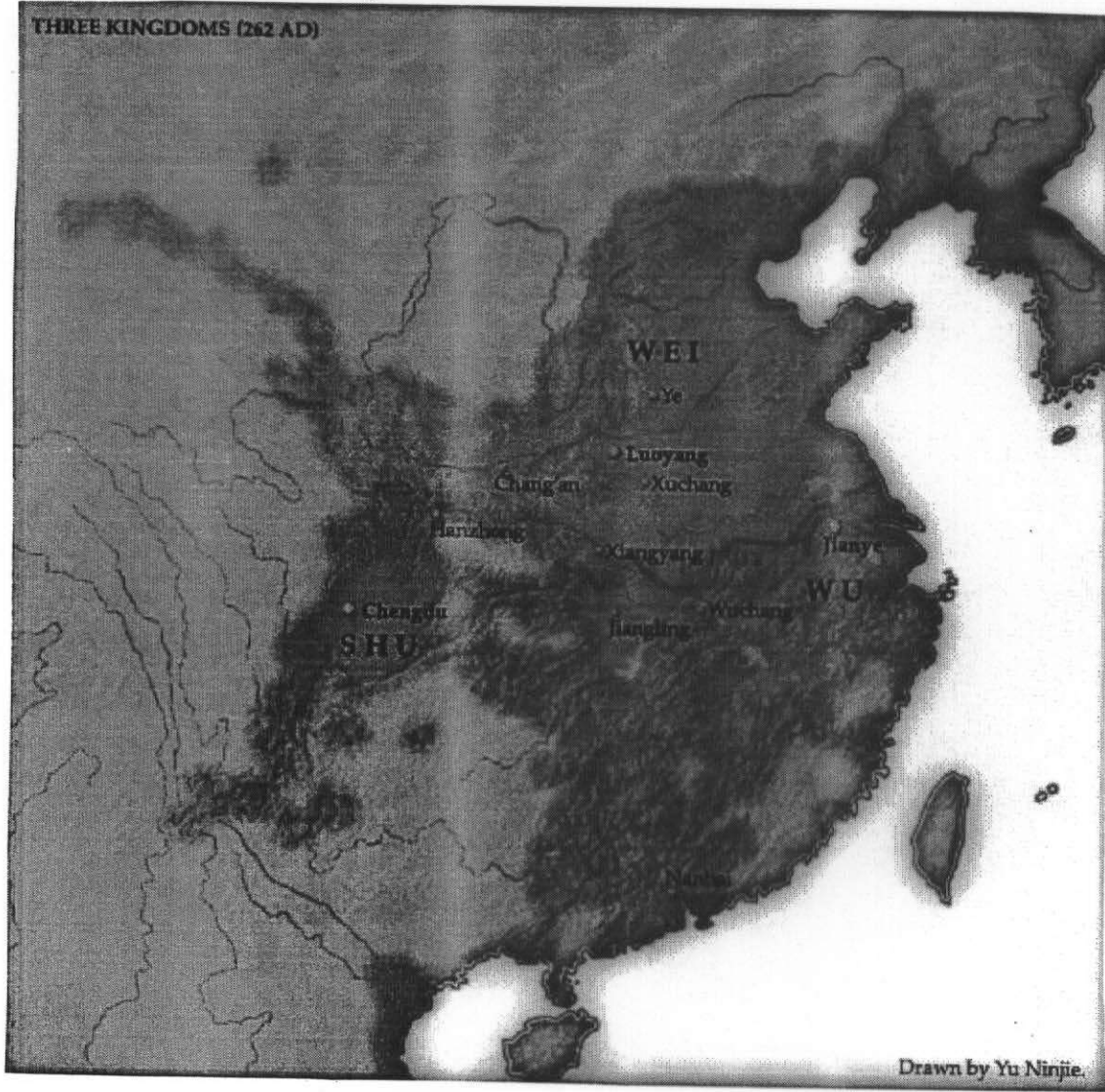


至以兩表相去二千里
 影差二寸為法除之得
 表端上至日八萬里也
 下為句日高為股句股
 得邪至日從解所旁至口
 萬里為股為之求弦句
 之法即邪至日之所也
 所法先置南至日底六
 三十六億為句實更置日
 自乘得六十四億為股實日
 為弦實開方除之得從
 十萬里問徑幾何曰一千

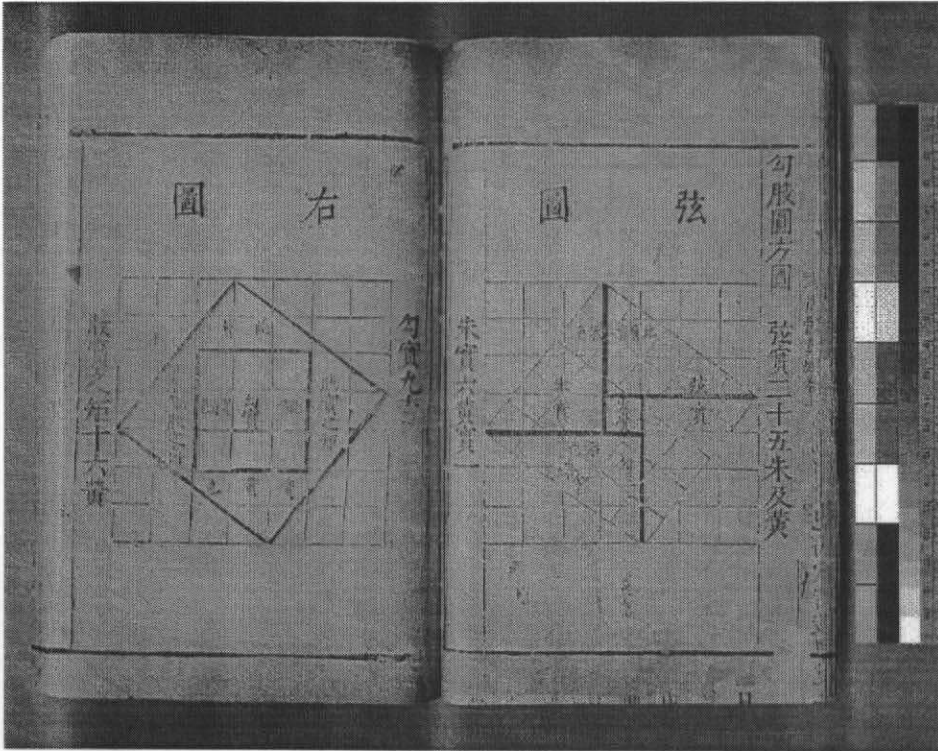
Zhao Shuang (220-280 AD)
 Three Kingdoms Period (Wei, Shu, Wu)



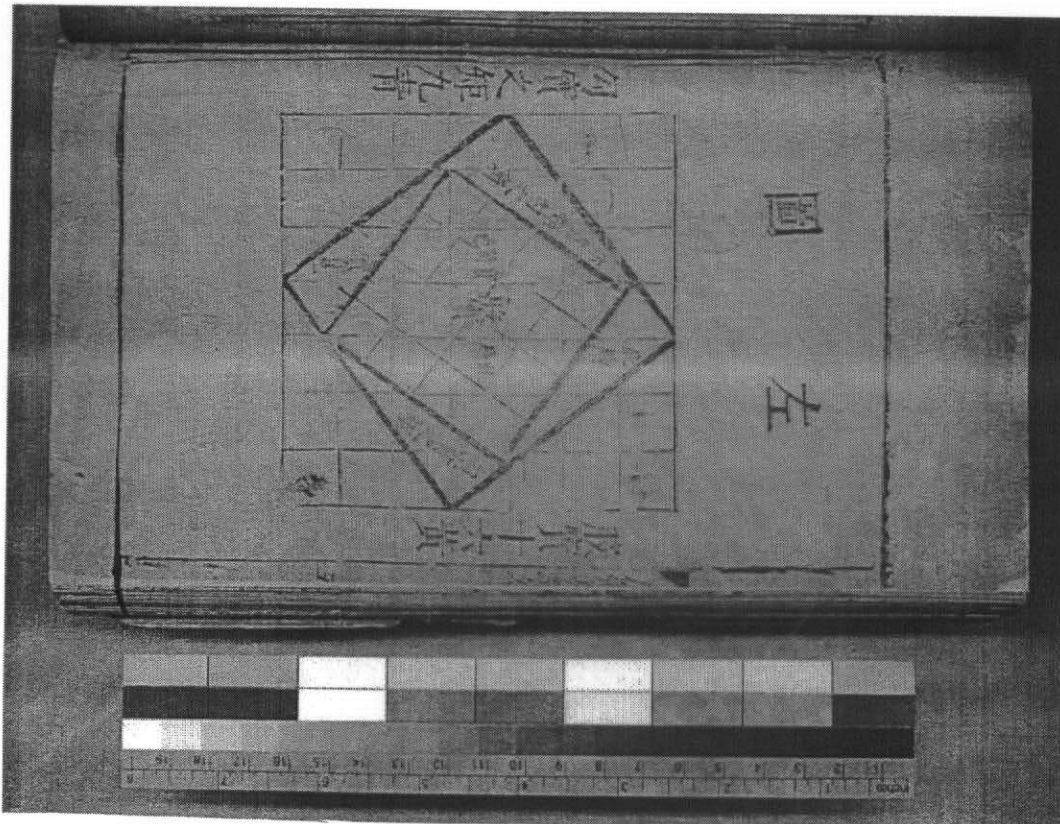
Drawn by Yu Ninjie.

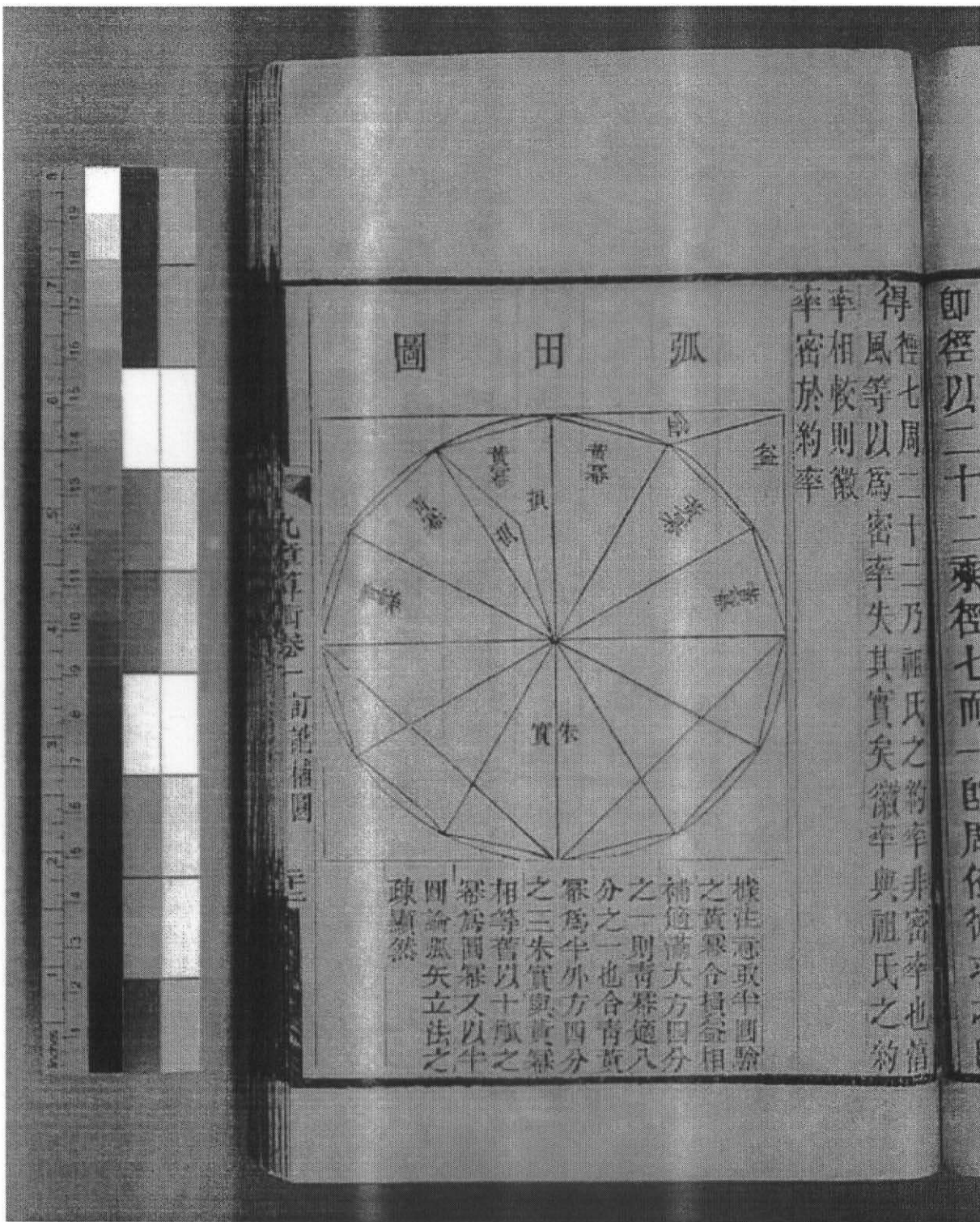
Zhoubi suanjing

These two pages are from the *Zhoubi suanjing* (*Arithmetical Classic of the Gnomon and the Circular Paths of Heaven*), a Chinese book on astronomy and mathematics dated to approximately 100 BCE. These images are from a Ming dynasty copy printed in 1603. These diagrams were added to the original text at some point an attempt to illustrate a dissection proof of the "Pythagorean Theorem", known by the Chinese as the *Gougu* theorem. A complete English translation and analysis of the *Zhoubi suanjing* is given by Christopher Cullen in his *Astronomy and mathematics in Ancient China: the Zhou bi suan jing* (Cambridge University Press, 1995). See, in particular, appendix one.



On [this page](#), the diagram on the right is usually called the "hypotenuse diagram" and illustrates the proof of the theorem in the 3-4-5 case. The diagram on the left shows how a square of side 3 fits into a square of side 5.





Jiuzhang suanshu
 "Nine Chapters on the Mathematical Art"
 Liu's method of computing π as 3.14024
 Zu Chongzhi (\approx 450AD) extended to 3.1415927

Ming Dynasty copy
 Original \approx 0 AD?

Polynomial Equations

① Han Dynasty: Square Root Algorithm

$$\sqrt{55,225} = 100a + 10b + c$$

$$= 200 + 10b + \text{lower term}$$

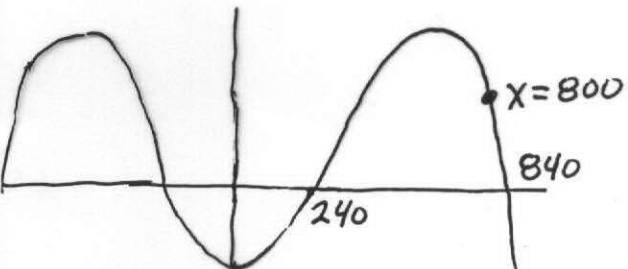
$$(200 + 10b)^2 = 40,000 + 4,000b + 100b^2 + \text{l.o.t.}$$

$$15,225 = 4000b + \text{hopefully smaller terms}$$

Try $b=3$.

② Song Dynasty: Solve polynomials the same way
Details taken from 1247 document of Qin Jiushao

$$f(x) = -x^4 + 763,200x^2 - 40,642,560,000 = 0$$



Guess $x=800$

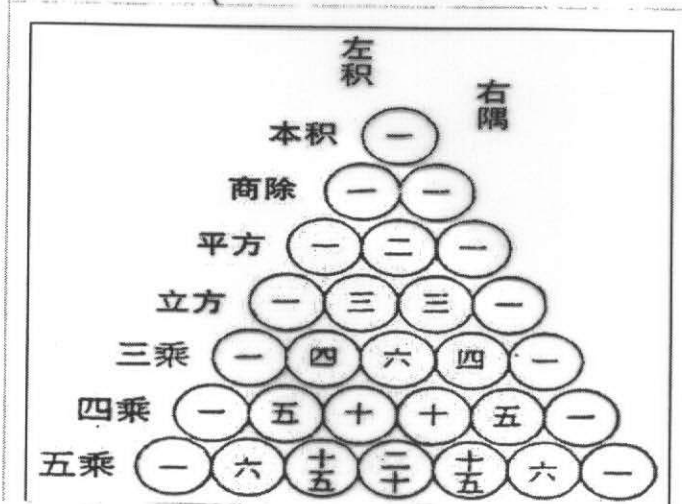
Evaluate $f(800+y)$

$$-y^4 - 3200y^3 - (3076800)y^2 - (\dots)y + (\dots) = 0$$

Guess $y=40$, evaluate $f(840+z)$, etc.

Synthetic division: $f(x) = (x-800) \{ (x-800) [(x-800) \{ (800-x) - 3200 \} - (3076800)] - C \} + D$

Jia Xian (1010-1070 AD)



Expansion of $(800+y)^4$ etc.
using "Pascal Triangle"
(France, 1650)