Math 115

Spring 2019

Lecture 22

$? \; a^2 + b^2 = c^2 \; ?$

$y = mx + b \quad ? \quad d = rt$

Factor Completely:

$A^2 - B^2$

① $17x^3y^2 + 51xy^3$

$= 17xy^2(x^2 + 3y)$

② $k^2(x-3) - 16(x-3)$

$= (x-3)(k^2 - 16)$

$= (x-3)(k^2 - 4^2) = (x-3)(k+4)(k-4)$

③ $5x^3 - 4x^2 + 10x - 8$

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

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

$P = -60$

$S = -7$

1, 60

2, 30

3, 20

4, 15

5, 12

6, 10

④ $2x^2 - 30 - 7x$

$= 2x^2 - 7x - 30$

-60

$= 2x^2 + 5x - 12x - 30$

$= x(2x+5) - 6(2x+5)$

$= (2x+5)(x-6)$

Factor completely:

Always do GCF first.

⑤ $10x^2 - 15x$

$= 5x(2x - 3)$

⑥ $x^2(x-10) + 7x(x-10) + 6(x-10)$

$= (x-10)(x^2 + 7x + 6)$

$= (x-10)(x+6)(x+1)$

⑦ $3x^2 - 300$

$= 3(x^2 - 100)$

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

$= 3(x-10)(x+10)$

⑧ $10x^3 - 7x^2 - 6x$

$= x(10x^2 - 7x - 6)$

$P = -60$

$S = -7$

$-12 \; 5$

See last slide

$10x^2 + 5x - 12x - 6$

$5x(2x+1) - 6(2x+1)$

$x(2x+1)(5x-6)$

Factor out the GCF, then factor the rest if possible by using A^2+B^2, A^2-B^2, A^3+B^3, or A^3-B^3:

⑨ $2x^2 - 32 = 2(x^2 - 16)$

$= 2(x^2 - 4^2)$

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

⑩ $4x^3 + 108$

$= 4(x^3 + 27)$

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

$= 4(x+3)(x^2 - 3x + 9)$

⑪ $5x^4 - 5000x$

$= 5x(x^3 - 1000)$

$= 5x(x^3 - 10^3)$

$= 5x(x-10)(x^2 + 10x + 100)$

⑫ $25x^2(5x-9) - 81(5x-9)$

$= (5x-9)(25x^2 - 81)$

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

$= (5x-9)^2(5x+9)$

Factor out the GCF, then factor completely if possible:

(13) $14x^3 + 7x^2 - 70x$

$= 7x(2x^2 + x - 10)$

$P = -20$, $S = 1$, $-4 \& 5$

-20

$2x^2 - 4x + 5x - 10$

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

$= \boxed{7x(x-2)(2x+5)}$

(14) $80m^4 - 20m^3 - 30m^2$

$= 10m^2(8m^2 - 2m - 3)$

$P = -24$, $S = -2$, $4 \& -6$

-24

$8m^2 + 4m - 6m - 3$

$4m(2m+1) - 3(2m+1)$

$\boxed{10m^2(2m+1)(4m-3)}$

Class Quiz: Box Your Final Ans.

Factor Completely:

1) $20x + 30y$

$= \boxed{10(2x + 3y)}$

2) $x^2 - 49 = x^2 - 7^2$

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

3) $x^2 - x - 30$

$= \boxed{(x-6)(x+5)}$

4) $x^3 + 64$

$= x^3 + 4^3$

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

Zero-Factor Property:

If $AB=0$, then $A=0$ or $B=0$

or both may be 0.

Solve $(x-8)(3x+5)=0$

By Z.F.P. $\Rightarrow$ $x-8=0$ or $3x+5=0$

RHS = 0

$x=8$

$3x=-5$

$x=-5/3$

LHS must be in Factored form.

$\left\{-\frac{5}{3}, 8\right\}$

Solve

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

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

$x=7$ $x=-2$

$\{-2, 7\}$

2) $(x-10)(x+10)=0$

By Z.P.R. $x-10=0$ or $x+10=0$

$x=10$ $x=-10$

$\{\pm 10\}$

3) $(4x-7)(3x+10)=0$

By Z.F.P. $4x-7=0$ or $3x+10=0$

$4x=7$

$x=7/4$

$3x=-10$

$x=\frac{-10}{3}$

$\left\{\frac{-10}{3}, \frac{7}{4}\right\}$

Make RHS=0, Factor the LHS Completely, then Use Zero-Factor Prop. to Solve.

① $x^2+3x+2=0$

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

Now by Z.F.P.

$x+1=0$ or $x+2=0$

$x=-1$ $x=-2$

$\{-2,-1\}$

② $x^2=24-5x$

$x^2-24+5x=0$

$x^2+5x-24=0$

$(x+8)(x-3)=0$

by Z.F.P.

$x+8=0$ OR $x-3=0$

$x=-8$ $x=3$

$\{-8,3\}$

③ $x^2-25=75$

$x^2-25-75=0$

$x^2-100=0$

$x^2-10^2=0$

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

By Z.F.P.

$x-10=0$ OR $x+10=0$

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

$\{\pm 10\}$

④ $3x^2-2=-5x$

$3x^2-2+5x=0$

$3x^2+5x-2=0$

$(3x-1)(x+2)=0$

By Z.F.P.

$3x-1=0$ OR $x+2=0$

$x=\frac{1}{3}$ $x=-2$

$\{-2,\frac{1}{3}\}$

Distribute, Foil, Simplify, then Solve:

$3x(x+1) = (2x+3)(x+1)$

$3x^2 + 3x = 2x^2 + 2x + 3x + 3$

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

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

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

By Z.F.P.

$x+1=0$ $\quad x-3=0$

$x=-1$ $\quad x=3$

$\{-1, 3\}$

Solve $(2x+3)(3x+2) = 25$

Hint: FOIL & Simplify

$6x^2 + 4x + 9x + 6 - 25 = 0$

$6x^2 + 13x - 19 = 0$

$(x-1)(6x+19) = 0$

By Z.F.P.

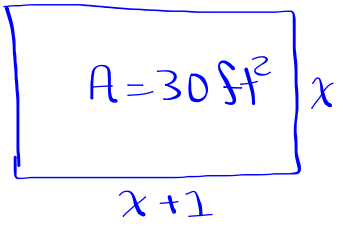
$x-1=0$ $\quad 6x+19=0$

$x=1$ $\quad x=\frac{-19}{6}$

$\left\{\frac{-19}{6}, 1\right\}$

Area of a rectangular room is $30\ ft^2$.
Its length is 1 ft longer than its width.

1) Draw & label



2) Find its dimensions

$A = 30$

$LW = 30$

$x(x+1) = 30$

$x^2 + x - 30 = 0$

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

By Z.P.R.

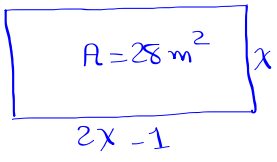
$x+6=0$ $\quad x-5=0$

$x=-6$ $\quad x=5$

5ft by 6 ft

Area of a rectangular room is $28\ m^2$.
The length is 1 m shorter than twice its width.

1) Draw & label



2) Find its dimensions.

$A = 28$

$LW = 28$

$x(2x-1) = 28$

$2x^2 - x = 28$

$2x^2 - x - 28 = 0$

$P = -56$

$S = -1$

$7\ \&\ -8$

$2x^2 + 7x - 8x - 28 = 0$

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

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

By Z.F.P.

$2x+7=0$ or $x-4=0$

$x=-\frac{7}{2}$ $\quad x=4$

4m by 7m

The sum of squares of two cons. integers is 25.

Find all such consecutive integers

x, $x+1$

$x^2 + (x+1)^2 = 25$

$x^2 + (x+1)(x+1) = 25$

$x^2 + x^2 + x + x + 1 - 25 = 0$

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

Divide by 2

$x^2 + x - 12 = 0$

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

By Z.F.P.

$x+4=0$ OR $x-3=0$

$x=-4$ $x=3$

x	$x+1$
3	4
-4	-3

3 & 4 or -4 & -3

Find two consecutive even integers with Product 48.

x & $x+2$

$x(x+2) = 48$

$x^2 + 2x = 48$

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

$(x-6)(x+8) = 0$

by Z.F.P.

$x-6=0$ $x+8=0$

$x=6$ $x=-8$

x	$x+2$
6	8
-8	-6

6 & 8 or -8 & -6

For Thursday Work on SG 15 & 16.

Open notes Quiz (Box Your Final ans.)

① Solve: $(2x-3)(x+20)=0$

$2x-3=0$ $\quad x+20=0$

$x=3/2$ $\quad x=-20$

$\left\{-20, \frac{3}{2}\right\}$

② Solve $x^2-9=40$

$x^2-9-40=0$

$x^2-49=0$

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

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

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

$\{\pm 7\}$

③ Solve $2x^2+7x=9.$

$2x^2+7x-9=0$

$(2x+9)(x-1)=0$

$2x+9=0$ $\quad x-1=0$

$x=-\frac{9}{2}$ $\quad x=1$

$\left\{-\frac{9}{2}, 1\right\}$