MATH1061 / MATH7861 Revision

Revision Chapter 1

- logical connectives $\sim$, $\vee$, $\wedge$, $\rightarrow$, $\leftrightarrow$;
- tautology, contradiction, logically equivalent statements;
- valid and invalid arguments;
- digital logic circuits.

Revision Chapter 2

- quantifiers $\forall$, $\exists$;
- contrapositive of an if – then statement;
- negation of quantified statements.

Revision Chapter 3

- methods of proof:
  - direct proof,
  - proof by contradiction,
  - proof by contraposition,
  - disproof by counterexample;
- mathematical definitions of:
  - even, odd, prime, coprime,
  - rational, irrational,
  - d divides n, d mod n,
  - floor, ceiling, gcd;
- Euclidean algorithm and solving linear diophantine equations.

Revision Chapter 4

- sum and product notation: $\sum_{i=1}^{n} \ldots$, $\prod_{i=1}^{n} \ldots$
- proof by mathematical induction.

Revision Chapter 5

- set notation, for example $\{x \in \mathbb{Z} \mid x \geq 3\}$;
- notation used to describe sets:
  - $a \in A$, $A \subseteq B$, $A \subset B$,
  - $A \cup B$, $A \cap B$, $A - B$, A^c,
  - $A \times B$, $\mathcal{P}(A)$, $\emptyset$.

Revision Chapter 11

- definitions of:
  graph, vertex, edge, parallel edges, loop, simple graph, bipartite graph,
  subgraph, degree of a vertex, total degree,
  walk, (simple) path, (simple) circuit, Euler circuit, Euler path,
  connected graph, tree, forest;
- matrix representation of a graph;
- a tree with n vertices has $n - 1$ edges.

Revision Chapter 10

- binary relations defined by
  a set of ordered pairs,
  a directed graph,
  a general description of the relationship;
- inverse relation;
- properties of relations:
  reflexive, symmetric, antisymmetric, transitive;
- types of relations:
  equivalence relation, partial order relation, total order relation.

Revision Chapter 7

- definitions of: function, domain, co-domain, range;
- properties of functions:
  one-to-one, onto, one-to-one correspondence;
- inverse function, composite function;
- pigeonhole principle;
- finite-state automata.

Revision Chapter G

- definition of a group:
  closed, associative, identity, inverse;
- abelian groups;
- subgroups, cyclic subgroups, generators;
- definition of a field.

Revision Chapter 6

- probability;
- permutations : order matters, $P(n, r) = \dfrac{n!}{(n-r)!}$;
- combinations: order does not matter, $C(n, r) = \binom{n}{r} = \dfrac{n!}{r!\,(n-r)!}$;
- inclusion/exclusion principle for sets;
- Pascal's formula, Binomial Theorem.