Complex Numbers: Polar Form and Arithmetic

Modulus and argument of two complex numbers given in rectangular form, and their sum, difference, product and quotient.

Method: Complex arithmetic (Kreyszig, Advanced Engineering Mathematics, 10th ed. (Wiley), ch. 13)

Input parameters

Unit system: SI

Parameter	Value	Unit
Real part of z_1	3.0000	
Imaginary part of z_1	4.0000	
Real part of z_2	1.0000	
Imaginary part of z_2	-2.0000	

Calculated results

Parameter	Value	Unit
Modulus of z_1	5.0000	
Argument of z_1	53.130	°
Modulus of z_2	2.2361	
Argument of z_2	-63.435	°
Sum, real	4.0000	
Sum, imaginary	2.0000	
Difference, real	2.0000	
Difference, imaginary	6.0000	
Product, real	11.000	
Product, imaginary	-2.0000	
Quotient, real	-1.0000	
Quotient, imaginary	2.0000	

Notes for this case

- Arguments are between −180° and +180°. In a.c. circuits a complex impedance R + jX has modulus |Z| and phase angle arg Z.

Formula and method

The formula is shown on the calculator page: https://calc.firecad.com/general/geometry/complex-number-calculator

Variables

a_1	Real part of z_1	-
b_1	Imaginary part of z_1	-
a_2	Real part of z_2	-
b_2	Imaginary part of z_2	-
	z_1	$
$\arg z_1$	Argument of z_1	rad
	z_2	$
$\arg z_2$	Argument of z_2	rad
$\Re(z_1 + z_2)$	Sum, real	-
$\Im(z_1 + z_2)$	Sum, imaginary	-
$\Re(z_1 - z_2)$	Difference, real	-

$\Im(z_1 - z_2)$	Difference, imaginary	-
$\Re(z_1 z_2)$	Product, real	-
$\Im(z_1 z_2)$	Product, imaginary	-
$\Re(z_1 / z_2)$	Quotient, real	-
$\Im(z_1 / z_2)$	Quotient, imaginary	-

Method and standards

Complex arithmetic.

Assumptions and limits

- Exact arithmetic.
- When z_2 is zero the quotient is not shown; the other results still are.

References

- Complex arithmetic (Kreyszig, Advanced Engineering Mathematics, 10th ed. (Wiley), ch. 13)

Report details

Report reference	FCC-S86V-7WF2 (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Complex Numbers: Polar Form and Arithmetic
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/general/geometry/complex-number-calculator

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.