Problem Set 1

2019 Math Boot Camp for the Political and Social Sciences

Deeper Thinking

1. Let A be the set of all even numbers, and B be the set of all multiples of 3. What is $A \cap B$? Can this be generalised?
2. Factorise $x^2 - y^2$. Can you factorise $x^3 - y^3$? What about $x^n - y^n$?
3. Prove the quadratic formula by completing the square to solve the equation $ax^2 + bx + c = 0$.
4. Prove that $\sqrt{2}$ is irrational (i.e. not expressable a fraction $\frac{p}{q}$ with p, q whole numbers).

Some practice

1. Consider the sets $A = \{1, 3, 5, 7, 9\}$ and $B = \{1, 2, 3, 4, 5\}$.
   (a) Compute $A \cap B$.
   (b) Compute $A \cup B$.
   (c) Compute the mean of A.
   (d) Compute the mean of B.
2. Simplify $\frac{128}{24}$ and $\frac{24}{128}$, then (a) multiply them and (b) add them.
3. Solve $3t - 5t + 4 = 2$ for t.
4. Solve $(2 - b)(b + 3) = 0$ for b.
5. Expand $(2x + 3y)^2$.
6. Factorise $x^2 + 5x + 6$.
7. Simplify $\dfrac{x^2 + x}{xy + x + y + 1}$.
8. Read the exercises from Chapters 1 and 2 in [Moore-Siegel] and either do them or thoroughly convince yourself they're not worth your time.