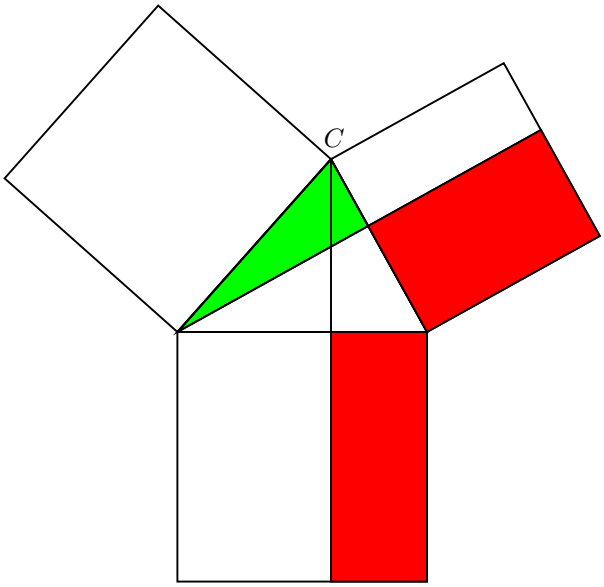
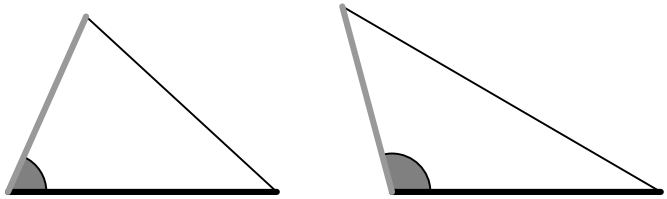
[25] 1. *Do one of these*, using in either case lots of pictures and as little text as possible:

• State and prove the cosine rule, using the following picture.

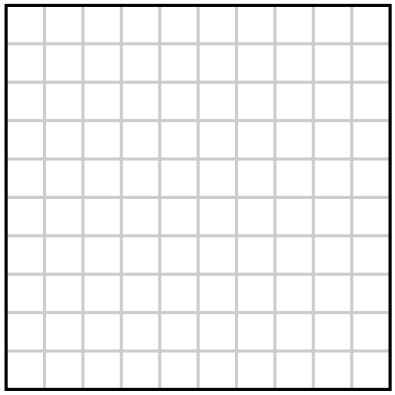


• The following is Proposition I.25 from Euclid: *Suppose we are given two triangles* ABC *and* $A'B'C'$ *with sides* $AB = A'B'$, $AC = A'C'$. *If* $BC > B'C'$ *then* $A > A'$.

Prove this, starting with the following figure. You should follow Menelaus' proof (reproduced on an extra sheet) as closely as possible. Be careful about the part of Menelaus' proof I have emphasized.



[10] 2. Write a PostScript program which will draw the following figure:



[15] 3. Sketch the figure produced by this program

```
72 dup scale
0.01 setlinewidth
2 2 translate

/N 5 def
/dT 360 N div def
/T dT 0.5 mul def

N {
  newpath
  0 0 moveto
  T cos 0 lineto
  T cos T sin lineto
  closepath

  gsave
  1 0 0 setrgbcolor
  fill
  grestore
  stroke

  1 -1 scale
  newpath
  0 0 moveto
  T cos 0 lineto
  T cos T sin lineto
  closepath
  stroke
  1 -1 scale
  dT rotate
} repeat
```

Please check your work.

The University of British Columbia
Midterm Examination
November 9, 1998

Mathematics 308
Section 101
Instructor: Dr. Casselman

Duration: 50 minutes

- Be sure that you have 7 pages in addition to this one.
- Put your name below and on the **back** of the other pages.
- In all questions, **you must show work** — i.e. display intermediate results — to get full credit.
- Be neat! I will not attempt to decipher messy writing.
- *All work you wish to be graded must be placed on these sheets. Work books should be used for scrap work only, and must not be handed in. I will simply throw away any other papers I receive.*

First Name _____ **Last Name** _____

Signature _____ **Student Number** _____

Rules governing examinations

- **Each candidate should be prepared to produce upon request his library/AMS card.**
- **No candidate shall be permitted to enter the examination room after the expiration of one half hour, or to leave during the first half hour of the examination.**
- **Candidates are not permitted to ask questions of the invigilators, except in cases of supposed errors or ambiguities in examination questions.**
- **CAUTION - Candidates guilty of any of the following or similar practices shall be immediately dismissed from the examination and shall be liable to disciplinary action.**
  - **(a) Making use of any books, papers, or memoranda, other than those authorized by the examiners.**
  - **(b) Speaking or communicating with other candidates.**
  - **(c) Purposely exposing written papers to the view of other candidates.**
- **Smoking is not permitted during examinations.**

1.	2.	3.	Total
25	10	15	50