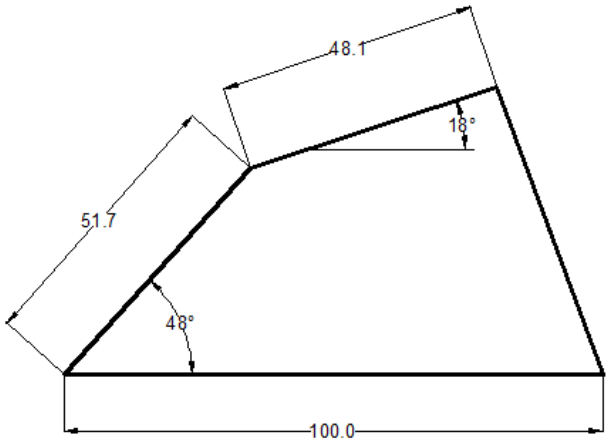
Velocity analysis example: 4-bar mechanism

Example 1: find ω_4 if you know that ω_2 = 1500 rpm CCW

All dimensions are in **mm**



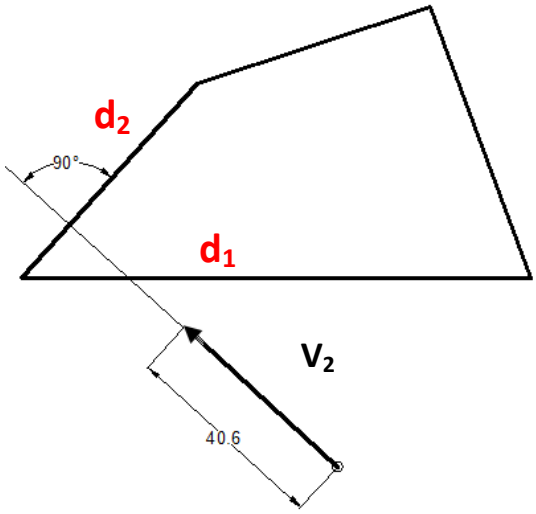
Solution:-

The vector loop equation is:

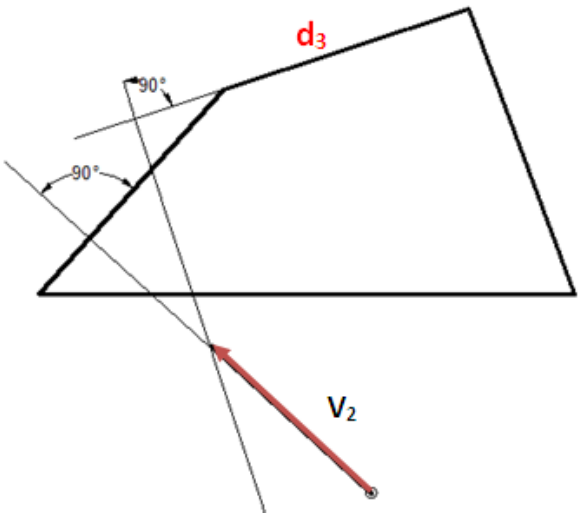
$$V_2+V_3=V_4$$

$$V_2 = \omega_2 d_2 = 1500 * \frac{2\pi}{60} * 51.7 = 8121 \frac{mm}{\sec}$$

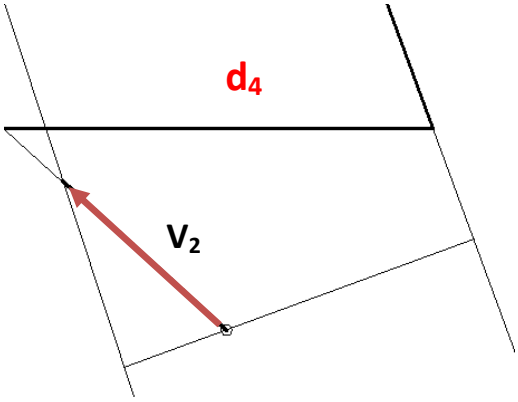
- Assume that each 200 mm/sec = 1mm on the drawing. So, V_2 = 406 mm = 40.6cm on the drawing
- Construct V_2 as sown in figure



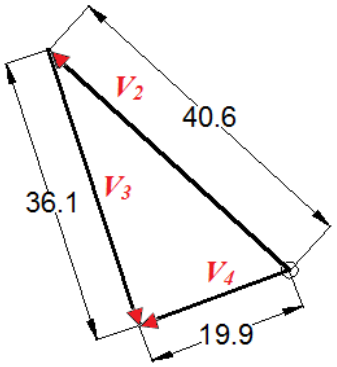
- Now construct the line that represent vector V_3. As you can see, you can take extension line from d_3.



Now, construct V_4:



- Draw the vectors V_3 and V_4 and measure them (in cm) using a ruler



Now V_4 = 19.9 cm which means

$$V_4 = 19.9cm * 20 = 398\frac{cm}{\sec} = 3980\frac{mm}{\sec}$$

But $V_4 = \omega_4 . d_4$. d4 can be found from the figure as 57 mm. so

$$\omega_4 = \frac{V_4}{d_4} = \frac{3980mm/\sec}{57mm} = 69.8rad/\sec = 666RPM$$