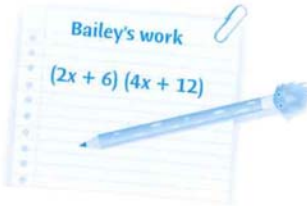


CRITIQUE & EXPLAIN

Seth and Bailey are given the polynomial $8x^2 + 48x + 72$ to factor.



A. Analyze each factored expression to see if both are equivalent to the given polynomial.

ex) $(x+3)(x+3)$

$x^2 + 3x + 3x + 9$

$\rightarrow x^2 + 6x + 9$

B. How can the product of different pairs of expressions be equivalent?

$\sqrt{1} = 1$

$\sqrt{9} = 3$

mult & double

$(1 \cdot 3) \cdot 2 = 6$

\rightarrow PST

C. Look for Relationships Find two other pairs of binomials that are different, but whose products are equal. © MP.7

Perfect
Square
Trinomial

HABITS OF MIND

Communicate Precisely What mathematical language was important to use in explaining the relationship between Seth's and Bailey's work? © MP.7

EXAMPLE 1 Try It! Understand Factoring a Perfect Square

PST pattern
or
ac box method

1. Factor each trinomial.

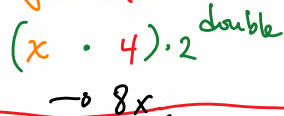
a. $4x^2 + 12x + 9$



$(2x + 3)(2x + 3)$

or $(2x + 3)^2$

b. $x^2 - 8x + 16$



$(x - 4)(x - 4)$

or $(x - 4)^2$

PST:
+ +
- +

Perfect Square Trinomials

$(a+b)(a+b) = (a+b)^2$
 $= a^2 + 2ab + b^2$

$(a-b)(a-b) = (a-b)^2$
 $= a^2 - 2ab + b^2$

EXAMPLE 2 Try It! Factor to Find a Dimension

2. What is the radius of a cylinder that has a height of 3 in. and a volume of $\pi(27x^2 + 18x + 3)$ in.³?

HABITS OF MIND

Use Structure How can you identify whether a given trinomial is a perfect square trinomial? © MP.7

/ / binomial, minus,

$$(a+b)(a-b) = a^2 - b^2$$

binomial, minus, square-rootable

conjugates ...

Notes

EXAMPLE 3 Try It! Factor a Difference of Two Squares

3. Factor each expression.

a. $x^2 - 64$ \rightarrow $x^2 + 0x - 64$

- binomial
- minus

$$(x+8)(x-8)$$

b. $9x^2 - 100$ \rightarrow $9x^2 + 0x - 100$

$$(3x+10)(3x-10)$$

EXAMPLE 4 Try It! Factor Out a Common Factor

4. Factor each expression completely.

a. $4x^3 + 24x^2 + 36x$

$\frac{GCF}{4x} (x^2 + 6x + 9) \rightarrow 4x(x+3)(x+3)$

\rightarrow or $4x(x+3)^2$

$$\frac{4x^3}{4x} = x^2$$

b. $50x^2 - 32y^2$

$\frac{GCF}{2} (25x^2 - 16y^2)$

$$2(5x+4y)(5x-4y)$$

HABITS OF MIND

Generalize Can you extend the difference of squares factoring pattern to $x^4 - y^4$? Explain. © MP.8

Do You UNDERSTAND?

1. **ESSENTIAL QUESTION** What special patterns are helpful when factoring a perfect-square trinomial and the difference of two squares?

2. **Error Analysis** A student says that to factor $x^2 - 4x + 2$, you should use the pattern of a difference of two squares. Explain the error in the student's thinking. © MP.3

3. **Vocabulary** How is a perfect square trinomial similar to a perfect square number? Is it possible to have a perfect square binomial? Explain.

4. **Communicate Precisely** How is the pattern for factoring a perfect-square trinomial like the pattern for factoring the difference of two squares? How is it different? © MP.6

5. **Construct Arguments** Why is it important to look for a common factor before factoring a trinomial? © MP.3

Do You KNOW HOW?

Identify the pattern you can use to factor each expression.

<p>6. $4x^2 - 9$ <i>diff of squares</i> $\sqrt{4x^2} - \sqrt{9}$ <i>minus</i> $\rightarrow (2x - 3)(2x + 3)$</p> <p>8. $9x^2 - 12x + 4$ <i>perfect square trinomial</i> $(3x - 2)$ doubled $\rightarrow (3x - 2)(3x - 2)$ <i>or</i> $(3x - 2)^2$</p> <p>10. $100 - 16y^2$ <i>diff of squares</i> $\sqrt{100} - \sqrt{16y^2}$ $\rightarrow 4(5 - 2y)(5 + 2y)$</p>	<p>7. $x^2 + 6x + 9$ <i>perfect square trinomial</i> $x^2 + 6x + 9$ $(x + 3)$ doubled $\rightarrow (x + 3)(x + 3)$ <i>or</i> $(x + 3)^2$</p> <p>9. $5x^2 - 30x + 45$ <i>GCF</i> 5 $5(x^2 - 6x + 9)$ <i>perfect square trinomial</i> $\rightarrow 5(x - 3)(x - 3)$ <i>or</i> $5(x - 3)^2$</p> <p>11. $3x^2 + 30x + 75$ <i>GCF</i> 3 $3(x^2 + 10x + 25)$ <i>perfect square trinomial</i> $\rightarrow 3(x + 5)(x + 5)$ <i>or</i> $3(x + 5)^2$</p>
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Write the factored form of each expression.

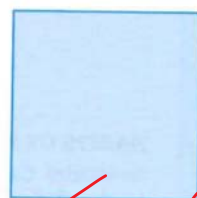
12. $49x^2 - 25$
diff of squares
 $\rightarrow (7x - 5)(7x + 5)$

13. $36x^2 + 48x + 16$
PST?
GCF 4
 $4(9x^2 + 12x + 4)$
 $(3x + 2)$ doubled
 $\rightarrow 4(3x + 2)(3x + 2)$
or $4(3x + 2)^2$

14. $3x^3 - 12x^2 + 12x$
GCF 3x
 $3x(x^2 - 4x + 4)$
PST?
 $\rightarrow 3x(x - 2)(x - 2)$
or $3x(x - 2)^2$

15. $72x^2 - 32$
GCF 8
 $8(9x^2 - 4)$
diff of squares...
 $\rightarrow 8(3x - 2)(3x + 2)$

16. What is the side length of the square shown below?



Area = $x^2 + 22x + 121$

PST
 $(x + 11)(x + 11)$
side length