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# **Factor Expressions by Trial and Error Examples**



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## Example 1

Factor  $x^2 + 14x + 24$ .



**Step 1:** Find the factors of the constant term, 24.

24:  $\pm 1, \pm 2, \pm 3, \pm 4, \pm 6, \pm 8, \pm 12, \pm 24$



**Step 2:** Next, choose the pair of factors that combines to give the middle term's coefficient, a positive 14 and multiplies to give you the last term, a positive 24. So, we are going to be working with the positive factors since we need two positive terms.

- $24+1=25$  and  $24 \times 1=24$
- $12+2=14$  and  $12 \times 2=24 \rightarrow$ Correct
- $8+3=11$  and  $8 \times 3=24$
- $6+4=10$  and  $6 \times 4=24$

**Step 3:** Now you can factor the polynomial (or trinomial) into two binomials.

$$x^2 + 14x + 24 = (x + 12)(x + 2)$$

**Step 4:** Check your work by multiplying the solution to see if you get the original trinomial.

$$\begin{aligned}(x + 12)(x + 2) &= x^2 + 2x + 12x + 24 \\ &= x^2 + 14x + 24 \checkmark\end{aligned}$$



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## Example 2

Factor  $x^2 - 2x - 63$ .

**Step 1:** Find all of the factors of 63.

63:  $\pm 1, \pm 3, \pm 7, \pm 9, \pm 21, \pm 63$



**Step 2:** Choose which factors will have a sum of -2 and a product of -63. In order to multiply and get a negative number, you will have to have a negative factor and a positive factor. Also, the larger factor needs to be negative.

- $1 + (-63) = -62$  and  $1 \times (-63) = -63$
- $3 + (-21) = -18$  and  $3 \times (-21) = -63$
- $7 + (-9) = -2$  and  $7 \times (-9) = -63 \rightarrow$ Correct

**Step 3:** Now you can factor the polynomial (or trinomial) into two binomials.

$$\mathbf{x^2 - 2x - 63 = (x + 7)(x - 9)}$$

**Step 4:** Check your work by multiplying the solution to see if you get the original trinomial.

$$\begin{aligned}(x + 7)(x - 9) &= x^2 - 9x + 7x - 63 \\ &= x^2 - 2x - 63 \checkmark\end{aligned}$$



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# In Summary

- When factoring by trial and error, first list out all the factors of the constant term.
- Then, choose the pair of factors that combines to give the middle term's coefficient and multiplies to give the last term.
- Next, factor the polynomial into two binomials
- Finally, check and make sure that the work is done correctly...a problem should never be factored incorrectly because it can always be checked for accuracy.