

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

CHALLENGE

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

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.