Complex Numbers Study Tutorial

50 Practice Problems: Rectangular, Polar, Powers, and Roots

Section 1: Rectangular Form Basics (a + bi)

1. (3 + 4i) + (2 - 7i)
Ans: 5 - 3i

2. (-5 + 2i) - (10 - 8i)
Ans: -15 + 10i

3. (1.5 - 0.5i) + (4.5 + 2.5i)
Ans: 6 + 2i

4. (6 + i) * (2 - 3i)
Ans: 15 - 16i

5. (-4 + 2i) * (5 + 2i)
Ans: -24 + 2i

6. (1 - i) * (1 + i)
Ans: 2

7. (10 + 5i) / (1 + 2i)
Ans: 4 - 3i

8. (4 - 2i) / (3 + i)
Ans: 1 - i

9. 1 / i
Ans: -i

10. 6i / (2 - i)
Ans: -1.2 + 2.4i

Section 2: Polar Form Basics (r < theta)

11. (4 < 30 deg) * (2 < 45 deg)
Ans: 8 < 75 deg

12. (10 < 120 deg) * (0.5 < -30 deg)
Ans: 5 < 90 deg (or 5i)

13. (3 < pi/4) * (5 < pi/6)
Ans: 15 < 5pi/12

14. (12 < 90 deg) / (3 < 30 deg)
Ans: 4 < 60 deg

15. (20 < 0 deg) / (5 < 45 deg)
Ans: 4 < 315 deg (or 4 < -45 deg)

16. (8 < 210 deg) / (2 < -60 deg)

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Ans: 4 < 270 deg (or -4i)

17. (1 < 180 deg) * (7 < 90 deg)
Ans: 7 < 270 deg (or -7i)

18. (6 < 45 deg) / (3 < 45 deg)
Ans: 2 < 0 deg (or 2)

19. (2 < 15 deg) * (3 < 15 deg) * (4 < 15 deg)
Ans: 24 < 45 deg

20. [(10 < 60 deg) * (2 < 30 deg)] / (5 < 45 deg)
Ans: 4 < 45 deg

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Section 3: Conversions

21. Convert 1 + i to Polar.

Ans: sqrt(2) < 45 deg

22. Convert -3 + 4i to Polar.

Ans: 5 < 126.87 deg

23. Convert -5i to Polar.

Ans: 5 < 270 deg

24. Convert 2 < 60 deg to Rectangular.

Ans: 1 + i*sqrt(3)

25. Convert 4 < 180 deg to Rectangular.

Ans: -4

Section 4: Squaring and Powers

26. (3 + 4i)^2

Ans: -7 + 24i

27. (1 - i)^2

Ans: -2i

28. (-2 + 2i)^2

Ans: -8i

29. (5 < 30 deg)^2

Ans: 25 < 60 deg

30. (2 < 120 deg)^2

Ans: 4 < 240 deg

31. (1 < 45 deg)^4

Ans: 1 < 180 deg (or -1)

32. (1 + i)^4

Ans: -4

33. (sqrt(3) + i)^3

Ans: 8i

34. (cos 15 + i sin 15)^2

Ans: sqrt(3)/2 + 0.5i (or 1 < 30 deg)

35. (2 - 2i)^3

Ans: -16 - 16i

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Section 5: Square Roots

36. Find sqrt(9 < 60 deg)

Ans: 3 < 30 deg and 3 < 210 deg

37. Find sqrt(16 < 180 deg)

Ans: 4i and -4i

38. Find sqrt(1 < 270 deg)

Ans: 1 < 135 deg and 1 < 315 deg

39. Find sqrt(4i)

Ans: sqrt(2) + i*sqrt(2) and -sqrt(2) - i*sqrt(2)

40. Find sqrt(-16)

Ans: 4i and -4i

41. Find sqrt(2 + 2i*sqrt(3))

Ans: sqrt(3) + i and -sqrt(3) - i

42. Find sqrt(i)

Ans: sqrt(2)/2 + i*sqrt(2)/2 and -sqrt(2)/2 - i*sqrt(2)/2

43. Find sqrt(-1 - i)

Ans: 1.19 < 112.5 deg and 1.19 < 292.5 deg

44. Find sqrt(5 + 12i)

Ans: 3 + 2i and -3 - 2i

45. Find sqrt(25 < 100 deg)

Ans: 5 < 50 deg and 5 < 230 deg

Section 6: Mixed Operations

46. Evaluate z^2 + 2z + 2 where z = -1 + i.

Ans: 0

47. [(1+i)^2] / (2 < 90 deg)

Ans: 1

48. (2 < 30 deg)^2 + (1 - i*sqrt(3))

Ans: 3 + i*sqrt(3)

49. Find the reciprocal of z = 3 + 4i.

Ans: 0.12 - 0.16i

50. Solve for z: z^2 = -9.

Ans: z = 3i, -3i