

Task 1: Investigating How to Solve by Graphing and Factoring

- Use the DESMOS to graph the parabola. Just provide a sketch on the paper, showing the zeros.
- Use the graph to determine the zeros.
- Factor the equation according to the type of expression (common, simple, tricky, difference of squares).

Standard Equation	Graph	Zeros/Solutions/ X-Intercepts	Factored Equation
$y = x^2 - 8x + 12$		$(2, 0)$ and $(6, 0)$ or $\{2, 6\}$	$y = (x - 2)(x - 6)$
$y = x^2 - 49$		$(-7, 0)$ and $(7, 0)$ or $\{-7, 7\}$	$y = (x + 7)(x - 7)$
$y = x^2 + 3x$		$(-3, 0)$ and $(0, 0)$ or $\{-3, 0\}$	$y = x(x + 3)$
$y = 2x^2 + 5x - 3$		$(-3, 0)$ and $(\frac{1}{2}, 0)$ or $\{-3, \frac{1}{2}\}$	$y = 2x^2 + 5x - 3$ $= 2x^2 - x + 6x - 3$ $= x(2x - 1) + 3(2x - 1)$ $= (2x - 1)(x + 3)$ $\begin{array}{r rr} M & A & N \\ -6 & 5 & -1, 6 \end{array}$

What is the relationship between the zeros/solutions/x-intercepts and the factors?

When you equal the factor to zero to solve it, you find the zeros/x-int.

Hint: if the factor was $(x - 6)$, what would the corresponding zero be? $x - 6 = 0$ $x = 6$

if the factor was $(x + 4)$, what would the corresponding zero be? $x + 4 = 0$ $x = -4$

if the factor was x , what would the corresponding zero be? $x = 0$

if the factor was $(2x - 3)$, what would the corresponding zero be? $2x - 3 = 0$

$2x = 3$

$x = \frac{3}{2}$

Task 3: Solving Quadratic Equations by Factoring Practice

1. Solve each quadratic equation by factoring. Follow along the steps in the first two examples.

a. $x^2 + 7x + 12 = 0$

simple trinomial

$(x+4)(x+3) = 0$

$x+4=0$ $x+3=0$

$x=-4$ and $x=-3$

- factor the expression as appropriate (common, simple, tricky, difference of squares)
- set each factor equal to zero
- solve each of these equations for x.

b. $10x^2 + 8x = 0$

common factoring

$2x(5x+4) = 0$

$2x=0$ $5x+4=0$

$5x=-4$

$x=0$ and $x=-3$

c. $x^2 - 8x + 16 = 0$

$(x-4)(x-4) = 0$

M	A	N
16	-8	-4, 4

$x-4=0$
 $x=4$

$x-4=0$
 $x=4$

$\therefore \{4\}$ or $x=4$

d. $6x^2 + 9x = 0$

GCF = $3x$

$3x(2x+3) = 0$

$\frac{3x}{3} = \frac{0}{3}$
 $x=0$

$2x+3=0$

$\frac{2x}{2} = \frac{-3}{2}$

$x = -\frac{3}{2}$

$\therefore \{-\frac{3}{2}, 0\}$

g. $x^2 - 16 = 0$

$(x+4)(x-4) = 0$

$x+4=0$
 $x=-4$

$x-4=0$
 $x=4$

$\therefore \{-4, 4\}$

f. $4x^2 - 4x + 1 = 0$

$4x^2 - 2x - 2x + 1 = 0$

$2x(2x-1) - (2x-1) = 0$

$(2x-1)(2x-1) = 0$

$2x-1=0$

$x = \frac{1}{2}$

M	A	N
4	-4	-2, -2

$\therefore \{\frac{1}{2}\}$

Note: Sometimes, you will need to put your equations into standard form first before you factor it.

i. $3x^2 - 2 = -7x + 4$

Collect all the terms

$3x^2 + 7x - 2 - 4 = 0$

← where the leading term is positive.

$3x^2 + 7x - 6 = 0$

← Factor the tricky tri

$3x^2 - 2x + 9x - 6 = 0$

$x(3x-2) + 3(3x-2) = 0$

xx	A	N
-18	+7	-2, +9

$(3x-2)(x+3) = 0$

$3x-2=0$

$3x=2$

$x = \frac{2}{3}$

$x+3=0$

$x = -3$

$\therefore \{-3, \frac{2}{3}\}$

j. $4x(x+1) = 9 + 4x$

FOIL (expand)

$4x^2 + 4x = 9 + 4x$

Collect terms LS

$4x^2 + 4x - 9 - 4x = 0$

simplify

$4x^2 - 9 = 0$

Factor DS

$(2x+3)(2x-3) = 0$

$2x+3=0$

$2x=-3$

$x = -\frac{3}{2}$

$2x-3=0$

$2x=3$

$x = \frac{3}{2}$

$\therefore \{-\frac{3}{2}, \frac{3}{2}\}$

Solving by Factoring Fun!

1) $(r - 4)(r + 1) = 0$

$r - 4 = 0$ $r + 1 = 0$ $\{-1, 4\}$
 $r = 4$ $r = -1$

2) $(3a - 2)(a + 2) = 0$

$3a - 2 = 0$ $a + 2 = 0$ $\{-2, 2/3\}$
 $3a = 2$ $a = -2$
 $a = 2/3$

3) $(b - 5)(b + 2) = 0$

$b - 5 = 0$ $b + 2 = 0$ $\{-2, 5\}$
 $b = 5$ $b = -2$

4) $(4n + 1)(4n - 5) = 0$

$4n + 1 = 0$ $4n - 5 = 0$ $\{-1/4, 5/4\}$
 $4n = -1$ $4n = 5$
 $n = -1/4$ $n = 5/4$

5) $(p + 5)(2p - 1) = 0$

$p + 5 = 0$ $2p - 1 = 0$ $\{-5, 1/2\}$
 $p = -5$ $2p = 1$

6) $(x - 5)(x - 4) = 0$

$x - 5 = 0$ $x - 4 = 0$ $\{4, 5\}$
 $x = 5$ $x = 4$

7) $n^2 - 7n + 12 = 0$ $p = 1/2$

$(n - 3)(n - 4) = 0$ $\{3, 4\}$
 $n = 3$ $n = 4$

8) $a^2 - 4a - 32 = 0$

$(a + 4)(a - 8) = 0$ $\{-4, 8\}$
 $a = -4$ $a = 8$

9) $r^2 + 10r + 21 = 0$

$(r + 3)(r + 7) = 0$ $\{-7, -3\}$
 $r = -3$ or $r = -7$

10) $v^2 - 3v - 10 = 0$

$(v + 2)(v - 5) = 0$ $\{-2, 5\}$
 $v = -2$ $v = 5$

11) $m^2 + 2m = 0$

$m(m + 2) = 0$ $\{-2, 0\}$
 $m = 0$ $m + 2 = 0$
 $m = -2$

12) $x^2 - 64 = 0$

$(x + 8)(x - 8) = 0$ $\{-8, 8\}$
 $x + 8 = 0$ $x - 8 = 0$
 $x = -8$ $x = 8$

13) $p^2 - 6p = 0$

$p(p - 6) = 0$ $\{0, 6\}$
 $p = 0$ $p - 6 = 0$
 $p = 6$

14) $a^2 - 4 = 0$

$(a + 2)(a - 2) = 0$ $\{-2, 2\}$
 $a + 2 = 0$ $a - 2 = 0$
 $a = -2$ $a = 2$

15) $3v^2 + 3v - 60 = 0$

$3(v^2 + v - 20) = 0$ $v - 4 = 0$ $v + 5 = 0$
 $3(v - 4)(v + 5) = 0$ $v = 4$ $v = -5$

16) $3r^2 - 27 = 0$

$3(r^2 - 9) = 0$ $r + 3 = 0$ $r - 3 = 0$
 $3(r + 3)(r - 3) = 0$ $r = -3$ $r = 3$
 $\{-3, 3\}$

17) $5v^2 - 2v - 7 = 0$

$5v^2 + 5v - 7v - 7 = 0$ $\{-5, 4\}$
 $5v(v + 1) - 7(v + 1) = 0$ $v + 1 = 0$ $5v - 7 = 0$
 $(v + 1)(5v - 7) = 0$ $v = -1$ $5v = 7$
 $v = 7/5$

18) $5a^2 - 2a = 0$

$a(5a - 2) = 0$ $\{2/5, 0\}$
 $a = 0$ $5a - 2 = 0$
 $a = 2/5$

19) $3n^2 + 11n - 4 = 0$

$3n^2 - n + 12n - 4 = 0$ $\{-4, 1/3\}$
 $n(3n - 1) + 4(3n - 1) = 0$
 $(3n - 1)(n + 4) = 0$
 $3n - 1 = 0$ $n + 4 = 0$
 $n = 1/3$ $n = -4$

20) $5n^2 + 43n + 24 = 0$

$5n^2 + 3n + 40n + 24 = 0$ $\{-8, -3/5\}$
 $n(5n + 3) + 8(5n + 3) = 0$
 $(5n + 3)(n + 8) = 0$
 $5n + 3 = 0$ $n + 8 = 0$
 $n = -3/5$ $n = -8$

21. $7m^2 - 13m - 24 = 0$

22. $5k^2 - 3k = 0$

23. $5x^2 + 12x - 9 = 0$

24. $15r^2 - 4r - 3 = 0$

25. $7p^2 - 4p = 0$

26. $8x^2 - 15x + 7 = 0$

27. $-4x^2 + 5x - 15 = -5x^2 - 1$

28. $-b^2 + 11b + 30 = -2b^2$

29. $3x^2 + 8x = -2x - 21 + 2x^2$

30. $-7a^2 - 13a + 49 = 7 - 8a^2$