

Algebra 2 · Real and Complex Numbers · Worksheet

Common Core N-RN.A.1, N-RN.A.2, N-CN.A.1, N-CN.A.2 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 24 problems practice the number systems of Algebra 2: classifying real numbers, rewriting square roots of negative numbers with the imaginary unit, and working with complex numbers of the form $a + bi$ (N-RN.A.1, N-CN.A.1, N-CN.A.2).

The problems move from sorting numbers and reading the complex plane to adding, subtracting and multiplying, then to powers of i and word problems. Show every step.

Algebra 2 Common Core: N-RN.A.1 · N-RN.A.2 · N-CN.A.1 · N-CN.A.2

Problem 1: Classify numbers

List every set (natural, integer, rational, irrational, real) that each number belongs to.

- a. 9
- b. -14
- c. $\frac{3}{8}$
- d. $\sqrt{13}$
- e. 0

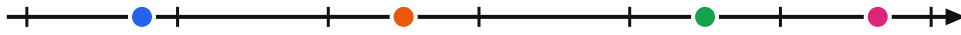
Problem 2: True or false

Decide whether each statement is true or false.

- a. Every integer is a rational number.
- b. Every irrational number is a real number.
- c. $\sqrt{49}$ is irrational.
- d. 0.125 is irrational.
- e. Every real number is rational.

Problem 3: Match points on a number line

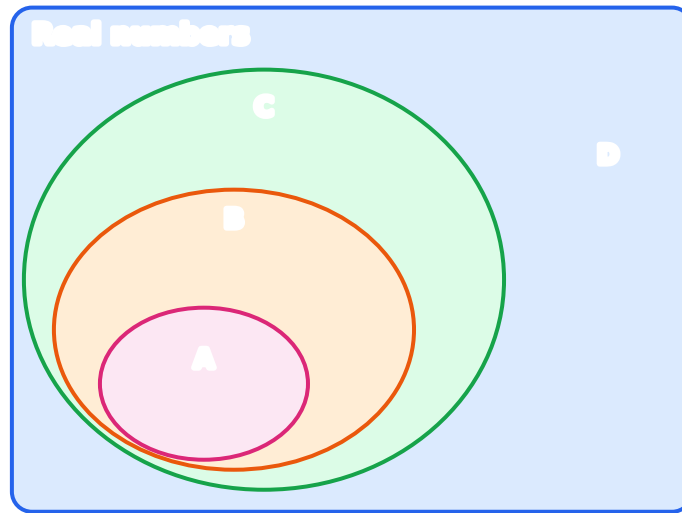
The points A, B, C, and D are marked on the number line. Match the numbers $-\sqrt{5}$, $-\frac{1}{2}$, $\frac{3}{2}$, and $\sqrt{7}$ to the points, then name the two that are rational.



Four points on a number line.

Problem 4: Regions of the number diagram

In the diagram, name the set of numbers that each region A, B, C, and D represents. Then name the smallest region that holds each number: 12 , -5 , $\frac{2}{7}$, and $\sqrt{11}$.



Four labeled regions of the real numbers.

Problem 5: Square roots of negative numbers

Write each expression in the form $b i$ or $b i \sqrt{c}$ with c as small as possible.

- $\sqrt{-49}$
- $\sqrt{-18}$
- $\sqrt{-75}$
- $-\sqrt{-81}$

Problem 6: Equations with imaginary solutions

Solve each equation over the complex numbers.

- $x^2 = -64$
- $x^2 + 45 = 0$
- $2x^2 + 50 = 0$

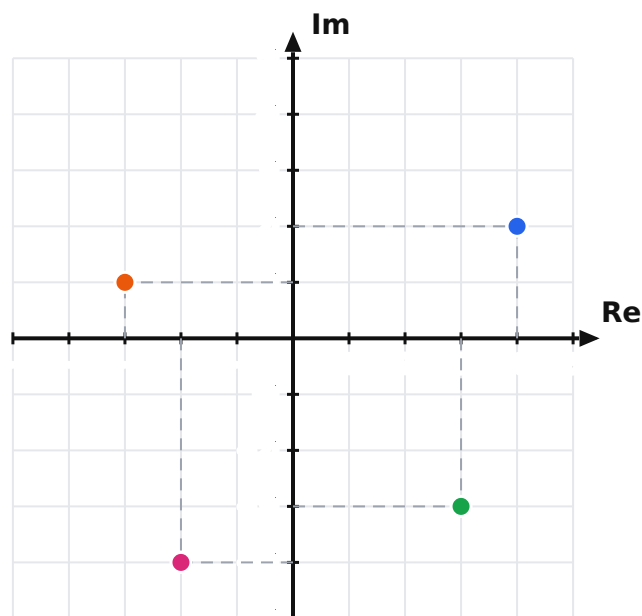
Problem 7: Real and imaginary parts

State the real part and the imaginary part of each number.

- a. $6+9i$
- b. $-4-7i$
- c. $12i$
- d. 15
- e. $\frac{1}{2}-i$

Problem 8: Read points in the complex plane

Write the complex number represented by each of the points P, Q, R, and S.



Points P, Q, R and S in the complex plane.

Problem 9: Plot complex numbers

Plot these numbers in the complex plane and label them: $A=3+2i$, $B=-4+i$, $C=-2-3i$, and $D=5-i$.

Problem 10: Add complex numbers

Find each sum.

- a. $(3+5i)+(2-8i)$
- b. $(-4+i)+(6+9i)$
- c. $(7-2i)+(-7+2i)$

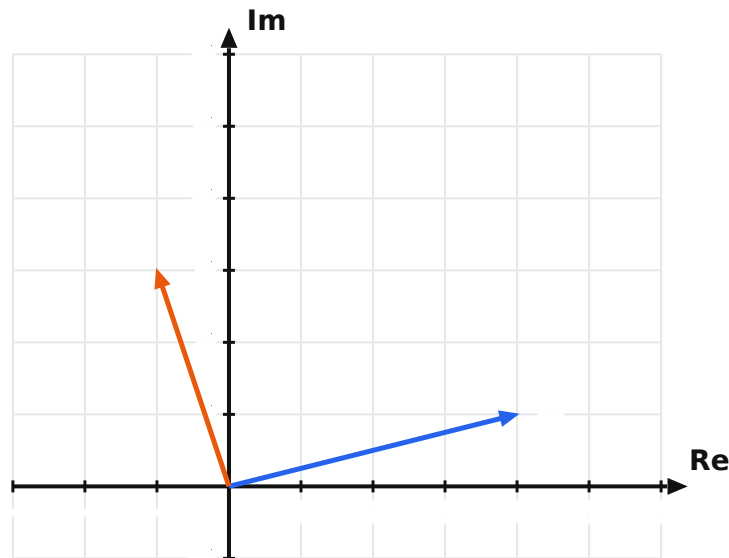
Problem 11: Subtract complex numbers

Find each difference.

- a. $(9+4i)-(3+6i)$
- b. $(2-5i)-(-3+i)$
- c. $(-1+8i)-(-1+3i)$

Problem 12: Add arrows in the plane

The arrows show z_1 and z_2 . Write each as $a+bi$, then find z_1+z_2 and z_1-z_2 .



The complex numbers z_1 and z_2 drawn from the origin.

Problem 13: Multiply by an imaginary number

Multiply and write the product as $a+bi$.

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

Problem 14: Multiply two binomials

Find each product.

- a. $(1+2i)(3+i)$
- b. $(5-2i)(1+4i)$
- c. $(3-i)^2$

Problem 15: Multiply conjugates

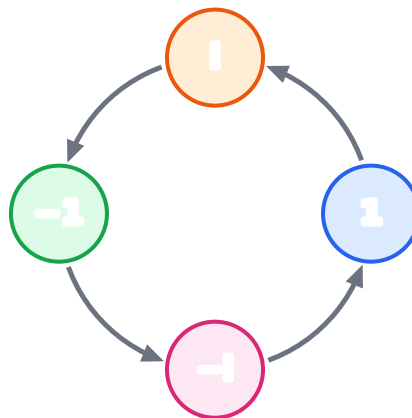
Find each product.

- a. $(4+3i)(4-3i)$
- b. $(6-i)(6+i)$
- c. $(1+i\sqrt{3})(1-i\sqrt{3})$

Problem 16: Powers of i

Simplify each power.

- a. i^6
- b. i^{13}
- c. i^{30}
- d. i^{47}
- e. i^{64}



The cycle of the powers of i .

Problem 17: Simplify with powers of i

Simplify each expression.

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

Problem 18: Verify a solution

Show that $1+2i$ is a solution of $x^2-2x+5=0$.

Problem 19: Impedance in a circuit

Electrical engineers use complex numbers for impedance, in ohms. A resistor and a coil are wired in series. Their impedances are $3+4i$ and $2-i$ ohms. The total impedance is the sum. Find it.

Problem 20: Voltage across a circuit

Maya measures a current of $2+i$ amps through a part with impedance $3-2i$ ohms. Voltage equals current times impedance. Find the voltage in volts.

Problem 21: Find the error

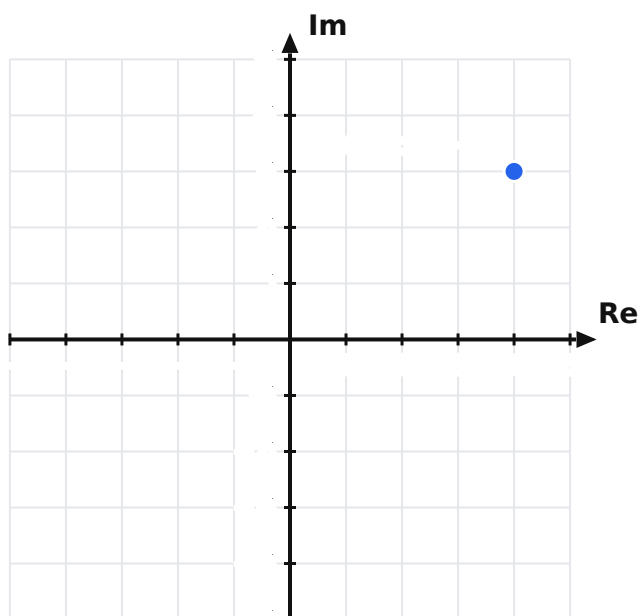
Noah writes $\sqrt{-4} \cdot \sqrt{-9} = \sqrt{36} = 6$. Explain his mistake and find the correct value.

Problem 22: Moving on a game map

A video game map is the complex plane. Diego's character starts at $3+2i$. It moves by $-5+4i$, and then by $2-7i$. Find the final position.

Problem 23: Rotating a drone

A drone starts at $4+3i$ on a map in the complex plane. Each time its position is multiplied by i , the drone moves to a new point. Find its position after one, two, and three multiplications, and describe what each multiplication does to the point.



The drone starts at $4 + 3i$ on the map.

Problem 24: Make a product real

Find the real number k that makes $(k+3i)(2-i)$ a real number, and give the product.