

# Proportionality in History

# Euclid

20. Numbers are proportional when the first is the same multiple, or the same part, or the same parts, of the second that the third is of the fourth.

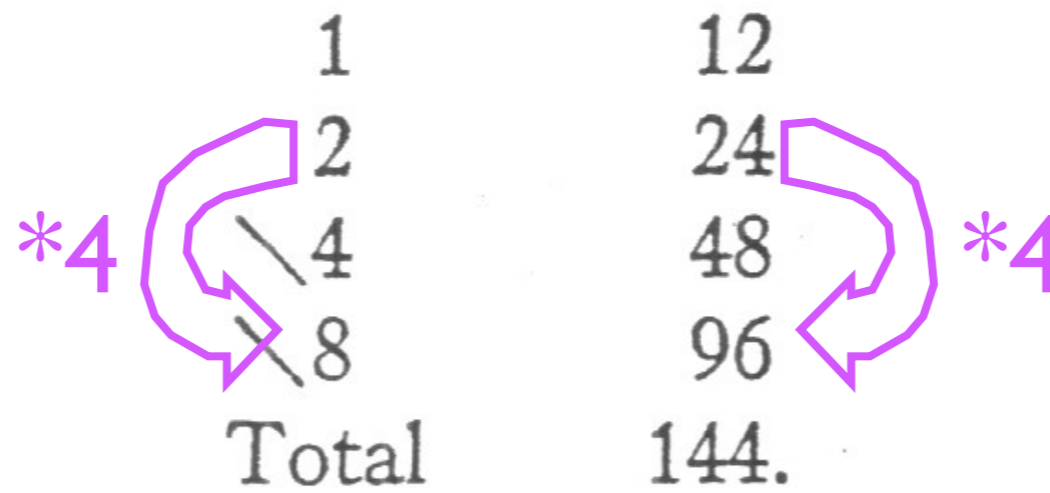
# Egypt

Take 12 times 12.

|       |      |
|-------|------|
| 1     | 12   |
| 2     | 24   |
| \ 4   | 48   |
| \ 8   | 96   |
| Total | 144. |

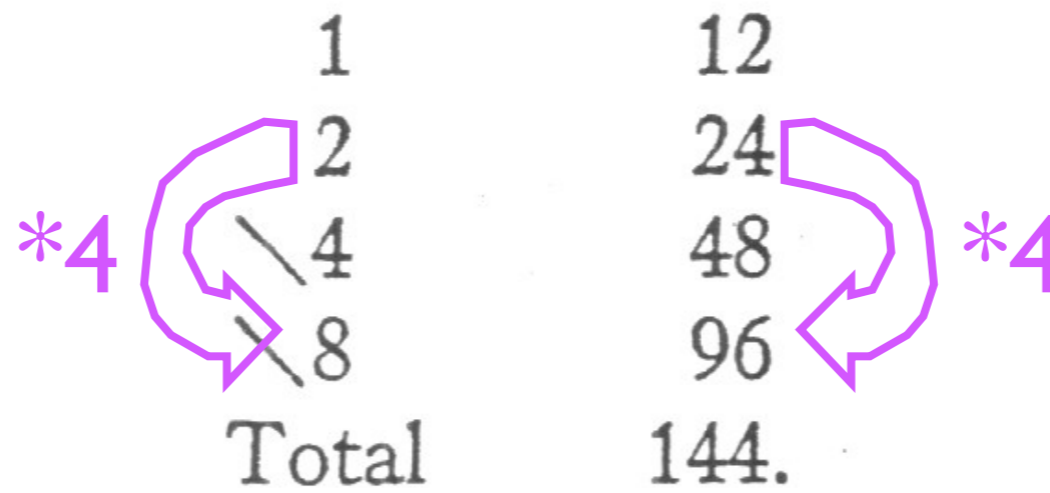
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$$\frac{2}{24} = \frac{8}{96}$$

# Egypt

## Problem 27

*A quantity and its  $\frac{1}{5}$  added together become 21. What is the quantity?*

Assume 5.

|                 |    |
|-----------------|----|
| \1              | 5  |
| \ $\frac{1}{5}$ | 1  |
| Total           | 6. |

As many times as 6 must be multiplied to give 21, so many times 5 must be multiplied to give the required number.

|                 |                  |
|-----------------|------------------|
| \1              | 6                |
| \2              | 12               |
| \ $\frac{1}{2}$ | 3                |
| Total           | $3\frac{1}{2}$ . |

|    |                |
|----|----------------|
| \1 | $3\frac{1}{2}$ |
| 2  | 7              |
| \4 | 14.            |

The quantity is

|               |                 |
|---------------|-----------------|
|               | $17\frac{1}{2}$ |
| $\frac{1}{5}$ | $3\frac{1}{2}$  |
| Total         | 21.             |

# Leonardo Pisano

## *On Two Serpents.*

Also there is a serpent at the base of a tower that is 100 palms high, and he ascends daily  $\frac{1}{3}$  of a palm, and he descends daily  $\frac{1}{4}$ . At the top of the tower there truly is another serpent who descends daily  $\frac{1}{5}$  of a palm, and ascends  $\frac{1}{6}$ ; it is sought in how many days will they meet in the tower; you put it that they will meet in 60 days because 60 is the least common multiple of the 6 and 5 and 4 and 3; you see therefore how much the serpents approach each other in the 60 days. The lower serpent truly ascends 5 palms more than he descends in the 60 days. The upper serpent truly descends 2 palms more than he ascends in the 60 days. Therefore they are closer by 7 palms. Therefore it is said, for the 60 days that I put, they are closer by 7 palms; what shall I put so that they are [p178] 100 palms closer; you multiply the 60 by the 100; there will be 6000 that you divide by the 7; the quotient will be  $\frac{1}{7}$ 857 days, and in this amount of time they meet each other.

# Leonardo Pisano

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50 rolls of cinnamon are similarly worth 3 Pisan pounds; it is sought how many rolls of cinamon will be had for 342 pounds of pepper



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| Rolls | Pisan Pounds | Pounds (Pepper) |
|-------|--------------|-----------------|
| 741   | 13           | 100             |
| 50    | 3            | 342             |

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