

Real and Complex Numbers: Working with i

Grade 11 – Algebra 2 math · Test · Standards: N-RN.A.1, N-RN.A.2, N-CN.A.1, N-CN.A.2

Name: _____ Date: _____ Class: _____

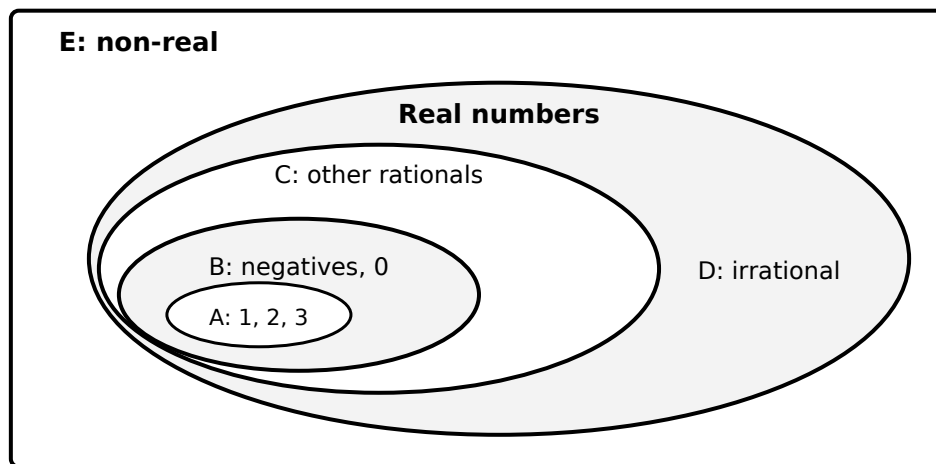
This test covers the number sets, the imaginary unit, and operations with complex numbers. Show all steps, simplify every answer to the form $a + bi$, and write final results clearly. Calculators are not needed. The test is worth 20 points.

Standards: N-RN.A.1, N-RN.A.2, N-CN.A.1, N-CN.A.2 · **Level:** Grade 11 Algebra 2

Time: 45 minutes · 9 questions · Total: 20 points · Calculator: as allowed by your teacher

Question 1 Place the numbers in the regions (2 points)

Each region letter in the figure names the smallest set that contains a number. Write the letter for each number.



Regions A to E.

- a. $36/4$
- b. $-\sqrt{100}$
- c. 0.125
- d. $\sqrt{40}$
- e. $\sqrt{-16}$

(2 points)

Question 2 Simplify negative square roots (2 points)

Simplify.

- a. $\sqrt{-150}$ (1 point)
- b. $-3 + \sqrt{-48}$ (1 point)

Question 3 Add and subtract (2 points)

Perform each operation.

- a. $(8 - 5i) + (-3 + 12i)$ (1 point)
- b. $(-6 + 9i) - (4 - i)$ (1 point)

Question 4 Multiply complex numbers (3 points)

Multiply and write each answer as $a + bi$.

- a. $(4 - 3i)(5 + 2i)$
- b. $(6 - i)^2$
- c. $(7 + 2i)(7 - 2i)$

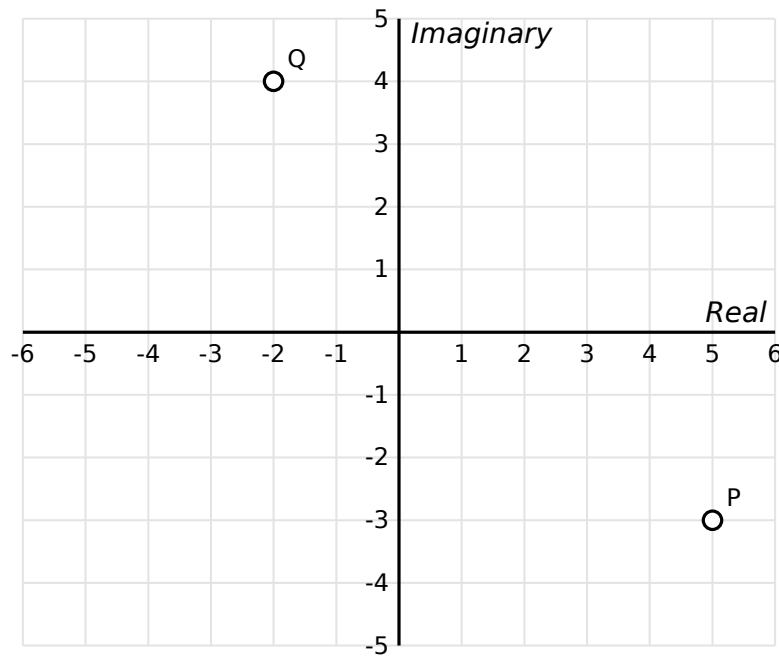
Question 5 Powers of i (2 points)

Evaluate each power.

- a. i^{47} (1 point)
- b. i^{82} (1 point)

Question 6 Two points on the complex plane (2 points)

The figure shows points P and Q .



Points P and Q.

- Write P and Q as complex numbers. (1 point)
- Find $P + Q$. (1 point)

Question 7 Solve for a and b (3 points)

Find real numbers a and b such that $(a + 2b) + (3a - b)i = 11 + 5i$.

Question 8 Verify a solution (2 points)

Show that $2 - 3i$ is a solution of $x^2 - 4x + 13 = 0$.

Question 9 Circuit calculations (2 points)

A series circuit has two parts with impedances $9 + 4i$ ohms and $5 - 7i$ ohms.

- Find the total impedance. (1 point)
- A current of $1 + 2i$ amps flows through a part with impedance $3 - 4i$ ohms. Find the voltage (current times impedance). (1 point)