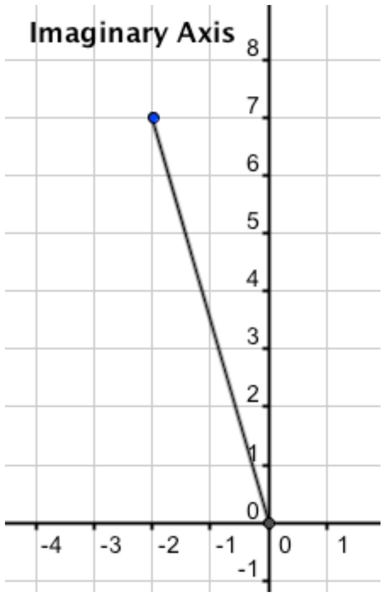
Precalc Honor   11-2a Graphing Complex Numbers   Name: _____________

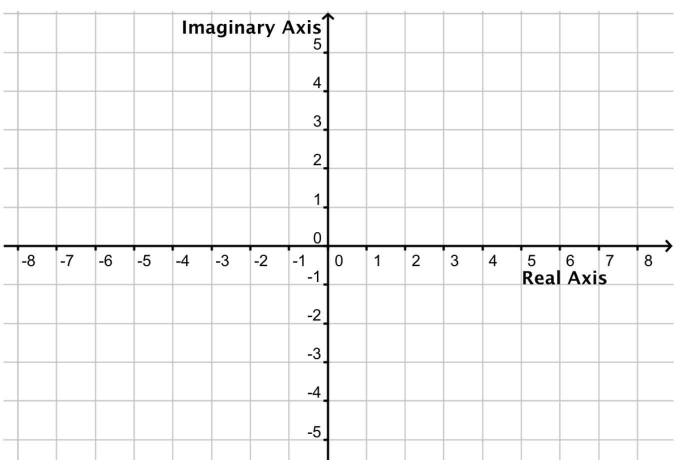
The x-y coordinate plane can be used to represent complex numbers, $a+bi$. The real part of the complex number, a, is represented by the x coordinate, and the imaginary part of the complex number, b, is represented by the y coordinate.



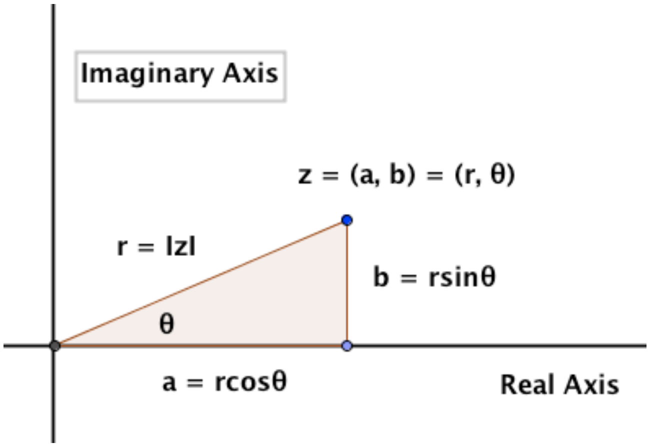
So the complex number $-2+7i$ can be represented by the ordered pair (-2, 7). Its graph is shown here:

<u>Rectangular Coordinates</u>	<u>Rectangular Form</u>
(-2, 7)	$-2+7i$

Graph the following complex numbers on the complex number plane given:



Rectangular Form	Rectangular Coordinates
1. Plot 3+2i	____________
2. Plot 4-i	____________
3. Plot -5i	____________
4. Plot 8	____________



The point representing the complex number can also be expressed in polar coordinates, (r,θ).

Polar Coordinates	Polar Form
(r,θ)	$r\cos\theta+(r\sin\theta)i$

Polar form of a complex number is long, so it is often abbreviated in the following way:

$r\cos\theta+(r\sin\theta)i$

$r(\cos\theta+i\sin\theta)$

$rcis\theta$

For example the polar form $\sqrt{2}cis45^{\circ}$ is an abbreviation for $\sqrt{2}\left(\cos45^{\circ}+i\sin45^{\circ}\right)$. The corresponding polar coordinates would be $\left(\sqrt{2},45^{\circ}\right)$.

The length of the arrow representing the complex number z is called the **absolute value of z.** Using the Pythagorean Theorem $|z|=\sqrt{a^2+b^2}$. Although points can be represented using both positive and negative r values, we will only use <u>positive values of r</u> in polar coordinates and polar form since $|z|$ is defined to be positive.

<u>Converting between polar and rectangular form</u>:

5. Convert $1+i\sqrt{3}$ to polar form.

6. Convert $9cis\frac{4\pi}{3}$ to rectangular form.