Factor Expressions by Special Products Examples

A perfect square trinomial can be written as a binomial squared. If you have a perfect square trinomial, the middle term will always be two times the square root of the first term times the square root of the second term.

$$x^2 + 2xy + y^2 = (x + y)^2$$

$$x^2 - 2xy + y^2 = (x - y)^2$$

Example 1

Factor $x^2 + 18x + 81$.

Step 1: The square root of the first term is x and the square root of the third term is 9. Two times the square root of the first term times the square root of the third term is 18x, which is the middle term. Therefore, this is a perfect square trinomial. Write your two sets of parentheses.

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Step 2: Put the square root of the first term in the first spot in each binomial and put the square root of the last term in the last spot of each binomial.

$$(x \quad 9)(x \quad 9)$$

Step 3: The middle term is + in the perfect square trinomial, so the binomials will both be + and +.

$$(x + 9)(x + 9)$$

Step 4: Check you answer.

$$(x + 9)(x + 9) = x^2 + 9x + 9x + 81 = x^2 + 18x + 81$$

Example 2

Factor $x^2 - 12x + 36$.

Step 1: The square root of the first term is x and the square root of the third term is 6. Two times the square root of the first term times the square root of the third term is 12x, which is the middle term. Therefore, this is a perfect square trinomial. Write your two sets of parentheses.

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Step 2: Put the square root of the first term in the first spot in each binomial and put the square root of the last term in the last spot of each binomial.

$$(x \quad 6)(x \quad 6)$$

Step 3: The middle term is - in the perfect square trinomial, so the binomials will both be - and -.

$$(x - 6)(x - 6)$$

Step 4: Check you answer.

$(x - 6)(x - 6) = x^2 - 6x - 6x + 36 = x^2 - 12x + 81$

In Summary

- A perfect square trinomial can be written as a binomial squared. If you have a perfect square trinomial, the middle term will always be two times the square root of the first term times the square root of the third term.

- Put the square root of the first term in the first spot in each binomial. Put the square root of the third term in the last spot of each binomial. Place the sign of the middle term in both binomials.

- Check your work!