Problem 1. Working in \( \mathbb{C} \), compute the following:
(a) \((3 + i2)(2 - i)\)
(b) \(\left(\frac{3}{2} + i\frac{1}{2}\right)\left(\frac{1}{2} + i\frac{3}{2}\right)\)
(c) \((3 + i2)(3 + i2)\)
(d) \(\left(2 \left(\cos \left(\frac{2\pi}{3}\right) + i \sin \left(\frac{2\pi}{3}\right)\right)\right) \left(5 \left(\cos \left(\frac{2\pi}{3}\right) + i \sin \left(\frac{2\pi}{3}\right)\right)\right)\)

Problem 2. Working in \( \mathbb{C} \), find all solutions for \( z \).
(a) \((2 + i3)z = i\)
(b) \(z^4 = 16\)
(c) \(z^2 = -4\)

Problem 3. Working in \( \mathbb{Z}_5 \), find all solutions for \( x \). As there are at most 5 possible solutions, it may be fastest to plug in all possible values for \( z \) and see which ones work. Only find solutions between (and including) 0 and 4.
(a) \(3z + 1 = 2\)
(b) \(z^4 = 3\)
(c) \(z^2 = 4\)

Problem 4.
(a) In \( \mathbb{Z}_5 \) solve for \( y \):
\[
2x + 3y = 1
\]
How many solutions are there? (Only count solutions where both \( x \) and \( y \) are between 0 and 4.)
(b) In \( \mathbb{Z}_7 \) solve for \( y \):
\[
2x + 3y = 1
\]
How many solutions are there? (Only count solutions where both \( x \) and \( y \) are between 0 and 6.)