



# **Gear Trains Formulas**

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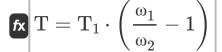




#### **List of 13 Gear Trains Formulas**

#### Gear Trains **G**

1) Braking or Holding Torque on Fixed Member given Input Torque



Open Calculator 🗗

$$-2.833333N*m = 17N*m \cdot \left(\frac{10 \text{rad/s}}{12 \text{rad/s}} - 1\right)$$

2) Holding or Braking or Fixing Torque on Fixed Member

$$\mathbf{T} = \mathrm{T}_1 \cdot \left( rac{\mathrm{N}_1}{\mathrm{N}_2} - 1 
ight)$$

Open Calculator 🗗

- ex  $196.6283\text{N*m} = 17\text{N*m} \cdot \left(\frac{1400\text{rev/min}}{700\text{rev/min}} 1\right)$
- 3) Holding or Braking or Fixing Torque on Fixed Member given Input and Output Torque

$$\mathbf{fx}oxed{\mathrm{T}=-(\mathrm{T}_1+\mathrm{T}_2)}$$

Open Calculator 🗗

$$[-35N*m = -(17N*m + 18N*m)]$$



# 4) Output Torque on Driven Member given Angular Speed of Driven and Driver

 $ag{T}_2 = ext{T}_1 \cdot rac{ ext{N}_1}{ ext{N}_2}$ 

Open Calculator

 $= 213.6283 \text{N*m} = 17 \text{N*m} \cdot \frac{1400 \text{rev/min}}{700 \text{rev/min}}$ 

# 5) Output Torque or Resisting or Load Torque on Driven Member

 $\left|\mathbf{T}_{2}=-\mathbf{T}_{1}\cdotrac{\omega_{1}}{\omega_{2}}
ight|$ 

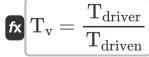
Open Calculator

ex  $-14.166667 \mathrm{N^*m} = -17 \mathrm{N^*m} \cdot \frac{10 \mathrm{rad/s}}{12 \mathrm{rad/s}}$ 6) Speed Ratio of Compound Gear Train

 $\mathbf{f}$   $\mathbf{i} = rac{\mathrm{P}_{\mathrm{driven}}}{\mathrm{P}_{\mathrm{driver}}}$ 

Open Calculator

## 7) Train Value given Number of Teeth



Open Calculator

 $= 1.333333 = \frac{20}{15}$ 





#### 8) Train Value given Speed of Follower and Driver



Open Calculator 🗗

$$extstyle extstyle ext$$

9) Train Value of Compound Gear Train given product of Teeth on Driven and Driver Gear

$$T_{
m v} = rac{P_{
m driver}}{P_{
m driven}}$$

Open Calculator 🗗

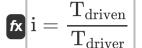
10) Train Value of Compound Gear Train given Speed of Driven and Driver Gear

$$ag{T_{
m v}} = rac{
m N_{
m n}}{
m N_{
m d1}}$$

Open Calculator 🗗



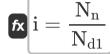
### 11) Velocity Ratio



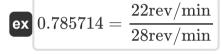
Open Calculator

$$0.75 = rac{15}{20}$$

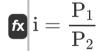
### 12) Velocity Ratio of Compound Belt Drive



Open Calculator



# 13) Velocity Ratio of Compound Belt Drive given Product of Diameter of Driven



Open Calculator 🗗

 $ex 0.666667 = \frac{40}{60}$ 



#### Variables Used

- i Velocity Ratio
- **N**<sub>1</sub> Angular Speed of Driving Member in RPM (*Revolution per Minute*)
- N<sub>2</sub> Angular Speed of Driven Member in RPM (Revolution per Minute)
- N<sub>d</sub> Speed of Driver (Revolution per Minute)
- N<sub>d1</sub> Speed of First Driver (Revolution per Minute)
- **N**<sub>f</sub> Speed of Follower (Revolution per Minute)
- N<sub>n</sub> Speed of Last Driven Pulley (Revolution per Minute)
- P<sub>1</sub> Product of Diameters of Drivers
- P<sub>2</sub> Product of Diameters of Drivens
- Pdriven Product of Number of Teeth on Driven
- P<sub>driver</sub> Product of Number of Teeth on Drivers
- **T** Total Torque (Newton Meter)
- T<sub>1</sub> Input Torque on Driving Member (Newton Meter)
- T<sub>2</sub> Output Torque or Load Torque on Driven Member (Newton Meter)
- T<sub>driven</sub> No. of Teeth on Driven
- T<sub>driver</sub> No. of Teeth on Driver
- T<sub>v</sub> Train Value
- ω<sub>1</sub> Angular Speed of Driving Member (Radian per Second)
- ω<sub>2</sub> Angular Speed of Driven member (Radian per Second)





## Constants, Functions, Measurements used

- Measurement: Frequency in Revolution per Minute (rev/min)
   Frequency Unit Conversion
- Measurement: Angular Velocity in Radian per Second (rad/s), Revolution per Minute (rev/min)
   Angular Velocity Unit Conversion
- Measurement: Torque in Newton Meter (N\*m)
   Torque Unit Conversion





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