Gear Trains

Mechanical Engineering

Working out an overall ratio, including the idler that trips everyone.

Count teeth, never diameters, and track direction as you go.

1. **Take each mesh in turn**
   Ratio of a mesh is driven teeth over driving teeth.

2. **Multiply the meshes**
   The overall ratio is the product of the individual stages.

3. **Ignore idlers for ratio**
   An idler changes direction only; its tooth count cancels out.

4. **Track the direction**
   External mesh reverses; internal mesh keeps the same sense.

5. **Convert to torque**
   Torque rises by the ratio; power stays, less the losses.

Epicyclic trains do not follow this at all. Use the tabular method or Willis' equation for those.