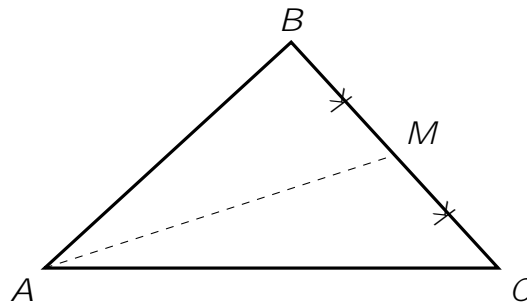


MATHEMATICS ENRICHMENT CLUB.
Problem Sheet 9, July 2, 2018

1. The angles in a triangle are in the ratio 2 : 3 : 4. Find, in degrees, the size of the largest angle.
2. How many digits does the number 125^{100} have?
3. Let ABC be a triangle with AM one of its medians.



Prove that AM is smaller than the semi-perimeter of $\triangle ABC$. That is, show that $AM < \frac{1}{2}(AB + BC + AC)$ ¹.

4. Let

$$= \frac{1}{1 + \frac{1}{1 + \frac{1}{\ddots}}};$$

Evaluate .

5. (a) Find the greatest common divisor of $2^{50} + 1$ and $2^{20} + 1$.
- (b) Explain why the greatest common divisor of $2^m + 1$ and $2^n + 1$ is at least three if m and n are both odd.

¹This question is adapted from A. P. Kiselev, *Geometry: Planimetry*, tr. A Givental, 2006

Senior Questions

1. **The Miquel Point.** Let ABC be a triangle. Let D , E and F be points on the sides of the triangle. Show that circles through ADE , BDF and CEF intersect at a common point G as shown. ²

