

Complex Numbers

Printable teaching and practice sheet

Chapter 3 | Module 11 | Student Book pages 106-114 | Suggested time: 50 minutes | 20 marks



Name: _____ Class: _____ Date: _____

Learning goals

- Explain and apply real and imaginary parts with valid conditions and clear reasoning.
- Explain and apply powers of i with valid conditions and clear reasoning.
- Explain and apply conjugate and division with valid conditions and clear reasoning.

Quick reference

Real and imaginary parts	A complex number has standard form $a+bi$ with real part a and imaginary part b .
Powers of i	Powers of i repeat every four: $1, i, -1, -i$.
Conjugate and division	The conjugate $a-bi$ makes $(a+bi)(a-bi)=a^2+b^2$ real.

Worked example

If $z=-3+5i$, then $\text{Re}(z)=-3$ and $\text{Im}(z)=5$; the imaginary part is the real coefficient of i .

Graduated practice

Answer without viewing the key. Show complete working for short-response questions.

1. If $z = -3 + 5i$, what are its real and imaginary parts? [1 marks]

A) $\operatorname{Re}(z) = -3$, $\operatorname{Im}(z) = 5$

B) $\operatorname{Re}(z) = 5$, $\operatorname{Im}(z) = -3$

C) $\operatorname{Re}(z) = -3$, $\operatorname{Im}(z) = 5i$

D) $\operatorname{Re}(z) = 3$, $\operatorname{Im}(z) = 5$

2. If $(2x-1) + (y+3)i = 7-2i$, find x and y . [1 marks]

A) $x=3$, $y=-5$

B) $x=4$, $y=-5$

C) $x=4$, $y=1$

D) $x=-4$, $y=5$

3. What is i^{2026} ? [1 marks]

A) 1

B) i

C) -1

D) $-i$

4. Calculate $(3-2i)(1+4i)$ and write the result as $a+bi$. [1 marks]

A) $-5+10i$

B) $11+10i$

C) $11-10i$

D) $3+8i$

5. Simplify $(4+2i)/(1-i)$ to the form $a+bi$. [1 marks]

A) $1+3i$

B) $3+i$

C) $1-3i$

D) $2+6i$

6. Solve $x^2+49=0$ in the complex numbers. [1 marks]

A) $x=7i$ only

B) $x=-7i$ only

C) $x=\pm 7$

D) $x=\pm 7i$

7. True or false: if $z=a+bi$, then z times its conjugate is a^2+b^2 , a non-negative real number. [1 marks]

☐ True ☐ False

8. True or false: $\sqrt{(-4)} \times \sqrt{(-9)} = \sqrt{36} = 6$. [1 marks]

☐ True ☐ False

9. Simplify $i^{37} + i^{58} + i^{99}$, showing how the four-term cycle is used. [3 marks]

10. If $(a+2)+(3b-1)i=5+8i$, find a and b and justify the comparison of parts. [3 marks]

11. Simplify $(2+3i)/(2-3i)$ to $a+bi$, showing the use of the conjugate. [3 marks]

12. Solve $x^2-6x+13=0$ in the complex numbers and check the two roots. [3 marks]

Challenge and review

1. Prove that if $z=a+bi$ is nonzero, then $1/z=(a-bi)/(a^2+b^2)$.
2. If z and its conjugate satisfy $z+\text{conjugate}(z)=8$ and $z-\text{conjugate}(z)=-6i$, find z .
3. Error analysis: a student writes $\sqrt{-a}\sqrt{-b}=\sqrt{ab}$ for positive a and b . Explain the error and give the correct product of principal roots.

Follow-up plan

Below 14/20: revisit the cycle of i , equality of parts and use of the conjugate, then retry Questions 2-6 and 9-12. At 14 or above: continue to the online module challenge.