

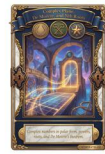
Complex Plane, De Moivre, and Nth Roots

Complex numbers in polar form, powers, roots, and De Moivre's theorem.

Name _____ Date _____

32 main 2-up grid 2 pages

Completion Reward



Shown here as a small pack artifact, not a preview destination.

1. What is i^2 ?

- A. -1
- B. 1
- C. i
- D. 0

2. In the complex plane, what does the vertical axis represent?

- A. Real values
- B. Radius values only
- C. Angles only
- D. Imaginary values

3. What is the conjugate of $4 - 7i$?

- A. $-4 + 7i$
- B. $7 - 4i$
- C. $4 - 7i$
- D. $4 + 7i$

4. What does the modulus of a complex number measure?

- A. Its slope
- B. Its distance from the origin in the complex plane
- C. Its imaginary part only
- D. Its argument only

5. Which expression is a polar-form description of a complex number?

- A. $a + bi$
- B. $r(\theta + i)$
- C. $r(\cos(\theta) + i \sin(\theta))$
- D. $r^2 = x^2 + y^2$

6. Which pattern is used in De Moivre's theorem?

- A. Raise the modulus to the power and multiply the angle by the power
- B. Raise both modulus and angle to the power
- C. Keep the modulus and add the power to the angle
- D. Square the real and imaginary parts separately

7. How many distinct complex fourth roots does a nonzero complex number have?

- A. 1
- B. 2
- C. 8
- D. 4

8. What is the argument of a complex number?

- A. Its distance from the origin
- B. Its real part
- C. Its modulus squared
- D. Its angle from the positive real axis

9. To compute a high power of a complex number efficiently, what is the best first step?

- A. Multiply it out term by term immediately
- B. Take the conjugate
- C. Convert to polar form
- D. Set the number equal to zero

10. To find all cube roots of a complex number, what is the best first step?

- A. Take the conjugate
- B. Write the number in polar form
- C. Differentiate it
- D. Put it in a table

11. A student says the conjugate of $-3 + 2i$ is $3 + 2i$. What is wrong?

- A. The real part should stay -3
- B. The imaginary part should stay $+2i$
- C. The conjugate should be $-3 - 2i^2$
- D. Nothing is wrong

12. A student says the modulus of $3 + 4i$ is 7. What is wrong?

- A. Modulus uses the Pythagorean theorem, not direct addition
- B. The real and imaginary parts should be subtracted
- C. Modulus should always equal the real part for positive numbers
- D. The modulus of $3 + 4i$ is undefined

13. Find the modulus of $3 + 4i$. Answer with a number.

14. Find the modulus of $-5 + 12i$. Answer with a number.

15. Compute $(2i)(-3i)$. Answer with a number.

16. Compute $(4 + 3i) + (2 - i)$. Answer in standard form.

17. Compute $(7 - 5i) - (2 + i)$. Answer in standard form.

18. Compute $(1 + i)(1 - i)$. Answer with a number.

19. Find a principal argument for $1 + \sqrt{3}i$. Answer as an exact value.

20. Find a principal argument for $-1 + \sqrt{3}i$. Answer as an exact value.

21. If $z = 2(\cos(\pi/6) + i \sin(\pi/6))$, find the modulus of z^2 . Answer with a number.

22. If $z = 3(\cos(\pi/5) + i \sin(\pi/5))$, what is the argument of z^4 ? Answer as an exact value.

23. How many distinct fifth roots does 32 have in the complex plane? Answer with a number.

24. What is the modulus of any cube root of $8(\cos(\theta) + i \sin(\theta))$? Answer with a number.

25. Write the conjugate of $5 - 2i$. Answer as an equation.

26. Write the polar-form template for a complex number with modulus r and argument θ . Answer as an equation.

27. Write i^2 . Answer as an equation.

28. Write i^4 . Answer as an equation.

29. Write the product of $z_1 = r_1 \operatorname{cis}(\theta_1)$ and $z_2 = r_2 \operatorname{cis}(\theta_2)$. Answer as an equation.

30. Write the quotient z_1 / z_2 in polar form. Answer as an equation.

31. If $z_1 = r_1 \operatorname{cis}(\theta_1)$ and $z_2 = r_2 \operatorname{cis}(\theta_2)$, which product is correct?

- A. $r_1 + r_2 \operatorname{cis}(\theta_1\theta_2)$
- B. $r_1r_2 \operatorname{cis}(\theta_1 - \theta_2)$
- C. $r_1r_2 \operatorname{cis}(\theta_1 + \theta_2)$
- D. $r_1 / r_2 \operatorname{cis}(\theta_1 + \theta_2)$

32. If $z_1 = r_1 \operatorname{cis}(\theta_1)$ and $z_2 = r_2 \operatorname{cis}(\theta_2)$, which quotient is correct?

- A. $(r_1 / r_2) \operatorname{cis}(\theta_1 - \theta_2)$
- B. $(r_1r_2) \operatorname{cis}(\theta_1 + \theta_2)$
- C. $(r_1 + r_2) \operatorname{cis}(\theta_1 - \theta_2)$
- D. $(r_1 / r_2) \operatorname{cis}(\theta_1 + \theta_2)$