CHAIN AND SPROCKET INFORMATION

Chain and sprocket systems (industrially, we use various sizes of roller chain, also on bicycles) are based on fixed pitches of the links, and there will be part variation (tolerance) allowed on all dimensions of every part, so it's not unlikely that in a VEX system, there will be differences.   The VEX chain systems were mathematically worked out so that two identical sized sprockets on a 1/2" VEX pitch can be connected with a chain and operate with only a little slack.   In many cases, VEX sprockets have 2 positions (90° from each other): if you are trying to balance a 2-chain system, this may be important to consider. If you need chain to be tight, a method of tensioning must be used.   The various methods of tensioning roller chain systems include making one of the sprockets adjustable (consider a 1-speed bicycle, loosen the rear axle, pull the wheel, and tighten it up), or adding a tensioning device, either fixed, adjustable, or spring loaded.   Here are some industrial examples, many of which might be adapted to a VEX system:

This is a popular commercial solution: sliding plastic blocks that can be tightened over the chain to pull it in.	
Another version, where sliding plastic pushes out to tension the chain. Our VEX-U team 3D printed a similar solution for their drive base.	
This is one of my personal favorites, because it looks neat and students can't believe it works, but "float" a larger sprocket in the middle of the chain run. There is a fair variety of sprockets in VEX, and the position of the floating sprocket can be adjusted to take up more or less slack.	
Other systems usually depend on a spring-loaded tensioner, which could be made from VEX parts: A multi-speed bicycle derailleur (shifter) uses this type of tensioner. In these cases, the tensioner should be located on the slack-side of the chain, so that the heaviest loads are transmitted directly from drive sprocket to driven sprocket.	

EDR High strength chain claims to have a strength of 50 pounds, so a good working limit would be 25 pounds, and also consider that sudden start/stops can increase load pretty dramatically.   While various ratios can be created, the question arises on 1:1 ratio: What side sprockets are best?   The answer, the largest diameter that can fit, see the illustration below.
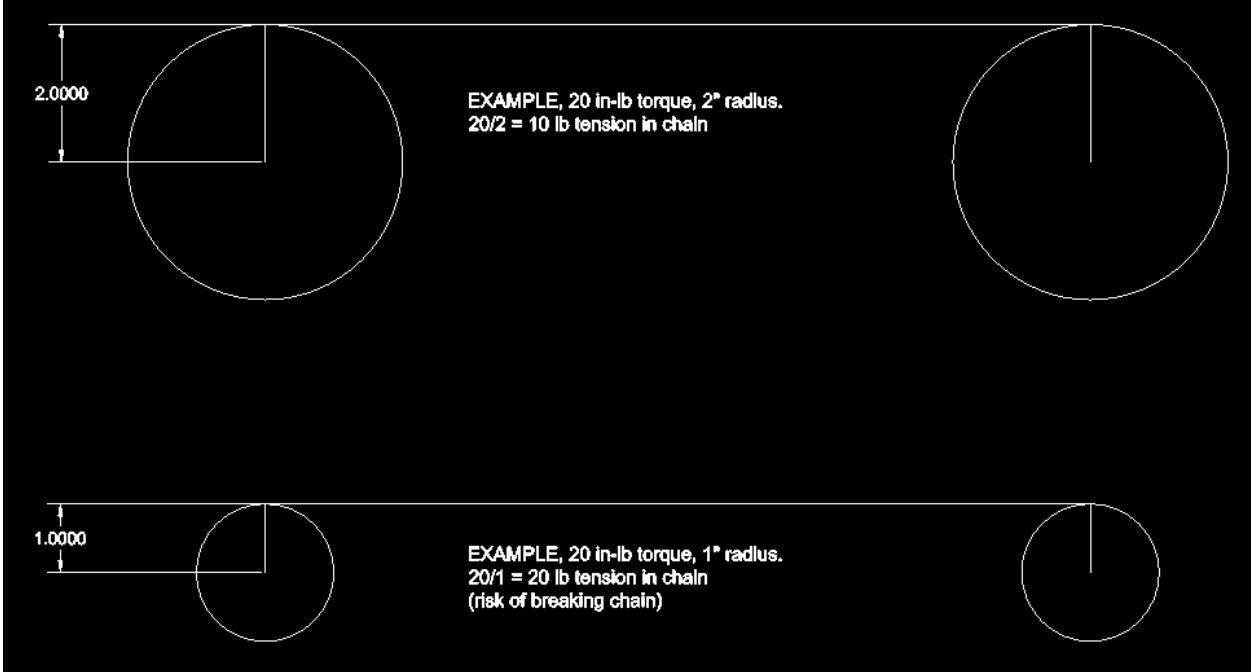
Besides the physics demonstrated in the sketch above, there is a more practical matter, that is, frictional losses as the chain passes around the sprocket.   General engineering design when using roller chain is that the **smallest drive sprocket that should ever be used is 17-teeth**.   While VEX chain is not roller chain, it still behaves the same as industrial roller chain. This means that in industrial practice, the VEX 6-tooth sprocket should only be used as a idler or chain guide, never for driving another sprocket.   The larger the sprocket diameter, the more easily the chain will pass over (and drive) the sprocket teeth.