Euclidian Algebra and Calculation 1 **Medium length activity**

The Ancient Greeks were skilled mathematicians who devised interesting number and algebra problems which were to be solved using only a pencil, a straight edge and a pair of compasses.

Numerical values were represented by straight lines of a given length.

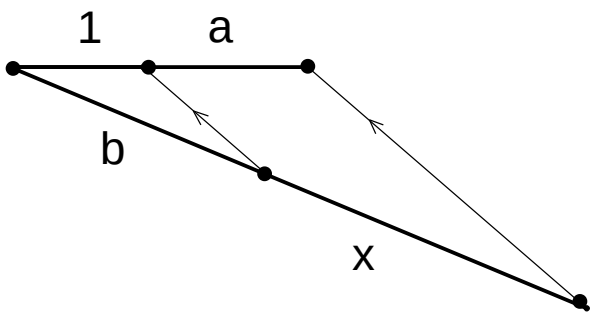
For example, if a length such as this _____ is said to be of length '1',
then a line twice its length _____ would have a value of '2'.

Random lengths are used to represent unknown values e.g.

a _____ b _____

Knowing this, can you construct a length of (a + b)? What about (b – a)?

Can you work out what the length of the following unknown value 'x' is in terms of a and b?



Using a similar idea, construct lengths of:

a^2

$a \div b$

$a^2 \div b$

What other algebraic combinations is it possible to construct?

Are there any which it is not possible to construct?

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Teacher notes

Content:

- Similar triangles
- Algebraic manipulation
- Rearranging formulae

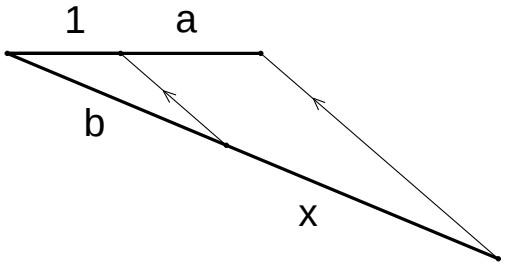
Possible uses:

- As an extension task for more able pupils
- As a challenge task for individuals or pairs of pupils

Resource options:

- PowerPoint file for whole class projection
- Worksheet for individual pupils

Answers



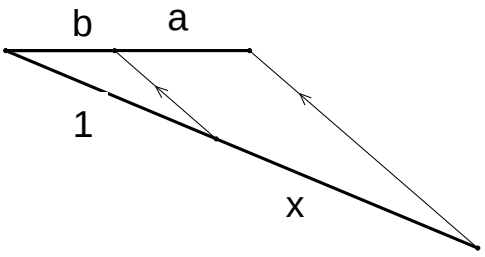
If pupils need a hint then discuss similar triangles and suggest they write down an equation about the ratio of the lengths of the sides.

$$\frac{1}{b} = \frac{(1+a)}{(b+x)}$$

This can then be rearranged to give $x = ab$

To find a^2 simply replace 'b' with 'a' in the diagram.

The diagram for a÷b is:



Similarly, forming an equation and rearranging it will give the required value.

$$\frac{b}{1} = \frac{(b+a)}{(1+x)}$$

a^2÷b is then a 2-part construction requiring a length representing a^2 to be constructed first, followed by the diagram to carry out the division by b.

There is scope for an interesting discussion about what a length of '1' should be. 1 is also an arbitrary length, since the units could be centimetres, metres, inches or some other unit length not yet defined.