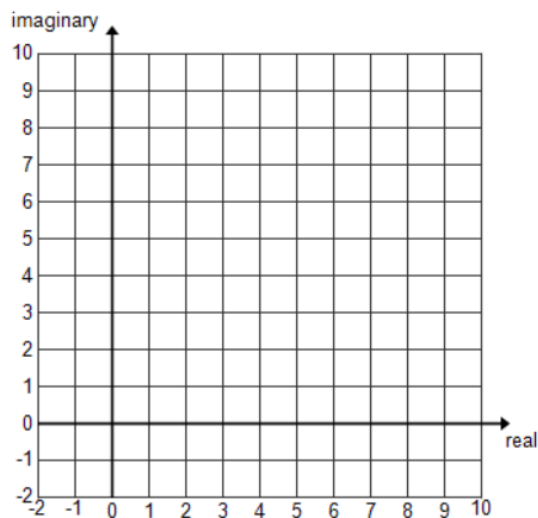


Lesson 11: Distance and Complex Numbers

Classwork

Opening Exercise

- a. Plot the complex number $z = 2 + 3i$ on the complex plane. Plot the ordered pair $(2, 3)$ on the coordinate plane.



- b. In what way are complex numbers “points”?
- c. What point on the coordinate plane corresponds to the complex number $-1 + 8i$?
- d. What complex number corresponds to the point located at coordinate $(0, -9)$?

Exercises

1. The endpoints of a \overline{AB} are $A(1, 8)$ and $B(-5, 3)$. What is the midpoint of \overline{AB} ?

2.
 - a. What is the midpoint of $A = 1 + 8i$ and $B = -5 + 3i$?

 - b. Using $A = x_1 + y_1i$ and $B = x_2 + y_2i$, show that in general the midpoint of points A and B is $\frac{A+B}{2}$, the arithmetic average of the two numbers.

3. The endpoints of \overline{AB} are $A(1, 8)$ and $B(-5, 3)$. What is the length of \overline{AB} ?

- 4.
- What is the distance between $A = 1 + 8i$ and $B = -5 + 3i$?

 - Show that, in general, the distance between $A = x_1 + y_1i$ and $B = x_2 + y_2i$ is the modulus of $A - B$.
5. Suppose $z = 2 + 7i$ and $w = -3 + i$.
- Find the midpoint m of z and w .

 - Verify that $|z - m| = |w - m|$.

Lesson Summary

- Complex numbers can be thought of as points in a plane, and points in a plane can be thought of as complex numbers.
- For two complex numbers $A = x_1 + y_1i$ and $B = x_2 + y_2i$, the midpoint of points A and B is $\frac{A+B}{2}$.
- The distance between two complex numbers $A = x_1 + y_1i$ and $B = x_2 + y_2i$ is equal to $|A - B|$.

Problem Set

- Find the midpoint between the two given points in the rectangular coordinate plane.
 - $2 + 4i$ and $4 + 8i$
 - $-3 + 7i$ and $5 - i$
 - $-4 + 3i$ and $9 - 4i$
 - $4 + i$ and $-12 - 7i$
 - $-8 - 3i$ and $3 - 4i$
 - $\frac{2}{3} - \frac{5}{2}i$ and $-0.2 + 0.4i$
- Let $A = 2 + 4i$, $B = 14 + 8i$, and suppose that C is the midpoint of A and B , and that D is the midpoint of A and C .
 - Find points C and D .
 - Find the distance between A and B .
 - Find the distance between A and C .
 - Find the distance between C and D .
 - Find the distance between D and B .
 - Find a point one quarter of the way along the line segment connecting segment A and B , closer to A than to B .
 - Terrence thinks the distance from B to C is the same as the distance from A to B . Is he correct? Explain why or why not.
 - Using your answer from part (g), if E is the midpoint of C and B , can you find the distance from E to C ? Explain.
 - Without doing any more work, can you find point E ? Explain.