Lizzie's Method to Factorise Quadratics

Lizzie's method of factorising a quadratic is named after Lizzie Seagle, an American High School student who rediscovered a special case of Vieta's theorem. Here it is.

Suppose we are faced with $8x^2 + 10x + 3$. Assuming it will resolve into rational factors here's an algorithm to determine them.

$ax^2 + bx + c$ $(nx + p)(mx + q)$

though of course we don't yet know the factors

$8x^2 + 10x + 3$ $mnx^2+(mp+nq)x+pq$

Multiply c term by "a" term and set a=1

$x^2 + bx + ac$

$x^2 + 10x + 24$ $x^2+(mp+nq)x+mnpq$

find two factors of 24 that add to 10

$24 = 2 \times 12$ so (minus 2) and 12

$(x + 12)(x - 2)$ $(x + mp)(x + nq)$

divide through by the "a" coefficient

$(x + {}^{12}/_{8})(x - {}^{2}/_{8})$ $(x + {}^{mp}/_{mn})(x + {}^{nq}/_{mn})$

because originally "a" was equal to mn though we didn't know that at the time

$(x + {}^{3}/_{2})(x - {}^{1}/_{4})$ $(x + {}^{p}/_{n})(x + {}^{q}/_{m})$

Multiply 1st bracket by 2 and 2nd by 4

$(2x + 3)(4x - 1)$ $(nx + p)(mx + q)$

which is the correct result.

Here it is again without the explanation

$12x^2 + x - 20$ $\times$ *last term by 12*

$x^2 + x - 240$ *find factors 240*

$(x + 16)(x - 15)$ *divide by 12*

$(x + {}^{16}/_{12})(x - {}^{15}/_{12})$ *rationalise*

$(x + {}^{4}/_{3})(x - {}^{5}/_{4})$ *multiply out*

$(3x + 4)(4x - 5)$ *which is correct*

Summary

Still not got it?

This is what you do

1) Multiply the last coefficient by the first
2) Set the first coefficient to 1
3) Find two factors of the new last coefficient that add to the middle coefficient.
4) Set up the initial factorising expression
5) Now divide the second term in each bracket by the original first coefficient
6) Now rationalise that 2nd term
7) Now multiply through each bracket by the denominator of the 2nd term I each bracket.
8) And that's your answer.

Lizzie's method is harder to describe than actually undertake. It eliminates that stage of having to juggle with that first coefficient so eliminates it in a non-standard way but then sneaks it back in by another non-standard way. The two "cancel our" to restore a correct expression.

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