

Review and Extension: Constructions, Polynomials, Sequences

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1 Key concepts for this term

- Existence results: Bezout, CRT, Pell equations, Hensel's Lemma, Dirichlet, Bertrand, Fermat Christmas, Schur, Zsigmondy
- Control properties of constructions
- Division algorithm, Euclid and Bezout for polynomials
- Unique factorisation for polynomials with integer coefficients and polynomials mod p
- If a and b are integers, then $a - b \mid p(a) - p(b)$
- Primitive polynomials
- Gauss' Lemma
- Irreducibility and Eisenstein
- Sequences and integer functions

2 What Now?

You now know all of the number theory that you need to solve problems at the high school olympiad level. What remains now is to familiarise yourself with this toolkit and how each of the tools within it can be applied in different situations. For this, there is no substitute for practice.

Apart from the problems on these handouts, the best place to go for practice problems is AoPS, especially the pages for international contests (<https://artofproblemsolving.com/community/c14>) and TSTs (<https://artofproblemsolving.com/community/c59>). However, note that solutions on AoPS are user-contributed and often incorrect.

3 Homework

Solve and submit any three problems from the Problems sections of this term's handouts that weren't covered in class.

Also complete the feedback form: <https://forms.gle/fR78jMzBeHKWy7nM7>