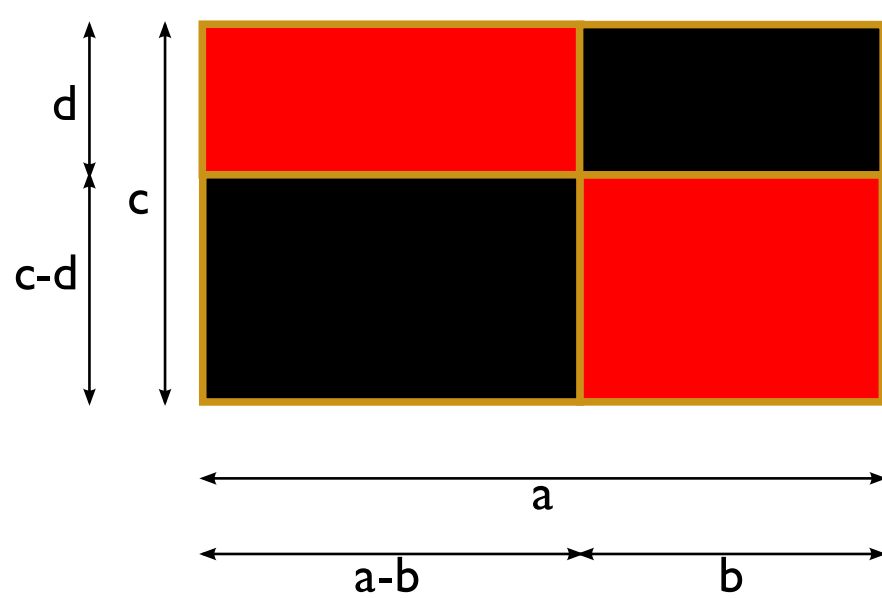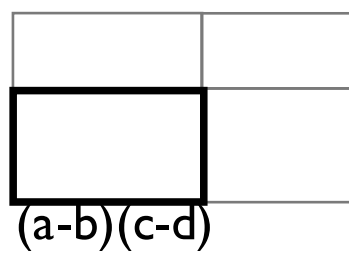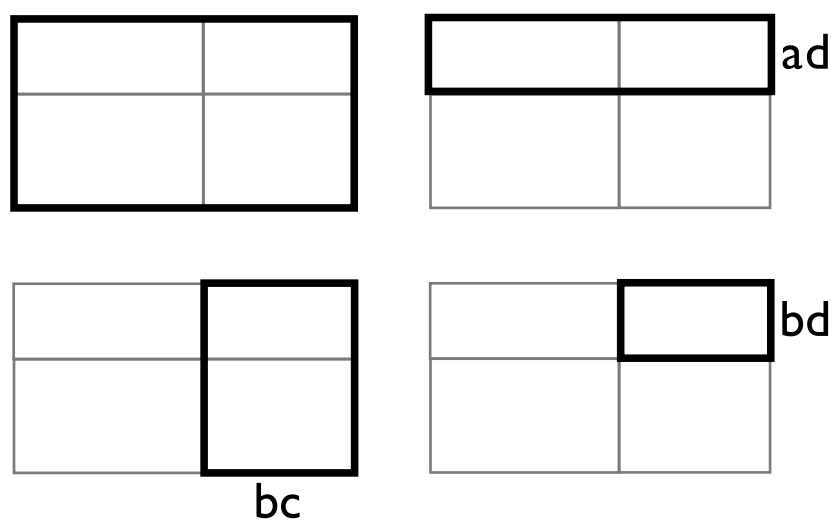Consider this illustration of (a-b)(c-d):

In the lower left is the rectangle that is (a-b)(c-d):

(a-b)(c-d)

and here are the rectangles representing simple products:
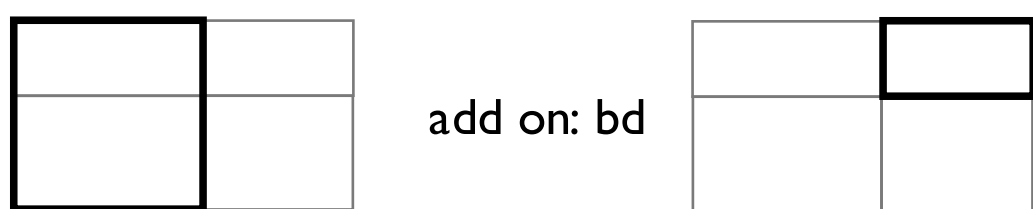

Making (a-b)(c-d)

Start with ac

take off: bc
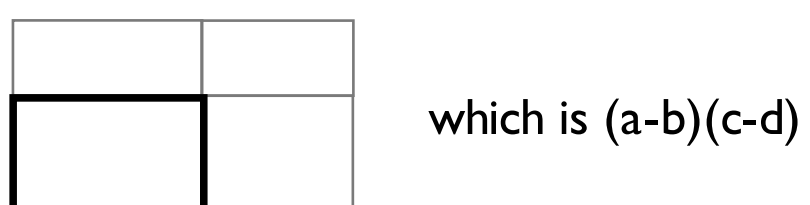
to get

add on: bd

to get

take off: ad

to get

which is (a-b)(c-d)

Algebraically we know (a-b)(c-d) = ac + a(-d) + (-b)c + (-b)(-d).
By comparing signs with the above list we can see that
(-b)(-d) is bd.