

Practice worksheet

Lesson 6 • Multiplying and dividing in polar form

Name: _____

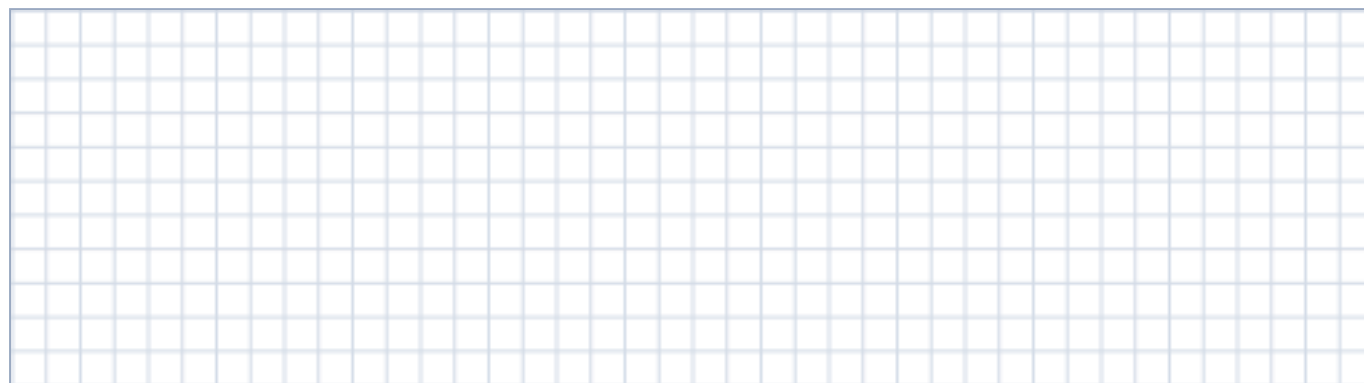
Date: _____

Multiplying and dividing

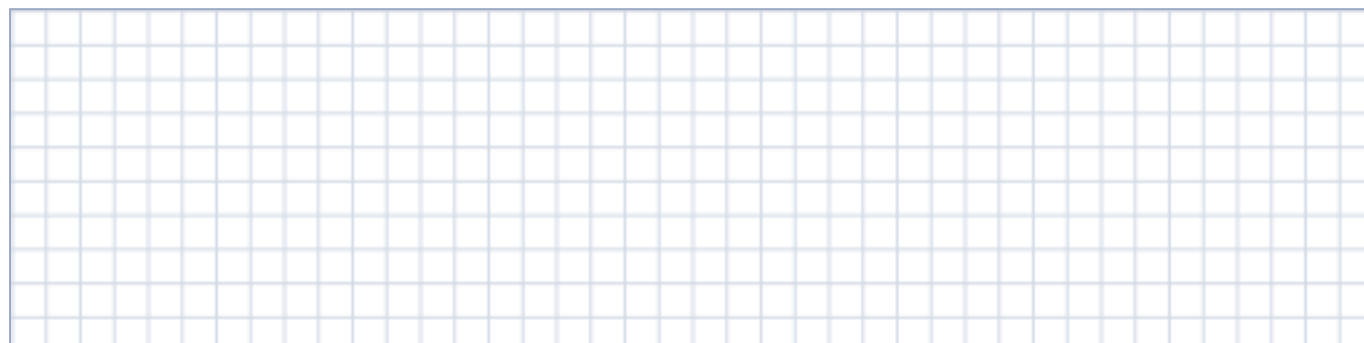
1. Express in polar form with the principal argument.

(a) $3 \operatorname{cis} \frac{2\pi}{3} \times 2 \operatorname{cis} \frac{3\pi}{4}$ (b) $\frac{8 \operatorname{cis} \frac{\pi}{6}}{2 \operatorname{cis} \frac{5\pi}{6}}$

(c) $\left(\sqrt{2} \operatorname{cis} \frac{3\pi}{4}\right)^3$

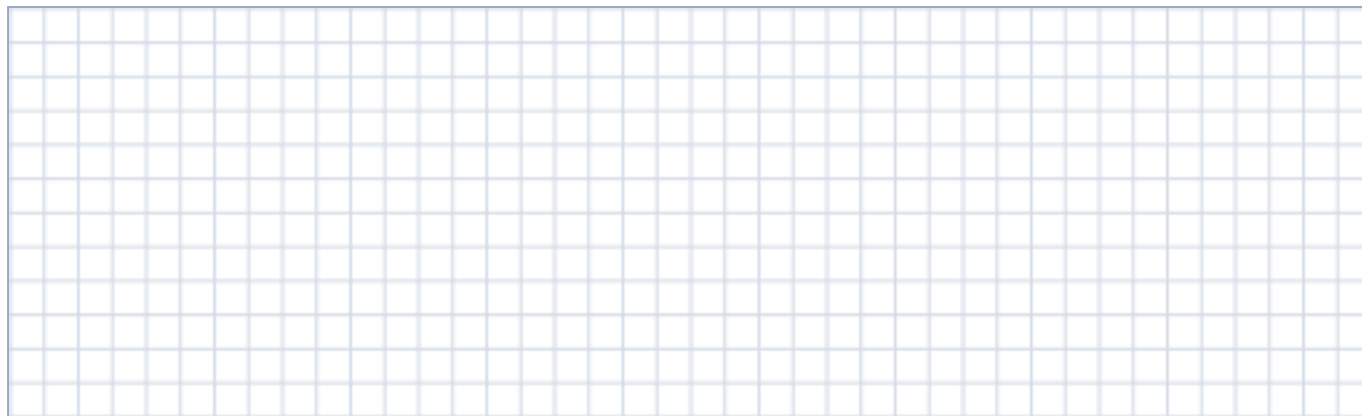


2. Write $z_1 = \sqrt{3} - i$ and $z_2 = -1 + i$ in polar form, then find $z_1 z_2$ and $\frac{z_1}{z_2}$ in polar form.



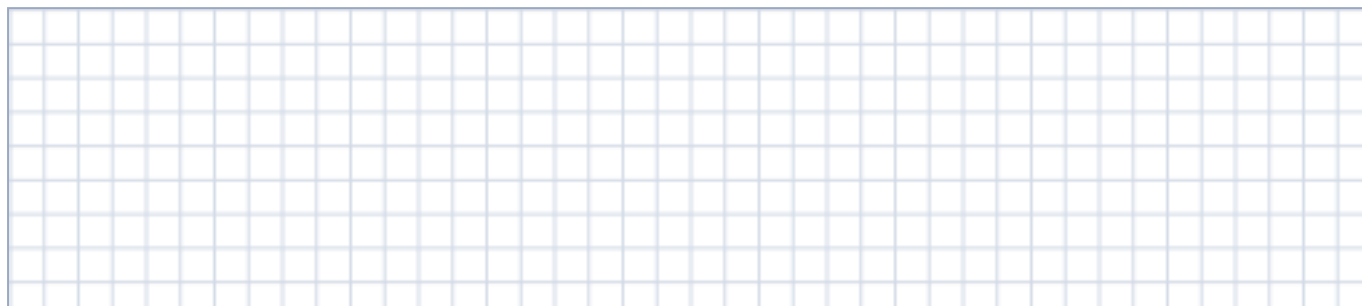
Exact values

3. Let $z_1 = \sqrt{3} + i$ and $z_2 = 1 - i$. Find $z_1 z_2$ in polar form and in Cartesian form. Hence find the exact value of $\cos\left(-\frac{\pi}{12}\right)$.

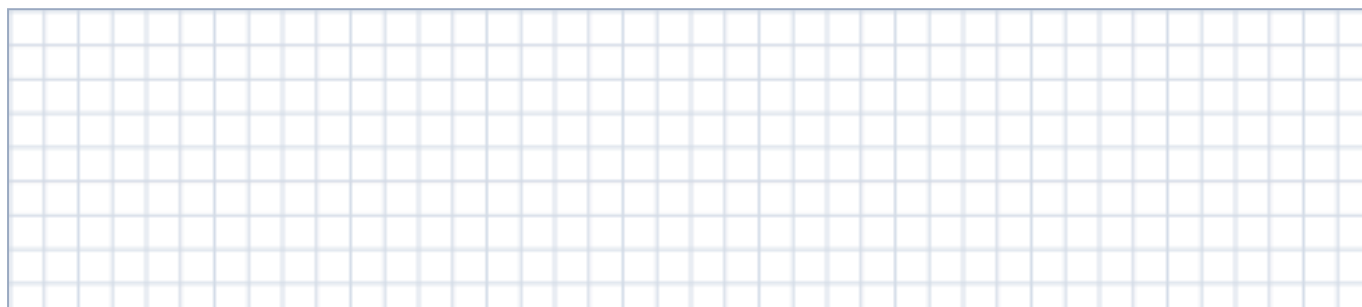


Proofs

4. Prove that $\arg\left(\frac{1}{z}\right) = -\arg z$ for $z \neq 0$, and explain the connection with the conjugate $\bar{z}$.

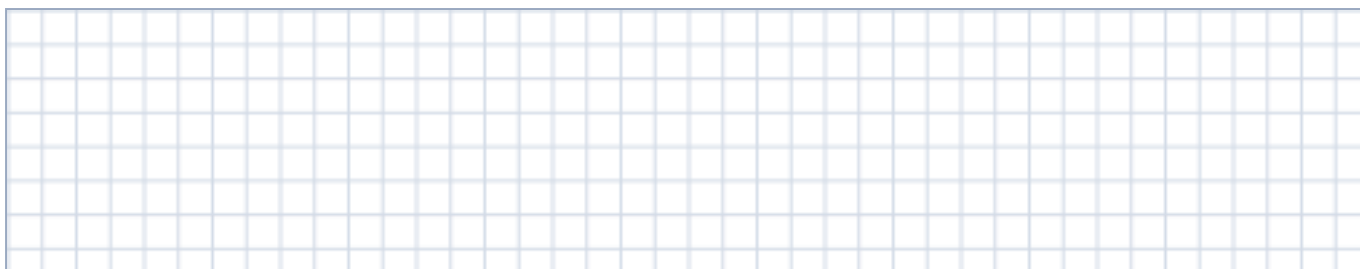


5. Prove that $\overline{\left(\frac{z_1}{z_2}\right)} = \frac{\bar{z}_1}{\bar{z}_2}$ using polar form.



Powers

6. Use polar form to find $(1 - i)^8$ and $(-1 + \sqrt{3}i)^6$.



HSC-style

7. Let $z = 1 + i$ and $w = \sqrt{3} + i$. (a) Write z and w in polar form. (b) Find $\frac{w^6}{z^4}$. (c) Find the smallest positive integer n such that $\left(\frac{w}{z}\right)^n$ is real.

