Course	Thing	Explanation	Date	Important	Index
CS1231S	Division Theorem	$\forall n \in \mathbb{Z}$ and $d \in \mathbb{Z}^*$, $\exists q, r \in \mathbb{Z}$ such that $n = dq + r$, $0 \leq r < d$	13/09/2021	Important	185
CS1231S	Definition of quotient (A/~)	A/~ = {[x]~: x ∈ A}; Quotients are the underlying set, when partitioned based on an equivalence relation	16/09/2021	Important	194
CS1231S	Definition 7.1.4 (Congruence-mod relation)	$\mathbb{Z}$/~n or $\mathbb{Z}\square$ means integers partitioned based on their congruence-mod n; [x] = {nk + x: k ∈ $\mathbb{Z}$}; Can use [x] + [y] = [x+y] and [x] × [y] = [x × y], when [x], [y] ∈ $\mathbb{Z}\square$ (can check whether well-defined or not)	16/09/2021	Important	196
CS1231S	Total order	All pairs x and y are connected by exactly 1 arrow	16/09/2021	Important	200
CS1231S	Well-ordering principle	Every nonempty finite subset has a smallest element	30/09/2021	Important	214
CS1231S	Theorem 5.3.13 (Inclusion-exclusion)	$|A \cup B| = |A| + |B| - |A \cap B|$	05/10/2021	Important	256
CS1231S	Definition 6.1.5 (Relation)	Relation from A to B is a subset of A × B	05/10/2021	Important	258
CS1231S	Definition 7.4.8 (Linearization)	Let A be a set and ≤ be a partial order on A; A linearization of ≤ is a total order ≤* on A such that $\forall x, y \in A(x \leq y \Rightarrow x \leq^* y)$	06/10/2021	Important	272
CS1231S	Definition 7.3.1 (Antisymmetry)	$xRy \land yRx \Rightarrow x = y$	07/10/2021	Important	273
CS1231S	Definition 7.3.1 (Partial Order)	R is reflexive, antisymmetric, transitive	07/10/2021	Important	274
CS1231S	Definition 7.3.1 (Total Order)	$xRy \lor yRx \ \forall x,y$	07/10/2021	Important	275
CS1231S	Set of all strings (A*)	If A = {s,u}, then A* is all the strings possible	13/10/2021	Important	336
CS1231S	Definition 9.2.1 (Composite function)	For $g \circ f$ to be defined, the codomain of f must equal the domain of g	13/10/2021	Important	338
CS1231S	Definition 9.3.14 (Invertible)	Let $f : A \to B$. Then $g : B \to A$ is an inverse of f if $\forall x \in A \ \forall y \in B \ y = f(x) \Leftrightarrow x = g(y)$	13/10/2021	Important	340
CS1231S	Definition 9.3.6 (Surjective)	$\forall y \in B \ \exists x \in A \ (y = f(x))$ Nobody in B is alone	13/10/2021	Important	341
CS1231S	Definition 9.3.6 (Injective)	$\forall x_1, x_2 \in A \ (f(x_1) = f(x_2) \Rightarrow x_1 = x_2)$ Nobody in B is F-boy	13/10/2021	Important	342
CS1231S	Definition 9.3.6 (Bijective)	$\forall y \in B \ \exists! x \in A \ (y = f(x))$ Everyone in B has one partner	13/10/2021	Important	343
CS1231S	Definition 9.1.6 (Function equality)	$f = g$ iff domains and codomains are the same and $f(x) = g(x)$	13/10/2021	Important	344
CS1231S	Theorem 10.1.2 (Dual Pigeonhole Principle)	If $f : A \to B$ is surjective, then $|A| \geq |B|$	14/10/2021	Important	350
CS1231S	Note 10.3.4 (Countably infinite)	Infinite set B is countable iff there is a sequence $b_0, b_1, b_2, ... \in$ B where every element of B appears exactly once	14/10/2021	Important	354
CS1231S	Theorem 10.4.3 (Uncountable ℘)	A countable infinite $\Rightarrow$ ℘(A) uncountable (use the $\mathbb{R}$ proof of uncountability)	15/10/2021	Important	369
CS1231S	Choose formulas	Ordered choose with repetition: n^k Ordered choose wout repetition: P(n, k) Unordered choose w repetition: C(k + n - 1, k) Unordered choose wout repetition C(n, k)	22/10/2021	Important	429
CS1231S	Adjacency matrix	Matrix that contains all the connections between vertices; Can be squared to find all connections of degree 2 (path length 2)	29/10/2021	Important	446
CS1231S	Uniqueness of complement	$X_1, X_2 \subseteq A \land Y_1, Y_2 \subseteq (U \setminus A) \Rightarrow X_1 \cup Y_1 = X_2 \cup Y_2 \to (X_1, Y_1) = (X_2, Y_2)$	19/11/2021	Important	506
CS1231S	Theorem 10.6.1 (Full Binary Tree)	If T is a full binary tree with k internal vertices, then T has a total of 2k + 1 vertices	19/11/2021	Important	509
CS1231S	Theorem 10.6.2 (Terminal Vertices of Binary Tree)	Maximum number of terminal vertices of a binary tree of height h is 2 ^ h	19/11/2021	Important	510
CS1231S	Depth-first traversal	Pre-order > Root, Left, Right In-order > Left, Root, Right Post-order > Left, Right, Root	19/11/2021	Simportant	511
CS1231S	Prove partition	Show every x ∈ A is in at least one S ∈ 𝒞 > Let S ∈ 𝒞 > Prove x ∈ S > x ∈ S ∈ 𝒞 Show every x ∈ A is in at most one S ∈ 𝒞 > Let x ∈ S₁ and x ∈ S₂ > Prove S₁ ⊆ S₂ > Prove S₂ ⊆ S₁ > S₁ = S₂	19/11/2021	Important	513
CS1231S	Prove same cardinality (Cantor's definition of same-cardinality)	Prove |A| = |B| > Let $f: A \to B$ > Prove f is well-defined & bijective	19/11/2021	Simportant	514
CS1231S	Prove there exists function	Prove $\exists f$ > Define $f: A \to B$ > Prove f is well-defined > Prove that it satisfies all criteria	19/11/2021	Important	515
CS1231S	Multiplicative inverse modulo	$ab \equiv 1 \bmod n \Leftrightarrow$ a and b are multiplicative inverse modulo	19/11/2021	Important	516
CS1231S	Kruskal Algorithm	Minimum spanning tree > Choose the lightest edge from current point > If edge doesn't end up in circuit, add the edge	21/11/2021	Important	517
CS1231S	Prim Algorithm	Minimum spanning tree > Choose the lightest edge from any point in the current tree	21/11/2021	Important	518