

LESSON
13-1

Practice A
Complex Numbers and Roots

Answer each question.

1. Circle the complex numbers.

$3i$ $(4)^2$ $3x + 1$ $7i - 1$ $-2i$ $\sqrt{8}$

2. What is another way of expressing $\sqrt{-1}$? _____
 3. What is the value of the square of i ? _____
 4. What is the real part of the complex number $a + bi$? _____
 5. What is the imaginary part of the complex number $a + bi$? _____

Express each number in terms of i .

6. $\sqrt{-4}$ 7. $3\sqrt{-9}$ 8. $-\sqrt{-81}$

 9. $2\sqrt{-16}$ 10. $\sqrt{-25}$ 11. $3\sqrt{-49}$

The complex conjugate of $a + bi$ is $a - bi$. What is the complex conjugate of each of the following?

12. $1 + 2i$ 13. $5i$ 14. $2 - 3i$

Solve.

15. a. What are the roots of the equation $x^2 = -25$?

 b. How could you check that these roots are correct?

16. a. What are the roots of the equation $48 + 3x^2 = 0$?

 b. How could you check that these roots are correct?

7. $132^\circ; 90^\circ; 48^\circ; 90^\circ$
 8. $101^\circ; 86^\circ; 79^\circ; 94^\circ$

Challenge

1. chord; inscribed
 2. a. 45°
 b. 67.5°
 c. $|180 - 11.25n|$
 d. $0 < |n - 16| < 16$
 e. $\left|180 - \frac{360n}{p}\right|$, or $\left[180\left(1 - \frac{2n}{p}\right)\right]$,
 where $0 < n - \left|n - \frac{p}{2}\right| < \frac{p}{2}$
 f. Answers will vary. Students may choose any values of n and p for which $\frac{n}{p} = \frac{5}{12}$. Sample answer: $n = 15, p = 36$

Problem Solving

1. 160°
 2. $112^\circ; 52^\circ; 68^\circ; 128^\circ$
 3. C
 4. G
 5. B
 6. G

Reading Strategies

1. half
 2. $m\angle A + m\angle C = 180; m\angle B + m\angle D = 180$
 3. 31°
 4. 60°
 5. 124°
 6. 60°
 7. 56°
 8. 120°

Answers for Unit 4

13-1 COMPLEX NUMBERS AND ROOTS

Practice A

1. $3i; 7i - 1; -2i$
 2. i
 3. -1
 4. a
 5. bi
 6. $2i$
 7. $9i$
 8. $-9i$
 9. $8i$
 10. $5i$
 11. $21i$
 12. $1 - 2i$

13. $-5i$
 14. $2 + 3i$

15. a. $x = \sqrt{-25}$, so $x = 5i$ and $-5i$.
 b. Possible answer: You could multiply $(x + 5i)(x - 5i)$ to get the original expression.
 16. a. $x = \sqrt{-16}$, so $x = 4i$ and $-4i$.
 b. Possible answer: You could multiply $(x + 4i)(x - 4i)$ to get the original expression.

Practice B

1. $4i\sqrt{2}$
 2. $6i\sqrt{2}$
 3. $\frac{1}{3}i$
 4. $x = \pm 3i\sqrt{3}$
 5. $x = \pm i\sqrt{7}$
 6. $x = \pm 4i\sqrt{3}$
 7. $x = \pm i\sqrt{21}$
 8. $x = 4, y = 5$
 9. $x = -\frac{1}{3}, y = \frac{1}{2}$
 10. $x = 1 \pm i\sqrt{3}$
 11. $x = -3 \pm i\sqrt{5}$
 12. $-3 - i$
 13. $-4 - 3i$
 14. $-11i$
 15. $3 \pm i\sqrt{11}$

Practice C

1. $x = \pm 2i\sqrt{14}$
 2. $x = \pm i\sqrt{11}$
 3. $x = 3 \pm i\sqrt{11}$
 4. $x = 2 \pm 2i$
 5. $x = 1 \pm i\sqrt{2}$
 6. $x = \frac{5}{3}, y = 1$
 7. $x = -6, y = -8$
 8. $x = 2, y = 0.25$
 9. $-25 - i\sqrt{3}$
 10. $\frac{12}{5} + 5i$
 11. $-2 + 1.5i$

12. Imaginary; possible answer: since a is positive, the parabola opens upward and the vertex is at the minimum. Since the function is in vertex form, you can tell that the vertex is at $(1, 5)$. With a minimum at 5, the function never crosses the x -axis, so the zeros have to be imaginary.