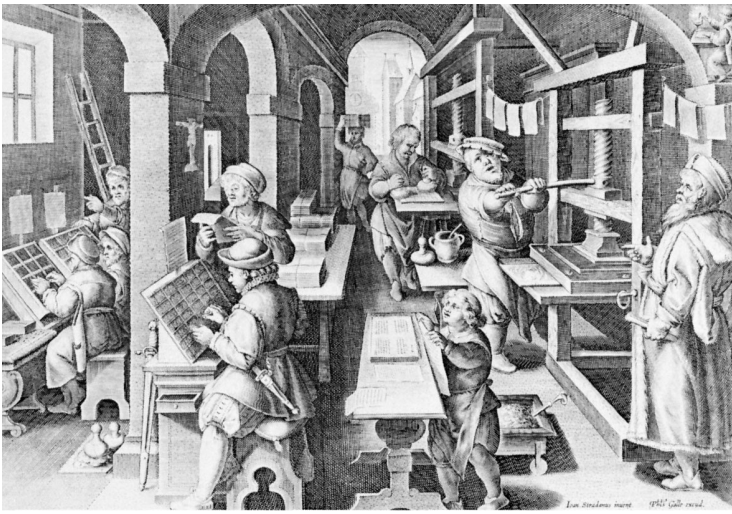
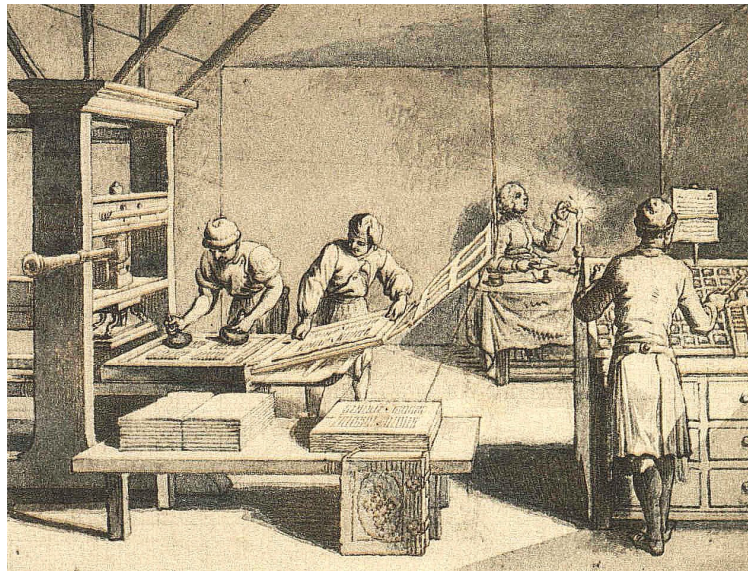




[Medieval university](#) class (1350s)



1440



Renaissance

3600 pages per day





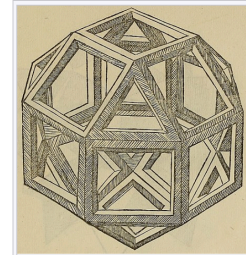
1492



Luca Pacioli
1494

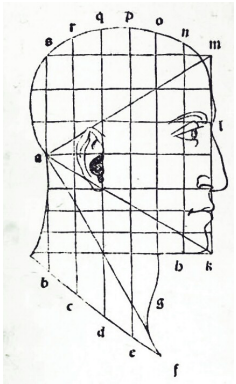
Luca Pacioli

- ▼ 1. Published *Divina Proportione*
 - a. On math / perspective / golden ratio
 - b. Da Vinci made the illustrations
- ▼ 2. Published *Summa de Arithmetica*
 - a. solve linear/quadratics
 - b. primitive symbolic algebra: $co = cosa = thing$
- 3. Wrote: the general cubic equation is unsolvable



The first printed illustration of a rhombicuboctahedron, by Leonardo da Vinci, published in *Divina proportione*

$ax^2 + bx + c = 0$ (quadratic formula)
 $ax^3 + bx^2 + cx + d = 0$
 similar?





Leonardo da Vinci's failed attempt to solve $x^3 = 2$



$$7x^3 + 5x = 5$$

Scipione del Ferro
Born: 1465

del Ferro

- ▼ 1. Father worked in paper industry
 - a. Possible b/c printing press
 - b. This likely gave del Ferro access
- ▼ 2. Depressed Cubic: Cube and cosa equals number
 - a. Solved it!
 - ▼ b. Didn't tell
 - i. Save the solution for challenges
- ▼ 3. Daughter married a mathematician
 - a. undoubtedly knew of Scipione's solution
- 4. On deathbed, told his student, Antonio Fior

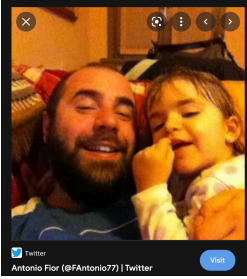
$$ax^3 + bx^2 + cx + d = 0$$

↓ depressed

$$ax^3 + cx = d$$

Antonio Fior

1. Student of del Ferro
- ▼ 2. Challenged Niccolo Fontana (b. 1500) to a duel
 - a. armed with ONLY the solution of the depressed cubic

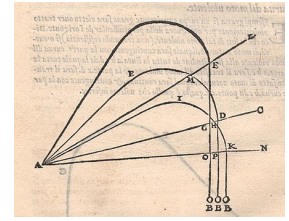
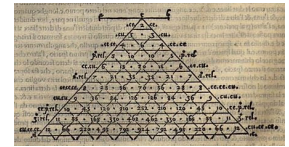


$$x^3 + mx = n$$



Niccolò Fontana Tartaglia: Italy 1500 - 1557

"Stammerer"



Tartaglia

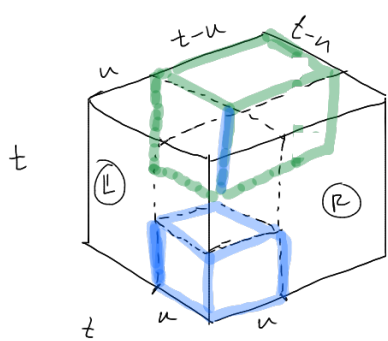
1. Powerful mathematician
2. 1st Italian translations of Euclid & Archimedes (1st correct European version of Elements)
3. Studied ballistics
4. Tartaglia eked out a living teaching practical mathematics in [abacus schools](#) and earned a penny where he could:

"This remarkable man was a self educated mathematics teacher who sold mathematical advice to gunners and architects, ten pennies one question, and had to litigate with his customers when they gave him a worn out cloak for his lectures on Euclid instead of the payment agreed on."



Begged Tartaglia for the solution

Cardano's sol'n of the depressed cubic



$t^3 = u^3 + (t-u)^3 + 2tu(t-u) + u^2(t-u) + u(t-u)^2$

 (L)+(R) above blue below green

algebra
 $t^3 - u^3 = (t-u)^3 + (t-u)[2tu + u^2 + u(t-u)]$

 $3tu$

$$t^3 - u^3 = (t-u)^3 + (t-u)(3tu)$$

← geometry + algebra

write

$$x = t - u$$

$$3tu = M$$

$$n = t^3 - u^3$$

$$n = x^3 + x \cdot M$$

depressed cubic



Pacioli: 1450



Scipione del Ferro: 1465

?

Antonio Fior: 1506



Niccolò Fontana Tartaglia: Italy 1500 - 1577

1st Italian translation of Euclid and Archimedes

eventually gave sol'n but:
promise - secrecy - poems - - - - ->



Cardano did not share Tartaglia's sol'n.

His student finds a sol'n (likely due to del Ferro's son-in-law)

Cardano shares this sol'n, Tartaglia hears about it, cries foul.

