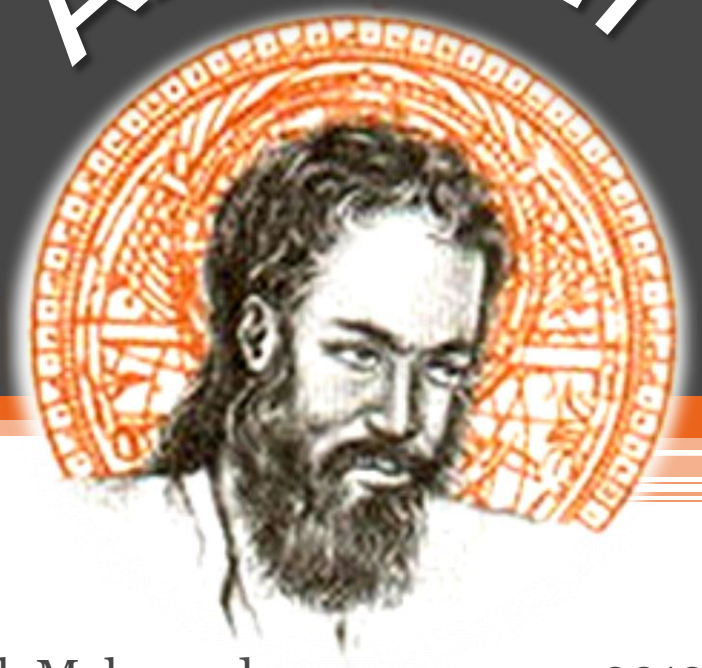
AL-Kashi



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Section 4

AL-Kashi

- Ghiyath al-Din Jamshid Mas'ud Al-Kashi
- ca. 1380 (Kachan, Iran) – 1429 (Samarkand , Uzbekistan)
- He is a scientist at an observatory and learning center established in Samarkand by the prince Ulugh Beg, a grandson of the Mongol conqueror Tamerlane.” (Zhang,C.2011)
- He “wrote numerous works in Persian and Arabic, contributing to mathematics and astronomy .” (Zhang,C.2011)
- His book “Miftah al-Hussab” (Key to Arithmetic) “provides sufficient knowledge of mathematics for those who are working on astronomy, surveying, architecture, accounting and trading.”

His Achievements

- "He wrote important texts applying arithmetic and algebra to problems in astronomy, measurement and accounting.
- He worked with binomial coefficients. $\binom{n}{k} = \frac{n!}{k!\,(n-k)!} \quad \text{for} \quad 0 \leq k \leq n.$
- He invented astronomical calculating machines.
- He invented the Law of Cosines.
- Approximated π into 16 digits .
- invention of decimal fractions (though he worked mainly with sexagesimal-60 fractions)" Allen,J.(2015).

Approximate π into 17 digits

Al-Kashi measured the circumference of an equal sided polygon that is surrounded by a circle, and another that is surrounded by a circle that has $3 \times 2^{28} = 805306368$ sides

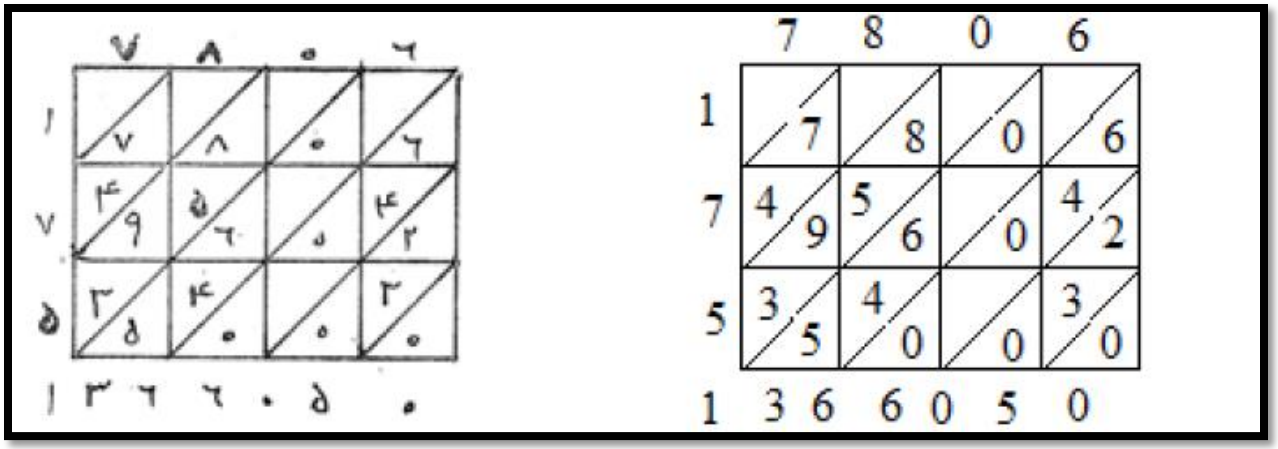
He presumed that the circumference of a circle is equal to the median of the two results, and he arrived at this conclusion (in the sexagesimal system): p = 3;8, 29, 44, 0, 47, 25, 53, 7, 25

He transformed it into the decimal system:

p = 3. 14 159 265 358 979 325

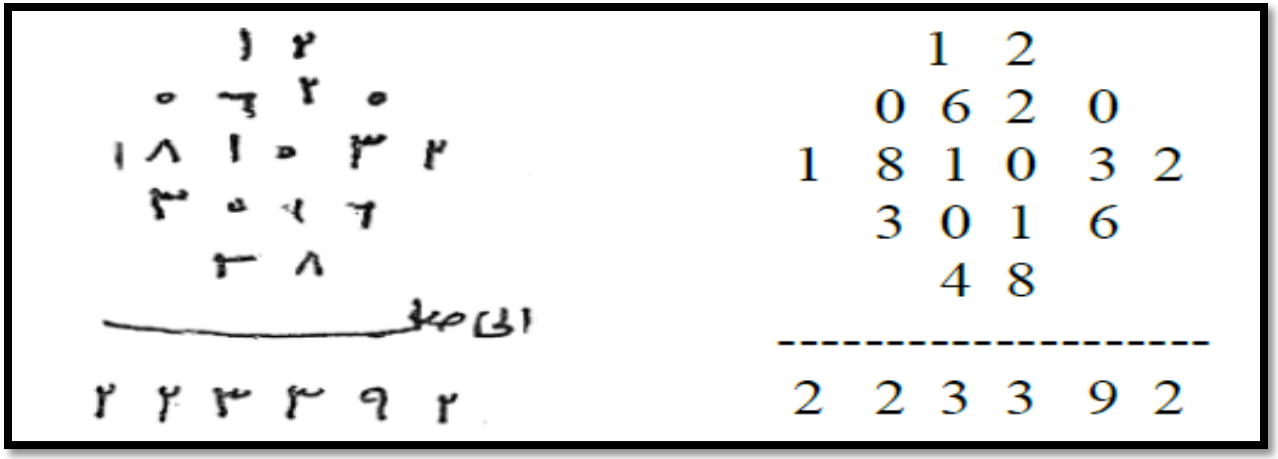
Multiple algorithms

Al-kashi described five multiplication algorithms in his Key to Arithmetic



	7	8	0	6
1	7	8	0	6
7	4 9	5 6	0	4 2
5	3 5	4 0	0	3 0

1 3 6 6 0 5 0

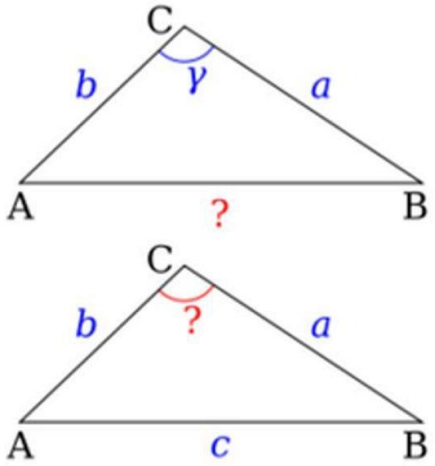


		1	2		
	0	6	2	0	
1	8	1	0	3	2
	3	0	1	6	
		4	8		

2 2 3 3 9 2

Law Of Cosines

- Used to calculate one side of a triangle the angle of the opposite side and the other sides are known.
- Euclid's elements (c.300 B.C.) has the main concepts that lead to this law



Théorème d'Al-Kashi

- Al Kashi provided accurate trigonometric tables.
- He also expressed the theorem in a suitable form for the modern usage.
- In French , the law of cosines in named **théorème d'Al-Kashi** after al-kashi unification of the exiting works on the subject.

Any Question?

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