- Sign up for gradescope.com accounts
- You need an email address (create one, needs to be functional)
- I don’t recommend giving your real name.
- No any ID #.
- Do homework, write reports: write on assignment your email addresses (gradescope)
- Add Math 441
- Please put solutions to different problems on different pages.
- Fill out "UBC Survey" give UBC ID, gradescope email.

This week: Applications of LP / Integer LP,
Project ideas, probably Friday or Monday form groups
Friday Oct 6 ± or a bit later — first preliminary overview.

Sample project: exam scheduling
- Graph colouring: Graph \( G = (V, E) \), vertices, edges,

\[
\begin{align*}
V & = \{ v_1, v_2, v_3, v_4 \}, \\
E & = \{ \{ v_1, v_2 \}, \{ v_2, v_3 \}, \{ v_3, v_4 \}, \{ v_3, v_5 \} \}
\end{align*}
\]
Graph Colouring: We have k colours, given graph \( G = (V, E) \). Can we assign colours \( 1, \ldots, k \) to \( V \) such that no edge has the same colour?

- Red, green, blue
- Each edge has different coloured endpoints

but

- We can't colour the vertices with 3 colours with each edge of endpoints different colours

Application: Schedule exam for classes into exam periods without conflicts.

Graph: Vertices, \( V \) (set of classes)

E.g. at UBC: \{ Math 100, Math 101, Math 102, CPSC 320, ... \}

Join vertices that share students

Say we have 44 exam periods, say colour each course with its exam period.
Math 100, French 300 exam period 1

they share students, and same colour for endpoints — colour vs exam period

Asking for a "good colouring", meaning no edge has same two colours, exam scheduling

Variant: Instead of no conflicts, allow some number of conflicts, or for each edge/conflict give a "weight"

Any graph colouring, weighted or not — solved with ILP

Say $V = \{v_1, \ldots, v_n\}$, each $i < j$, $1 \leq i < j \leq n$

we have weight $w_{ij} = \begin{cases} 0 & \text{if there's no edge } i - j \\ 1 & \text{otherwise, or some positive weight} \end{cases}$

Say colours $1, \ldots, k$

$x_{im} = \begin{cases} 1 & \text{if vertex } i \text{ is assigned colour } m \\ 0 & \text{otherwise} \end{cases}$

Want $x_{i1} + x_{i2} + \ldots + x_{ik} = 1$