Épreuve de section européenne

How to square a rectangle

Baudhãyana was an Indian mathematician, who was most likely also a priest. He is noted as the author of the earliest Sulba Sutra – appendices to the Vedas giving rules for the construction of altars – called the Baudhãyana Sulba Sutra, which contained several important mathematical results.

One of these results is a method to construct a square equal in area to a given rectangle.

A rectangle $ABCD$ is given, with AB less than AD. Let L be marked on AD so that $AL = AB$. Then complete the square $ABML$. Now bisect LD at X and divide the rectangle $LMCD$ into two equal rectangles with the line XY. Now move the rectangle $XYCD$ to the position $MBQN$, outside of $ABML$. Complete the square $AQPX$.

Now the square we have just constructed is not the one we require and a little more work is needed to complete the work. Rotate PQ about Q so that it touches BY at R. Then $QP = QR$ and we see that this is an ideal "rope" construction. Now draw RE parallel to YP, with E on PQ, and complete the square $QEFG$. This is the required square equal to the given rectangle $ABCD$.

<div align="right">Adapted from various sources.</div>

Questions

1. From what book is this construction extracted ? What was the principal aim of the constructions explained in it ?

2. Who was the author of this book ? Was he only a mathematician ?

3. Draw the complete figure by following the instructions.

4. The proof of the validity of this method can be given on short-hand notation as follows :

$$
\begin{aligned}
EQ^2 &= QR^2 - RE^2 \\
&= QP^2 - YP^2 \\
&= ABYX + BQNM \\
&= ABYX + XYCD \\
&= ABCD.
\end{aligned}
$$

Explain each step of this proof.