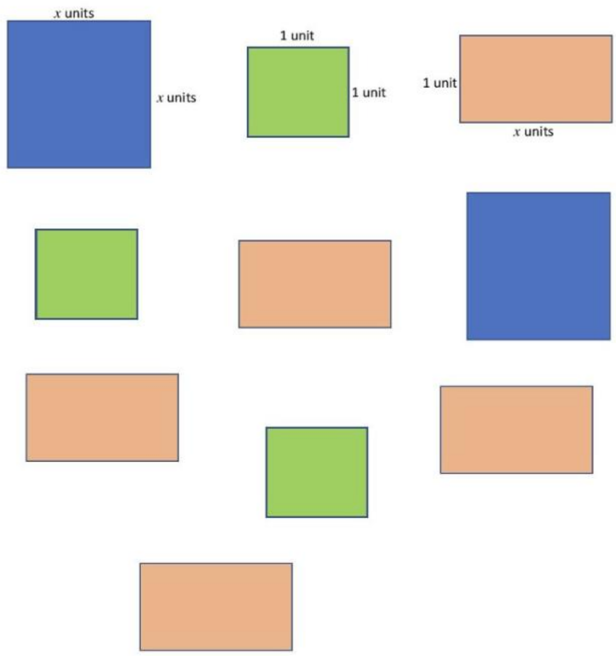
ALGEBRAREA JIGSAW PUZZLE GAME

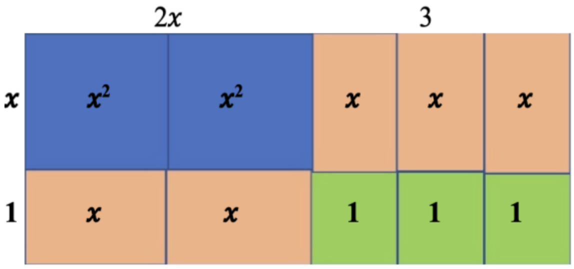
Product of two brackets and area

In this game players solve jigsaw puzzles and find the factors of quadratic expressions by fitting pieces together to make rectangles. To factorize the expression $ax^2 + bx + c$, where a, b and c are positive, players must arrange into a rectangle: ***a*** blue x^2 pieces, ***b*** brown x pieces and ***c*** green unit pieces.



This rectangle made from the pieces shown represents the algebraic expression $2x^2 + 5x + 3$ and its factors:

$2x^2 + 5x + 3 = (2x + 3)(x + 1)$.



THE ALGEBRAREA PUZZLE GAME

Each pair or group of players needs an envelope with at least 20 blue x^2 pieces, 20 brown x pieces and 30 green unit pieces. The teacher needs to have a list of quadratic expressions that can be factorized and a few that cannot.

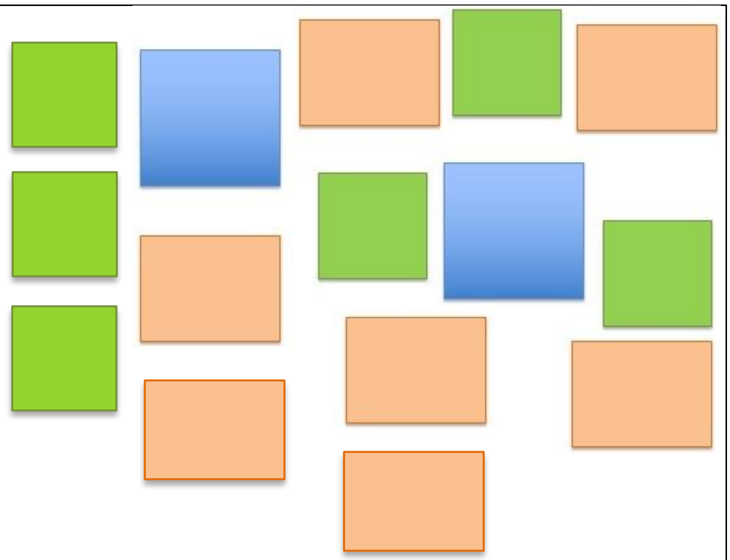
Rules of the Game:

1. The teacher writes a quadratic expression on the blackboard. The first pair or group to make a rectangle with the pieces and find the factors wins the round.
2. The winning pair should explain to the class how they solved the puzzle, and all the learners should copy the solution diagram into their notebooks.
3. This can be repeated for other quadratic expressions.

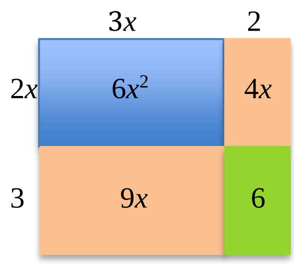
Extra challenge: The game can include a few quadratic expressions that cannot be factorized. In this case the winners are the players who can prove that the expression cannot be factored and explain why.

HELP

Visualise the finished rectangle as four smaller rectangles with the blue pieces in the top left, the green pieces in the bottom right, and the brown pieces at the top right and bottom left.
To put these pieces together to make a rectangle for $2x^2 + 7x + 6$ start with the blue x^2 pieces at the top left as for $2x^2 + 5x + 3$. Then arrange the green pieces into a rectangle, either 1 by 6 or 2 by 3, in the bottom right, with the brown pieces filling the rectangles at the top right and bottom left.



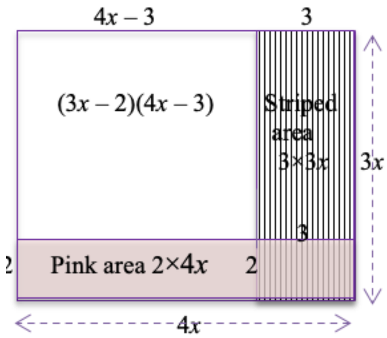
NEXT



Make up some examples for yourself and work out more problems involving expansion of brackets where all the coefficients are positive, such as $(3x + 2)(2x + 3)$.

When you are confident about the method without needing to draw a diagram, then multiply binomials with negative terms such as $(2x - 3)(2x + 4)$ and $(3x - 2)(4x - 3)$ in a similar way. Remember the rules that multiplying two positive numbers or two negative numbers gives a positive number and multiplying a positive and a negative gives a negative number.

As the example below shows, it is possible to illustrate these examples, but it is not necessary nor particularly helpful to draw a diagram.



The unshaded area is $(3x - 2)(4x - 3)$,
given by the area of the large rectangle minus the pink area, minus the striped area plus the overlapping area that has been deducted twice.

So $(3x - 2)(4x - 3) = 3x \times 4x$
$-2 \times 4x$
$-3 \times 3x$
$+2 \times 3$