Math 115

Fall 2017

Lecture 24

Solve by using the Zero-Factor Property:

1) $(x-5)(x+10)=0$

$x-5=0$ or $x+10=0$

$\boxed{x=5}$ $\boxed{x=-10}$ $\{-10, 5\}$

2) $(3x+7)(2x-9)=0$

$3x+7=0$ or $2x-9=0$

$3x=-7$ $2x=9$

$\boxed{x=\frac{-7}{3}}$ $\boxed{x=\frac{9}{2}}$ $\left\{\frac{-7}{3}, \frac{9}{2}\right\}$

Solve by factoring:

1) RHS = 0 2) LHS Comp. factored

3) use Z.F.P. to solve

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

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

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

$\boxed{x=5}$ $\boxed{x=-2}$

$\{-2, 5\}$

4) $x^2 + 16 = 8x$

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

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

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

by Z.F.P. $x-4=0$

$\boxed{x=4}$ $\{4\}$

Repeated Soln.

Solve $2x^2 = 7 - 5x$ by factoring.

$2x^2 - 7 + 5x = 0$ RHS = 0 ✓

$2x^2 + 5x - 7 = 0$ order ✓

$(2x + 7)(x - 1) = 0$ Factor

by Z.F.T.

$2x + 7 = 0$ $\quad x - 1 = 0$

$2x = -7$ $\quad \boxed{x = 1}$ $\quad \left\{-\frac{7}{2}, 1\right\}$

$\boxed{x = -\frac{7}{2}}$

The product of two consecutive integers is 30

Find all such integers

x	$x+1$
5	6
-6	-5

$x(x + 1) = 30$

$x^2 + x = 30$

$x^2 + x - 30 = 0$

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

$x + 6 = 0 \quad x = -6$

$x - 5 = 0 \quad x = 5$

Final Ans:
5 & 6
or
-6 & -5

The product of two consecutive odd integers is 63.

Find all such integers.

x	$x+2$
7	9
-9	-7

x must be odd.

7 & 9 or -9 & -7

$x(x+2)=63$

$x^2+2x=63$

$x^2+2x-63=0$

$(x+9)(x-7)=0$

$x+9=0 \quad x=-9$ ← by Z.P.R.

$x-7=0 \quad x=7$

Find two consecutive even integers such that the sum of their squares is 52.

x	$x+2$

x must be even.

$x^2+(x+2)^2=52$

$x^2+(x+2)(x+2)=52$

Foil & Simplify

$x^2+x^2+2x+2x+4=52$

$2x^2+4x+4=52$

→ Make RHS zero, and Simplify

$2x^2 + 4x + 4 - 52 = 0$

$2x^2 + 4x - 48 = 0$

Divide by 2 to reduce

$x^2 + 2x - 24 = 0$

Factor LHS completely, then use Z.F.P. to Solve

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

$x+6=0$ $\quad x-4=0$

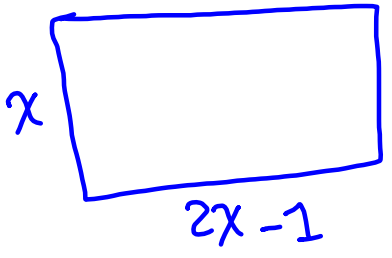
$x=-6$ $\quad x=4$

x	$x+2$
4	6
-6	-4

4 & 6 or -6 & -4

The Area of a rectangular Sign is 15 ft^2. The length is 1 ft shorter than twice its width.

Find its dimensions.



$A = 15\ ft^2$

$x(2x-1)=15$

$2x^2 - x = 15$

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

$P = -30$, $S = -1$

-6 & 5

-30

$2x^2 - 6x + 5x - 15 = 0$

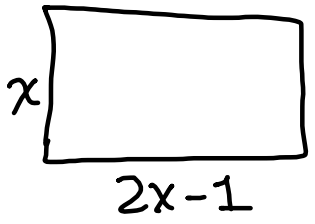
$2x(x-3) + 5(x-3) = 0$

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

by Z.F.T.

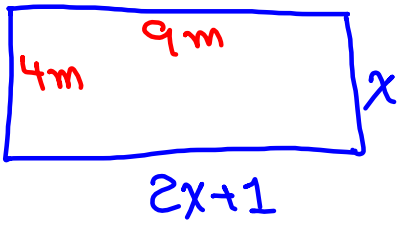
$x-3=0$ $\quad$ $2x+5=0$

$\boxed{x=3}$ $\quad$ ~~$x=-\frac{5}{2}$~~



Dimensions: 3 ft by 5 ft

Area of a rectangular room is $36\ m^2$. The length is 1 m longer than twice its width. Find its dimensions.



$x(2x+1)=36$

$2x^2+x=36$

$2x^2+x-36=0$

$9\xi-8$ $\quad$ $P=-72$ $\quad$ $S=1$

-72

$2x^2+9x-8x-36=0$

$x(2x+9)-4(2x+9)=0$

$(2x+9)(x-4)=0$

$2x+9=0$ $\quad$ ~~$x=-\frac{9}{2}$~~

$x-4=0$ $\quad$ $\boxed{x=4}$

Solve: $(x-2)^2 + x^2 = (x+2)^2$

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

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

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

$x^2 - 8x = 0$

$x(x-8) = 0$

by Z.F.P. $\rightarrow$ $x = 0$ or $x - 8 = 0$ $\rightarrow$ $x = 8$

$\{0, 8\}$

Reduce $\frac{36}{45}$

$\frac{36}{45} = \frac{9 \cdot 4}{9 \cdot 5} = \frac{4}{5}$

Reduce

$\frac{x^2 + 2x}{x^2 + 7x + 10} = \frac{x(x+2)}{(x+5)(x+2)} = \frac{x}{x+5}$

Reduce $\dfrac{x^2-25}{x^2-8x+15} = \dfrac{(x+5)\cancel{(x-5)}}{(x-3)\cancel{(x-5)}}$

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

$3 \cdot -4 = -12$

$3x(x+1)-4(x+1)$

$= \dfrac{x+5}{x-3}$

Reduce $\dfrac{3x^2-x-4}{4x^2-x-5} = \dfrac{\cancel{(x+1)}(3x-4)}{\cancel{(x+1)}(4x-5)}$

$4x^2-x-5 = 4x^2+4x-5x-5$

$4 \cdot -5 = -20$

$= 4x(x+1)-5(x+1)$

$= \dfrac{3x-4}{4x-5}$

Reduce:

$\dfrac{x^2-100}{x^3-1000} = \dfrac{(x)^2-(10)^2}{(x)^3-(10)^3}$

$= \dfrac{(x+10)\cancel{(x-10)}}{\cancel{(x-10)}(x^2+10x+100)}$

$= \dfrac{x+10}{x^2+10x+100}$

Quadratic Equation : $ax^2+bx+c=0 ; a\neq 0$

Ex: $2x^2+3x-7=0$, $x^2-8x+10=0$

$\frac{2}{3}x^2-8x+\frac{1}{2}=0$, $5x^2+3x=0$

Quadratic Formula : $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

Solve $x^2+3x-10=0$ by Quadratic formula.

$ax^2+bx+c=0$

$a=1,\ b=3,\ c=-10$

we compute $b^2-4ac=(3)^2-4(1)(-10)$

$=9+40$

$=49$

we use Q-formula to solve

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-3\pm\sqrt{49}}{2(1)}$

$=\frac{-3\pm 7}{2}$

$x=\frac{-3+7}{2}=\frac{4}{2}=\boxed{2}$

$x=\frac{-3-7}{2}=\frac{-10}{2}=\boxed{-5}$

$\{-5,2\}$

Solve $2x^2 - 5x = 7$ by Quadratic formula.

$2x^2 - 5x - 7 = 0$

$a=2 \quad b=-5 \quad c=-7$

$b^2-4ac = (-5)^2 - 4(2)(-7) = 25 + 56 = 81$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-(-5) \pm \sqrt{81}}{2(2)} = \frac{5 \pm 9}{4}$$

$x = \frac{5+9}{4} = \frac{14}{4}$ $\quad x = \frac{5-9}{4} = \frac{-4}{4}$ $\quad \left\{-1, \frac{7}{2}\right\}$

$\boxed{x = 7/2}$ $\quad \boxed{x = -1}$

Solve $(3x-1)(2x+3) = 72$ by Quadratic formula.

Hint: FOIL, Simplify, and write in Stand. form. $ax^2+bx+c=0$

$6x^2 + 9x - 2x - 3 - 72 = 0$

$6x^2 + 7x - 75 = 0$

$a=6, \quad b=7, \quad c=-75$

$b^2-4ac = (7)^2 - 4(6)(-75) = 1849$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-7 \pm \sqrt{1849}}{2(6)}$$

$$x = \frac{-7 \pm 43}{12}$$

$$x = \frac{-7+43}{12} = \frac{36}{12} = \boxed{3}$$

$$x = \frac{-7-43}{12} = \frac{-50}{12} = \boxed{\frac{-25}{6}}$$

$$\left\{\frac{-25}{6}, 3\right\}$$

Solve $3x(5x-2) = 48$ by Q-formula.

$15x^2 - 6x - 48 = 0$

Divide by 3 to reduce,

$5x^2 - 2x - 16 = 0$

$a = 5$, $b = -2$, $c = -16$

$b^2 - 4ac = (-2)^2 - 4(5)(-16) = 324$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-(-2) \pm \sqrt{324}}{2(5)}$$

$$x = \frac{2 \pm 18}{10}$$

$$x = \frac{2+18}{10} = \frac{20}{10} = \boxed{2}$$

$$\left\{-\frac{8}{5}, 2\right\}$$

$$x = \frac{2-18}{10} = \frac{-16}{10} = \boxed{\frac{-8}{5}}$$

Solve $5x(4x+3) = 110$ by using Quadratic formula.

$$20x^2 + 15x - 110 = 0$$

Divide by 5 to reduce

$$4x^2 + 3x - 22 = 0$$

$a=4 \quad b=3 \quad c=-22$

$$b^2-4ac = (3)^2 - 4(4)(-22) = 361$$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-3 \pm \sqrt{361}}{2(4)}$$

$$= \frac{-3 \pm 19}{8} \qquad x = \frac{-3+19}{8} = \frac{16}{8} = \boxed{2}$$

$$\left\{ \frac{-11}{4}, 2 \right\} \qquad x = \frac{-3-19}{8} = \frac{-22}{8} = \boxed{\frac{-11}{4}}$$

Solve $x^2 = 100$ by inspection.

The answer is 10 and -10.

Work on the next two study guides.