9.5 Factor x^2+bx+c when $a=1$

$(x + 3)(x + 4) =$ $x^2+4x+3x+12$

$x^2+7x+12=(x+3)(x+4)$

You will reverse this process to factor trinomials of the form $x^2 + bx + c$.

Factoring $x^2 + bx + c$

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

Example $x^2 + 5x + 6 = (x + 3)(x + 2)$ because $3 + 2 = 5$ and $3 \cdot 2 = 6$.

Factor $x^2 + 11x + 18$.

Find two positive factors of 18 whose sum is 11. Make an organized list.

Factors of 18	Sum of factors
1 18	19
2 9 →	11 → $(x+9)(x+2)$
3 6	9

Factor the trinomial.

1. $x^2 + 3x + 2$ 2 $1\ 2$ $(x+2)(x+1)$

2. $a^2 + 7a + 10$ 10 $1\ 10$ $2\ 5$ $(a+5)(a+2)$

3. $t^2 + 9t + 14$ $(t+7)(t+2)$

Factoring Made Easy

$x^2 + 11x + 24$

① Make Parenthesis
② Split 1st term into parenthesis
③ Bring 1st sign into 1st parenthesis
- If 2nd sign +, both signs same
- If 2nd Signs −, both signs different

④ If 'c' is +, factors add to b
If 'c' is −, factors subtract to b

Biggest factor first

① ( )( )
② (x)(x)
③ (x+)(x+)

24
1 24
2 12
3 8
4 6

④ (x+8)(x+3)

$x^2 - 5x - 24$

① ( )( )
② (x)(x)
③ (x−)(x+)

④ 24
1 24
2 12
3 8
4 6

④ (x−8)(x+3)

Factor $n^2 - 6n + 8$.

factors add to 'b'
Bring down
same signs

(n − 4)(n − 2)

Factor $y^2 + 2y - 15$.

Subtract to 'b'
different signs

(y + 5)(y − 3)

Factor the trinomial.

4. $x^2 + 6x + 5$

5. $a^2 + 10a + 21$

6. $w^2 + 8w + 15$

7. $p^2 - 3p - 10$

8. $c^2 + 10c - 11$

9. $y^2 + 5y - 14$

13. $z^2 + 7z + 12$

14. $s^2 - 3s - 18$

15. $d^2 - 5d - 24$

Zero Product Property

If $ab=0$, then $a=0$ or $b=0$

Solve a polynomial equation

- $x^2 + 3x - 18 = 0$

$(x+6)(x-3)=0$

a b

$x+6=0$ or $x-3=0$

$x=-6$ or $x=3$

- $s^2 - 2s = 24$

$s^2-2s-24=0$

$(s-6)(s+4)=0$

$s-6=0$ $s+4=0$

$s=6$ $s=-4$

$x(x+7)=-10$

$x^2+7x=-10$

$x^2+7x+10=0$

$(x+5)(x+2)=0$

$x+5=0$ or $x+2=0$

$x=-5$ $x=-2$

Solve the equation.

16. $x^2 + 5x + 4 = 0$

17. $d^2 + 7d + 10 = 0$

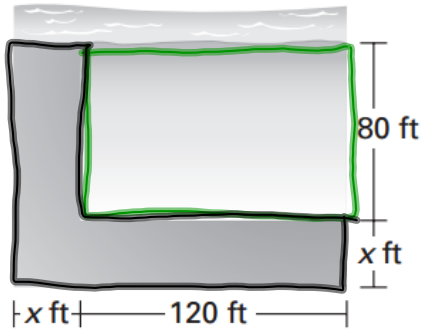
18. $p^2 + 9p + 14 = 0$

19. $w^2 - 12w + 11 = 0$

20. $n^2 - n - 6 = 0$

21. $a^2 - 12a + 35 = 0$

Boardwalk A boardwalk is being built along two sides of a beach area. The beach area is rectangular with a width of 80 feet and a length of 120 feet. The boardwalk will have the same width on each side of the beach area. If the combined area of the beach and the boardwalk is 16,500 square feet, How wide should the boardwalk be?



$\ell \cdot w = 16,500$

$(x+120)(x+80) = 16,500$

$(x+120)(x+80) - 16500 = 0$ $\quad -16500 \quad -16\ 500$

$x^2 + 120x + 80x + 9600 - 16500 = 0$

$x^2 + 200x - 6900 = 0$

$(x + 230)(x - 30) = 0$

$x+230=0$ or $x-30=0$

~~$x=-230$~~ $\quad x=30$