

Name: _____

Teacher: _____

M202: Rational Exponents and Complex Numbers

Post-Badge Task

Reflecting on Badge Learning

Now that you have learned more about rational exponents and complex numbers, respond to the questions that follow. These are the same questions you responded to before the start of this badge.

The Task

QUESTION 1 Consider the following powers of 4:

$$4^{-1} = \frac{1}{4} \quad 4^0 = 1 \quad 4^1 = 4 \quad 4^2 = 16$$

What do you think $4^{\frac{1}{2}}$ would be? Explain your reasoning.



QUESTION 2 Abigail and Ben are comparing their methods to solving for the roots of $f(x) = x^2 + 4x + 13$.

Abigail's work:

$$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(13)}}{2(1)}$$
$$x = \frac{-4 \pm \sqrt{16 - 52}}{2}$$

Ben's work:

$$x = \frac{-4 \pm \sqrt{4^2 - 4(1)(13)}}{2(1)}$$
$$x = \frac{-4 \pm \sqrt{16 - 52}}{2}$$

$$x = \frac{-4 \pm \sqrt{-36}}{2}$$

$$x = \frac{-4 \pm 6i}{2}$$

$$x = -2 \pm 3i$$

$$x = \frac{-4 \pm \sqrt{36}}{2}$$

$$x = \frac{-4 \pm 6}{2}$$

$$x = 1 \text{ and } x = -5$$

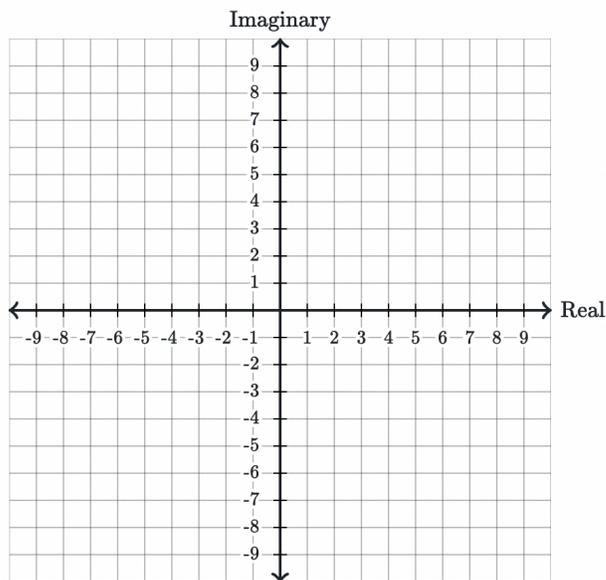
After reviewing Abigail and Ben's work, answer the following questions:

- Who is correct? Explain.
- Graph the two correct solutions on a complex plane.



Who is correct and why:

Graph:



QUESTION 3 A researcher is studying bacterial growth and finds that the number of bacteria in a sample follows the function: $P(t) = 100(2^{\frac{t}{3}})$ where t represents time in hours.

- Solve for $P(900)$. Interpret this solution in the context of bacteria growth.
- Suppose another researcher uses a different model: $Q(t) = 100(4^{\frac{t}{6}})$. Compare the growth rates of P and Q . Which model predicts faster growth? Why?



QUESTION 4 Consider the function $h(x) = x^{\frac{2}{3}} - 4$.

- Graph $h(x)$ by hand or using technology.
- Identify any intercepts and describe the overall shape of the graph.
- How does the graph of this function differ from the graphs of $f(x) = x^2$ or $f(x) = x^3$?
What patterns do you notice?



QUESTION 5 Consider $A = 4 - i$ and $B = 3 + 2i$. Compute the following:

- $A + B$
- $B - A$
- A^2
- $(A - 4)^2$

How do your solutions for A^2 and $(A - 4)^2$ compare? What do you notice?



QUESTION 6 What else did you learn that was not reflected in Questions 1-5?



QUESTION 7 Compare your answers to these questions now to your answers from the earlier attempt. What do you notice about your progress?

