Question # 81989. The vertices of a triangle are situated at points (15, 30), (25, 35) and (5, 45). Find the coordinates of the vertices if the triangle is first rotated 100 counter clockwise direction about the origin and then scaled to twice its size.

Solution. Calculations are presented in MathCAD file "**Question # 81989**".

It' s considered that triangle is rotated clockwise. It means that auxiliary axes will be rotated anticlockwise. It's not clear to what the word "counter" in task formulation is applied. May be this word must be "contrary". In case if it's "contrary", change the sign for variable **angleDegrees** in applied MathCAD file. "Origin" is assumed as the beginning of the coordinate system (CS).

So the triangle will be first rotated clockwise for 100º relatively beginning of the CS and after enlarged into two times relatively beginning of the CS.

The CS *xy* have to be rotated for angle +100º (if the triangle is going to be rotated clockwise). We shall have the points positions in the CS *Xrot*, *Yrot* (see MathCAD file).

To scale the triangle we shall use formulae of vector algebra for division of the segment in given ratio

$$\left.\begin{aligned} Xrot_i &= \frac{x_0 + \lambda \cdot Xscaled_i}{1+\lambda} \Rightarrow Xscaled_i = \frac{(1+\lambda)Xrot_i - x_0}{\lambda} \\ Yscaled_i &= \frac{(1+\lambda)Yrot_i - y_0}{\lambda} \\ \lambda &= 1 \end{aligned}\right\} \quad (1)$$

After applying the (4) we shall get next coordinates of the triangle vertices after rotation clockwise (unticlockwise) and enlarging into two times

$$\left.\begin{aligned} &(53.879;\ -39.963) \\ &(60.254;\ -61.396) \\ &(86.896;\ -25.476) \end{aligned}\right\} \quad \left.\begin{aligned} &(-64.298;\ 19.125) \\ &(-77.619;\ 37.085) \\ &(-90.369;\ -5.78) \end{aligned}\right\} \quad (2)$$

if clockwise — if unticlockwise

Drawing made in AutoCAD confirm the (2).

Answer: see (2).