

# Solving Quadratic Equations

**What does it mean to be a solution?**

**What is the difference between an Equation and an Expression?**

**Equation – Has a solution**  
- has an = sign

EX.  $x^3 + 2x^2 = 15x$

**Expression – Does NOT have a solution**  
- Has NO = sign

EX.  $x^3 + 2x^2 + 15x$

**4 steps for solving a quadratic equation**

1. Set the equation equal to 0.
2. Factor the equation.
3. Set each part equal to 0 and solve.
4. Check your answer!

Set = 0  
Factor  
Split/Solve  
Check

**Zero Product Property**

If  $a \cdot b = 0$  then  
 $a=0$ ,  
 $b=0$ ,  
or both a and b equal 0.

1. Solve  $(x + 3)(x - 5) = 0$   
Using the Zero Product Property,  
you know that either  
 $x + 3 = 0$  or  $x - 5 = 0$   
Solve each equation.  
 $x = -3$  or  $x = 5$   
 $\{-3, 5\}$

2. Solve  $(2a + 4)(a + 7) = 0$

$$2a + 4 = 0 \text{ or } a + 7 = 0$$

$$2a = -4 \text{ or } a = -7$$

$$a = -2 \text{ or } a = -7$$

$$\{-2, -7\}$$

3. Solve  $(3t + 5)(t - 3) = 0$

$$3t + 5 = 0 \text{ or } t - 3 = 0$$

$$3t = -5 \text{ or } t = 3$$

$$t = -5/3 \text{ or } t = 3$$

$$\{-5/3, 3\}$$

Solve  $(y - 3)(2y + 6) = 0$

✓1.  $\{-3, 3\}$

2.  $\{-3, 6\}$

3.  $\{3, 6\}$

4.  $\{3, -6\}$

4. Solve  $x^2 - 11x = 0$

$$\text{GCF} = x$$

$$x(x - 11) = 0$$

$$x = 0 \text{ or } x - 11 = 0$$

$$x = 0 \text{ or } x = 11$$

$$\{0, 11\}$$

5. Solve.  $-24a + 144 = -a^2$

Put exponents in descending order.

$$a^2 - 24a + 144 = 0$$

$$(a - 12)^2 = 0$$

$$a - 12 = 0$$

$$a = 12$$

$$\{12\}$$

6. Solve  $4m^2 + 25 = 20m$

$$4m^2 - 20m + 25 = 0$$

$$(2m - 5)^2 = 0$$

$$2m - 5 = 0$$

$$2m = 5$$

$$m = \frac{5}{2}$$

$$\left\{\frac{5}{2}\right\} \text{ or } \{2.5\}$$

7. Solve  $x^3 + 2x^2 = 15x$

$$x^3 + 2x^2 - 15x = 0$$

$$x(x^2 + 2x - 15) = 0$$

$$x(x + 5)(x - 3) = 0$$

$$x = 0 \text{ or } x + 5 = 0 \text{ or } x - 3 = 0$$

$$\{0, -5, 3\}$$

Solve  $a^2 - 3a = 40$

1.  $\{-8, 5\}$
- ✓2.  $\{-5, 8\}$
3.  $\{-8, -5\}$
4.  $\{5, 8\}$

Solve  $4r^3 - 16r = 0$

1.  $\{-16, 4\}$
2.  $\{-4, 16\}$
3.  $\{0, 2\}$
4.  $\{0, 4\}$
- ✓5.  $\{-2, 0, 2\}$

The degree will tell you how many answers you have.

Maria told this puzzle to her friends. "The product of four times my age and 45 less than three times my age is zero. How old am I?"

Find Maria's age.

Let  $m =$  Maria's age.

$$4m(3m - 45) = 0$$

$$4m = 0 \text{ or } 3m - 45 = 0$$

$$m = 0 \text{ or } 3m = 45$$

$$m = 0 \text{ or } m = 15$$

0 is not reasonable so Maria is **15 years old!!**

Find two consecutive integers

whose product is 240.

Let  $n =$  1st integer.

Let  $n + 1 =$  2nd integer.

$$n(n + 1) = 240$$

$$n^2 + n = 240$$

$$n^2 + n - 240 = 0$$

$$(n - 15)(n + 16) = 0$$

$$(n - 15)(n + 16) = 0$$

$$n - 15 = 0 \text{ or } n + 16 = 0$$

$$n = 15 \text{ or } n = -16$$

The consecutive integers are

**15, 16 or -16, -15.**

# Moving Words

Solve each equation in the top block and find the solution set in the bottom block. Transfer the word from the top box to the corresponding bottom box. Keep working and you will get a moving fact.

$(x+3)(x+8) = 0$ ① WHY	$(x-12)(x+5) = 0$ ⑥ THAT	$(x-10)(4x-3) = 0$ ⑪ ONLY	$x(4x+7) = 0$ ⑮ ROBBERS
$(x+4)(x+11) = 0$ ② THE	$x(x-9) = 0$ ⑦ TO	$(3x+2)(3x-2) = 0$ ⑫ BANK	$x(2x+1)(x-6) = 0$ ⑰ PLACE
$(x-5)(x-2) = 0$ ③ IS	$x(x+14)(x-1) = 0$ ⑧ THEY	$(9x-2)(5x+1) = 0$ ⑬ BECAUSE	$2x(4x-8)(x+1) = 0$ ⑱ CANADA
$(x-1)(x-6) = 0$ ④ HAVE	$(2x-1)(x+4) = 0$ ⑨ IS	$(2x+2)(7x+6) = 0$ ⑭ ESCAPED	$7x(3x+5)(5x+2) = 0$ ⑲ TORONTO
$(x+3)(x-7) = 0$ ⑤ ALWAYS	$(x-2)(3x+1) = 0$ ⑩ THE	$(2x-5)(3x+1) = 0$ ⑮ REASON	$(x-9)(x+1)(x-1) = 0$ ⑳ RUN
$\left\{2, -\frac{1}{3}\right\}$	$\left\{\frac{5}{2}, -\frac{1}{3}\right\}$	$\{-3, -8\}$	$\left\{-\frac{2}{3}, \frac{2}{3}\right\}$
$\left\{0, -\frac{7}{4}\right\}$	$\{-3, 7\}$	$\{9, -1, 1\}$	$\{0, 2, -1\}$
$\{5, 2\}$	$\left\{\frac{2}{9}, -\frac{1}{5}\right\}$	$\{12, -5\}$	$\{-4, -11\}$
$\left\{10, \frac{3}{4}\right\}$	$\left\{0, -\frac{1}{2}, 6\right\}$	$\{0, -14, 1\}$	$\left\{0, -\frac{5}{3}, -\frac{2}{5}\right\}$

OBJECTIVE 4-a: To solve equations when one side is in factored form and the other side is 0.

## Solving Quadratic Equations by Factoring

Solve each equation by factoring.

1)  $(k + 1)(k - 5) = 0$

2)  $(a + 1)(a + 2) = 0$

3)  $(4k + 5)(k + 1) = 0$

4)  $(2m + 3)(4m + 3) = 0$

5)  $x^2 - 11x + 19 = -5$

6)  $n^2 + 7n + 15 = 5$

7)  $n^2 - 10n + 22 = -2$

8)  $n^2 + 3n - 12 = 6$

9)  $6n^2 - 18n - 18 = 6$

10)  $7r^2 - 14r = -7$

$$11) n^2 + 8n = -15$$

$$12) 5r^2 - 44r + 120 = -30 + 11r$$

$$13) -4k^2 - 8k - 3 = -3 - 5k^2$$

$$14) b^2 + 5b - 35 = 3b$$

$$15) 3r^2 - 16r - 7 = 5$$

$$16) 6b^2 - 13b + 3 = -3$$

$$17) 7k^2 - 6k + 3 = 3$$

$$18) 35k^2 - 22k + 7 = 4$$

$$19) 7x^2 + 2x = 0$$

$$20) 10b^2 = 27b - 18$$

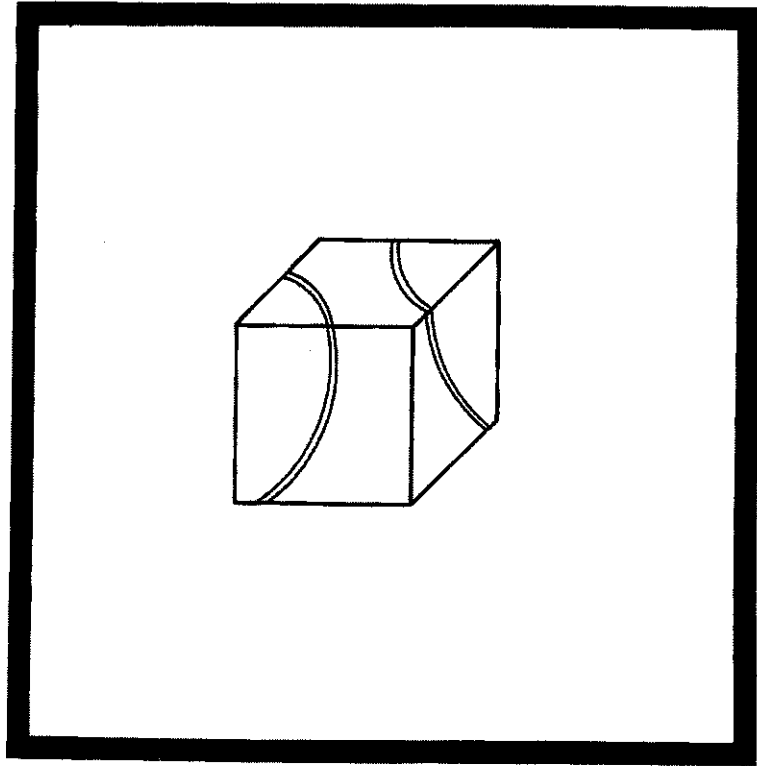
$$21) 8x^2 + 21 = -59x$$

$$22) 15a^2 - 3a = 3 - 7a$$

# What Is the Title of This Picture ?

Solve each equation below. Find the solution set in the answer list and notice the letter next to it. Each time the exercise number appears in the code, write this letter above it. Keep working and you will decode the title of the picture.

- ①  $a^2 + 7a + 10 = 0$
- ②  $n^2 - 8n + 12 = 0$
- ③  $y^2 - 49 = 0$
- ④  $x^2 + 5x - 6 = 0$
- ⑤  $u^2 - 7u - 18 = 0$
- ⑥  $m^2 - 5m = 0$
- ⑦  $2t^2 + 5t - 3 = 0$
- ⑧  $3w^2 - 8w + 4 = 0$
- ⑨  $2x^2 - 3x - 5 = 0$
- ⑩  $5v^2 + 29v + 20 = 0$
- ⑪  $6n^2 - 19n + 15 = 0$
- ⑫  $2k^2 + 7k = 0$
- ⑬  $3b^2 + b - 10 = 0$
- ⑭  $4y^2 - 25 = 0$



CODED TITLE:

$\frac{14}{10} \frac{12}{11} \frac{13}{2} \frac{13}{14} \frac{1}{3} \frac{6}{8} \frac{9}{8} \frac{11}{12} \frac{5}{7} \frac{5}{12} \frac{5}{14}$

① $\left\{\frac{5}{3}, -2\right\}$	② $\left\{\frac{3}{2}, \frac{5}{2}\right\}$	③ $\left\{\frac{5}{2}, -1\right\}$	④ $\{-2, 9\}$
⑤ $\left\{\frac{2}{3}, 2\right\}$	⑥ $\{-2, -5\}$	⑦ $\left\{0, -\frac{7}{2}\right\}$	⑧ $\left\{\frac{3}{5}, -1\right\}$
⑨ $\{0, 5\}$	⑩ $\left\{\frac{5}{2}, -\frac{5}{2}\right\}$	⑪ $\{-6, 1\}$	⑫ $\{2, 6\}$
⑬ $\{7, -7\}$	⑭ $\left\{-\frac{4}{5}, -5\right\}$	⑮ $\left\{\frac{1}{2}, -3\right\}$	⑯ $\left\{\frac{3}{2}, \frac{5}{3}\right\}$