

# 5.2<sup>4</sup> Solving Quadratic Equations By Factoring<sup>\*</sup>

Warmup<sup>\*</sup> 1. The sum of the squares of 3 consecutive positive integers is 194. Find the integers.

→ Do NOT solve the quadratic equation. Just set up the let sentence, design the equation and manipulate the quadratic equation to standard format:  $ax^2 + bx + c = 0$

Soln

Let  $x$  represent one integer ✓

Synonyms: Successive and consecutive... aka one after the other...

Then  $(x)^2 + (x+1)^2 + (x+2)^2 = 194$  ✓

$$x^2 + (x+1)(x+1) + (x+2)(x+2) = 194$$

$$x^2 + \underset{F}{x^2} + \underset{O}{x} + \underset{I}{x} + 1 + \underset{F}{x^2} + \underset{O}{2x} + \underset{I}{2x} + 4 = 194$$

$$\therefore 3x^2 + 6x + 5 = 194, \text{ collected likes}$$

$$3x^2 + 6x - 189 = 0 \quad \checkmark$$

$$x^2 + 2x - 63 = 0, \text{ divided by 3... did you see that?}$$

Remark: When 2 factors multiply to equal zero, one or both of them must be zero.

Zero Product Property: If  $(a)(b) = 0$ , then  $a = 0$  or  $b = 0$  or both  $a = 0$  and  $b = 0$  \*  
"ZPP" "Logic"

Ex, Solve

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

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

Soln, Factor:  $(x+5)(x-3) = 0$ , sum+product trinomial

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

$$\therefore x = -5 \quad x = 3$$

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Soln, Factor:  $(x+5)(x+2) = 0$ , Sum+Product Tri

$$\therefore x+5=0 \text{ or } x+2=0, \text{ ZPP}$$

$$\therefore x = -5 \quad x = -2$$

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c)  $x^2 + 4x = 0$

d)  $x^2 - 16 = 0$

Soln, Factor:  $(x)(x+4) = 0$ , Common Factor  $x$  to front

\* Don't divide out the  $x$ !!

$$\therefore x = 0 \text{ or } x+4=0, \text{ ZPP}$$

$$\therefore x = 0 \quad x = -4$$

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Soln, Factor:  $(x+4)(x-4) = 0$ , difference of squares pattern.

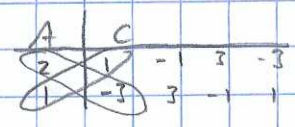
$$\therefore x+4=0 \text{ or } x-4=0, \text{ ZPP}$$

$$\therefore x = -4 \quad x = 4$$

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→

e)  $2x^2 - 5x - 3 = 0$



Sol'n Factor:  $(2x+1)(x-3) = 0$ , Tricky Trinomial  
 Factoring  $\rightarrow$  A-C chart  $\checkmark$   
 $\rightarrow$  Decomposition  
 $\rightarrow$  Guess + Check

$\therefore 2x+1=0$  or  $x-3=0$ , ZPP  
 $\therefore 2x=-1$        $x=3$   
 $x = -\frac{1}{2}$   $\checkmark$

Ex 2 Solve. First manipulate equation so one side = 0 so we can factor and the ZPP  $\therefore$

a)  $\frac{x^2}{5} + \frac{x}{3} = \frac{22}{15}$

A side  $\therefore$

Sol'n  $\frac{3x^2}{15} + \frac{5x}{15} = \frac{22}{15}$ , build common denom  
 $3x^2 + 5x = 22$ , clear common denom  
 $-22 \quad -22$   
 $3x^2 + 5x - 22 = 0$   $\checkmark$

Checking  $x = +2$ ,

LS =  $\frac{x^2}{5} + \frac{x}{3}$       RS =  $\frac{22}{15}$   
 $= \frac{(+2)^2}{5} + \frac{(+2)}{3}$   
 $= \frac{4}{5} + \frac{2}{3} \times \frac{2}{2} = \frac{4}{5} + \frac{4}{3}$   
 $= \frac{12}{15} + \frac{20}{15}$        $\therefore LS = RS$   
 $= \frac{32}{15}$        $\therefore x = 2$   $\checkmark$

Factor:  $3x^2 - 6x + 11x - 22 = 0$ , Tricky Trinomial  
 $3x(x-2) + 11(x-2) = 0$  Factoring  $\rightarrow$  A-C chart  $\checkmark$   
 $\rightarrow$  Decomposition  
 $\rightarrow$  Guess and check  
 $(3x-2)(3x+11) = 0$ , Group to front

$\therefore x-2=0$  or  $3x+11=0$ , ZPP  
 $\therefore x = +2$        $3x = -11$   
 $\checkmark$        $x = -\frac{11}{3}$

Checking  $x = -3.66$

LS =  $\frac{x^2}{5} + \frac{x}{3}$       RS =  $\frac{22}{15}$   
 $= \frac{(-3.66)^2}{5} + \frac{(-3.66)}{3} = 1.46$   
 $= 1.46$        $\therefore LS = RS$   
 $\therefore x = -\frac{11}{3}$   $\checkmark$

b)  $3x(x-2) = 72$

Sol'n  $3x^2 - 6x = 72$ , Distributive Property  
 $-72 \quad -72$   
 $3x^2 - 6x - 72 = 0$ , Quadratic Equation in Standard Form  $ax^2 + bx + c = 0$

$x^2 - 2x - 24 = 0$ , divide by 3

Factor:  $(x-6)(x+4) = 0$ , Sum and Product Trinomial

$\therefore x-6=0$  or  $x+4=0$   
 $\therefore x = 6$        $x = -4$   
 $\checkmark$

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