Zeitschrift: L'Enseignement Mathématique

Herausgeber: Commission Internationale de l'Enseignement Mathématique

Band: 8 (1962)

Heft: 1-2: L'ENSEIGNEMENT MATHÉMATIQUE

Artikel: MODERN FUNDAMENTAL OPERATIONS IN AN EARLY ARABIC FORM: 'ANAB'S HEBREW COMMENTARY ON IBN LABBN'S KITB F USL HISB AL-HIND

Autor: Levey, Martin / Petruck, Marvin

Kapitel: 5. Ibn Labbn's influence.

DOI: https://doi.org/10.5169/seals-37970

In this figure, $588 = 436+152 = 3a^2+3ab+b^2+(3a+2b)\,b = 3a^2+6ab+3b^2 = 3\,(a+b)^2$; $42 = 3\,(a+b)$ [21]. Now, a third number (of the cube root) is sought as was the second; this gives 4 which is placed in the first line after the 14 and also after the 42 on the lowest line. Multiply the 424 of the lowest line by 4 to give 1696 and add to the third line to give 60496; multiply by 4 and subtract it from the remainder to give 116. This is shown in the diagram:

144 [22]
116
60496
424

Now, double the 4 on the right in the lowest line to give 8 or 428. Multiply this by the 4 on the right in the upper line to give 1712. Add this to the 60496 to give 62208; add 1 to the third line. The diagram is then:

144 = cube root;
116 = the remainder or 116 parts of 62209 according to ibn Labbān.

62209 [24]
428

5. Ibn Labbān's influence.

The fundamental operations of ibn Labbān are to be found reproduced almost exactly, although in much greater detail, in al-Nasawī. In the Arabic manuscript, there is a paragraph in which al-Nasawī remarks on his debt to his great teacher. The origin of ibn Labbān's algorisms is unknown. They are not so radically different from those of Indian sources to claim them as independent inventions. The main difference between the Indian algorisms and those of ibn Labbān seems to be in the shortened process effected by the latter. For example, $\{3a^2+(3a+b)\,b\}\,b$, in the cube root process, is calculated at one time to shorten the work instead of working out $3a^2\,b$, $3ab^2$, and

b^3 in cube root. Analogously in the square root operation, $2ab$ and b^2 are not reckoned separately but as one term $(2a+b)\ b$.

There is as yet no substantial evidence that ibn Labbān influenced his immediate successor mathematicians except through his student, al-Nasawī. However, it is important that the processes he used are very close to those used today so that ibn Labbān was certainly a transmitter of ancient arithmetic as well as a probable innovator in the improvement of the methods of arithmetic calculation.

Ibn Labbān's debt to the Indians, however, is clear from an early paragraph where he states, "Here I write what is necessary to establish for the general need and Hindu arithmetic, according to astronomy and according to other disciplines in the manner in which the general public uses it, whether according to the discipline as used for whole numbers or whether according to the general public's use in making change, or whatever number it is, or the general public's use for fractions refined in studies or the counted change, and for small change until he reaches the division of the numerical remainder, and for the division of the remainder of the remainder until all that is written of our statements comprises twelve chapters."

6. 'Anābî's terminology.

The Hebrew terminology is of interest since mathematicians and translators were still having difficulty in making up new termini technici even at the late date of the fifteenth century. 'Anābî's commentary, however, tries to elaborate on the new terms brought into the discussions. *Jadr* or *jadhr* in Arabic is equated to the Hebrew *shōresh*. Nowhere, however, does the commentator or ibn Labbān indicate the true understanding of the original meaning of this term as al-Khwārizmī, for example, knew it [27]. This is shown in an elementary explanation of 'Anābî.

"When he (ibn Labbān) says *jadhr*, he refers to that multiplied number or divided number, whichever it is. The example is 5 which is a root when it is either multiplied by itself, when