Math 135 Lecture 1

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University of Waterloo

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Say Hello

Meet and greet your neighbour! Possibly topics to discuss: Course schedule, program, favourite sport/game, an odd (or even) hobby, favourite mathematical concept, etc.

About Me

- Website: `cemc.uwaterloo.ca/~cbruni`
- Background
- Office MC 6227
- Email: cbruni@uwaterloo.ca

Office Hours

- Assignments are due Wednesdays;
- Proposal: M, Tu and F?
- Can always email for an appointment or just try to find me. If I'm around and have time I can meet.

Tips for Surviving 1B

- Start early! (Assignments, studying, etc.) Don't fall behind!
- Go to class!
- Eat well, sleep right and exercise. Surviving is harder when you are unhealthy!
- Brace yourself for failure (not in a course necessarily, but expect problems you will have difficulty solving).
- Swimming analogy
- Find help (More on next slide).

Options for Help

- Me! Office hours (preferred) or by appointment.
- Friends! (Discuss cheating and how to avoid it.)
- Piazza, our online forum `www.piazza.com`
- LEARN `https://learn.uwaterloo.ca/d2l/home` (UWaterloo link for resources)
- Math Tutorial Centre `https://uwaterloo.ca/math/current-undergraduates/mathematics-tutorial-centre` (MC 4066 8:30-5:30 starting NEXT Monday)
- My webpage `cemc.uwaterloo.ca/~cbruni`.
- Math 135 Resources Page `http://www.cemc.uwaterloo.ca/~cbruni/Math135Resources.php` (Videos, course notes, etc.).

Assessment and Assignments

- 60% Final Exam 30% Midterm 10% Assignments (11 total assignments best 10 count).
- Assignments will be due on Wednesdays at 8:25am EXCEPT for Assignment 0 is due this Friday at 8:25am and Assignment 10 which is due the last Friday of classes at 8:25am.
- Midterm exam is Monday February 8th from 7:00-8:50pm. It covers everything up to Mathematical Induction.
- Final exam is sometime during the final exam period. Information on this will appear later.
- Check the course syllabus on LEARN for the official information.

Assessment and Assignments

- Crowdmark for all assignments. (A link to A0 has been emailed to you - Check your UWaterloo.ca account)
- Action items: Make sure you log onto your uwaterloo email account and AT LEAST set up mail forwarding. Make sure you have your Crowdmark email for assignment 0.
- Every Wednesday make sure you have your weekly Crowdmark link.
- DO NOT SHARE Crowdmark links. They are unique to the person so using your friend's email will make their submission count for their score and not yours.

Assessment and Assignments

- **You** are responsible for good scans of your documents. Either buy a scanner, use MATHSOC, take pictures using a phone app (More on this in assignment 0) take pictures using your webcam etc. Illegible submissions will not be marked and will not be offered any recourse.
- No late assignments will be accepted. Log on and submit early and often to Crowdmark. "My internet crashed 5 minutes before the assignment was due" and "I do not have my Crowdmark link" are NOT acceptable excuses.

Other Information and Homework

- Read the course syllabus found online on LEARN.
- Explore my webpage and the Math 135 Resources page.
- Clicker Fridays.
- Make sure you do the extra problem sets found on LEARN.

Tips for University

These are some tips on some extra things you should learn throughout your university career.

- Learn a programming language. I strongly recommend the combination of Python and Sage.
- Learn how to LaTeX, that is, how to type math (professionally) into a computer.

Begin Math 135

- Welcome to your first math course!
- What is a proof? The difference between science and mathematics.
- Rough outline: Proof Techniques, Number Theory, Complex Numbers and Polynomials.

(Thanks to Ryan Trelford for the next set of slides!)

Example

A group of six people attend a party. Must there be three of these people that are all friends or all strangers?

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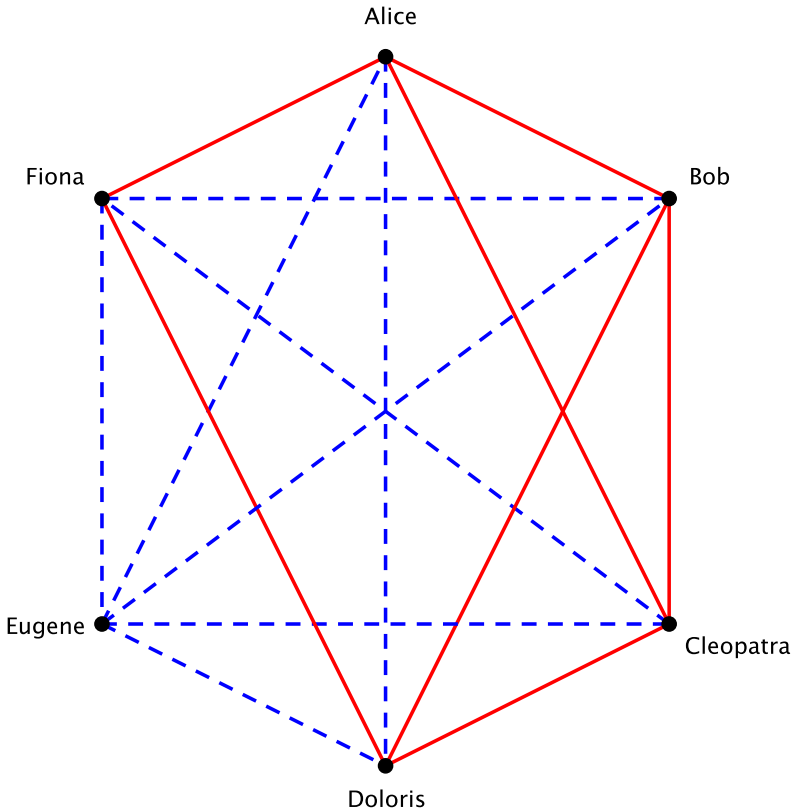

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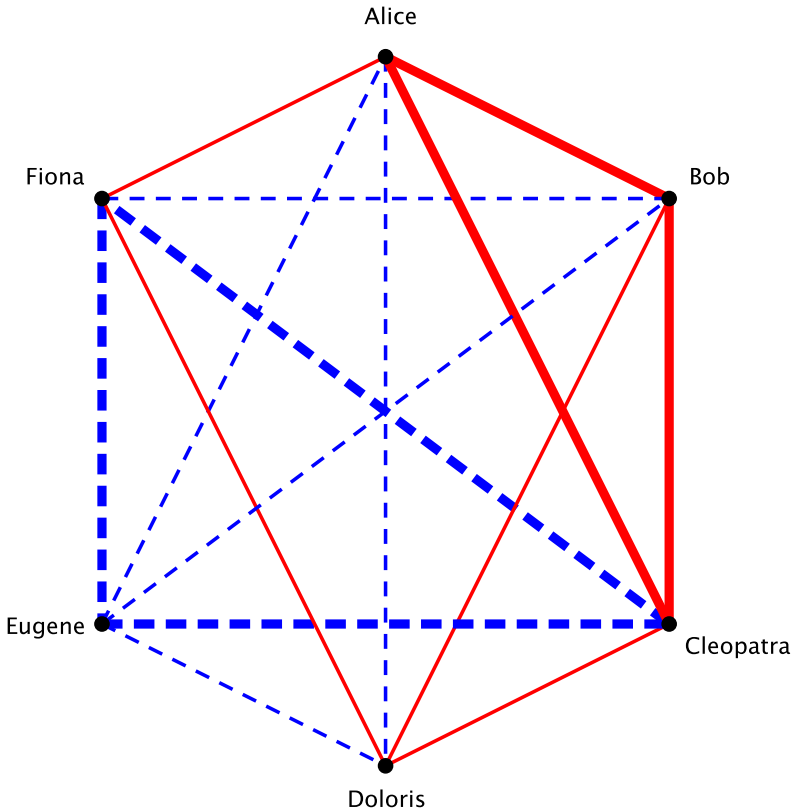

Consider any one of the people. Then they either know (red line) or don't know (dashed blue line) each of the other five people.

# of people they know	# of people they don't know
5	0
4	1
3	2
2	3
1	4
0	5

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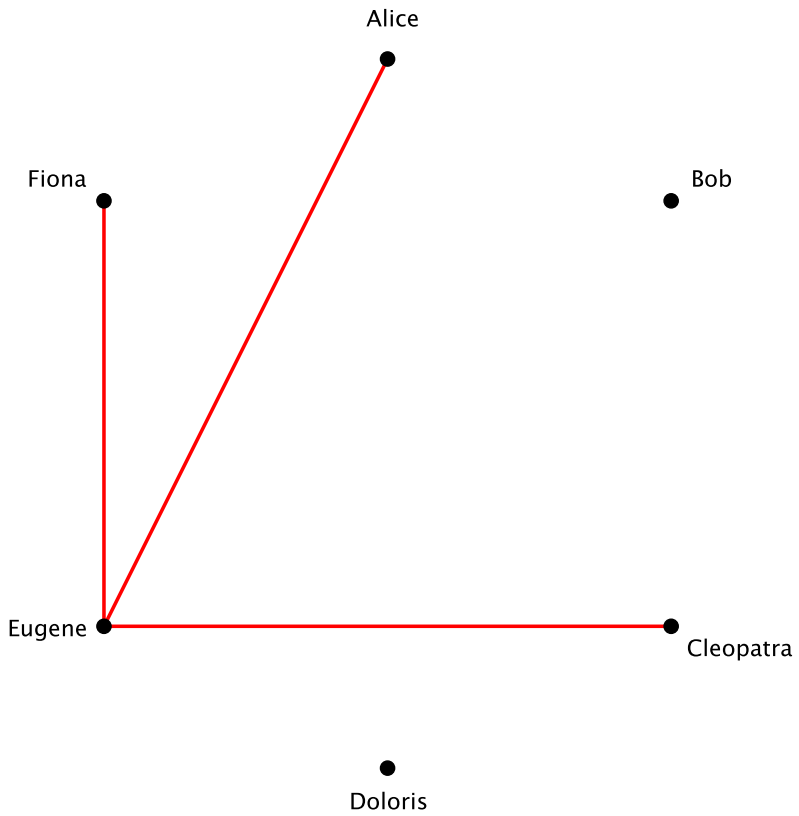
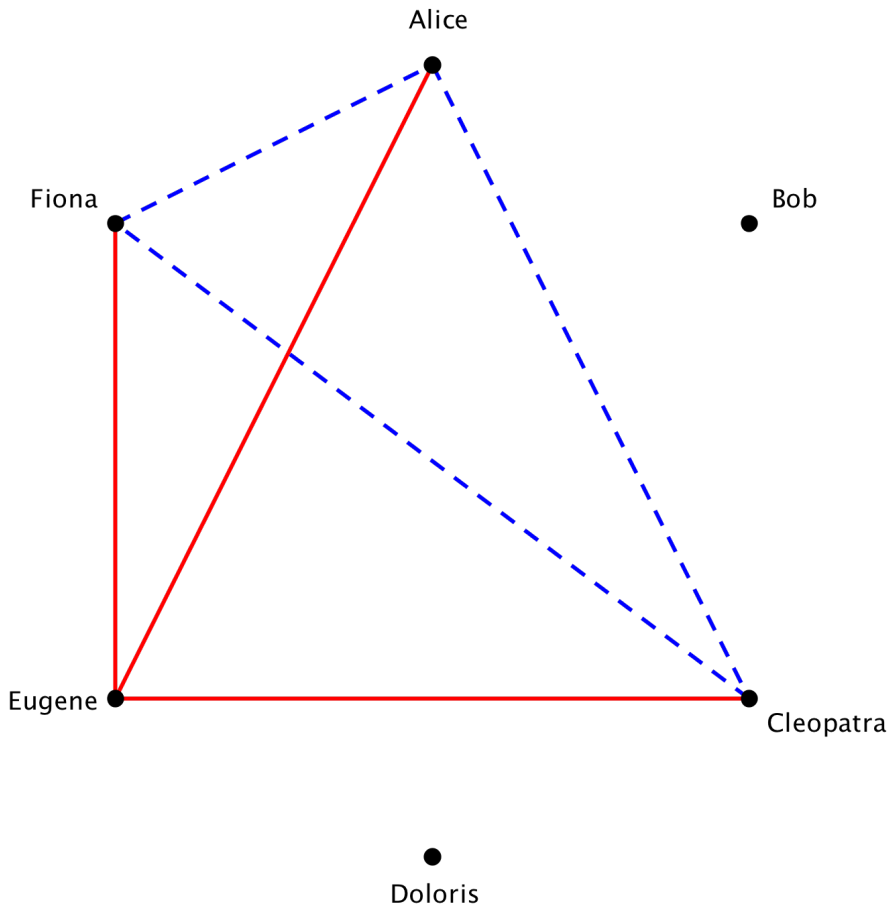
Each person either knows at least three people or doesn't know at least three people.

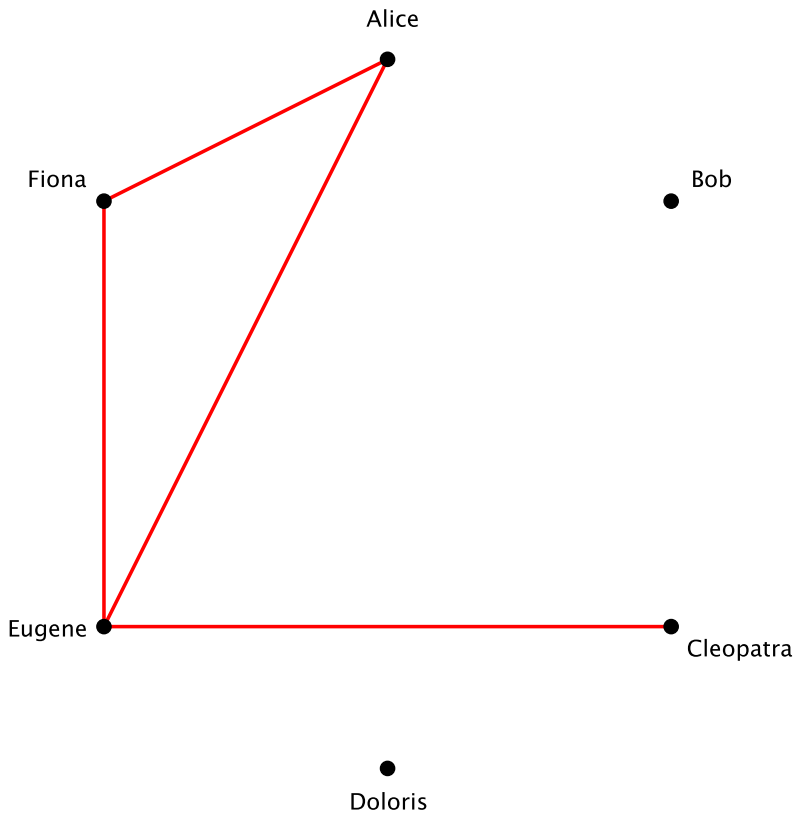
Assume that Eugene knows at least three people (which people don't matter).



If those three people don't know each other, then we are done.



Otherwise, at least two of the people Eugene knows also know each other.



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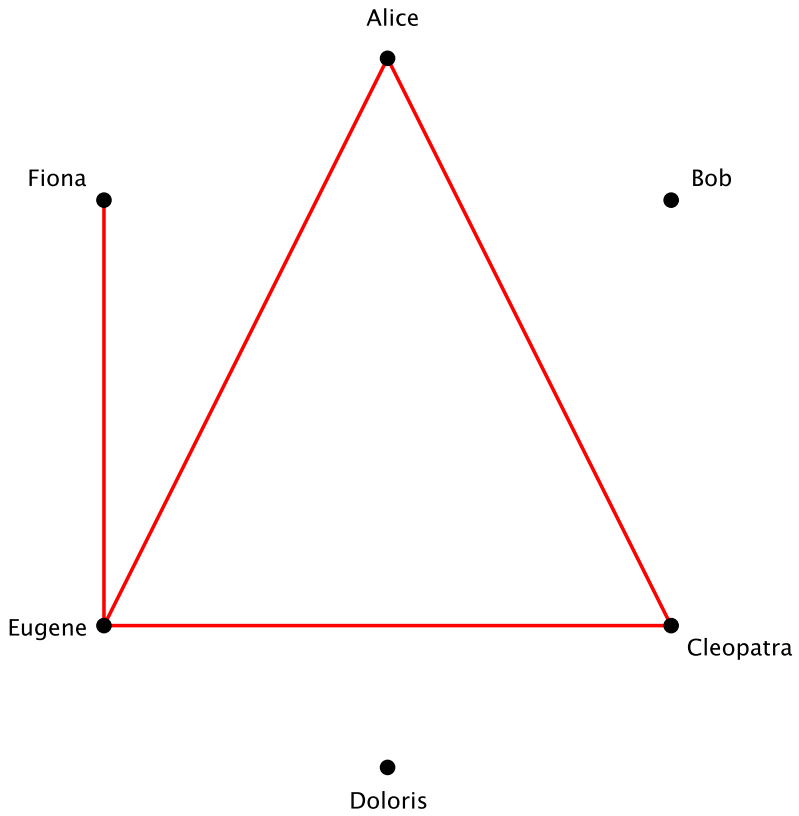

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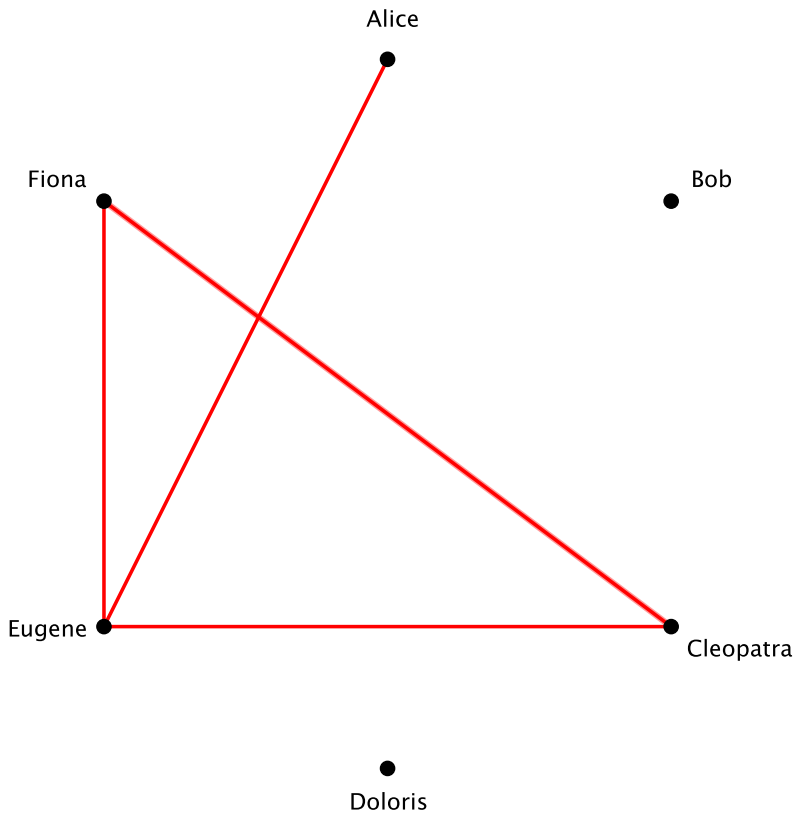

A similar argument is used if Eugene doesn't know at least three people (swap red and blue lines)

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We now write a concise proof:

Proof.

Name one of the six people A. Then A knows at least three people or A doesn't know at least three people. Assume A knows at least three people, say B, C and D. If none of B, C, and D know each other, then we have three people who mutually don't know one another. If any two of B, C and D know each other, then those two people along with A form three people who mutually know one another. A similar argument is used if we assume A doesn't know at least three people. □

Question: Does the statement remain true if we replace "six people" with "n people" where $n \geq 6$?

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Answer: Yes - just pick six people from the n people and apply the previous result!

Question: Does the statement remain true if we replace "six people" with "five people"?

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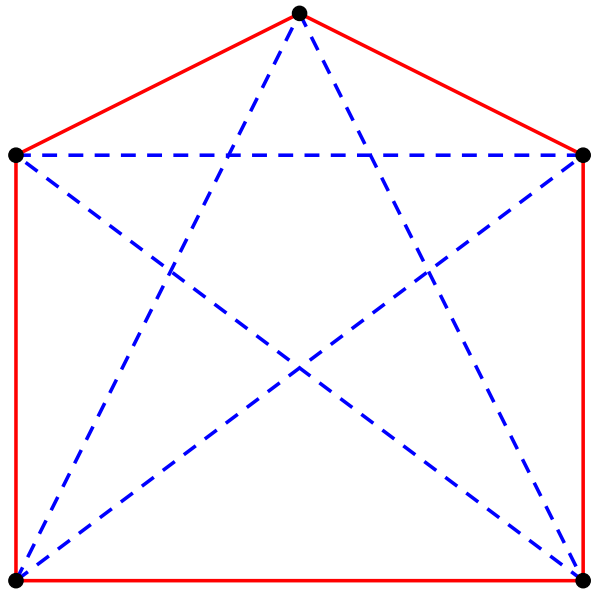
Answer: No



Another Example

Is there a positive integer n such that $n^2 + 1$ is also a square?

Another Short Proof

Since $n^2 < n^2 + 1 < n^2 + 2n + 1 = (n+1)^2$ and there are no positive integer squares between n^2 and $(n+1)^2$, the answer is no.

Notice that some proofs contain all words, some use algebra. A proof should be a convincing argument of a statement. A proof requires at least two people, a creator and an observer.
Throughout this course you should assume that the observer is a *typical Math 135 student* (and not a mathematical professor!)