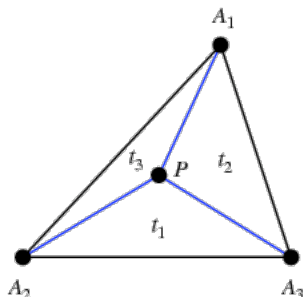


In this lab exercise you will experiment with another interpretation of barycentric coordinates. As illustrated in this diagram from Mathworld, if $P = (t_1, t_2, t_3)^{\triangle A_1 A_2 A_3} = t_1 A_1 + t_2 A_2 + t_3 A_3$, where P is inside the triangle and $t_1 + t_2 + t_3 = 1$, then t_1 represents the area of triangle $PA_2 A_3$ as a percentage of the area of the whole triangle. Similarly, t_2 represents the area of the triangle $PA_1 A_3$ as a percentage of the whole triangle, and t_3 represents the percentage of $PA_1 A_2$.



GEOGEBRA CONSTRUCTION

- (1) Open a new GeoGebra window. Define a triangle with vertices $A = (-1, 1)$, $B = (2, -1)$ and $C = (3, 3)$. If this is the first thing you've done, GeoGebra will also show a dependent object called `poly1` which represents the area of this triangle. Right click on the name (or the interior of the triangle) and rename it `totalArea`.
- (2) Define a point P somewhere inside the triangle (e.g. $(1, 1)$).
- (3) Define the triangle `ta = Polygon[P, B, C]`; you can either enter this command in the Input Field below, or choose the Polygon tool and click on those points. (You can then rename the Polygon to `ta` in that case.) Define triangles `tb` and `tc` as appropriate. You should now see the triangle ABC split into three smaller triangles which meet at P , similar to the picture above.
- (4) You are now ready to define the barycentric coordinates of your point P . In the input field below, enter

$$r = ta / totalArea$$

followed by appropriate definitions for s and t .

- (5) To check your coordinates, defined a point Q by typing `Q = r*A + s*B + t*C` in the input field. The new point Q should be superimposed on the point P if you've done everything correctly.
- (6) Test your construction by moving the points A , B , C , and P . What happens when you move P outside of the triangle? Looking at the values of r , s and t , and using your knowledge of the "quadrants" of the barycentric plane, why is it not surprising that Q is in the wrong place?

To receive credit for this assignment, save your file as `lastname-5335-lab3.ggb` and email it to me as an attachment by 11:59pm on Monday, 11/15/10. Before you send it to me, you should spend a bit of time right-clicking on unnecessary labels and hiding them, etc., to make everything look nice!