Operations with Complex Numbers

Algebra II Worksheet · Grade 9–11

Name: _____ Date: _____

Learning Objectives

- Simplify square roots of negative numbers using the imaginary unit i
- Write complex numbers in standard form a + bi
- Add, subtract, and identify parts of complex numbers

Problems

1. Simplify the square root below using the imaginary unit i:

$\sqrt{-1}$

2. Simplify the expression below:

$\sqrt{-49}$

3. Simplify the expression below:

$\sqrt{-5}$

4. Simplify the expression below:

$\sqrt{-48}$

5. Identify the real part and imaginary part of the complex number below:

$7 + 5i$

6. Write the complex number in standard form a + bi:

$3i + 6$

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7. Simplify the expression and write it in standard form:

$2 - \sqrt{-9}$

8. Add the two complex numbers below and write in standard form:

$(8 + 6i) + (3 + 2i)$

9. Subtract the complex numbers below and write in standard form:

$(10 + 7i) - (4 + 3i)$

10. Simplify the square root, then add the complex numbers and write the result in standard form:

$(5 + \sqrt{-16}) + (3 - \sqrt{-36})$

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Operations with Complex Numbers — Answer Key

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Answer Key

1. Answer: i
- By definition, the square root of negative one is i
- Answer: i

2. Answer: 7i
- Factor: sqrt(-1) * sqrt(49)
- sqrt(-1) = i and sqrt(49) = 7
- Answer: 7i

3. Answer: i√5
- Factor: sqrt(-1) * sqrt(5)
- sqrt(-1) = i, and 5 is not a perfect square so it stays as sqrt(5)
- Answer: i√5

4. Answer: 4i√3
- Factor -48 as -1 * 16 * 3
- sqrt(-1) = i, sqrt(16) = 4, sqrt(3) stays
- Answer: 4i√3

5. Answer: Real part: 7, Imaginary part: 5i
- A complex number is written as a + bi
- a = 7 is the real part
- b = 5, so the imaginary part is 5i

6. Answer: 6 + 3i
- Standard form requires the real part first
- Real part is 6, imaginary part is 3i
- Answer: 6 + 3i

7. Answer: 2 - 3i
- Simplify sqrt(-9): sqrt(-1)*sqrt(9) = i*3 = 3i
- Substitute back: 2 - 3i
- Answer: 2 - 3i

8. Answer: 11 + 8i
- Combine real parts: 8 + 3 = 11
- Combine imaginary parts: 6i + 2i = 8i

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- Answer: 11 + 8i

9. Answer: 6 + 4i

- Distribute the negative: (10 + 7i) + (-4 - 3i)
- Combine real parts: 10 - 4 = 6
- Combine imaginary parts: 7i - 3i = 4i
- Answer: 6 + 4i

10. Answer: 8 - 2i

- Simplify sqrt(-16) = 4i and sqrt(-36) = 6i
- Rewrite: (5 + 4i) + (3 - 6i)
- Combine real parts: 5 + 3 = 8
- Combine imaginary parts: 4i - 6i = -2i
- Answer: 8 - 2i

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