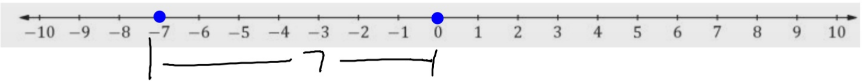
Absolute Value:

Distance from zero.

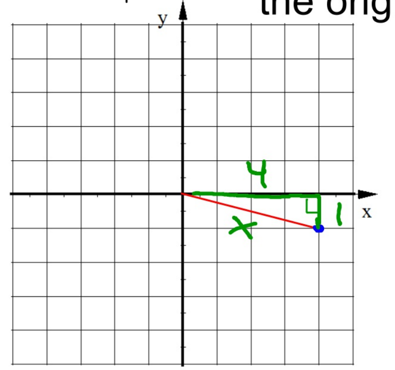


|-7| = 7

−7 is 7 units from zero

What could the absolute value of an ordered pair mean?

|(4, -1)| = ? means the distance (4,-1) is from the origin.



$Leg^2 + Leg^2 = Hypot^2$

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

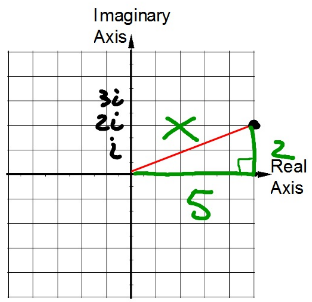
$16 + 1 = x^2$

$x^2 = 17$

$x = \sqrt{17}$

What could the absolute value of a Complex Number mean?

|5 + 2i| = ? means the distance 5+2i is from the origin.



$Leg^2 + Leg^2 = hypot^2$

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

$\sqrt{29} = \sqrt{x^2}$

$x = \sqrt{29}$

$|a + bi| = \sqrt{a^2 + b^2}$

Find the absolute value of this complex number.

$|3 - 7i| = \sqrt{3^2 + 7^2}$

$a = 3$, $b = -7$

$= \sqrt{9 + 49}$

$= \sqrt{58}$

Find the absolute value of this complex number.

$|6i| = |0 + 6i|$

$= \sqrt{0^2 + 6^2}$

$= \sqrt{36} = 6$

5th/6th

You can now do Hwk #15.   Sec 5-6

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Problems 6-8, 17, 18, 20, 21, 59, 60

Due tomorrow

$i = \sqrt{-1}$

$i^2 = (\sqrt{-1})^2 = -1$

When simplifying, every i^2 can be replaced with -1 then look to continue simplifying.

Simplify each.

1. $7i(2 - 8i)$

$= 14i - 56i^2$

$= 14i - 56(-1)$

$= 14i + 56$

$= 56 + 14i$

2. $(1 + 6i)(4 - 3i)$

	1	$+6i$
4	4	$+24i$
$-3i$	$-3i$	$-18i^2 = +18$

$-18i^2 \rightarrow (-18)(-1)$

$22 + 21i$

When dealing with Real Numbers only:

(x + 5)(3x + 2) is a Trinomial

When dealing with Imaginary Numbers only:

(5 + i)(2 + 3i) is a Binomial

The product of two imaginary numbers is Another Imaginary Number.

Simplify:

$(7 + 9i)(3 - 2i)$

	7	$+9i$
3	21	$+27i$
$-2i$	$-14i$	$-18i^2 = -18(-1) = +18$

$= 39 + 13i$

Simplify:

$(1 + 5i)^2 = (1 + 5i)(1 + 5i)$

	1	$+5i$
1	1	$+5i$
$+5i$	$+5i$	$+25i = -25$

$= -24 + 10i$

$(x + 5)^2$ is never just 2 terms!!!

$(a + b)^2 = a^2 + 2ab + b^2$

$(x + 5)^2 = (x)^2 + 2(1)(5)x + (5)^2$

$= x^2 + 10x + 25$

However.......

$(1 + 5i)^2 = (1)^2 + 2(1)(5i) + (5i)^2$

$= 1 + 10i + 25i^2 = 1 + 10i - 25$

$25(-1)$

$= -24 + 10i$

When you square a complex number you get another complex number.

Simplify.

$(3 - 4i)^2$

	3	$-4i$
3	9	$-12i$
$-4i$	$-12i$	$+16i^2 = -16$

$-7 - 24i$

or $3^2 - 2(3)(4i) + (4i)^2$

$= 9 - 24i + 16i^2$

$16(-1)$

$= 9 - 24i - 16$

$= -7 - 24i$

Simplify.

$(4 + 2i)(4 - 2i)$

	4	$+2i$
4	16	$+8i$
$-2i$	$-8i$	$-4i^2 = +4$

$-4i^2 \to -4(-1)$

$= 20$

Simplify each.

1. $(2x - 3)(2x + 3)$

	$2x$	-3
$2x$	$4x^2$	~~$-6x$~~
$+3$	~~$+6x$~~	-9

$4x^2 - 9$

2. $(2 - 3i)(2 + 3i)$

	2	$-3i$
2	4	~~$-6i$~~
$+3i$	~~$+6i$~~	$-9i^2 = +9$

$4 + 9 = 13$

When a and b are REAL #'s

$(a + b)(a - b) = a^2 - b^2$

With Imaginary Numbers:

$(a + bi)(a - bi) = a^2 + b^2$ $\longrightarrow a^2 - b^2 i^2 = a^2 - b^2(-1) = a^2 + b^2$

$(4 + 2i)(4 - 2i) = (4)^2 + (2)^2 = 16 + 4 = 20$

$a = 4$, $b = 2$

Factors such as (a + b) and (a - b) are called CONJUGATES

Conjugate

The conjugate is where we **change the sign in the middle** of two terms like this:

$3x + 1$

Conjugate: $3x - 1$

Complex Conjugates: a + bi and a - bi

$(7 + 4i)(7 - 4i) = 7^2 + 4^2 = 49 + 16 = 65$

$a = 7$

$b = 4$

The product of complex conjugates is always a constant

Simplify each.

1. $(9 - 5i)^2$

	9	$-5i$
9	81	$-45i$
$-5i$	$-45i$	$+25i^2 = -25$

$= \boxed{56 - 90i}$

2. $(6 - 3i)(6 + 3i)$

$= (6)^2 + (3)^2$

$= 36 + 9$

$= \boxed{45}$

$i = \sqrt{-1} = i$

$i^2 = (\sqrt{-1})^2 = -1$

$i^3 = i^2 \cdot i = (-1)(i) = -i$

$i^4 = i^2 \cdot i^2 = (-1)(-1) = 1$

$i^5 = \underbrace{i \cdot i}_{-1} \cdot \underbrace{i \cdot i}_{-1} \cdot i = (-1)(-1)(i) = i$

$i^6 = \underbrace{i \cdot i}_{-1} \cdot \underbrace{i \cdot i}_{-1} \cdot \underbrace{i \cdot i}_{-1} = (-1)(-1)(-1) = -1$

Powers of i repeat every 4:

$i = i$	$i^5 = i$	$i^9 = i$	$i^{13} = i$	
$i^2 = -1$	$i^6 = -1$	$i^{10} = -1$	$i^{14} = -1$	
$i^3 = -i$	$i^7 = -i$	$i^{11} = -i$	$i^{15} = -i$	etc.
$i^4 = 1$	$i^8 = 1$	$i^{12} = 1$	$i^{16} = 1$	

Simplify each.

1. $7i(5 + 2i)$

$= 35i + 14i^2$

$= 35i + 14(-1)$

$= 35i - 14$

$= \boxed{-14 + 35i}$

---

2. $(3i)(5i)(2i) =$

$= 30i^3$

$= 30(-i)$

$= \boxed{-30i}$

3. $(-2i)(10i)(i)(4i) =$

$-80i^4$

$= (-80)(1) = -80$

You can now finish Hwk #16

Sec 5-6

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Problems 37, 40, 50-52, 57, 62, 65