**8-6 Study Guide and Intervention**

***Solving x*2+ *bx* + *c* = *0***

**Factor** $x^{2}$ **+ *bx* + *c*** To factor a trinomial of the form $x^{2}$ + *bx* + *c*, find two integers, *m* and *p*, whose sum is equal to *b* and whose product is equal to *c*.

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| --- | --- |
| **Factoring** $x^{2}$ **+ *bx* + *c*** | $x^{2}$ + *bx* + *c* = (*x* + *m*)(*x* + *p*), where *m* + *p* = *b* and *mp* = *c* |

**Example 1: Factor each polynomial.**

 **a.** $x^{2}$ **+ 7*x* + 10**

In this trinomial, *b* = 7 and *c* = 10.

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| **Factors of 10** | **Sum of Factors** |
| 1, 10 | 11 |
| 2, 5 | 7 |

Since 2 + 5 = 7 and 2 \_ 5 = 10, let *m* = 2 and *p* = 5.

$x^{2}$ + 7*x* + 10 = (*x* + 5)(*x* + 2)

**b.** $x^{2}$ **– 8*x* + 7**

In this trinomial, *b* = –8 and *c* = 7. Notice that *m* + *p* is negative and *mp* is positive, so *m* and *p* are both negative.

Since –7 + (–1) = –8 and (–7)(–1) = 7, *m* = –7 and *p* = –1.

$x^{2}$ – 8*x* + 7 = (*x* – 7)(*x* – 1)

**Example 2 : Factor** $x^{2}$ **+ 6*x* – 16.**

In this trinomial, *b* = 6 and *c* = –16. This means *m* + *p* is positive and *mp* is negative. Make a list of the factors of
–16, where one factor of each pair is positive.

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| --- | --- |
| **Factors of –16** | **Sum of Factors** |
| 1, –16 | –15 |
| –1, 16 | 15 |
| 2, –8 | –6 |
| –2, 8 | 6 |

Therefore, *m* = –2 and *p* = 8.

$x^{2}$ + 6*x* – 16 = (*x* – 2)(*x* + 8)

**Exercises**

**Factor each polynomial.**

 **1.** $x^{2}$ + 4*x* + 3 **2.** $m^{2}$ + 12*m* + 32 **3.** $r^{2}$ – 3*r* + 2

 **4.** $x^{2}$ – *x* – 6 **5.** $x^{2}$ – 4*x* – 21 **6.** $x^{2}$ – 22*x* + 121

 **7.** $t^{2}$ – 4*t* – 12 **8.** $p^{2}$ – 16*p* + 64 **9.** 9 – 10*x* + $x^{2}$

**10.** $x^{2}$ + 6*x* + 5 **11.** $a^{2}$ + 8*a* – 9 **12.** $y^{2}$ – 7*y* – 8

**13.** $x^{2}$ – 2*x* – 3 **14.** $y^{2}$ + 14*y* + 13 **15.** $m^{2}$ + 9*m* + 20

**16.** $x^{2}$ + 12*x* + 20 **17.** $a^{2}$ – 14*a* + 24 **18.** 18 + 11*y* + $y^{2}$

**19.** $x^{2}$ + 2*xy* + $y^{2}$ **20.** $a^{2}$ – 4*ab* + 4$b^{2}$ **21.** $x^{2}$ + 6*xy* – 7$y^{2}$

**8-6 Study Guide and Intervention** *(continued)*

***Solving x*2+ *bx* + *c* = 0**

**Solve Equations by Factoring** Factoring and the Zero Product Property can be used to solve many equations of the form $x^{2}$ + *bx* + *c* = 0.

**Example 1: Solve** $x^{2}$ **+ 6*x* = 7. Check your solutions.**

$x^{2}$ + 6*x* = 7 Original equation

$x^{2}$ + 6*x* – 7 = 0 Rewrite equation so that one side equals 0.

(*x* – 1)(*x* + 7) = 0 Factor.

*x* – 1 = 0 or *x* + 7 = 0 Zero Product Property

 *x* = 1 *x* = –7 Solve each equation.

The solution set is {1, –7}. Since $1^{2}$ + 6(1) = 7 and $(–7)^{2}$ + 6(–7) = 7, the solutions check.

**Example 2: ROCKET LAUNCH The formula *h* = *vt* – 16**$t^{2}$ **gives the height *h* of a rocket after *t* seconds when the initial velocity *v* is given in feet per second. If a rocket is fired with initial velocity 2288 feet per second, how many seconds will it take for the rocket to reach a height of 6720 feet?**

*h* = *vt* – 16$t^{2}$ Formula

6720 = 2288*t* – 16$t^{2}$ Substitute.

 0 = –16$t^{2}$ + 2288*t* – 6720 Rewrite equation so that one side equals 0.

0 = –16(*t* – 143*t* + 420) Factor out GCF.

0 = –16(*t* – 3)(*t* – 140) Factor

*t* – 3 = 0 or *t* – 140 = 0 Zero Product Property

 *t* = 3 *t* = 140 Solve each equation.

The rocket reaches 6720 feet in 3 seconds and again in 140 seconds, or 2 minutes 20 seconds after launch.

**Exercises**

**Solve each equation. Check the solutions.**

 **1.** $x^{2}$ – 4*x* + 3 = 0 **2.** $y^{2}$ – 5*y* + 4 = 0 **3.** $m^{2}$ + 10*m* + 9 = 0

 **4.** $x^{2}$ = *x* + 2 **5.** $x^{2}$ – 4*x* = 5 **6.** $x^{2}$ – 12*x* + 36 = 0

 **7.** $t^{2}$ – 8 = –7*t* **8.** $p^{2}$ = 9*p* – 14 **9.** –9 – 8*x* + $x^{2}$ = 0

**10.** $x^{2}$ + 6 = 5*x*  **11.** $a^{2}$ = 11*a* – 18 **12.** $y^{2}$ – 8*y* + 15 = 0

**13.** $x^{2}$ = 24 – 10*x*  **14.** $a^{2}$ – 18*a* = –72 **15.** $b^{2}$ = 10*b* – 16

**Use the formula *h* = *vt* – 16**$t^{2}$ **to solve each problem.**

**16. FOOTBALL** A punter can kick a football with an initial velocity of 48 feet per second. How many seconds will it take for the ball to first reach a height of 32 feet?

**17. ROCKET LAUNCH** If a rocket is launched with an initial velocity of 1600 feet per second, when will the rocket be 14,400 feet high?