Mathematics 10D

2.6 – Exploring Properties: Circumcentre

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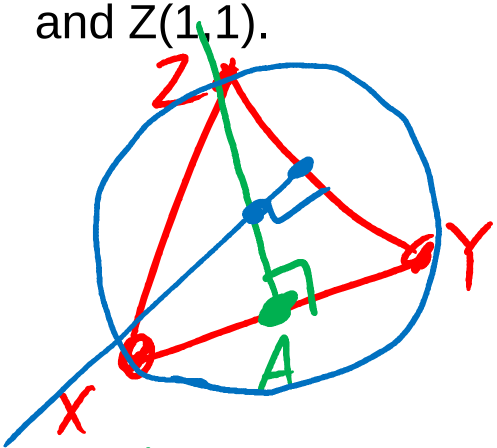
Circumcentre: Find the circumcentre of the triangle with vertices at X(4,8), Y(-2,6) and Z(1,1).

The circumcentre is the intersection of the perpendicular bisectors. It is the centre of the circle formed by the corners of the triangle.

Steps to finding the circumcentre:

1. Make a sketch of the triangle.
2. Calculate a midpoint. Label it on your sketch.
3. Calculate the slope of the same line that contains the above midpoint.
4. Perpendicularize the slope from 3 (the negative reciprocal).
5. Find the equation (y=mx+b) of that line (the perpendicular bisector)
6. Repeat steps 2-5 starting with a different midpoint
7. Find the point of intersection using the two equations. That is your circumcentre.

Circumcentre: Find the circumcentre of the triangle with vertices at X(4,8), Y(-2,6) and Z(1,1).



① $M_{XY}\left(\frac{4+-2}{2}, \frac{8+6}{2}\right)$

$M_{XY}(1, 7)$

② $m_{XY} = \frac{6-8}{-2-4} = \frac{-2}{-6} = \frac{1}{3}$

$m_\perp = -3$

③ $y = mx + b$

$7 = -3(1) + b$

$10 = b$

$\therefore y = -3x + 10$

④ $M_{YZ}\left(\frac{-2+1}{2}, \frac{6+1}{2}\right)$

$M_{YZ}\left(-\frac{1}{2}, \frac{7}{2}\right)$

⑤ $m_{YZ} = \frac{6-1}{-2-1} = \frac{5}{-3}$

$m_\perp = \frac{3}{5}$

⑥ $y = mx + b$

$\frac{7}{2} = \frac{3}{5}\left(-\frac{1}{2}\right) + b$

$\frac{7}{2} = \frac{-3}{10} + b$

$\frac{7}{2} + \frac{3}{10} = b$

$\frac{35}{10} + \frac{3}{10} = b$

$\frac{38}{10} = b$

$\frac{19}{5} = b$

$\therefore y = \frac{3}{5}x + \frac{19}{5}$

7) PoI

$$\left(-3x+10=\frac{3}{5}x+\frac{19}{5}\right)5$$

$$-15x+50=3x+19$$

$$-18x=-31$$

$$x=1.72$$

$$y=-3(1.72)+10$$

$$y=4.83$$

$\therefore$ the circumcentre is $(1.72, 4.83)$