LESSON MAKER PRO

# Factor Power

*Rewrite polynomial expressions as products.*

**HIGH SCHOOL · MA.912.AR.1.8**

**MA.912.AR.1.8** "Rewrite a polynomial expression as a product of polynomials over the real or complex number system."

NAME _____ DATE _____

## CHOOSE THE FACTORS

First, look for a greatest common factor. For a trinomial $x^2 + bx + c$, find two numbers whose product is c and whose sum is b. Over the complex numbers, use $i^2 = -1$ to factor expressions such as sums of squares.

## WORKED EXAMPLE

Factor completely: $x^2 + 13x + 42$

1. Find two numbers with product 42 and sum 13.
2. The numbers are 6 and 7.
3. Write the product: $(x + 6)(x + 7)$.

**Answer: $(x + 6)(x + 7)$**

## PRACTICE 6 problems

**1** Factor completely: $5x^3 - 15x^2$

**ANSWER** _____

**2** Factor completely: $x^2 - x - 20$

**ANSWER** _____

**3** Factor completely: $4x^2 - 25$

**ANSWER** _____

**4** Factor completely: $x^3 + 4x^2 - 9x - 36$

**ANSWER** _____

**5** Factor completely over the complex numbers: $x^2 + 9$

**ANSWER** _____

**6** Factor completely over the real numbers: $x^3 + 27$

**ANSWER** _____

## APPLY IT Show your work

**1** A student makes a rectangular banner for a team event. Its area is modeled by $x^2 + 9x + 20$ square units. Factor the expression to show possible length and width expressions.

WORK SPACE

**ANSWER** _____

**2** A club's profit from selling fundraiser batches is modeled by $P(x) = 2x^2 - 18x$, where x is the number of batches sold. Factor P(x) and identify the break-even values of x.

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

Factor completely over the complex numbers: $x^4 + 5x^2 + 4$

WORK SPACE AND ANSWER

**ANSWER KEY**

# Factor Power

**HIGH SCHOOL · MA.912.AR.1.8**

## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Factor completely: $5x^3 - 15x^2$ | **$5x^2(x - 3)$** |
| 2 | Factor completely: $x^2 - x - 20$ | **$(x - 5)(x + 4)$** |
| 3 | Factor completely: $4x^2 - 25$ | **$(2x - 5)(2x + 5)$** |
| 4 | Factor completely: $x^3 + 4x^2 - 9x - 36$ | **$(x + 4)(x - 3)(x + 3)$** |
| 5 | Factor completely over the complex numbers: $x^2 + 9$ | **$(x + 3i)(x - 3i)$** |
| 6 | Factor completely over the real numbers: $x^3 + 27$ | **$(x + 3)(x^2 - 3x + 9)$** |

## PART 2 · APPLY IT

1. **$(x + 4)(x + 5)$, so possible dimensions are $x + 4$ units and $x + 5$ units.** Find two numbers with product 20 and sum 9. The factors are $x + 4$ and $x + 5$.
2. **$P(x) = 2x(x - 9)$; the break-even values are $x = 0$ and $x = 9$.** Factor out the greatest common factor, $2x$. Set each factor equal to zero to find the break-even values.

## CHALLENGE

**$(x - i)(x + i)(x - 2i)(x + 2i)$**

Accept factors in any order and equivalent forms with a constant distributed among factors. For complex-number items, accept correctly paired factors with i signs in either order.