०।
५५५५५५५५५५	ब	११	११।
९९९९९९९९९९	भ	१२	१२।
००००००००००००	म	१३	१३।
००००००००००००	य	१४	१४।

Figure 5: A specimen showing the use of fractions and the currency symbol to write *ānā* and *pāi* in the Mahajani script (from *Mahājanīsārahissāavvalavadoyama*, 18-?: 12).

## 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 गौ	श्री अभय ॥।)
वैदिक अध्यात्म विद्या	श्री भगवद् १।)
वैदिक स्वप्न-विज्ञान	श्री भगवद् २)
वेद गीताञ्जली [ वैदिक गीतीयां ]	श्री वेदव्रत २)
वैदिक सूक्तियां	श्री रामनाथ १।।।)
वह्ण की नौका [ दो भाग ]	श्री मियत्रत ६)
सोम-सरोवर, सजिल्द, अजिल्द	श्री चम्पूति 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 गीतीयां ]	१)
आर्यसमाज और विचार-संसार	श्री चम्पूति 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 ‘चूर्णिका’ 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 ( मल्लिनाथी टीका ) सम्पूर्ण ३)
महाकवि कल्हणकृत राजतरङ्गिणी भाषा टीका २०)	रघुवंश भा० टी० सम्पूर्ण ३)
कौटिलीय अर्थशास्त्र भा० टी० ८)	मेघदूत मल्लिनाथी 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।।)	लघुपत्रिका ( बड़ी ) १०) सै० ।
नाड़ीज्ञानदर्पण भा० टी० ॥।)	

( 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  
मराठीत विस्तृत विवरणासह व प्रक्रियेसह

## सुबोध भाषांतर

विवरणकर्ता

कै० रावबहादुर ना. दा. वाडेगांवकर, एम्. ए.  
सेवानिवृत्त डिस्ट्रिक्ट व सेशन जज, नागपूर.

किंमत ७॥ रु.

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  
ॐ  
मध्यसिद्धान्तकौमुदी  
प्रभाकरौ-विभूति-सहिता परमोपयोगि-परिशिष्ट-विशिष्टा च  
हिन्दीभाषानुवाद-संवलितान् अन्ते प्रश्नोच्चारण-सहिता च  
सम्पादको विभूतिकारश्च—  
पण्डित-श्रीरामनारायणशर्म-तनूजन्मा  
श्रीविश्वनाथशास्त्री 'प्रभाकरः'  
( प्रिंसिपल, श्रीसरस्वती-संस्कृत-कालेज खन्ना पञ्जाब )  
उपसम्पादकः परिशिष्टकारश्च—  
कविकान्तः श्रीनिगमानन्दशास्त्री हिन्दीप्रभाकरो विद्यालङ्कारः

प्रकाशकः  
मोतीलाल बनारसदास

पो० न० ७५ बाराखसी  
( बनारस )

द्वितीयं संस्करणम्  
२०००

सन् १९५६

{ मूल्यम् ५॥ }

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

इतिहास ज़रुरी है पढ़ो  
प्रसिद्ध है कि इस दुकान पर हर क्रि. म. के कापे की पुस्तकें भरी  
फारसी-नागरी-अंग्रेजी-की मिलती हैं। जिन साहबों के ज़रूरत  
हो वोह कीमत भेज कर या वेल्थ पीविल मंगाले। और असली  
पत्रों जैनी जीयालाल ज्योतिषालीन वासी फरुखनगर का यहीम  
लता है। और जो साहब पेन के खरीदें वोह पेन के दोह का पद कर  
रंग दे। क्योंकि जीयालाल अब बहुत से बन बैठे हैं और धोका देने  
के वास्ते किसी ने अपने पेन पर पण्डित जीयालाल और कि सी  
ने जीयालाल लिख दिया है। अब जो साहब खरीदें वोह दोह के  
पद कर खरीदें। दोहो। अजर अमर असरा सरा अविनाशी और  
कार। आदि कुमीर शुभ परम गुरु चंदा बास्वार ॥ १॥ क्योंकि बहुत  
तसे आदमी धोखा खा जाते हैं और पत्रा असली बम्बई का पण्डित  
श्रीधर शिवलाल का भी इस दुकान से मिलता है। और सागीत  
होथरस वालों के सब तरफ के सब तरफ के हमारे यहाँ से नुद है। और  
साग पूरन भक्त ॥ अनिक और साग अमर सिंह और ॥ ॥ ॥  
का और भजन शंकर दास के और भजन फूल सिंह के सब तरफ के उ  
ई नागरी के मोद है जिस कदर ज़रूरत हो वेल्थ पीविल इस पत्र से  
मंगाले। और निहायत ही उम्दा शेरनाई जिस के घाटने व कान  
ने की कोइ ज़रूरत नहीं है। जो कि खालिस सरसों के तेल के का  
मूल से तयार की गई है। ॥ ॥ ॥ सेर से ६ सेर तक का कद प्रेम गाकर देती  
पता ॥ गंगा दास मुशीलाल जैनी  
जुजर कुतब दरीबा देहली  
पता ॥ गंगा दास मुशीलाल जैनी ताजर कुतब दरीबा कल्या देहली ॥

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

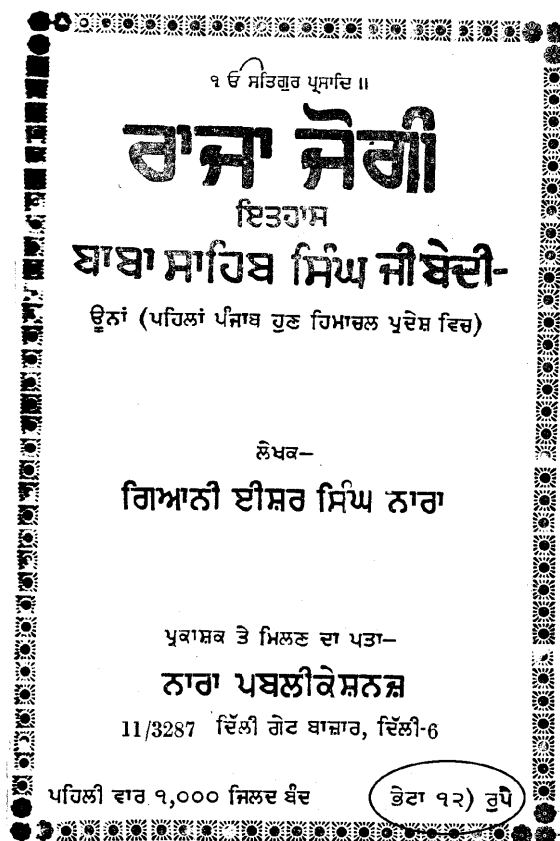


Figure 11: Title page showing the use of the rupee mark and fractions to denote price in the Gurmukhi script. The Latin right-parenthesis is used for the rupee mark.

ਖੁਦਾਈ ਹੋ ਰਹੀ ਸੀ। ਤਾਂ ੨੫ ਜੂਨ ੧੯੫੪ ਨੂੰ ਸ਼ਾਮ ਦੇ ਪੰਜ ਵਜੇ ਕੁਝ ਮਜ਼ਦੂਰਾਂ ਨੂੰ ਚਮਕ-ਚਮਕ ਕਰਦਾ ਸੋਨੇ ਦੀਆਂ ਕੋਲੀਆਂ ਦਾ ਇਕ ਤੁੰਗਸ (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 ਮਧਸੂਦਨ 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) ਅਣਾਰਾਂ ਹਜ਼ਾਰ 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 ਤੀੜ 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 ਗਡਵੀਆਂ ਭੀ ਹੋਣੀਆਂ ਚਾਹੀਦੀਆਂ ਹਨ। ਅਤੇ ਪੁਲੀਸ ਅਫਸਰ ਬੜੀ ਸਰਗਰਮੀ ਨਾਲ ਨੌਂ ਹੋਰ ਮਜ਼ਦੂਰਾਂ ਦੀ ਵਲਾਸ਼ 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 pies=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 pies.

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  $\text{₹}$  after it.  $₹5 = 5 \text{ Rs.}$   $₹2 = 2 \text{ Rs.}$

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

Thus —  $\text{₹}$  or  $\text{₹}$  is 1 anna,  $\text{₹}$  or  $\text{₹}$  is 3 annas,  $\text{₹}$  is 4 annas,  $\text{₹}$  is 6 annas,  $\text{₹}$  is 15 annas, etc.

Pice are indicated by similar horizontal strokes written to the right hand of this  $\text{₹}$ . 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 *pie*. Rs. 5-4-3 means 5 rupees, four annas, 3 pies (*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)= 1 pice.

४1=)11 = Rs. 4-7.6; १२11-)111 = Rs. 12-9-9  
111=)1 = 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).

Fractions.					
$\frac{1}{4}$	१. पाव.	$2\frac{3}{4}$	२।। पावणेतीन.	$\frac{1}{2}$	$\frac{3}{4}$ एकद्वितीयांश.
$\frac{1}{2}$	१।. अर्धा.	$3\frac{1}{4}$	३। सवातीन.	$\frac{1}{3}$	$\frac{1}{6}$ एकतृतीयांश.
$\frac{3}{4}$	१।।. पाऊण.	$3\frac{1}{2}$	३। साडेतीन.	$\frac{1}{4}$	$\frac{1}{2}$ एकचतुर्थीश.
$1\frac{1}{4}$	१। सव्वा.	$3\frac{3}{4}$	३।। पावणेचार.	$\frac{1}{5}$	$\frac{1}{10}$ एकपंचमांश.
$1\frac{1}{2}$	१। दीड.	$4\frac{1}{4}$	४। सवाचार.	$\frac{1}{6}$	$\frac{1}{12}$ एकशष्ठांश.
$1\frac{3}{4}$	१।। पावणेदोन.	$4\frac{1}{2}$	४। साडेचार.	$\frac{1}{7}$	$\frac{1}{14}$ एकसप्तमांश.
$2\frac{1}{4}$	२। सवादोन.	$4\frac{3}{4}$	४।। पावणेपांच.	$\frac{1}{8}$	$\frac{1}{16}$ एकअष्टमांश.
$2\frac{1}{2}$	२। अडीच.			$\frac{1}{10}$	$\frac{1}{20}$ एकदशांश.

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

<i>Fractional Numbers.</i>	
$\frac{1}{4}$	१. पाव.
$\frac{1}{2}$	२. अर्धा-धी-धें, &c.
$\frac{3}{4}$	३. पाऊण
$1\frac{1}{4}$	४. सव्वा.
$1\frac{1}{2}$	५. दीड.
$1\frac{3}{4}$	६. पावणेदोन, पाउणेदोन.
$2\frac{1}{4}$	७. सव्वादोन.
$2\frac{1}{2}$	८. अडीच.
$2\frac{3}{4}$	९. पावणेतीन, पाउणेतीन.
$3\frac{1}{4}$	१०. सव्वातीन.
$3\frac{1}{2}$	११. साडेतीन.
$3\frac{3}{4}$	१२. पावणेचार, पाउणेचार.

Figure 17: An excerpt from a Marathi grammar showing variant forms of the independent fractions (from Navalkar, 1925: 80).

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 pice is equal to 3 Rupees 2 pavalis, 2 annas, 3 pice and 2 pies and is written ₹॥=॥३२. If any item is omitted, the sign ८ (आठ्ठी) is inserted, as २ Rupees २ annas is २८= and the sign ८ 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 (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  (or, among the Gujaráthís, ) 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 अली (*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 *paísá*, ॐ; two *paise*, ॐ; three *paise*, ॐ; one *ána*, ॐ; two *áne*, ॐ; three *áne*, ॐ; four *áne*, ॐ; eight *áne*, ॐ; twelve *áne*, ॐ. These, again, are combined, after the following manner:—Five *áne* and one *paísá*, ॐ; six *áne* and two *paise*, ॐ; eleven *áne* and three *paise*, ॐ; fourteen *áne* and one *paísá*, ॐ; one rupee, ॐ; thirty rupees and four *áne*, ॐ; two hundred and thirty-five rupees, seven *áne* and two *paise*, ॐ.

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 कट्ठा	3600	3010.058	.301	32400	.7438
कट्ठा = 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।१२।२ = दू बिगहा बारह कट्टा सात धूर।

**सारणी VIII : TABLE VIII**

मुद्रा : Money

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

**प्राचीन मुद्रा (Obsolote 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 system of measures and currency notation in the Maithili script (from Jhā, 1999: 691). Example (A) shows notation for measures using *avagraha* to represent the NORTH INDIAN QUANTITY MARK. Example (B) shows currency notation using the Latin right-parenthesis to represent the NORTH INDIAN RUPEE MARK.

पाइ	आना	टाका		कनमा	सेर
)I	)०I	I/	III/		S/ SII५
)II	)०II	I०.	III०	*	S० III०
)III	)०III	I५	III५		S५ SIII/
)I/	)५	II)	S)	*	S।० SIII०
)I/	)५I	II/	S)/		S।/ SIII५
)I/II	)५II	II०	S)०	*	S।० SS
)I/III	)५III	II५	S)५	*	S।५ SS/
)०	I)	III)	SII)		SII० SS०
					SII/ SS५
					SII० SS०

Figure 22: A method of writing currency — *pāī* (पाई), *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, ३, are used to write the quarter units of currency.

11. V devanāgarském písmě píše se čtvrt značkou । (pro čtvrt hodiny, čtvrt rupie ap., srov. § 157, 2), půl ॥, tři čtvrti ॥॥. Např.: १ ।, 1 $\frac{1}{4}$ ’, १ ॥, 1 $\frac{1}{2}$ ’, १ ॥॥, 1 $\frac{3}{4}$ ’ 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 । ‘1 $\frac{1}{4}$ ’, १ ॥ ‘1 $\frac{1}{2}$ ’, १ ॥॥ ‘1 $\frac{3}{4}$ ’, etc.

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

V údajích ceny se píše např.:	Price is written, e.g.:
रु. ५,०० (रु० ५-००) } ,pět rupií‘	‘five rupees’
५ रु.	
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 <b>rup(a)yā m.</b> ) = 16 ánũ	1 rupee (रुपया <b>rup(a)yā m.</b> ) = 16 annas
1 án (आना <b>ānā m.</b> ) = 4 paisy	1 anna (आना <b>ānā m.</b> ) = 4 pice
1 pais (पैसा <b>paisā m.</b> ) = 3 páí	1 pice (पैसा <b>paisā m.</b> ) = 3 pies
पाई <b>pāī f.</b> ,pái‘	पाई <b>pāī f.</b> ‘pie’.
Značky, kterých se užívá v devanāgarském písmě:	Signs used in the Devanāgarī Script:
१ ,jedna rupie‘	‘one rupee’
। ,čtvrt rupie‘ (srov. § 61, 11)	‘a quarter of a rupee’ (cf. § 61, 11)
५ ,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 ánũ‘	‘4 rupees 8 annas’
Rs 4—8—0 (= Rs 4/8/0)	
५ ॥॥ ८ } ,5 rupií 14 ánũ 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.

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छ १९ जिल्काद

१७४०॥= श्रीमंत माहाराज राजश्री छत्रपति स्वामी  
यांजकडे सातारियास राजश्री चिमणाजी  
माधवराव यास पेशवाईचे पदाची वस्त्रे  
आणावयास त्रिबकराव अमृतेश्वर पेठ्ये  
पाठविले होते त्यास तेथे खर्च जाहाला  
तो गुा सिंदोजी कांत्या 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 यांज-  
कडील शागीर्दपेशा  
वगैरे यांस नव्हत.

No. 253]

[23-5-1796

छ १९ जिल्काद

राजश्री चिमणाजी माधवराव यांस पेशवाईची वस्त्रे सातारियाहून आणली;  
सबब दिला हुजारत 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).	<div> <div>क ख ग घ च छ ज झ</div> <div>ट ठ ड ढ ण त थ द ध न</div> <div>प फ ब भ म</div> <div>य र ल व श ष स ह ळ क्ष ञ</div> </div>
14	Half letters (a) Consonants.	<div> <div>क् ख् ग् घ् च् छ् ज् झ्</div> <div>ट् ठ् ड् ढ् ण् त् थ् द् ध् न्</div> <div>प् फ् ब् भ् म्</div> <div>य् र् ल् व् श् ष् स् ह् ल् क्ष् ञ्</div> </div>
15	Vowel Symbols full body.	<div> <div>। ि िी िीी िीीी िीीीी िीीीीी</div> </div>
16	Vowel Symbols (a) <i>Mātrā</i> Degree.	<div> <div>ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ</div> <div>ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ</div> </div>
17	Vowel Symbols (b) <i>Ukār</i> Degree.	<div> <div>ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ ˆ</div> </div>
18	Letters *for conjuncts on <i>Ukār</i> degree.	<div> <div>उ क ळ क ख ग ज ङ</div> <div>त न म र ल ल व</div> </div>
19	Conjunct letters Full body.	<div> <div>कु क्क क्क क्क क्क क्क क्क</div> <div>ख्ख ग्ग म्म ग्र्र घृ घृ घृ घृ</div> <div>ङ्ङ ख्ख् ख्ख् ख्ख् ख्ख् ख्ख् ख्ख्</div> <div>ञ्ञ म्म च्च ज्ज ज्ज ज्ज ज्ज ज्ज</div> <div>ट्ट थ्थ ठ्ठ ठ्ठ ठ्ठ ठ्ठ ठ्ठ ठ्ठ</div> <div>तृ तृ तृ तृ तृ तृ तृ तृ तृ तृ</div> <div>दृ दृ दृ दृ दृ दृ दृ दृ दृ दृ</div> <div>झ्झ झ्झ झ्झ झ्झ झ्झ झ्झ झ्झ</div> <div>पृ तृ म्म म्म म्म म्म म्म म्म म्म</div> <div>ब्र ब्र वृ भृ भृ भृ भृ भृ भृ भृ</div> <div>लृ लृ लृ लृ लृ लृ लृ लृ लृ</div> <div>शृ शृ शृ शृ शृ शृ शृ शृ शृ</div> <div>सृ सृ सृ सृ सृ सृ सृ सृ सृ</div> <div>हृ हृ हृ हृ हृ हृ हृ हृ हृ</div> </div>
20	Figures.	१ २ ३ ४ ५ ६ ७ ८ ९ ०
21	Punctuation marks & signs.	<div> <div>◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻</div> <div>◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻</div> <div>◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻ ◻</div> </div>
22	Spaces.	3 to Pica, 4 to Pica, 6 to Pica, Quad ems 2, 3, 4, 1 ½.
23	Degrees.	6, 5, 4, 3, 2½, 2, 1½, 1¼, 1, ¾
Total ...		609

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

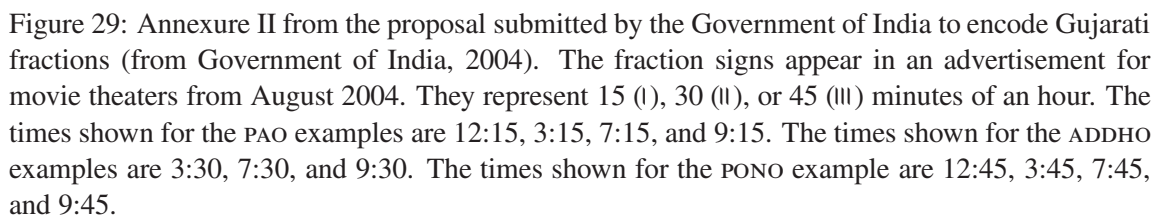
Figure 27: A specimen from the Nirnaya-Sagar Devanagari font showing the placeholder mark and the six fractions (from Naik, 1971: Table 57, after p.337). It is likely that the signs for the fractions ¼ and ½ are used for *daṇḍā* and double *daṇḍā*.

Vowel-signs, Figures and Conjuncts									
१	२	३	४	५	६	७	८	९	०
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*	5/238*		
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		7/265	5/128	5/126
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								
१	२	३	४	५	६	७	८	९	०
12/502	/108	12/109	11/110	11/111	12/235	/112	12/113	12/114	/115
12/236									
१	२	३	४	५	६	७	८	९	०
12/237	12/116*	12/117	12/118*	12/25	12/267	12/268	12/270	5/264	/351
कृ	क	ख	ग	घ	ङ	च	छ	ज	झ
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* १ २ and *Velānti-rāfār* ३ ४ overhang. They do not meet the vertibar of the letter i.e. (मार्मिक).
- (2) The *Ukārs* cast on high-species do not fit properly, distorting the look of the letter (कुणबी).
- (3) The *Mātrās* and *Ukārs* do not touch the headline and the Vertibar (मैबर, नूतन).
- (4) The double *mātrās* are too small (मैने).
- (5) Letter ५ is disproportionate in height.
- (6) Letter ६, and conjuncts of ५, ६, ७ are disproportionate. ८, ९, ० are wide in set. Letters like १ 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 INDIAN QUANTITY MARK; “12/118” is the NORTH INDIAN PLACEHOLDER MARK; and “12/266,” “12/267,” and “12/268” are NORTH INDIAN FRACTION ONE SIXTEENTH, NORTH INDIAN FRACTION ONE EIGHTH, and NORTH INDIAN 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 *daṇḍā*. Note the distinct between the NORTH INDIAN QUANTITY MARK and the *avagraha*, which appears as glyph “7/219.”



'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 $\frac{1}{4}$	১০	5 ānās	৫০	9 ānās	৯০	13 ānās	১৩০
2 ānās	২০	6 ānās	৬০	10 ānās	১০০	14 ānās	১৪০
3 ānās	৩০	7 ānās	৭০	11 ānās	১১০	15 ānās	১৫০
4 ānās or $\frac{1}{2}$	৪০	8 ānās or $\frac{1}{2}$	৮০	12 ānās or $\frac{3}{4}$	১২০		

Figure 30: Method of writing fractions and currency in the Bengali script (from Grierson, 1903a: 29)

ന	ന്ന	ന്യ	ഷ്ക	ജ്ഹ	ഹാ	ഗ	പ്ര	ദ്ര
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
൯								
ña								
100								

Figure 31: The 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	ഏഴു ഏ = 8	ഒമ്പതു ഒമ്പ = 9
മുക്കാൽ മു = $\frac{3}{4}$	അര അ = $\frac{1}{2}$	പാലു പ = $\frac{1}{4}$	അരക്കാലു 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 ന = $\frac{1}{5}$	മൂന്നു മാ ന = $\frac{3}{20}$	അരക്കാണി മുന്തിരി $\frac{1}{160} + \frac{1}{320} = \frac{3}{320}$

Figure 32: The method of writing fractions in Malayalam (from Ganesan, 2006).