Al-Qalaṣ | Encyclopedia.com

(*b*. Basta [now Baza], Spain, 1412; *d*. Béja, Tunisia, December 1486)

arithmetic, algebra, [Islamic law].

Al-Qalaṣadi, the last known Spanish-Muslim mathematician, is also known by the epithets al-Qurashī and al-Basṭī, the latter referring to his place of birth. He remained in Basṭṭā until the city was taken by the Christians, at which time he began his journey through the Islamic world and studied with learned men.

Several books on arithmetic and one on algebra are attributed to al-Qalassādi. The one on algebra is a commentary on the *al-urjūzā al-Yāsmīnīya*of Ibn al-Yāsmīnī (d. 1204), which gave algebraic rules in verse. This *urjūzā* (poem) had been commented upon by several Western Muslims before al-Qalaṣādi.

One of his arithmetical works is a commentary on the *Talkhiṣ a'māl al-ḥisāb* ("Summary of Arithmetical Operations") of Ibn at-Bannā several summaries and extracts of this commentary have reached us. Al-Qalaṣādī' original work began with *al-Tahsira fi'lm at-ḥisāb*("Clarification of the Science of Arithmetic"); it proved to contain difficult material, and he therefore simplified it in Kashf al-jilbāb an ilm al-Itisdb ("Unveiling the Science of Arithmetic"). A shorter version of the same work is *Kashf al-asrār an 'ilm alḥisāb* ("Unfolding the Secrets of the Use of Dust Letters [Hindu Numerals]")The last two are said to have been used in some schools of North Africa for several generations, and the last is the work studied by F. Woepcke in his "Traduction du traite d' ariithmetique d'Aboul-Hacan Alī Ben Mohammed Alklcadi" (Atti dell' Accademia Pontificia d' nuovi lincei),**12** [1858–1859], 399–438)

Since the 1850s' al-Qalaṣādī has been credited with the following:

Dealing with the sequences Σn^2 and Σn^3.

Using the method of successive approximations for obtaining the roots of imperfect squares.

Using symbols in algebraic equations.

In the light of our present knowledge, the following can be stated:

First, al-Qalaṣādi has claim to priority in the field of sequences. Those that he treated and more advanced ones, such as those of polygonal and pyramidal numbers, had been treated by Abū Mansur al-Baghadaādī (*d*1037) and al-Umawī al-Andalusī (*ft*. fourteenth century).

Second, the method of finding square roots by successive approximation had been known to the Greeks and, probably, the Babylonians. In principle, it states that if r_1 is an approximation $\sqrt{n}$,of then let $r_2 = n/r_1$ and a better approximation is $r_3 = l/2(r_1 + r_2)$.

This method must have been known to the arithmetician of eastern Islam, but they seem to have preferred to find roots, expressed in sexagesimāl fractions in almost the same way we use to find them to any desired decimāl place. Al-Qalaṣādi, however, is the first mathematician known to have stressed it.

Third, al-Qalaṣādi used both short Arabic words and letters as symbols. The short words are

wa(and) for addition

illā(less) for subtraction

fi(times) for multiplication

'alā(over) for division.

Letters were also used to designate certain terms; these correspond to:

j for *jadhr* (root)

sh (from *shay*, "thing"), or (the diacritical points from *shay*) for x.

m for *māl* (x^2)

k for kaʿb (x^3)

mm for *mal mal* (x^4)

l (from the verb *yaʿdilu*) for equaliīty.

The letters. more than the words, indicate a sense of symbolism. But al-Qalaṣādi has no claim to priority here, either; the same symbols were used in the same way by Ibn Qunfudh of Algiers (*d* 1407/1408) and Ya'qyb Ibn Ayyub of Morocco (*fl. ca.* 1350), and many earlier writers in the East.

Like similar works from the thirteenth century on, al-Qalaṣādi' writings show Arabic arithmetic and algebra when their constituents-ancient manipulational tradition, Hindu techniques, and Greek number theory—-are combined to form one entity. But they also reflect a civilization on the wane, for most of them are commentaries, summaries, or summaries of summaries of works by al-Qalaṣādi himself or by others.

BIBLIOGRAPHY

See C. Brockelmann, *Geschichte der arabischen literatur*, **II,** pt. 2 (Leiden, 1949), 343–344, and supp. **II** (Leiden, 1938), 363–369; al-Maqqari, *Nafh al-tib*, Ihsan 'Abbas, ed., II (Beirut, 1968), 692–694; and H. Suer, *Die Mathematiker und Astronomen der Araber und ihre Werke* (Leipiz, 1900) no. 444, pp. 180–182. The best Arabic bilography of al-Qalaṣādi is perhaps that written by M. Souissi of the University of Tunisia in the University Periodical, **9** (1972), 33–49.

A. S. Saidan