COMPEX NUMBERS

Agenda:

Objective:

-Graph complex numbers on the complex plane
(Identify the **Real** and **Imaginary** parts of a Complex Number by **labeling** a diagram)
-Find the magnitude of a complex number

1) DO NOW
2) Check HW
   Questions?
3) Identify: **Real** and **Imaginary parts** of Complex Numbers
4) Graph: Complex Numbers
5) Calculate: **Magnitude** Complex Numbers
6) Exit Ticket

HW: "HW Worksheet #4"

"518 Complex Number Graded Assignment"
Due Monday 3/10/14 in Class.
Late assignments will receive a 0%.

DO NOW:

Given the following equation: $x^2 + 4x = -10$

a) Find the discriminant $(b^2 - 4ac)$.

b) Are the roots rational, irrational, or imaginary?

c) **Solve** for the roots.

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DO NOW:

Given the following equation: $x^2 + 4x = -10$

a) Find the discriminant $(b^2 - 4ac)$.

$$x^2 + 4x + 10 = 0$$
$$discriminant = 4^2 - 4(1)(10)$$
$$= 16 - 40$$
$$\boldsymbol{discriminant = -24}$$

b) Are the roots rational, irrational, or imaginary?

$$\pm\sqrt{-24} = \pm\sqrt{-1 \cdot 4 \cdot 6} = \pm 2i\sqrt{6}$$

since there is a negative under the radical, there are ***two imaginary roots***

c) **Solve** for the roots.

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

$$\boldsymbol{x = -2 \pm i\sqrt{6}}$$

The *complex number*, Z is then defined: $\boxed{Z = a + bi}$

Directions: Identify the real and imaginary parts of each complex number below. That is... what is a and what is b?

K: 3 , **L**: 9 + 5*i* , **N**: -5*i* , **P**: -5 - 7*i*

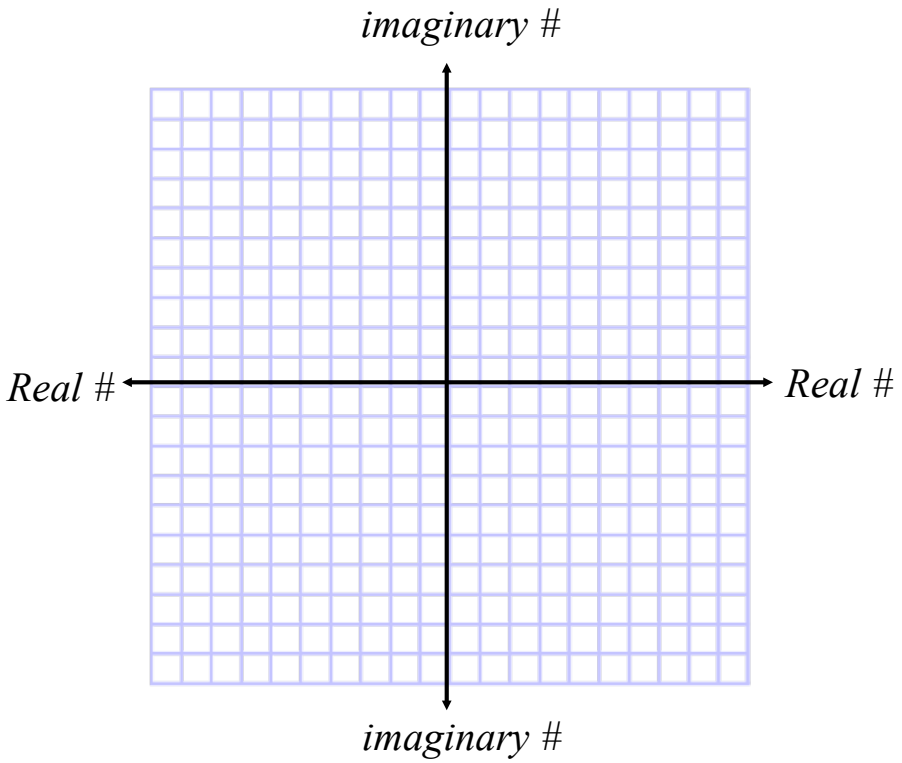
a = _____ b = _____ a = _____ b = _____ a = _____ b = _____ a = _____ b = _____

Graphing Complex Numbers

Due to their unique nature, complex numbers cannot be represented on a normal set of coordinate axes.

The **Argand Diagram**, establishes a relationship between the *x*-axis **(real axis)** with real numbers and the *y*-axis **(imaginary axis)** with imaginary numbers. Complex numbers are graphed as the point **(x,y).**

Directions: Graph the complex numbers K, L, N, P from above. Indicate the real and imaginary parts by labeling the diagram.



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K: 3 , **L**: 9 + 5*i* , **N**: -5*i* , **P**: -5 - 7*i*

a = 3 b = 0 a = 9 b = 5 a = 0 b = -5 a = -5 b = -7

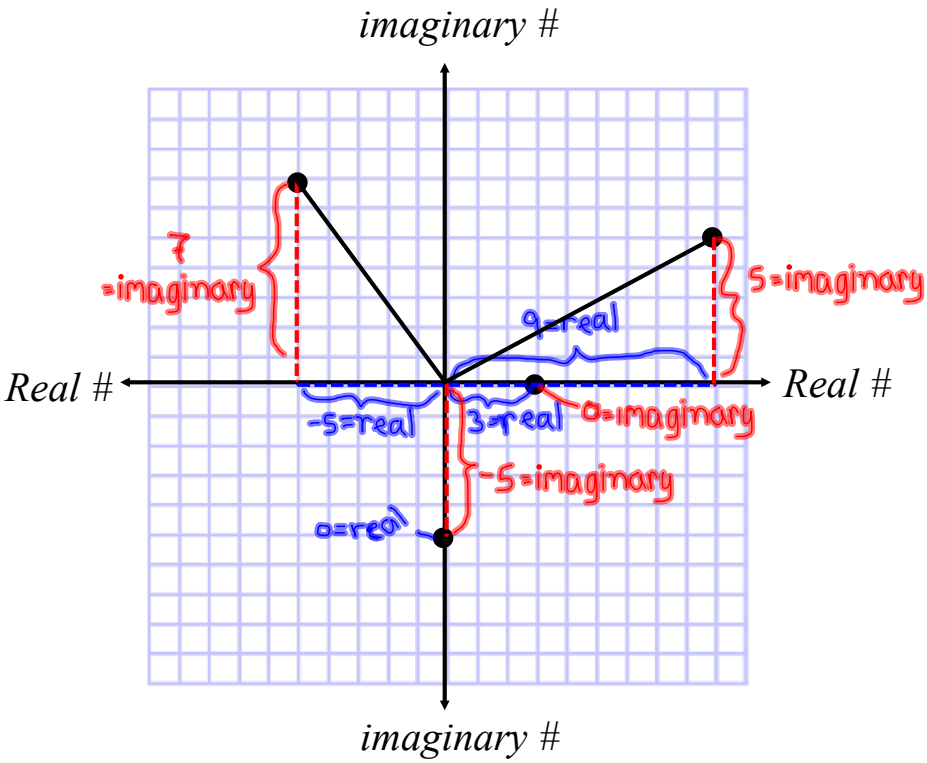
(3, 0) (9, 5) (0, -5) (-5, -7)

Graphing Complex Numbers

Due to their unique nature, complex numbers cannot be represented on a normal set of coordinate axes.

The **Argand Diagram**, establishes a relationship between the *x*-axis **(real axis)** with real numbers and the *y*-axis **(imaginary axis)** with imaginary numbers. Complex numbers are graphed as the point **(x,y).**

Directions: Graph the four complex numbers K, L, N, P from above. Indicate the real and imaginary parts by labeling the diagram.



Magnitude of Complex Numbers

Magnitude = size or quantity

So if we want to know the **magnitude** of a complex number, we are trying to get an idea of the **size** of the complex number

The **magnitude** of complex number z is defined as $|z|$.

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

From the previous Argand Diagram:

1) What is the magnitude of K?

2) What is the |L|?

3) What is the magnitude of N?

4) What is the |P|?

Magnitude of Complex Numbers

Magnitude = size or quantity

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The **magnitude** of complex number z is defined as $|z|$.

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

From the previous Argand Diagram:

1) What is the magnitude of K?

$$\sqrt{(3)^2 + (0)^2}$$
$$\sqrt{9 + 0}$$
$$\sqrt{9}$$
$$3$$
$$Magnitude = 3$$

2) What is the |L|?

$$\sqrt{(9)^2 + (5)^2}$$
$$\sqrt{81 + 25}$$
$$\sqrt{106}$$
$$Magnitude = \sqrt{106} \approx 10.30$$

3) What is the magnitude of N?

$$\sqrt{(0)^2 + (-5)^2}$$
$$\sqrt{0 + 25}$$
$$\sqrt{25}$$
$$5$$
$$Magnitude = 5$$

4) What is the |P|?

$$\sqrt{(-5)^2 + (-7)^2}$$
$$\sqrt{25 + 49}$$
$$\sqrt{74}$$
$$Magnitude = \sqrt{74} \approx 8.60$$

A) Identify ***a*** and ***b*** for the following numbers, and write the number in complex form if it is not already done so:

1) $5 - 3i$, 2) -4 3) $6i$ 4) $-9 + 2i$

a = ___ b = ___ a = ___ b = ___ a = ___ b = ___ a = ___ b = ___

B) Answer each of the following:

1) What is the magnitude of $5- 3i$?

2) What is the magnitude of -4?

3) What is $|6i|$?

4) What is $|-9 + 2i|$

C) Answer each of the following:

Find the magnitude of each complex number.

1) 3

2) $4 - 3i$

3) - 4 - 3i

4) $- 8i$

Find the absolute value of each complex number.

1) $|7 - i|$

2) $| -5 - 5i|$

3) $|- 2 + 4i|$

4) $|3 - 6i|$

A) Identify ***a*** and ***b*** for the following numbers, and write the number in complex form if it is not already done so:

1) $5 - 3i$, 2) -4 3) $6i$ 4) $-9 + 2i$

a = 5 b = -3 a = -4 b = 0 a = 0 b = 6 a = -9 b = 2

B) Answer each of the following:

1) What is the magnitude of $5 - 3i$?

$\sqrt{34} \approx 5.83095$

2) What is the magnitude of -4?

4

3) What is $|6i|$?

6

4) What is $|-9 + 2i|$

$\sqrt{85} \approx 9.21954$

C) Answer each of the following:

Find the magnitude of each complex number.

1) 3 3

2) $4 - 3i$

5

3) $- 4 - 3i$

5

4) $- 8i$

8

Find the absolute value of each complex number.

1) $|7 - i|$

$5\sqrt{2} \approx 7.07107$

2) $| -5 - 5i|$

$5\sqrt{2} \approx 7.07107$

3) $|- 2 + 4i|$

$2\sqrt{5} \approx 4.47214$

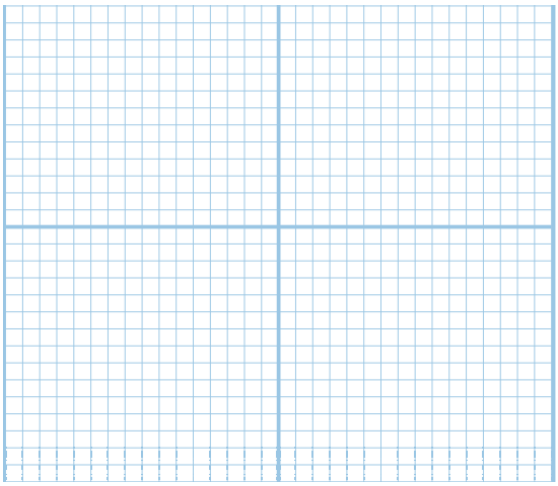
4) $|3 - 6i|$

$3\sqrt{5} \approx 6.7082$

Score: _____/10 Name_____

Block_____

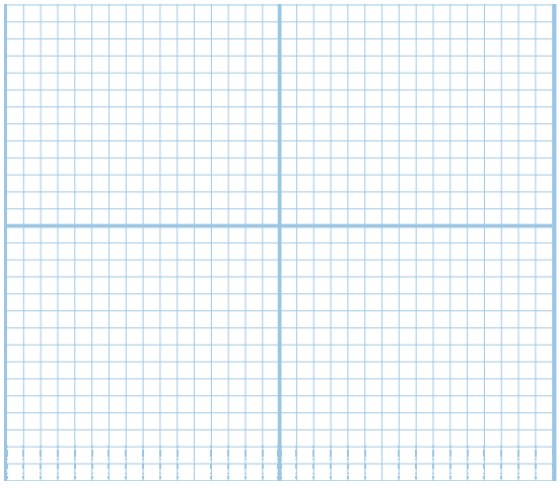
Exit Ticket

Graph the following complex number $8 - 15i$. **Indicate** the **real** and **imaginary parts** by labeling your diagram. 	Find the **magnitude** of the complex number: $8 - 15i$.

Score: _____/10 Name_____

Block_____

Exit Ticket

Graph the following complex number $5 - 12i$. **Indicate** the **real** and **imaginary parts** by labeling your diagram. 	Find the **magnitude** of the complex number: $5 - 12i$.

Score: _____/10 Name_____

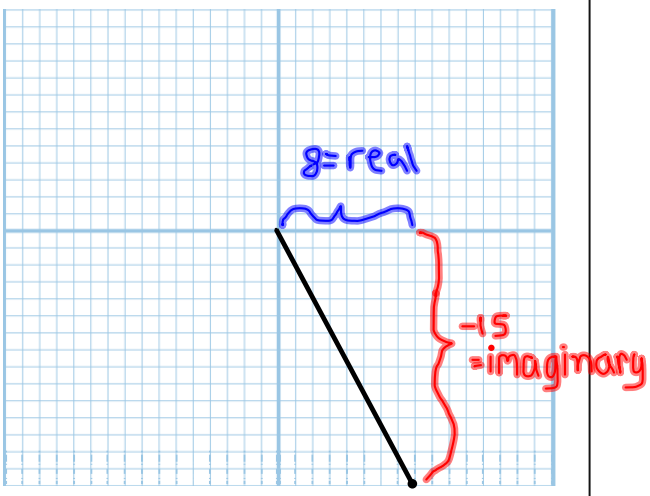
Block_____

Exit Ticket

Graph the following complex number

$8 - 15i.$

Indicate the **real** and **imaginary parts** by labeling your diagram.



Find the **magnitude** of the complex number:

$8 - 15i.$

$$\sqrt{8^2 + (-15)^2}$$
$$\sqrt{64 + 225}$$
$$\sqrt{289}$$
$$17$$

Magnitude=17.

Score: _____/10 Name_____

Block_____

Exit Ticket

Graph the following complex number

$5 - 12i.$

Indicate the **real** and **imaginary parts** by labeling your diagram.

Find the **magnitude** of the complex number:

$5 - 12i.$

$$\sqrt{5^2 + (-12)^2}$$
$$\sqrt{25 + 144}$$
$$\sqrt{169}$$
$$13$$

Magnitude = 13

HW Worksheet # 4 Name_____
Plotting Complex Numbers and Finding Magnitude Block _____

1. Write the following numbers in complex number form.

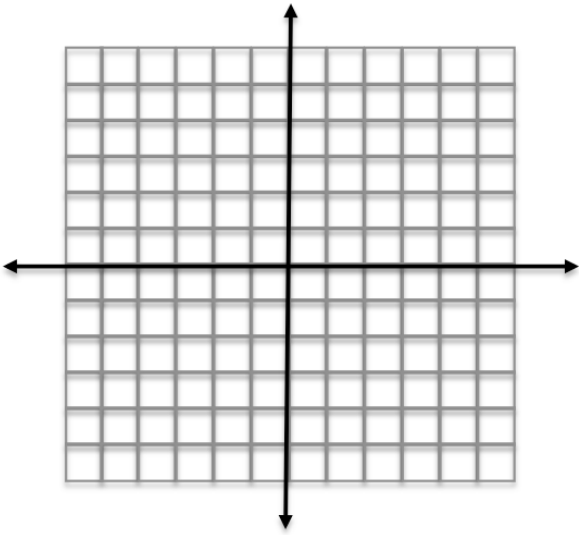
   a. $4i$ =_____ + _____ i b. 8 = c. $\frac{2+4i}{2}$ =

2. Remember that the horizontal axis is the real number part and the vertical axis is the number of imaginary units you have.

   a. **Plot** the complex number *3-4i* on the grid provided. Find the **magnitude** of *3-4i*.

   b. Now plot *-3 + 4i* on the same grid, label it and find the magnitude.

   c. Plot *0+5i*, label it and find the magnitude.



   d. Plot *-5 + 0i*, label it and find the magnitude.

3. If you did a –d correctly, you should have the same magnitude for all four numbers. Identify another number with the same magnitude. Plot it, label it and show that its magnitude is the same as the other 4 points.

   The number is _____.

4. How many points have a magnitude that is the same as the one you found for the points above?

5. Find the magnitude of each of the following complex numbers. Then, order the following complex numbers from the least to the greatest (using magnitude as "size").

   10-15i *-12+i* *-6.5 -9i* *9 + 5i*

   _____ _____ _____ _____
   Least magnitude