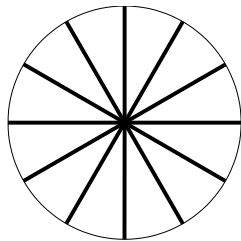


PROBLEM:

In old TV movies, all of us have seen the phenomenon where a spoked wagon wheel appears to move backwards. This is due to the 30 frames/sec sampling rate used in transmitting TV images. In the figure to the right, a twelve-spoked wheel is shown. Assume that the wheel is rotating *clockwise at a constant speed*. However, when seen on TV the spoke pattern of the wheel appears to to make a full 360° counter-clockwise revolution once every 60 frames (i.e., 2 seconds). Determine the rotation rate(s) that could have caused this illusion.



- Write a rotating phasor formula for the observed movement of an individual spoke. This should be a discrete-time signal formula that depends on n (the frame index).
- Derive a general equation that will give all possible rotation rates (in revs/sec).
- Evaluate your formula to find the slowest rotation rate that produces the observation.