

Math 115
Spring 2018
Lecture 23

? $a^2 + b^2 = c^2$?
 $y = mx + b$? $d = rt$

Factor Completely:

① $7x + 14$
 $= 7(x + 2)$

③ $x^2 - x - 56$
 $= (x + 7)(x - 8)$

1, 56
 2, 28
 4, 14
 7, 8

② $6y^2 + 9y + 4xy + 6x$
 $= 3y(2y + 3) + 2x(2y + 3)$
 $= (2y + 3)(3y + 2x)$

④ $2x^2 + 5x + 2$

$P = 4$
 $S = 5$
 4

(1, 4)
 2, 2

$= 2x^2 + 1x + 4x + 2$
 $= x(2x + 1) + 2(2x + 1)$
 $= (2x + 1)(x + 2)$

Find the missing factor:

$$\textcircled{1} 24x^3 - 36x^2 - 6x = 6x(4x^2 - 6x - 1)$$

$$\textcircled{2} 7x^2(4x-5) - 12x(4x-5) + 10(4x-5) = (7x^2 - 12x + 10)(4x - 5)$$

$$\textcircled{3} (8x+3)(8x-3) = 64x^2 - 9$$

$$\textcircled{4} \underset{x^3 + 4^3}{x^3} + 64 = (x + 4)(x^2 - 4x + 16)$$

Factor completely:

$$\textcircled{1} 12x^5y^6 - 48x^3y^4 = 12x^3y^4(x^2y^2 - 4)$$

$$= 12x^3y^4(xy + 2)(xy - 2)$$

$$A^2 - B^2 = (A + B)(A - B)$$

$$\textcircled{2} 25x^3 - 10x^2 - 15x$$

$$= 5x(5x^2 - 2x - 3)$$

$p = -15$
 $S = -2$
 -15
 $1, 15$
 $3, 5$

$$= 5x(5x+3)(x-1)$$

$$= \underbrace{5x^2 + 3x - 5x - 3}_{=x(5x+3) - 1(5x+3)} = (5x+3)(x-1)$$

$$\textcircled{3} \quad x^3 - 64x$$

$$= x(x^2 - 64)$$

use $A^2 - B^2 = (A+B)(A-B)$

$$x^2 - 8^2$$

$$= \boxed{x(x+8)(x-8)}$$

$$\textcircled{4} \quad 2x^4y - 128xy$$

$$= 2xy(x^3 - 64)$$

use $A^3 - B^3$, why?

$$x^3 - 4^3$$

$$(A-B)(A^2+AB+B^2)$$

$$= \boxed{2xy(x-4)(x^2+4x+16)}$$

Factor Completely:

$$\textcircled{1} \quad x^3 + 100x$$

$$= \boxed{x(x^2 + 100)}$$

$$\textcircled{2} \quad x^3 - 100x$$

$$= x(x^2 - 100)$$

$$= x(x^2 - 10^2)$$

$$= \boxed{x(x+10)(x-10)}$$

$$\textcircled{3} \quad 6x^2 - x - 7$$

$P = -42$ -7×6

$S = -1$ -42

$$= \underline{6x^2 - 7x} + \underline{6x - 7}$$

$$= x(6x-7) + 1(6x-7)$$

$$= \boxed{(6x-7)(x+1)}$$

$$\textcircled{4} \quad x^2 + 5x + 25$$

$P = 25$ 25

$S = 5$

Prime

Polynomial Equations:

$$x^2 - 5x - 6 = 0, \quad x^2 + 10x = 0$$

$$x^3 + 5x^2 = 2x + 10, \quad 3x - 5 = 0$$

Zero-Product Rule:

Zero-Factor Property:

If $A \cdot B = 0$, then $A = 0$ or $B = 0$
 "Maybe both"

Solve $(x+5)(x-8) = 0$

RHS = 0, LHS is factored completely

by Z.F.P. $x+5=0$ or $x-8=0$

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

$$\text{or } \boxed{x = 8}$$

$$\rightarrow \{-5, 8\}$$

Solve $(2x-7)(3x+4) = 0$

RHS = 0, LHS factored,

By Z.F.P. $2x-7=0$ or $3x+4=0$

$$2x=7$$

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

$$3x = -4$$

$$\boxed{x = -\frac{4}{3}}$$

Solve $(5x+9)(5x-9) = 0$

By Z.F.P.

$$5x+9=0$$

$$5x = -9$$

$$\boxed{x = -\frac{9}{5}}$$

$$5x-9=0$$

$$5x = 9$$

$$\boxed{x = \frac{9}{5}}$$

$$\left\{ \pm \frac{9}{5} \right\}$$

$$\left\{ -\frac{4}{3}, \frac{7}{2} \right\}$$

How to Solve Polynomial equations:

- ① RHS = 0.
- ② LHS must be factored completely.
- ③ Use Z.F.R. to Solve.
- ④ Final Ans: Soln Set

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

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

By Z.F.R. $x - 6 = 0$ or $x + 4 = 0$

$$\boxed{x = 6}$$

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

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

Solve $x^2 = 20 - x$

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

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

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

By Z.F.R.

$$x + 5 = 0$$

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

$$\text{or } x - 4 = 0$$

$$\boxed{x = 4}$$

$$\{-5, 4\}$$

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

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

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

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

$\begin{array}{c} +2x \\ -7x \end{array}$

→ By Z.F.P.

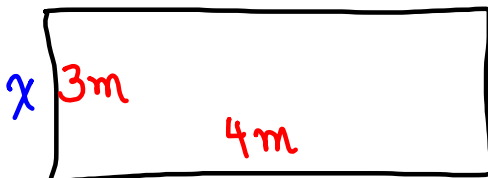
$$x+1=0 \text{ or } 2x-7=0$$

$$\boxed{x=-1}$$

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

$$\left\{-1, \frac{7}{2}\right\}$$

Area of a rectangular room is 12 m^2 .
The length is 1 m longer than its width.
Find its dimensions



$$x + 1$$

By Z.F.P.

$$x-3=0 \text{ or } x+4=0$$

$$\boxed{x=3}$$

$$\cancel{x=-4}$$

$$A = 12$$

$$LW = 12$$

$$x(x+1) = 12$$

$$x^2 + x = 12$$

$$x^2 + x - 12 = 0$$

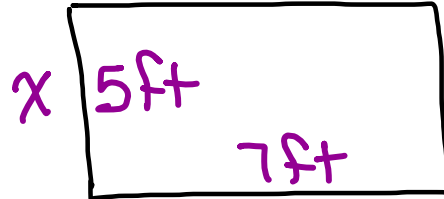
$$(x-3)(x+4) = 0$$

$$\boxed{3 \text{ m by } 4 \text{ m}}$$

Dimension of a rectangle are two consecutive odd integers.

Area is 35 ft^2

find its dimensions.



$$A = 35$$

$$LW = 35$$

$$x(x+2) = 35$$

$$x^2 + 2x = 35$$

$$x^2 + 2x - 35 = 0$$

$$\rightarrow (x+7)(x-5) = 0$$

$+7x$ $x+2$
 $-5x$

By Z.F.P.

$$x+7=0$$

~~$$x = -7$$~~

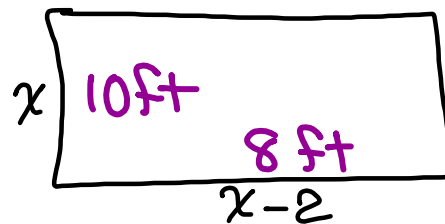
$$x-5=0$$

$$x = 5$$

The length of a rectangle is 2 ft shorter than its width.

Its Area is 80 ft^2

find its dimensions.



$$A = 80$$

$$x(x-2) = 80$$

$$x^2 - 2x = 80$$

$$x^2 - 2x - 80 = 0$$

$$\rightarrow (x+8)(x-10) = 0$$

~~$$x = -8$$~~

$$10$$

Solve

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

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

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

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

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

$$(x+1)(x-3) = 0$$

↙
-1

↘
3

$\{-1, 3\}$

find x :

x
 8m $A = 120\text{m}^2$
 15m
 $2x-1$

$$A = 120$$

$$LW = 120$$

$$x(2x-1) = 120$$

$$2x^2 - x = 120$$

$$2x^2 - x - 120 = 0$$

$$(2x+15)(x-8) = 0$$

↙
 ~~$\frac{-15}{2}$~~

↘
8

Leo has \$1.85 in nickels & Dimes.

of dimes is 1 more than twice # of nickels. Make a chart, then find how many of each coin.

Cat.	Number	Value	Amount
Dimes	$2x+1$	10¢	$10(2x+1)$
Nickels	x	5¢	$5x$

$$10(2x+1) + 5x = 185$$

$$20x + 10 + 5x = 185$$

$$25x = 175$$

$$x = 7$$

7 nickels

&

15 Dimes

Small print → \$8

Large Print → \$12

Total cost → \$272

Total # of Prints → 30

How many of each

Cat.	Value	Number	Cost
Small	\$8	x	$8x$
Large	\$12	$30-x$	$12(30-x)$

$$8x + 12(30-x) = 272$$

$$8x + 360 - 12x = 272$$

$$-4x = -88$$

$$x = 22$$

22 Small prints

&

8 Large Prints

Lisa has \$280 in bills.

of \$10 bills is twice # of \$5 bills.

of \$20 bills is 1 more than twice # of \$5 bills.

How many of each?

Cat	Value	Number	Amount
\$5	5	x	$5x$
\$10	10	$2x$	$10(2x)$
\$20	20	$2x+1$	$20(2x+1)$

$$5x + 10(2x) + 20(2x+1) = 280$$

$$5x + 20x + 40x + 20 = 280$$

$$65x = 260$$

$$\boxed{x=4}$$

4 \$5 bills

8 \$10 bills

9 \$20 bills