LESSON MAKER PRO

Factor Detective

Find the pattern, then check the product.

HIGH SCHOOL · A2.A.2.1

A2.A.2.1 "Factor polynomial expressions including, but not limited to, trinomials, differences of squares, sum and difference of cubes, and factoring by grouping, using a variety of tools and strategies."

NAME _____ DATE _____

CHOOSE A STRATEGY

First, check whether every term has a common factor. Then look for a pattern: a trinomial, a difference of squares, a sum or difference of cubes, or terms you can group. Multiply your factors to check your answer.

WORKED EXAMPLE

Factor $x^2 + 19x + 84$.

1. Find two numbers with a product of 84 and a sum of 19: 7 and 12.
2. Rewrite: $x^2 + 7x + 12x + 84$.
3. Group: $x(x + 7) + 12(x + 7)$.
4. Factor the shared binomial: $(x + 7)(x + 12)$.

Answer: (x + 7)(x + 12)

PRACTICE 6 problems

1 Factor $x^2 + 9x + 20$.

ANSWER _____

2 Factor $4x^2 - 25$.

ANSWER _____

3 Factor $x^3 + 27$.

ANSWER _____

4 Factor $x^3 - 64$.

ANSWER _____

5 Factor $3x^2 + 6x + 5x + 10$ by grouping.

ANSWER _____

6 Factor $6x^2 - 54$ completely.

ANSWER _____

APPLY IT Show your work

1 A school club has $x^2 + 10x + 24$ stickers to divide equally among $x + 4$ volunteers. Factor the total number of stickers. How many stickers does each volunteer get?

WORK SPACE

ANSWER _____

2 A student selling custom phone cases models their profit, in dollars, after selling x cases as $P(x) = x^2 + 4x - 60$. Factor P(x), then find the nonnegative number of cases sold when profit is $0.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Factor $x^4 - 81$ completely over the integers. Explain why none of your factors can be factored further over the integers.

WORK SPACE AND ANSWER

ANSWER KEY

Factor Detective

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Factor $x^2 + 9x + 20$.	**$(x + 4)(x + 5)$**
2	Factor $4x^2 - 25$.	**$(2x - 5)(2x + 5)$**
3	Factor $x^3 + 27$.	**$(x + 3)(x^2 - 3x + 9)$**
4	Factor $x^3 - 64$.	**$(x - 4)(x^2 + 4x + 16)$**
5	Factor $3x^2 + 6x + 5x + 10$ by grouping.	**$(x + 2)(3x + 5)$**
6	Factor $6x^2 - 54$ completely.	**$6(x - 3)(x + 3)$**

PART 2 · APPLY IT

1. **$(x + 4)(x + 6)$; each volunteer gets $x + 6$ stickers.** The factors show that $(x^2 + 10x + 24)/(x + 4) = x + 6$.
2. **$P(x) = (x + 10)(x - 6)$; profit is $0 after 6 cases.** Set each factor equal to zero. The solutions are -10 and 6, but a number of cases cannot be negative.

CHALLENGE

$(x - 3)(x + 3)(x^2 + 9)$. The linear factors cannot be factored further, and $x^2 + 9$ has no real roots, so it cannot factor into linear factors with integer coefficients.

Accept factors in either order. For the challenge, accept a correct explanation that $x^2 + 9$ is a sum of squares that does not factor over the integers.