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Worksheet 7-6: Factoring Trinomials

For a trinomial of the form $x^2 + bx + c$,
the factors are of the form $(x+m)(x+n)$, **where** $m+n=b$ **and** $mn=c$.

Therefore:

$$x^2 + bx + c \;=\; x^2 + (m+n)x + (mn) \;=\; (x+m)(x+n)$$

To factor a trinomial means writing $x^2 + bx + c$ **as** $(x+m)(x+n)$.

How do we find m **and** n **to factor the trinomial?**
We need to find two factors when multiplied equals c but added to b.

Example 1:

Factor each trinomial.
(Hint: Find two factors of c when added together equals b. **Watch for the signs!)**

(a) $x^2 + 5x + 6$ $\quad b = \mathbf{5}$ $\quad c = 6$ $\quad m = 2$ $\quad n = 3$
= $(x+2)(x+3)$ $\quad$ **2 × 3 = 6** $\quad$ **2 + 3 = 5**

x^2	6
x	**2**
x	**3**

(Check your answer by expanding the brackets to see if the brackets multiplied to $x^2 + 5x + 6$.)

(b) $a^2 - 3a - 18$ $\quad b = \mathbf{-3}$ $\quad c = -18$ $\quad m = -6$ $\quad n = 3$
= $(a-6)(a+3)$ $\quad$ **−6 × 3 = −18** $\quad$ **−6 + 3 = −3**

a^2	−18
a	**−6**
a	3

(c) $y^2 - 8y + 15$ $\quad b = \mathbf{-8}$ $\quad c = 15$ $\quad m = -3$ $\quad n = -5$
= $(y-3)(y-5)$ $\quad$ **−3 × −5 = 15** $\quad$ **−3 + −5 = −8**

y^2	15
y	**−3**
y	**−5**

When ***c*** is **positive** then the signs of ***m*** and ***n*** must both be either positive or negative… + + / − − → + then $m \times n = c$ and $|m| + |n| = b$ with the signs of m and n = the sign of b (***b* determines the signs**)

When ***c*** is **negative** then the signs of ***m*** and ***n*** must be one positive and one negative… + − / − + → − then $m \times n = c$ and $|m| - |n| = b$ with the sign of b = the sign of $|m|$ or $|n|$ whichever is greater

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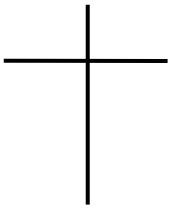
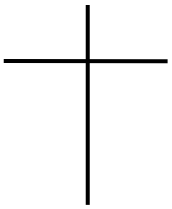
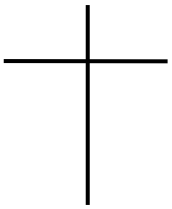
1. Factor $x^2 + 6x + 8$. $b =$ $c =$ $m =$ $n =$



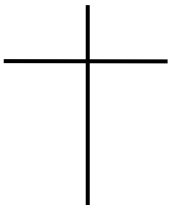
2. Factor $a^2 - 13a + 36$. $b =$ $c =$ $m =$ $n =$



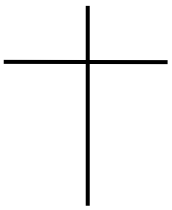
3. Factor $y^2 - 2y - 24$. $b =$ $c =$ $m =$ $n =$



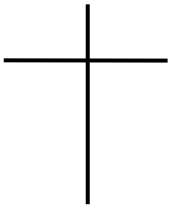
4. Factor $x^2 + 7x + 12$. $b =$ $c =$ $m =$ $n =$



5. Factor $a^2 - 9a + 18$. $b =$ $c =$ $m =$ $n =$



6. Factor $y^2 + 7y - 18$. $b =$ $c =$ $m =$ $n =$



Answers: 1. $(x+2)(x+4)$ **; 2.** $(a-4)(a-9)$ **; 3.** $(y-6)(y+4)$ **; 4.** $(x+3)(x+4)$ **; 5.** $(a-3)(a-6)$ **; 6.** $(y-2)(y+9)$

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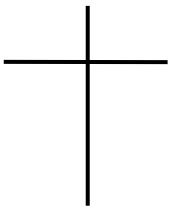
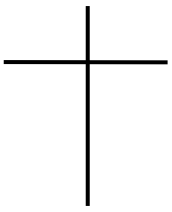
Worksheet 7-7: Factoring Trinomials in the form $x^2 + bx + c$

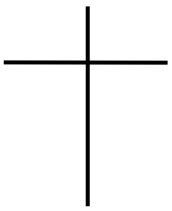
1. Factor $x^2 + 13x + 12$. $b =$ $c =$ $m =$ $n =$



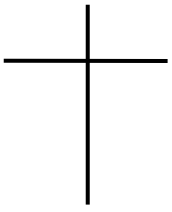
2. Factor $a^2 - 8a + 15$. $b =$ $c =$ $m =$ $n =$



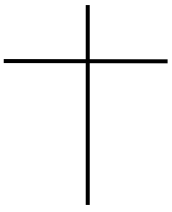
3. Factor $y^2 - 7y - 30$. $b =$ $c =$ $m =$ $n =$



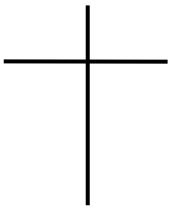
4. Factor $x^2 + 11x + 28$. $b =$ $c =$ $m =$ $n =$



5. Factor $a^2 - 11a + 24$. $b =$ $c =$ $m =$ $n =$



6. Factor $y^2 + 2y - 35$. $b =$ $c =$ $m =$ $n =$



Answers: **1.** $(x+1)(x+12)$**;** **2.** $(a-3)(a-5)$**;** **3.** $(y+3)(y-10)$**;** **4.** $(x+4)(x+7)$**;** **5.** $(a-3)(a-8)$**;** **6.** $(y-5)(y+7)$

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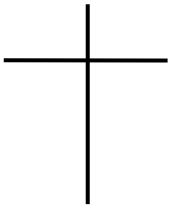
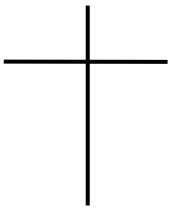
****IMPORTANT NOTE:** $(x+a)(x+a)=(x+a)^2$ and $(x-a)(x-a)=(x-a)^2$ ******

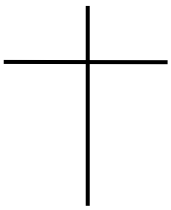
7. Factor $x^2+14x+49$. $b=$ $c=$ $m=$ $n=$



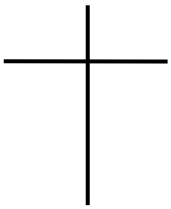
8. Factor $a^2-10a+25$. $b=$ $c=$ $m=$ $n=$



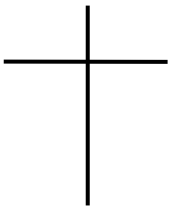
9. Factor $y^2+8y+16$. $b=$ $c=$ $m=$ $n=$



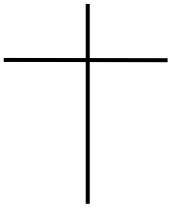
10. Factor x^2-2x+1. $b=$ $c=$ $m=$ $n=$



11. Factor a^2-4. $b=0$ $c=$ $m=$ $n=$



12. Factor y^2-64. $b=$ $c=$ $m=$ $n=$



Answers: 7. $(x+7)^2$ **; 8.** $(a-5)^2$ **; 9.** $(y+4)^2$ **; 10.** $(x-1)^2$ **; 11.** $(a+2)(a-2)$ **; 12.** $(y+8)(y-8)$

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Bingo: Factoring Trinomials

Factor.

1. $x^2 + 12x + 32$ **2.** $y^2 - 4y - 45$ **3.** $a^2 - 17a + 70$

4. $x^2 + x - 72$ **5.** $y^2 - 4y + 4$ **6.** $a^2 + 6a + 9$

7. $x^2 - 18x + 81$ **8.** $y^2 - 121$ **9.** $a^2 - 36$