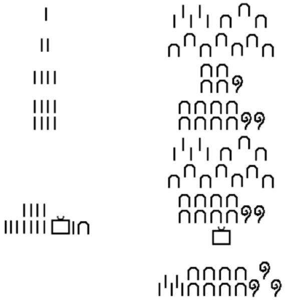
# Ancient Egyptian multiplication

The ancient Egyptian multiplication is a method involving only addition, doubling, and halving, which mixed 2-based and 10-based characteristics.



a example calculation

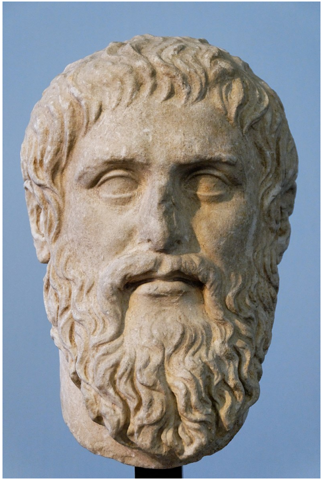
| | |
|---|---|
| 1* | 35 |
| 2* | 70 |
| 4 | 140 |
| 8* | 280 |
| 1+2+8=11 | 35+70+280=385 |

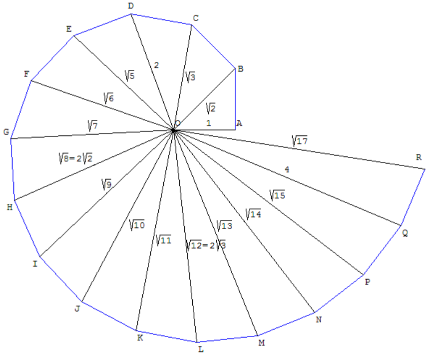
Ahmes Papyrus

http://www.math.buffalo.edu/mad/Ancient-Africa/mad_ancient_egypt_arith.html

# A story of square root of 17

A story from Plato's Theaetetus: Theodorus of Cyrene, a young mathematician, was able to prove that $\sqrt{3}$, $\sqrt{5}$... are irrational, but not $\sqrt{17}$.





This story remained a mystery for more than 2000 years until Prof. Pambuccian's work published in 2012. Prof. Pambuccian and Celia Schacht gave formal systems showed that irrationality of $\sqrt{17}$ is unprovable.

**A 1.** $(x+y)+z = x+(y+z)$

**A 2.** $x+y = y+x$

**A 3.** $(x \cdot y) \cdot z = x \cdot (y \cdot z)$

**A 4.** $x \cdot y = y \cdot x$

**A 5.** $x \cdot (y+z) = x \cdot y + x \cdot z$

**A 6.** $x + 0 = x \wedge x \cdot 0 = 0$

**A 7.** $x \cdot 1 = x$

**A 8.** $(x < y \wedge y < z) \to x < z$

**A 9.** $\neg x < x$

**A 10.** $x < y \vee x = y \vee y < x$

**A 11.** $x < y \to x + z < y + z$

**A 12.** $(0 < z \wedge x < y) \to x \cdot z < y \cdot z$

**A 13.** $x < y \to x + (y - x) = y$

**A 14.** $0 < 1 \wedge (x > 0 \to (x > 1 \vee x = 1))$

**A 15.** $x > 0 \vee x = 0$

**A 16.** $m = \kappa(m,n) \cdot \mu(m,n) \wedge n = \kappa(m,n) \cdot \mu(n,m) \wedge (\mu(m,n) = 2\left[\frac{\mu(m,n)}{2}\right] + 1 \vee \mu(n,m) = 2\left[\frac{\mu(n,m)}{2}\right] + 1).$

**A 17.** $x = \left[\frac{2x}{2}\right].$

**A 18.** $x = 2\left[\frac{x}{2}\right] \vee x = 2\left[\frac{x}{2}\right] + 1$

**A 19.** $\pi_2(n) \wedge a \cdot b = n \wedge a > 1 \to a = 2\left[\frac{a}{2}\right]$

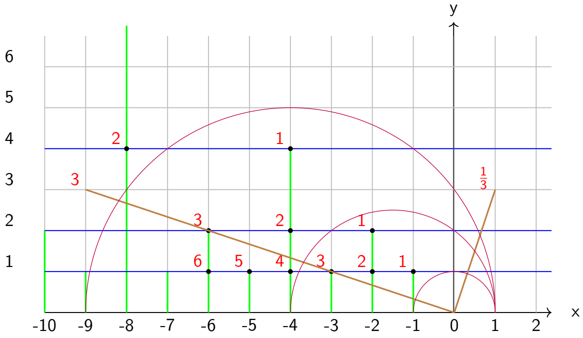
**A 20.** $0 < n \to n = \tau(n) \cdot \omega(n) \wedge \pi_2(\tau(n)) \wedge \omega(n) = 2\left[\frac{\omega(n)}{2}\right] + 1$

**A 21.** $n < m \wedge \pi_2(m) \wedge \pi_2(n) \to \tau(m-n) = n.$

- A.1 - A.7 are involving arithmetic operations with equality.
- A.8 - A.15 are involving order relations.
- A.16 - A.22 are involving arithmetic functions related with odd and even.

# Embedding

The axioms A.1 - A.7 are also fit into expressions, and then some terms of the formal system can be embedded into the expression space.



Can we migrate the problem of irrationality of $\sqrt{17}$ from proof theory into a problem in group theory?