Sample Pacing Guide

Week	Topics	IOLA Tasks
1	Linear Combinations & Span (define: vector equation, system of equations, matrix equation, and augmented matrix)	Unit 1, Tasks 1 & 2
2	Linear Dependence & Independence	Unit 1, Tasks 3 & 4
3	Solving Systems of Equations: Gaussian Elimination & RREF	Unit 1a (Systems)
4	Interpreting solutions sets to systems of equations	Unit 1a (Systems)
5	Introduction to Linear Transformations	Unit 2, Tasks 1 & 2
6	Linear Transformations (composition, invertibility)	Unit 2, Tasks 3 & 4
7	One-to-one, onto, determinants	
8	Vectors spaces; subspaces, basis	
9	Null space & column space	
10	Change of Basis, Informal intro to eigenvalues & eigenvectors ($A=PDP^{-1}$)	Unit 3, Tasks 1 & 2
11	Eigenvalues & eigenvectors	Unit 3, Tasks 3 & 4
12	Diagonalization (What kinds of matrices are diagonalizable?)	
13	Dot Product, Orthogonality, Normality	
14	Orthogonal projections; Gram-Schmidt Process	
15	(left open to make time for exams where instructors see fit to work them in)	

IOLA: Semester Overview

Week	***Topics***
1	Linear Combinations, Span, & Linear Independence
2	
3	Systems of Equations
4	
5	Matrices as Linear Transformations
6	
7	One-to-one and onto
8	Determinants
9	Vector space and subspace
10	Change of Basis, Eigentheory, & Diagonalization
11	
12	
13	Dot product, orthogonality, normality
14	Projections, Gram-Schmidt Process
15	

Unit 1: Linear Independence & Span "Magic Carpet Ride"

Students first work on the task:	Afterwards, the instructor formalizes:
1. Can you get to Old Man Gauss?	
	Linear combination of vectors
2. Can Old Man Gauss hide?	
	Definition of span
3. Can you start and end at home? (in R^3)	
	Definition of linear (in)dependence
4. Generate sets of linearly dependent and independent vectors, <u>and</u> two generalizations that can be made	
	Linear dependence theorems

Bridging Sequence: Linear Systems*

Students first work on the task:	Afterwards, the instructor formalizes:
	Instructor uses MCR to motivate a way to solve larger systems efficiently (and teach Gaussian elimination & RREF)
1. Intersection of Planes	
	Geometry of infinite solution sets, parametric vector form of solutions
2. Traffic Flow (optional)	
	Further exploration of free variables
3. Example Generation	
	More interpretation of RREF and relation to geometric interpretation of solutions

***We will dive into this a bit more at the end of this session as time allows**

Unit 2: Matrices as Transformations "Italicizing N"

Students first work on the task:	Afterwards, the instructor formalizes:
	Introduce transformation interpretation of A**x**=**b**
1. Italicizing N	
	Definition of linear transformation, basis; $A[\mathbf{b}_1 \ldots \mathbf{b}_n]=[A\mathbf{b}_1 \ldots A\mathbf{b}_n]$
2. Beyond the N	
	Discuss what happens to entire plane; Explore geometry of transformations
3. Pat & Jamie	
	Definition of composition of transformations; associativity and non-commutativity of matrix mult.
4. Getting Back to N	
	Definition of inverses of transformations & matrices

Unit 3: Change of Basis & Eigentheory "Blue and Black"

Students first work on the task:	Afterwards, the instructor formalizes:
1. The Stretching Task	
	task functions to support students' geometric intuition for $A=PDP^{-1}$ (without introducing that notation yet)
2. Blue and Black Task	
	Change of basis, commutative diagram for $A=PDP^{-1}$
3. Stretch Factors and Stretch Directions	
	Eigenvalue, eigenvector
4. Eigenvalues and Eigenvectors for a 3x3	
	Characteristic polynomial, diagonalizability