Make a list of factors for the number.

1. 42
2. 102
3. 28

4. 56

1 56
2 28
4 14
7 8

5. 60

1 60
2 30
3 20
4 15
5 12
6 10

6. 36

1 36
2 18
3 12
4 9
6 6

Warm Up

* factors are pairs of numbers multiplied together

example 1 · 6
2 · 3

are factors of 6

Determine whether the equation represents a *linear* or *nonlinear* function. Explain.

1. $y = x^2 - 14$
2. $y = \sqrt{8} + x$

Cumulative Warm Up

review

linear is $y = mx + b$

Essential Question

How can you use algebra tiles to factor the trinomial $x^2 + bx + c$ into the product of two binomials?

Essential Question

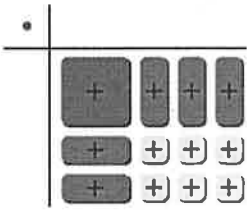
What you will learn:

- Factor $x^2 + bx + c$
- Use factoring to solve real world problems

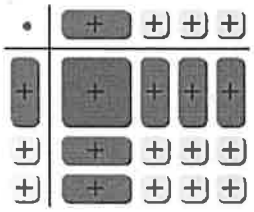
Work with a partner. Use algebra tiles to write each polynomial as the product of two binomials. Check your answer by multiplying.

Sample $x^2 + 5x + 6$

Step 1 Arrange algebra tiles that model $x^2 + 5x + 6$ into a rectangular array.



Step 2 Use additional algebra tiles to model the dimensions of the rectangle.



Exploration 1 Steps 1-2

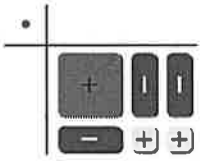
Skip

Step 3 Write the polynomial in factored form using the dimensions of the rectangle.

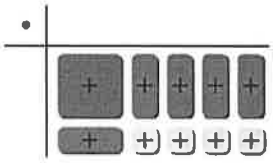
width length

Area $= x^2 + 5x + 6 = (x + 2)(x + 3)$

a. $x^2 - 3x + 2 =$



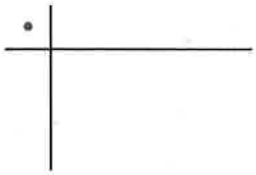
b. $x^2 + 5x + 4 =$



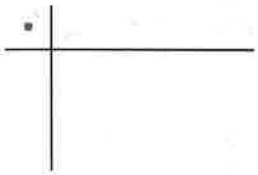
Exploration 1 Step 3a-b

Skip

c. $x^2 - 7x + 12 =$



d. $x^2 + 7x + 12 =$



Exploration 1 Step 3c-d

Skip

Core Concept

Factoring $x^2 + bx + c$ When c Is Positive

Algebra $x^2 + bx + c = (x + p)(x + q)$ when $p + q = b$ and $pq = c$.
When c is positive, p and q have the same sign as b.

Examples $x^2 + 6x + 5 = (x + 1)(x + 5)$
$x^2 - 6x + 5 = (x - 1)(x - 5)$

Core Concept

* Use the ac method
* Explain standard form and look at product/sum

Factor $x^2 + 10x + 16$.

$16 \cdot 1$
$+1 + 16$
$+2 + 8$
$+4 + 4$

$x^2 + 4x + 4x + 16$

$(x^2 + 4x) + (4x + 16)$

$x(x+4) + 4(x+4)$

$(x+4)(x+4)$

Example 1

- multiply c term by a term
- write all factors that equal 16
- find the sum that equals b term
- rewrite polynomial in 4 terms
- factor by grouping
- factor common binomials
- write what is left over.

Factor the polynomial.

1. $x^2 + 7x + 6$

$6 \cdot 1 = 6$
$+1 + 6$
$+2 + 3$

$(x^2 + 1x) + (6x + 6)$

$x(x+1) + 6(x+1)$

$(x+1)(x+6)$

2. $x^2 + 9x + 8$

$8 \cdot 1 = 8$
$+1 + 8$
$+2 + 4$

$(x^2 + 1x) + (8x + 8)$

$x(x+1) + 8(x+1)$

$(x+1)(x+8)$

Monitoring Progress 1-2

- Notice how when we rewrite in 4 terms we are just re writing the center term in 2 like terms which then allows us to factor by grouping.

Factor $x^2 - 8x + 12$.

$12 \cdot 1 = 12$

$-1 \quad -12$

$-2 \quad -6$

$-3 \quad -4$

$(x^2 - 2x)(-6x + 12)$

$x(x-2) - 6(x-2)$

$(x-2)(x-6)$

Example 2

* Student practice

Core Concept

Factoring $x^2 + bx + c$ When c Is Negative

Algebra $x^2 + bx + c = (x + p)(x + q)$ when $p + q = b$ and $pq = c$.

When c is negative, p and q have different signs.

Example $x^2 - 4x - 5 = (x + 1)(x - 5)$

Core Concept

* create chart of signs to use for factoring:

$ax^2 + bx + c = (+)(+)$

$ax^2 - bx + c = (-)(-)$

$ax^2 - bx - c = (+)(-)$ larger

$ax^2 + bx - c = (+)(-)$ larger

Factor $x^2 + 4x - 21$.

$21 \cdot 1$

$-1 + 21$

$-3 + 7$

$(x^2 - 3x) + (7x - 21)$

$x(x-3) + 7(x-3)$

$(x-3)(x+7)$

Example 3

Factor the polynomial.

3. $w^2 - 4w + 3$ $(w-3)(w-1)$

4. $n^2 - 12n + 35$ $(n-7)(n-5)$

5. $x^2 - 14x + 24$ $(x-2)(x-12)$

6. $x^2 + 2x - 15$ $(x+5)(x-3)$

7. $y^2 + 13y - 30$ $(y+15)(y-2)$

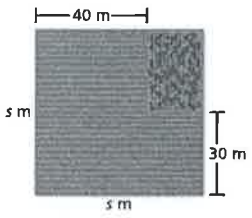
8. $v^2 - v - 42$ $(v-7)(v+6)$

Monitoring Progress 3-8

Student practice

* watch signs

A farmer plants a rectangular pumpkin patch in the northeast corner of a square plot of land. The area of the pumpkin patch is 600 square meters. What is the area of the square plot of land?



Example 4

$600 = (s-30)(s-40)$

$600 = x^2 - 70s + 1200$

$0 = x^2 - 70s + 600$

$0 = (s-10)(s-60)$

$s-10=0$ $s-60=0$

$s=10$ or $s=60$

area of plot: $60(60) = 3600$

9. WHAT IF? The area of the pumpkin patch is 200 square meters. What is the area of the square plot of land?

Monitoring Progress 9

• Explain your strategy for factoring the following polynomials.

a. $x^2 - 2x - 15$

b. $x^2 + 2x - 15$

c. $x^2 + 8x + 15$

d. $x^2 - 8x + 15$

Closure