

# Math 115

## Spring 2017

### Lecture 22

Solve by using Zero-Product Rule: If  $A \cdot B = 0$   
then  $A = 0$  or  $B = 0$

$$\textcircled{1} (x+4)(x-8) = 0$$

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

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

$$\boxed{x=8}$$

$$\{-4, 8\}$$

$$\textcircled{3} 7x(5x-2) = 0$$

$$7x=0 \quad \text{or} \quad 5x-2=0$$

$$x=\frac{0}{7}$$

$$\boxed{x=0}$$

$$5x=2$$

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

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

$$\textcircled{2} (3x-5)(2x+5) = 0$$

$$3x-5=0 \quad \text{or} \quad 2x+5=0$$

$$3x=5$$

$$\boxed{x=\frac{5}{3}}$$

$$2x=-5$$

$$\left\{\frac{5}{2}, \frac{5}{3}\right\} \quad \boxed{x=-\frac{5}{2}}$$

$$\textcircled{4} -2x(x+10)(x-10) = 0$$

$$-2x=0 \quad \text{or} \quad x+10=0 \quad \text{or} \quad x-10=0$$

$$x=\frac{0}{-2}$$

$$\boxed{x=0}$$

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

$$\boxed{x=10}$$

$$\{0, \pm 10\}$$

Solve by factoring: 1) RHS = 0

$$x^2 - 7x + 10 = 0$$

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

by Z.P.R.

$$x-2=0 \quad \text{or} \quad x-5=0$$

$$\boxed{x=2}$$

$$\boxed{x=5}$$

$$\{2, 5\}$$

Solve

$$x^2 - 4 = 60$$

$$x^2 - 4 - 60 = 0$$

$$x^2 - 64 = 0$$

2) LHS factored Comp.

3) use Z.P.R. &amp; Solve each factor

4) Soln Set

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

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

by Z.P.R.

$$x+8=0 \quad \text{or} \quad x-8=0$$

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

$$\boxed{x=8}$$

$$\{\pm 8\}$$

Solve  $3x^2 + 5 = 8x$

Make RHS 0

Factor LHS Comp.

Use Z.F.T.

$$x-1=0 \quad \text{or} \quad 3x-5=0$$

$$\boxed{x=1}$$

$$3x=5$$

$$\boxed{x=\frac{5}{3}}$$

$$\left\{1, \frac{5}{3}\right\}$$

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

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

$$P=15, S=-8$$

$$-3, -5$$

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

$$3x(x-1) - 5(x-1) = 0$$

$$(x-1)(3x-5) = 0$$

Solve:  $2x^2 - 15 = 13x$

$$2x^2 - 15 - 13x = 0$$

$$2x^2 - 13x - 15 = 0$$

$P = -30$   
 $S = -13$   
 $-30$        $-15, 2$

$\rightarrow 2x - 15 = 0$  or  
 $x + 1 = 0$

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

$$x(2x - 15) + 1(2x - 15) = 0$$

$$(2x - 15)(x + 1) = 0$$

by Z.P.R.

$x = \frac{15}{2},$   
 $x = -1$

$\left\{-1, \frac{15}{2}\right\}$

Solve  $(2x + 1)(x + 3) = 25$

Hint: FOIL & Simplify First.

$$2x^2 + 6x + x + 3 = 25$$

$$2x^2 + 7x + 3 - 25 = 0$$

$$2x^2 + 7x - 22 = 0$$

$P = -44$

$S = 7$

$-4, +11$

$-44$

$$2x^2 - 4x + 11x - 22 = 0$$

$$2x(x - 2) + 11(x - 2) = 0$$

$$(x - 2)(2x + 11) = 0$$

$x - 2 = 0$

$x = 2$

$2x + 11 = 0$

$x = -\frac{11}{2}$

$\left\{-\frac{11}{2}, 2\right\}$

The area of a rectangular garden is  $40 \text{ ft}^2$ .  
 the length is 3 ft longer than its width.  
 Find its dimensions.  $A = LW = 40$

$$\boxed{A = 40 \text{ ft}^2} \quad w = x$$

$$L = x + 3$$

$$\boxed{5 \text{ ft by } 8 \text{ ft}}$$

$$(x+3)x = 40$$

$$x^2 + 3x = 40$$

$$x^2 + 3x - 40 = 0$$

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

by Z.P.R

$$x+8=0 \quad x-5=0$$

$$\cancel{x=-8} \quad \boxed{x=5}$$

the length of a rectangle is 4 meter shorter  
 than 3 times its width. The area is  $15 \text{ m}^2$ .

Find its dimensions.

$$A = 15$$

$$LW = 15$$

$$(3x-4)x = 15$$

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

$$3x^2 \boxed{-4x} - 15 = 0$$

$$\begin{array}{l} P = -45 \\ S = -4 \end{array} \quad \begin{array}{l} -9 \div 5 \\ -45 \end{array}$$

$\rightarrow 3 \text{ m by } 5 \text{ m}$

$$\boxed{A = 15 \text{ m}^2} \quad w = x$$

$$L = 3x - 4$$

$$\rightarrow 3x^2 \boxed{-9x+5x} - 15 = 0$$

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

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

by Z.F.P.

$$x-3=0$$

$$\boxed{x=3}$$

$$3x+5=0$$

$$\cancel{x=-5/3}$$

The product of two numbers is 21.

One of them is 1 more than twice the other one. Find all such numbers.

$$x \neq 2x+1$$

$x$	$2x+1$
3	7
$-\frac{7}{2}$	$2(-\frac{7}{2})+1 = -7+1 = -6$

$$x(2x+1) = 21$$

$$2x^2 + x = 21$$

$$2x^2 + x - 21 = 0$$

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

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

$$x = 3$$

3 and 7 or  $-\frac{7}{2}$  and -6

The sum of Squares of two consecutive odd integers is 74. Find all such integers.

$$x \neq x+2$$

$$x^2 + (x+2)^2 = 74$$

$$x^2 + (x+2)(x+2) = 74$$

$$x^2 + x^2 + 2x + 2x + 4 = 74$$

$$2x^2 + 4x + 4 - 74 = 0$$

$$2x^2 + 4x - 70 = 0$$

Divide by 2 to reduce

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

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

By Z.P.R.

$$x+7=0 \text{ or } x-5=0$$

$$x=-7 \text{ or } x=5$$

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

5 and 7 or -7 and -5

The Sum of Square of two Cons. even integers is 52. Find all such integers.

$$x \text{ \& } x+2$$

By Z.F.P.

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

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

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

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

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

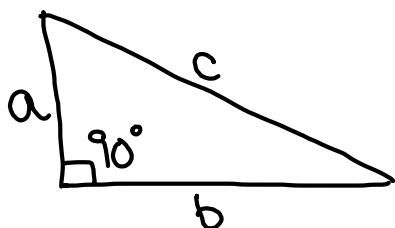
$$2x^2 + 4x - 48 = 0$$

Divide by 2 to reduce numbers

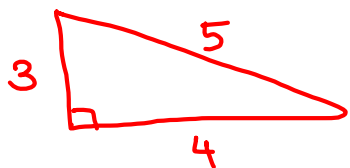
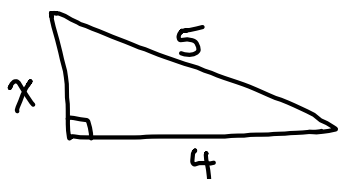
$$x^2 + 2x - 24 = 0$$

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

$$4 \text{ \& } 6 \text{ or } -6 \text{ \& } -4$$



find  $x$ :



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

$$9 + 16 = 25$$

Right Triangle

$a \text{ \& } b \rightarrow$  legs

$c \rightarrow$  hypotenuse

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

Pythagorean thrm

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

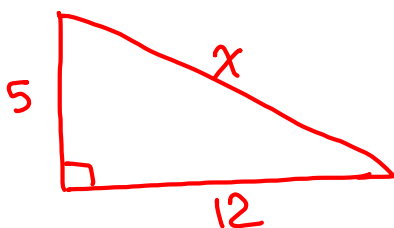
$$x^2 + 16 = 25$$

$$x^2 + 16 - 25 = 0$$

$$x^2 - 9 = 0$$

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

$$\cancel{x=-3} \rightarrow x=3$$

Find  $x$ :

By Pythagorean thrm

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

$$25 + 144 = x^2$$

$$169 = x^2$$



$$x^2 - 169 = 0$$

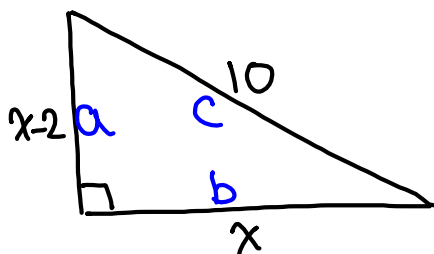
$$x^2 - 13^2 = 0$$

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

$$\downarrow$$
  

$$\boxed{x = 13}$$

$$\downarrow$$
  
 ~~$x = -13$~~

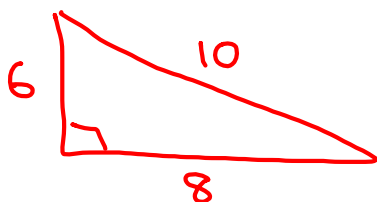


by Z.P.R.

$$x + 6 = 0 \quad \text{or} \quad x - 8 = 0$$

~~$x = -6$~~

$$\boxed{x = 8}$$



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

Find both legs.

By Pythagorean thrm

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

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

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

$$x^2 - 2x - 2x + 4 + x^2 - 100 = 0$$

$$2x^2 - 4x - 96 = 0$$

Divide by 2

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

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

One leg of a right triangle is 4 cm.

Hypotenuse is 1 cm shorter than twice the other leg. find the measure of missing leg and hypotenuse.

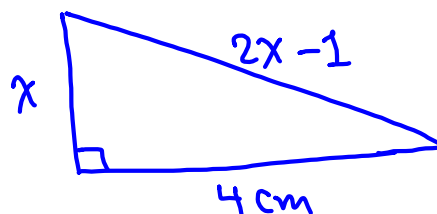
By Pythagorean thm

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

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

$$x^2 + 16 = (2x-1)(2x-1)$$

$$x^2 + 16 = 4x^2 - 2x - 2x + 1$$



$$\Rightarrow 4x^2 - 4x + 1 - x^2 - 16 = 0$$

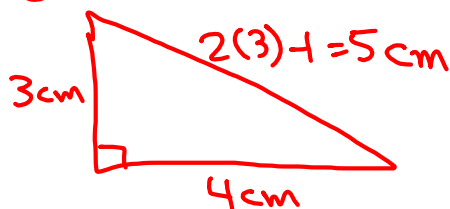
$$3x^2 - 4x - 15 = 0$$

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

Factor & Solve

$$P = -45, \quad -9 \text{ \& \# 5}$$

$$S = -4$$



$$\Rightarrow 3x^2 - 9x + 5x - 15 = 0$$

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

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

by Z.F.P.

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

$$x=3$$

~~$$x = -\frac{5}{3}$$~~



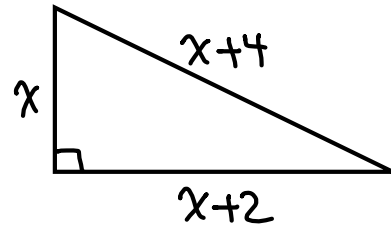
Three sides of a right triangle are three Consecutive even integers. use inches as unit.

1) Draw & label such triangle

2) find all 3 sides

3) find its perimeter

4) find its area



Using Pythagorean  
thrm

$$\underline{2x^2} + 4x + 4 = \underline{x^2} + 8x + 16$$

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

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

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

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

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

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



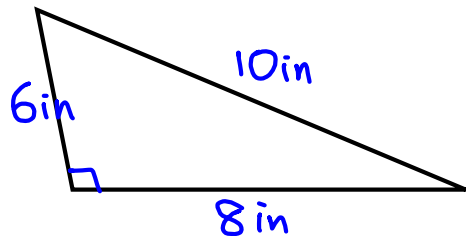
$$x = 6$$



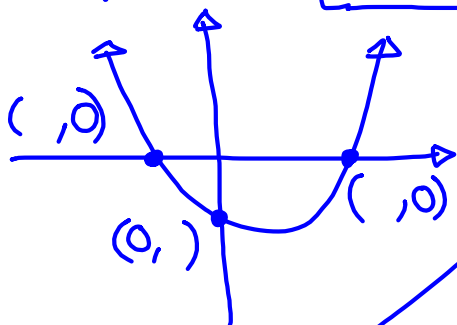
$$x = -2$$

$$A = \frac{6 \cdot 8}{2} = \frac{48}{2} = \boxed{24 \text{ in}^2}$$

$$P = 6 + 8 + 10 = \boxed{24 \text{ in}}$$



Graph of  $y = x^2 - 2x - 15$  has the following shape.



Find all its intercepts.

y-Int  $(0, -15)$

x-Ints  $(-3, 0), (5, 0)$

$$y = 0$$

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

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

$$\downarrow$$

$$x = 5$$

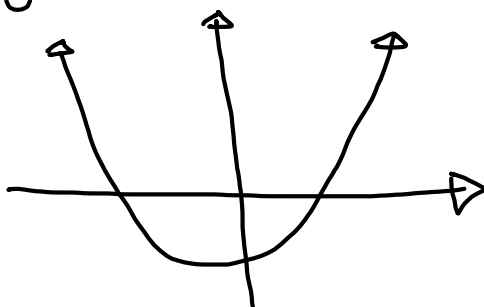
$$\downarrow$$

$$x = -3$$

$$y = 0^2 - 2(0) - 15 = -15$$

$$(5, 0) \text{ and } (-3, 0)$$

Find all intercepts for the graph of  $y = 2x^2 + x - 3$  as shown below.



y-Int  $\rightarrow x = 0$

$$y = 2(0)^2 + 0 - 3 = -3$$

$$(0, -3)$$

x-Int  $\rightarrow y = 0$

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

$$P = -6, S = 1$$

$$3, -2$$

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

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

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

$$x = 1$$

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

$$(1, 0) \text{ and } \left(-\frac{3}{2}, 0\right)$$

Agenda for tomorrow:

- 1) Lecture from 6:00 - 7:00
  - 2) Collect SG 16 & Factoring package
  - 3) Exam III
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My tips to you

- 1) Review exam 1 & exam 2
- 2) Review Exponential rules, operations with Polynomials.
- 3) Know Your Factoring.