

Worksheet: Argand Diagrams and Polar Form

This worksheet covers Argand diagrams and the polar form of complex numbers. Please read the study guide: [Argand Diagrams and Polar Form](#) before doing these questions.

Argand Diagrams
and Polar Form
study guide



Model answers for
this sheet



1. For each of the following complex numbers in Cartesian form, $z = a + bi$:

- represent the number on an Argand diagram;
- find the modulus and the argument, and;
- write the number in polar form $z = re^{i\theta}$.

i) $z = 1 + i$ ii) $z = 5 - 12i$ iii) $z = -5 - 4i$
iv) $z = 8 + 0i$ v) $z = 0 + 8i$ vi) $z = -\sqrt{3} + i$

2. For each of the following complex numbers in polar form, $z = re^{i\theta}$:

- write down the modulus and the argument;
- write the number in Cartesian form $z = a + bi$, and;
- represent the number on an Argand diagram.

i) $z = 8e^i$ ii) $z = 8e^{\frac{\pi}{2}i}$ iii) $z = 8e^{\pi i}$
iv) $z = \sqrt{8}e^{-\frac{3\pi}{4}i}$ v) $z = 8e^{-3i}$ vi) $z = \sqrt[3]{8}e^{-\frac{\pi}{2}i}$

3. Work out the modulus and the argument of each of the following complex numbers in Cartesian form $z = a + bi$.

i) $z = 6 + \sqrt{8}i$ ii) $z = -4 + \sqrt{28}i$ iii) $z = -4\sqrt{2} + 2\sqrt{14}i$ iv) $z = -8 - 2\sqrt{6}i$

v) $z = -4 - \sqrt{6}i$ vi) $z = \sqrt{11} - \sqrt{11}i$ vii) $z = \sqrt{22} - \sqrt{22}i$ viii) $z = \sqrt{36} + 2\sqrt{2}i$

What do you notice about your answers?

4. For each of the following complex numbers in polar form, $z = re^{i\theta}$, write them in Cartesian form $z = a + bi$.

i) $z = e^{0i}$ ii) $z = e^{\frac{\pi}{3}i}$ iii) $z = e^{\frac{2\pi}{3}i}$ iv) $z = e^{\frac{3\pi}{3}i}$ v) $z = e^{-\frac{\pi}{3}i}$ vi) $z = e^{-\frac{2\pi}{3}i}$

Draw all of these complex numbers on the same Argand diagram. Join the dots.

What can you see?

Write the following complex numbers in Cartesian form $z = a + bi$.

vii) $z = 1e^{0i}$ viii) $z = 2e^{\frac{\pi}{3}i}$ ix) $z = 3e^{\frac{2\pi}{3}i}$ x) $z = 4e^{\frac{3\pi}{3}i}$

xi) $z = 5e^{-\frac{2\pi}{3}i}$ xii) $z = 6e^{-\frac{\pi}{3}i}$ xiii) $z = 7e^{-\frac{3\pi}{3}i}$

Draw the complex numbers vii)-xiii) on the same Argand diagram. Join the dots.



This worksheet is one of a series on mathematics produced by the Learning Enhancement Team with funding from the UEA Alumni Fund. Scan the QR-code with a smartphone app for [more resources](#).



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