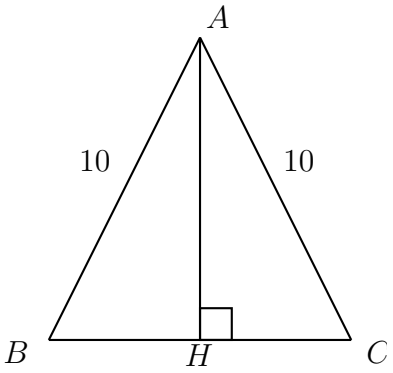
Homework #4

In the figure below, ABC is an isosceles triangle with both lengths AB and AC equal to 10 cm. The length BC is variable, let's denote it x, in cm. The point H is the foot of the altitude passing through A.
The aim of this homework is to find the length of BC that maximizes the area of the triangle ABC.



Part A – Using Geogebra

1. Use Geogebra to draw the figure. Keep in mind that the triangle must be isosceles with two sides equal to 10cm. Find out how to display the area of the triangle on the picture. When you're done, send your file by internet to your teacher.
2. Change the length of BC. Conjecture the maximal value of the area of ABC.

Part B – Using a function

1. Compute the area of the triangle when $x = 5$.
2. Is it possible to have $x = 30$? What is the maximal value for x ?
3. What is the minimal value for x ? Explain quickly your answer.
4. Write the length of the altitude AH as a function of x.
5. Let f be the function that maps any adequate value of x to the corresponding area of ABC. Prove that $f(x) = \frac{x}{4}\sqrt{400 - x^2}$.
6. Draw the graph of f.
7. Let α be the value for which f is maximal.
   (a) Using your calculator, build the table of values for f between 1 and 20, with step 1, and give two consecutive values bounding α.
   (b) Compute a new table of values for f between your previous answers, with step 0.1. Deduce a better interval for α.
   (c) In the same way, give an interval with diameter 0.001 including α.