Example 2

Factor the trinomial $x^2 + x + 1$.

The b-value is 1 and the c-value is 1. Look for p and q such that $pq = 1$ and $p + q = 1$.

p	q	pq	$p + q$	Pattern Match?
1	1	$1 \times 1 = 1$	$1 + 1 = 2$	✘
–1	–1	$-1 \times (-1) = 1$	$-1 + (-1) = -2$	✘

There are no other integer values of p and q that have a product of 1. The trinomial $x^2 + x + 1$ cannot be factored in the form $(x + p)(x + q) = x^2 + bx + c$ using integer values of p and q.

This unit focuses on integer values for p and q. However, some trinomials can be factored using non-integer values for p and q.

Check Up

1. Identify two integers with the given product and sum.

   a. product = 24, sum = 10

   b. product = –6, sum = 1

   c. product = –36, sum = –16

2. Factor the following trinomials.

   a. $x^2 + 2x + 1$

   b. $x^2 - 3x + 2$

☑ Compare your answers.

1. Identify two integers with the given product and sum.

   a. product = 24, sum = 10

p	q	pq	$p + q$	Pattern Match?
1	24	$1 \times 24 = 24$	$1 + 24 = 25$	✗
2	12	$2 \times 12 = 24$	$2 + 12 = 14$	✗
3	8	$3 \times 8 = 24$	$3 + 8 = 11$	✗
4	6	$4 \times 6 = 24$	$4 + 6 = 10$	✓

The integers are 4 and 6.

   b. product = –6, sum = 1

p	q	pq	$p + q$	Pattern Match?
1	–6	$1 \times (-6) = -6$	$1 + (-6) = -5$	✗
2	–3	$2 \times (-3) = -6$	$2 + (-3) = -1$	✗
3	–2	$3 \times (-2) = -6$	$3 + (-2) = 1$	✓

The integers are 3 and –2.

   c. product = –36, sum = –16

p	q	pq	$p + q$	Pattern Match?
1	–36	$1 \times (-36) = -36$	$1 + (-36) = -35$	✗
2	–18	$2 \times (-18) = -36$	$2 + (-18) = -16$	✓

The integers are 2 and –18.

2. Factor the following trinomials.

   a. $x^2 + 2x + 1$

      $b = 2$ and $c = 1$

      The integers 1 and 1 add to 2 and have a product of 1.

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

   b. $x^2 - 3x + 2$

      $b = -3$ and $c = 2$

      The integers –2 and –1 add to –3 and have a product of 2.

      $x^2 - 3x + 2 = (x - 2)(x - 1)$