Just In Time Quick Check

Standard of Learning (SOL) AII.2

Strand: Expressions and Operations

Standard of Learning (SOL) AII.2

The student will perform operations on complex numbers and express the results in simplest form using patterns of the powers of i.

Grade Level Skills:

- Recognize that the square root of –1 is represented as *i*.
- Simplify radical expressions containing negative rational numbers and express in *a* + *bi* form.
- Simplify powers of *i*.
- Add, subtract, and multiply complex numbers.

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Just in Time Quick Check Teacher Notes

Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - AII.2 – Complex Numbers (Word)/PDF Version
- VDOE Word Wall Cards: Algebra II (Word) | (PDF)
  - Complex Numbers
  - Complex Numbers Examples

Supporting and Prerequisite SOL: A.2a, A.2b, 8.14b

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1. Simplify the expression show. Show your work/thinking.

$$7 + \sqrt{-81}$$

2. Simplify the expression $\sqrt{-5} \cdot \sqrt{-5} \cdot \sqrt{-5}$. Show your work/thinking.

3. Simplify the expression $i^{33} - i^{37}$. Show your work/thinking.

4. Simplify the expression $(3 - 8i)(7 + 2i)$. Show your work/thinking.

5. Student A was asked to find the product of the expression. Their work is shown below.

$$(2 - 7i)(2 + 7i)$$
$$= 4 - 14i + 14i - 49i^2$$
$$= 4 - 49$$
$$= -45$$

Describe and correct the error made. Show your work/thinking.

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Common Errors/Misconceptions and their Possible Indications

1. Simplify the expression show. Show your work/thinking.

$$7 + \sqrt{-81}$$

A common misconception some students may have is to simplify the radical to -9 instead of ±9i. This may indicate that the student does not recognize that the square root of a negative number is an imaginary number. Teachers may want to have students rewrite the problem as $7 + \sqrt{-1} \cdot \sqrt{81}$ to help students identify the imaginary portion of the square root. Teachers could also have students complete a real numbers system graphic organizer.

2. Simplify the expression $\sqrt{-5} \cdot \sqrt{-5} \cdot \sqrt{-5}$. Show your work/thinking.
A common error some students may make is to multiply the three radicands resulting in $\sqrt{-125}$ before simplifying. This may indicate that some students are not aware that $\sqrt{-5}$ should be simplified to $i\sqrt{5}$ before multiplying the radicands. Students may benefit from creating a graphic organizer to help identify the process for multiplying radicals.

3. Simplify the expression $i^{33} - i^{37}$. Show your work/thinking.
A common error some students may make is to subtract the powers resulting in $-i^4$. This may indicate that students believe they can use the product theorem in error and subtract the powers since the bases are the same. Teachers may find it useful to have students list the the powers of i in order to recognize the pattern of the solutions.

4. Simplify the expression $(3 - 8i)(7 + 2i)$. Show your work/thinking.
A common misconception some students may have is to only multiply the constant terms and only multiply the terms containing i, resulting in $21 - 16i$. This may indicate that a student does not realize that 3 and $-8i$ must be distributed to both terms of the binomial expression $7 + 2i$. Teachers may find it useful to model multiplying binomials to obtain a similar result of (a+b)(c+d) = ac + ad + bc + bd.

5. Student A was asked to find the product of the expression. Their work is shown below.

$$(2 - 7i)(2 + 7i)$$
$$= 4 - 14i + 14i - 49i^2$$
$$= 4 - 49$$
$$= -45$$

Describe and correct the error made. Show your work/thinking
A common error some students may make is to find the correct product of $-7i \cdot 7i$ as $-49i^2$, but simplify that expression to -49. This may indicate that some students may not understand that i^2 is equivalent to -1. Teachers may want to show that multiplying complex numbers such as $(a + bi) \cdot (c + di)$, the imaginary parts $(bi)(di) = bd(-1) = -db$. Another strategy teachers may find beneficial would be to have students complete a simpler problem like $(8i)(4i)$ to practice writing the product in simplest form.