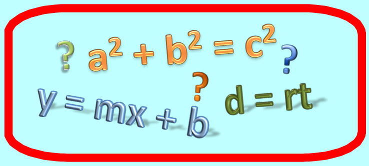
Math 115

Fall 2018

Lecture 24



Feb 19-8:47 AM

Factor Completely:

① $10x^6 - 1000x^4 = 10x^4(x^2 - 100)$

$= \boxed{10x^4(x+10)(x-10)}$

② $\underbrace{6y^2 + 9y}\ \underbrace{-4xy - 6x}$

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

③ $25x^2(5x-7) - 49(5x-7)$

$= (5x-7)(25x^2 - 49) = (5x-7)(5x-7)(5x+7)$

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

Dec 4-6:04 AM

(4) $8x^3 - 24x^2 - 80x$

$= 8x(x^2 - 3x - 10) = \boxed{8x(x-5)(x+2)}$

(5) $x^2(x+5) + 10x(x+5) + 25(x+5)$

$= (x+5)(x^2 + 10x + 25) = (x+5)(x+5)(x+5)$

$= \boxed{(x+5)^3}$

(6) $24x^5 - 20x^4 + 4x^3$

$= 4x^3(6x^2 - 5x + 1)$

$P = 6$

$S = -5$

-2 & -3

6

$\underbrace{6x^2 - 2x}\underbrace{-3x + 1}$

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

$\boxed{4x^3(3x-1)(2x-1)}$

Dec 4-6:13 AM

(7) $125x^3 + 64y^3$

$= (5x)^3 + (4y)^3 = \boxed{(5x+4y)(25x^2 - 20xy + 16y^2)}$

(8) $64x^4 - 343x$

$= x(64x^3 - 343) = x[(4x)^3 - (7)^3]$

$= \boxed{x(4x-7)(16x^2 + 28x + 49)}$

(9) $625x^2 - 400xy + 64y^2$

$2 \cdot 25x \cdot 8y$

$= (25x - 8y)^2$

Dec 4-6:22 AM

Use Zero-Factor Property to Solve:

If $A \cdot B = 0$, then $A = 0$ or $B = 0$

Maybe both

① $(4x+3)(x-1)=0$

$4x+3=0$ or $x-1=0$

$\boxed{x=\frac{-3}{4}}$ $\boxed{x=1}$ $\left\{\frac{-3}{4}, 1\right\}$

② $(x+7)(x-3)(x+10)=0$

$x+7=0$ $x-3=0$ $x+10=0$

$\boxed{x=-7}$ $\boxed{x=3}$ $\boxed{x=-10}$

$\{-10, -7, 3\}$

③ $x(2x-5)=0$

0

$\boxed{x=0}$

0

$2x-5=0$

$\boxed{x=5/2}$

$\left\{0, \frac{5}{2}\right\}$

Dec 4-6:32 AM

Solve by Factoring method:

RHS $=0$
LHS factored

① $x^2-4x=-3$

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

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

by Z.F.P.

$x-1=0$ $x-3=0$

$x=1$ $x=3$

$\{1, 3\}$

② $x^2-5=20$

$x^2-5-20=0$

$x^2-25=0$

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

By Z.F.P.

$x+5=0$ $x-5=0$

$x=-5$ $x=5$

$\{\pm 5\}$

Dec 4-6:40 AM

④ $3x^2 - 20 = 11x$

$3x^2 - 20 - 11x = 0$

$3x^2 - 11x - 20 = 0$

P=-60

S=-11

-60

-15 & 4

$(3x+4)(x-5)=0$

By Z.F.P.

$3x+4=0$ $\qquad$ $x-5=0$

$\boxed{x=-\frac{4}{3}}$ $\quad$ $\left\{-\frac{4}{3}, 5\right\}$ $\quad$ $\boxed{x=5}$

⑤ $(x+1)(x+3) = 15$

Hint: Foil & Simplify

$x^2+3x+1x+3=15$

$x^2+4x+3-15=0$

$x^2+4x-12=0$

$(x+6)(x-2)=0$

By Z.F.P.

$x+6=0$ $\qquad$ $x-2=0$

$\boxed{x=-6}$ $\quad$ $\{-6, 2\}$ $\quad$ $\boxed{x=2}$

Dec 4-6:46 AM

Solve

$4x^2 - 15x = 19$

$4x^2 - 15x - 19 = 0$

P=-76

S=-15

-76

4, -19

$\underbrace{4x^2 + 4x}\ \underbrace{-19x - 19}=0$

$4x(x+1) - 19(x+1) = 0$

$(x+1)(4x-19)=0$

by Z.F.P.

$x+1=0$ $\qquad$ $4x-19=0$

$\boxed{x=-1}$ $\qquad$ $\boxed{x=\frac{19}{4}}$

$\left\{-1, \frac{19}{4}\right\}$

Solve:

$(2x-1)(3x+5)=8$

$6x^2+10x-3x-5-8=0$

$6x^2+7x-13=0$

P=-78

S=7

-78

13, -6

$\underbrace{6x^2+13x}\ \underbrace{-6x-13}=0$

$x(6x+13)-1(6x+13)=0$

$(6x+13)(x-1)=0$

By Z.F.P.

$6x+13=0$ $\qquad$ $x-1=0$

$\boxed{x=-\frac{13}{6}}$ $\quad$ $\left\{-\frac{13}{6}, 1\right\}$ $\quad$ $\boxed{x=1}$

Dec 4-6:58 AM

Solve

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

Hint:

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

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

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

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

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

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

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

By Z.F.P. $\rightarrow$ $x - 3 = 0$ or $x + 1 = 0$

$\boxed{x=3}$ $\boxed{x=-1}$

$\{-1, 3\}$

Dec 4-7:11 AM

The product of two consecutive integers is 20.

x & $x+1$

Find all such integers.

x	$x+1$
4	5
-5	-4

$$x(x+1) = 20$$

$$x^2 + x = 20$$

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

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

By Z.F.P.,

$x + 5 = 0$ or $x - 4 = 0$

$\boxed{x=-5}$ $\boxed{x=4}$

4 & 5
or
-5 & -4

Dec 4-7:38 AM

The product of two consecutive even integers is 48.

x & $x+2$

Find all such integers.

$x(x+2)=48$

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

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

By Z.F.P.

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

$x=6$ $\quad$ $x=-8$

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

6 & 8

or

-8 & -6

Dec 4-7:42 AM

Find two consecutive odd integers such that the sum of their squares is 34.

x & $x+2$

$(x)^2+(x+2)^2=34$

$x^2+(x+2)(x+2)=34$

$x^2+x^2+2x+2x+4-34=0$

$2x^2+4x-30=0$

Divide by 2

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

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

By Z.F.P.

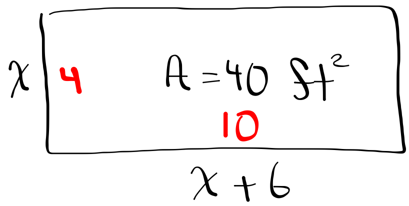
$x+5=0$ $\quad$ $x-3=0$

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

x	$x+2$
3	5
-5	-3

Dec 4-7:48 AM

A rectangular rug has an area of 40 ft². It is 6 ft longer than its width. Find its dimensions.



$$x(x+6)=40$$

$$x^2+6x-40=0$$

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

By Z.F.P.

$x+10=0$ $\qquad$ $x-4=0$

$\cancel{x=-10}$ $\qquad$ $x=4$

4 ft by 10 ft

Dec 4-7:56 AM

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

Quadratic Formula:

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

Solve $x^2-8x+15=0$ by Quadratic Formula.

$a=1$ $\qquad$ $b=-8$ $\qquad$ $c=15$

$$b^2-4ac=(-8)^2-4(1)(15)=64-60=4$$

$$x=\frac{-b \pm \sqrt{b^2-4ac}}{2a}=\frac{-(-8) \pm \sqrt{4}}{2(1)}=\frac{8 \pm 2}{2}$$

$$x=\frac{8+2}{2}=\frac{10}{2}=\boxed{5} \qquad x=\frac{8-2}{2}=\frac{6}{2}=\boxed{3} \qquad \{3,5\}$$

Dec 4-8:00 AM

Solve $6x^2 + x = 2$ by Quadratic Formula.

$ax^2 + bx + c = 0$

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

$a = 6 \quad b = 1 \quad c = -2$

$b^2 - 4ac = (1)^2 - 4(6)(-2) = 1 + 48 = \boxed{49}$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-1 \pm \sqrt{49}}{2(6)} = \frac{-1 \pm 7}{12}$$

$x = \frac{-1+7}{12} = \frac{6}{12} = \boxed{\frac{1}{2}} \qquad x = \frac{-1-7}{12} = \frac{-8}{12} = \boxed{\frac{-2}{3}}$

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

Dec 4-8:06 AM

Solve $(3x+1)(x-1) = 7$ by quadratic formula.

$ax^2 + bx + c = 0$

$3x^2 - 3x + x - 1 - 7 = 0$

$3x^2 - 2x - 8 = 0$

$a = 3 \quad b = -2 \quad c = -8$

$b^2 - 4ac = (-2)^2 - 4(3)(-8) = 4 + 96 = 100$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-2) \pm \sqrt{100}}{2(3)}$$

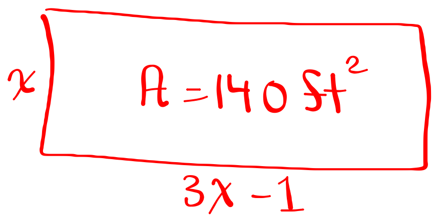
$= \frac{2 \pm 10}{6} \qquad x = \frac{2+10}{6} \qquad x = \frac{2-10}{6}$

$\{-\frac{4}{3}, 2\} \qquad \boxed{x = 2} \qquad \boxed{x = -\frac{4}{3}}$

Dec 4-8:10 AM

Area of a rectangular room is 140 ft^2. Its length is 1 ft shorter than 3 times its width.

(1) Draw & label



(2) Set-up the eqn & Simplify.

$x(3x-1) = 140$

$3x^2 - x - 140 = 0$

(3) Use Q-formula to Solve

(4) Give the dimensions of the room.

Dec 4-8:17 AM

$3x^2 - x - 140 = 0$

$a = 3 \qquad b = -1 \qquad c = -140$

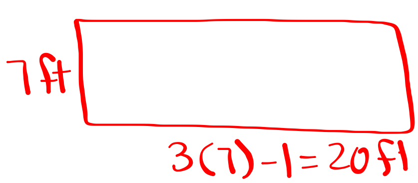
$b^2 - 4ac = (-1)^2 - 4(3)(-140) = 1681$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-(-1) \pm \sqrt{1681}}{2(3)}$$

$$= \frac{1 \pm 41}{6}$$

$$x = \frac{1+41}{6} = \frac{42}{6} = 7$$

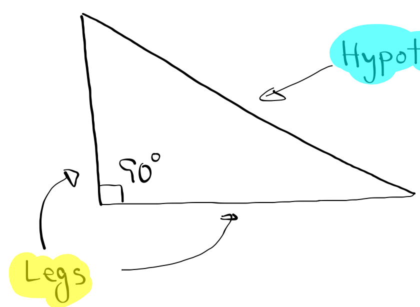
$$x = \frac{1-41}{6} = \cancel{\frac{-40}{6}}$$

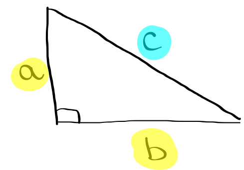


7 ft by 20 ft

Dec 4-8:26 AM

Right Triangle

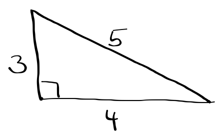




$a^2 + b^2 = c^2$

$(\text{leg})^2 + (\text{other leg})^2 = (\text{hyp.})^2$

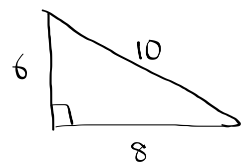
Pythagorean Formula



$3^2 + 4^2 = 5^2$

$9 + 16 = 25$

$25 = 25$ ✓

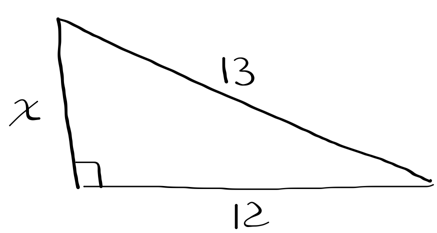


$6^2 + 8^2 = 10^2$

$36 + 64 = 100$ ✓

Dec 4-8:38 AM

Find x:



Right Triangle

Use Pythagorean Thrm

$x^2 + 12^2 = 13^2$

$x^2 + 144 = 169$

$x^2 + 144 - 169 = 0$

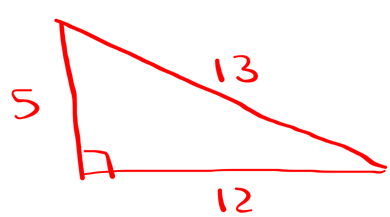
$x^2 - 25 = 0$

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

By Z.F.P.

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

$\cancel{x = -5}$ $\quad$ $x = 5$



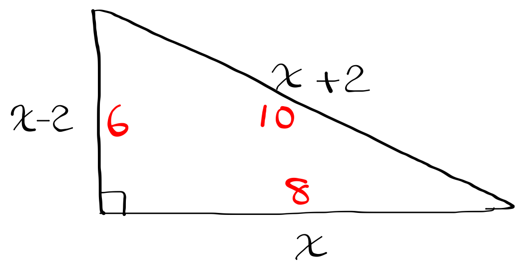
check:

$5^2 + 12^2 = 13^2$

$25 + 144 = 169$ ✓

Dec 4-8:57 AM

Find x:



Right Triangle

Use Pythagorean thrm

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

$$a^2 + b^2 = c^2$$

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

$$x^2 - 2x - 2x \cancel{+4} \cancel{+x^2} = \cancel{x^2} + 2x + 2x \cancel{+4}$$

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

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

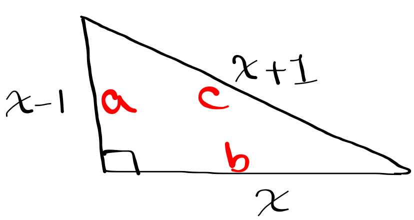
$$x(x-8) = 0$$

By Z.F.P.

$\cancel{x=0}$ $\quad x - 8 = 0 \quad \boxed{x=8}$

Dec 4-9:00 AM

Find x



Right Triangle

Pythagorean thrm

$$a^2 + b^2 = c^2$$

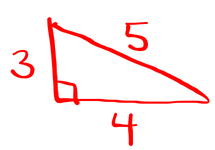
$$(x-1)^2 + x^2 = (x+1)^2$$

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

$$x^2 - x - x \cancel{+1} \cancel{+x^2} = \cancel{x^2} + x + x \cancel{+1}$$

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

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



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

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

Dec 4-9:06 AM

Class QZ:

(1) Solve: $(x-4)(x+8)=0$

$x-4=0$ $\quad$ $x+8=0$ $\quad$ $\{-8,4\}$

$\boxed{x=4}$ $\quad$ $\boxed{x=-8}$

(2) Solve $x^2-1=80$

$x^2-1-80=0$

$x^2-81=0$

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

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

$x=-9$ $\quad$ $x=9$

$\{\pm 9\}$

(3) Solve $x^2-24=2x$

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

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

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

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

$\boxed{x=6}$ $\quad$ $\boxed{x=-4}$

$\{-4,6\}$

Dec 4-9:12 AM