## Lesson 12: Arithmetic with Complex Numbers

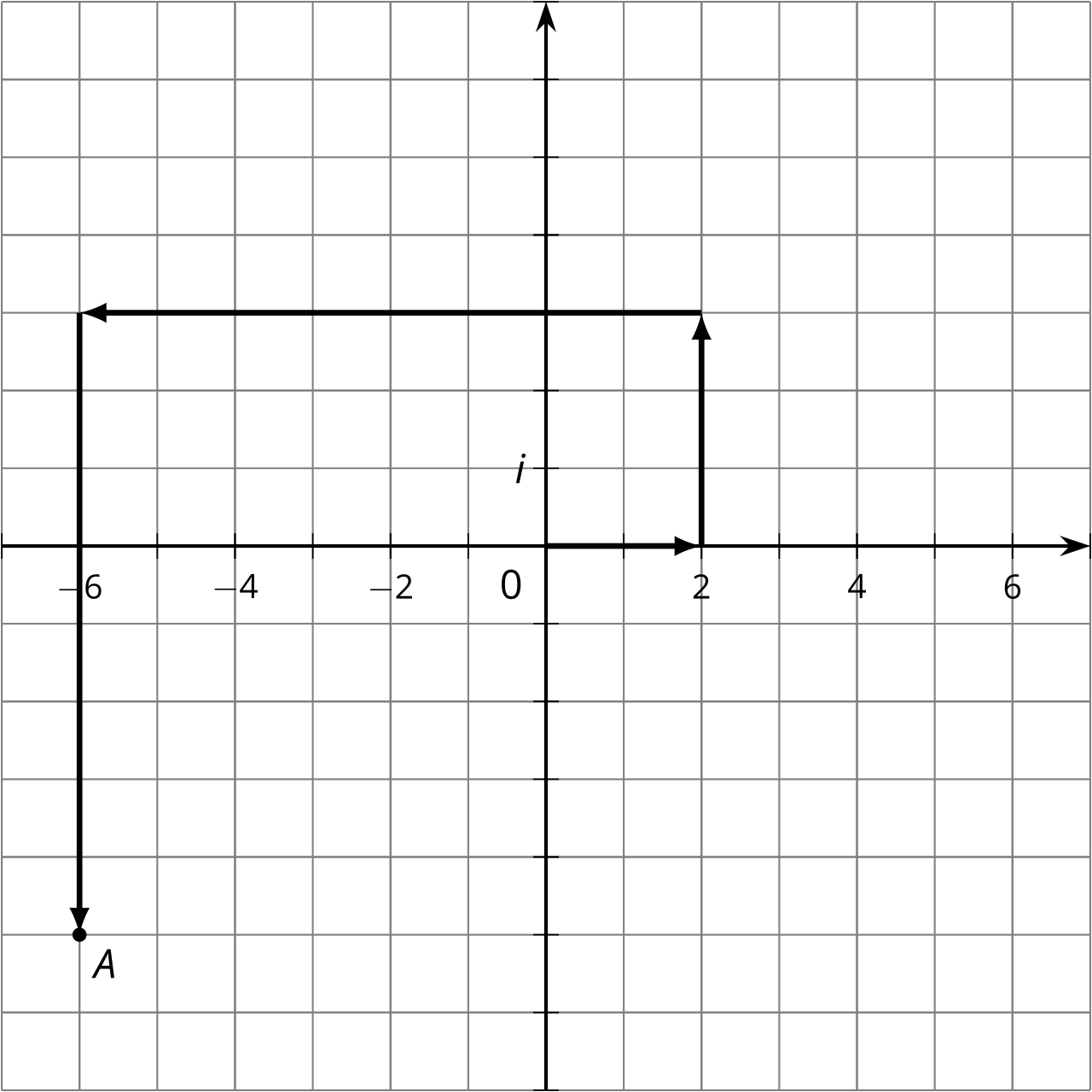
* Let’s work with complex numbers.

### 12.1: Math Talk: Telescoping Sums

Find the value of these expressions mentally.

### 12.2: Adding Complex Numbers

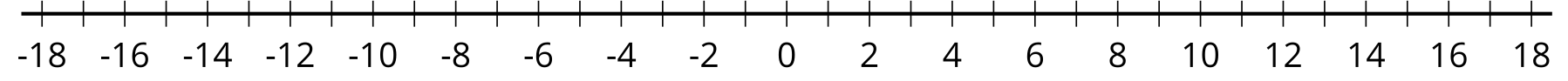
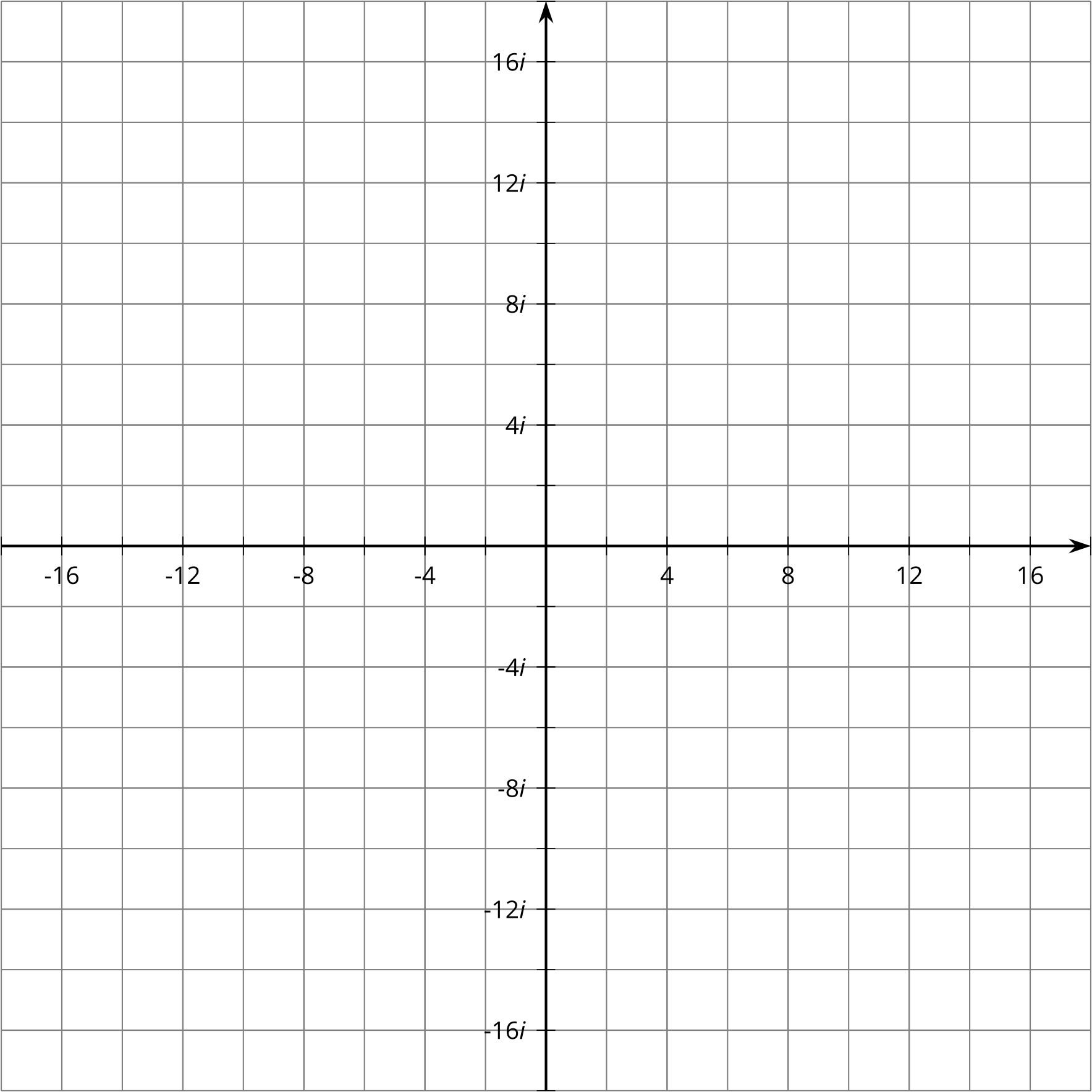
1. This diagram represents .

* 
  1. How do you see represented?
  2. How do you see represented?
  3. What complex number does represent?
  4. Add “like terms” in the expression . What do you get?

1. Write these sums and differences in the form , where and are real numbers.
   1. (Check your work by drawing a diagram.)

### 12.3: Multiplication on the Complex Plane

1. Draw points to represent 2, 22, 23, and 24 on the real number line.

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  1. Write , , , and in the form .
  2. Plot , , , and on the complex plane.
  + 

#### Are you ready for more?

1. If and are positive numbers, is it true that ? Explain how you know.
2. If and are negative numbers, is it true that ? Explain how you know.

### Lesson 12 Summary

When we add a real number with an imaginary number, we get a complex number. We usually write complex numbers as:

where and are real numbers. We say that is the real part and is the imaginary part.

To add (or subtract) two complex numbers, we add (or subtract) the real parts and add (or subtract) the imaginary parts. For example:

In general:

and:

When we raise an imaginary number to a power, we can use the fact that to write the result in the form . For example, . We can group the  factors together to see how to rewrite this.

So in this example, is 0 and is -64.



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