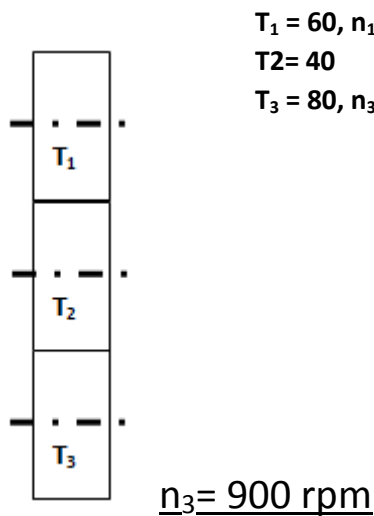


- Simple gear train consists of three gears. The number of teeth on the driving gear is 60 and on the idler is 40 and on the driven gear is 80. Find the velocity ratio. If the driving gear rotates at 1200 rpm, calculate the speed of driven gear.



$$\text{Velocity Ratio} = \frac{n_3}{n_1} = \frac{T_1}{T_3}$$

$$\frac{n_3}{1200} = \frac{60}{80}$$

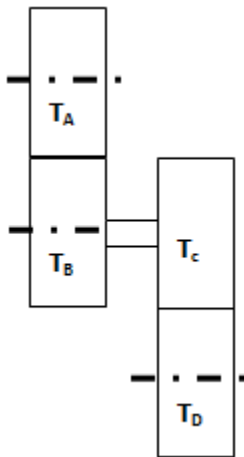
### b) Velocity Ratio

$$\frac{n_3}{n_1} = \frac{900}{1200} = \frac{3}{4} = 3:4$$

- In a compound gear train of wheels, A, B, C and D have 15,30,20,40 teeth respectively. The wheel B and C are keyed to the same shaft. If the wheel A runs at 400 rpm, find the speed of wheel D. Sketch the arrangement if B meshes with A and C meshes with D.

**Ans:-** Assuming gear "A" to rotate in clockwise direction  
 Gear "A" drives Gear "B" and Gear "C" drives Gear "D"

Driving Gear		Driven Gear	
Gear A	Gear C	Gear B	Gear D
$T_A = 15$	$T_C = 20$	$T_B = 30$	$T_D = 40$
$n_A = 400 \text{ rpm}$			



Velocity Ratio for compound gear train=  $\frac{n_D}{n_A} = \frac{T_A \cdot T_C}{T_B \cdot T_D}$

$$\frac{n_D}{400} = \frac{15(20)}{30(40)}$$

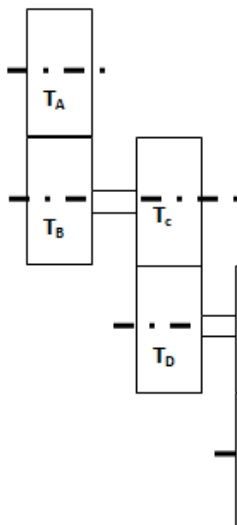
Speed of Wheel "D" =  $n_D = 100$  rpm

3. The shaft from the motor is connected to gear A and rotates at 950 rpm. Gear B and C is compound gear as well as D and E. Gear A meshes with gear B and gear C drives gear D. The gear E meshes with gear F which is fixed on output shaft. Determine speed of gear F. Number of teeth on gear A,B,C,D,E,F are 20,50,25,75,25,65 respectively. Sketch arrangement and find the velocity ratio of the gear train.

Ans. Let Gear "A" rotate in clockwise direction

Driving Gear			Driven Gear		
Gear A	Gear C	Gear E	Gear B	Gear D	Gear F
$T_A = 20$	$T_C = 25$	$T_E = 25$	$T_B = 50$	$T_D = 75$	$T_F = 65$
$n_A = 950$ rpm					$n_F = ?$

Velocity Ratio for compound gear train=  $\frac{n_F}{n_A} = \frac{T_A \cdot T_C \cdot T_E}{T_B \cdot T_D \cdot T_F}$

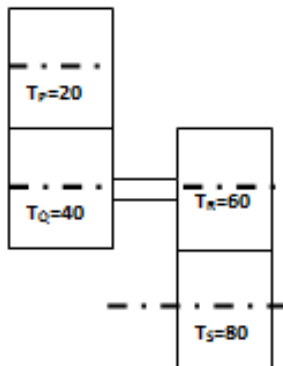


$$\frac{n_F}{950} = \frac{20.(25).(25)}{50.(75).(65)}$$

Speed of Wheel "F" =  $n_F = 48.72$  rpm

4. A compound gear train consists of 4 gears, P, Q, R, S having 20, 40, 60 and 80 teeth respectively. The gear P is keyed to the driving shaft, gear S to driven shaft. Q and R are compound gears. Q meeting with P and R meshes with S. If P rotates with 150 rpm, what is the speed of gear S? Show the gear arrangements.

Driving Gear		Driven Gear	
Gear P	Gear R	Gear Q	Gear S
$T_P = 20$	$T_R = 60$	$T_Q = 40$	$T_S = 80$
$N_P = 150 \text{ rpm}$			



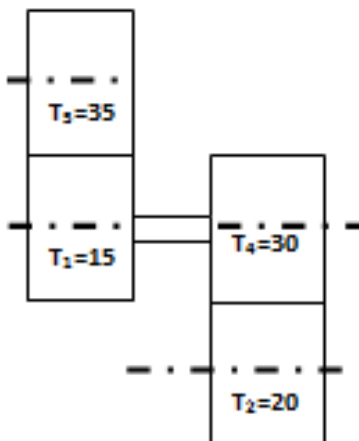
$$\text{Max. Velocity ratio} = \frac{n_S}{n_P} = \frac{T_P \cdot T_R}{T_Q \cdot T_S}$$

$$\frac{n_S}{150} = \frac{20 \cdot 60}{40 \cdot 80}$$

$$N_S = 56.25 \text{ rpm}$$

5. Five gears of 15, 20, 25, 30, 35 are available. Show an arrangement of gears to obtain maximum velocity ratio.

Selected Gear for maximum Velocity ratio =  $T_1=15$ ,  $T_2=20$ ,  $T_4=30$  and  $T_5=35$   
( $T_3=25$  not required)



$$\text{Max. Velocity ratio} = \frac{n_2}{n_5} = \frac{35 \cdot 30}{15 \cdot 20}$$

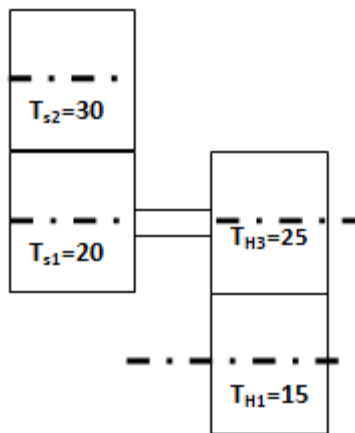
$$\frac{n_2}{n_5} = \frac{T_5 \cdot T_4}{T_1 \cdot T_2}$$

$$\text{Velocity ratio} = 3.5$$

6. Two gears having teeth 20, 30 of spur gear is available along with three gears of helical gear having 15, 20, 25 teeth. Show the gear arrangement to obtain maximum velocity ratio.

Selected gear:- Spur gear-----  $T_{s1}=20$ ,  $T_{s2}=30$

Helical gear---  $T_{H1}=15$ ,  $T_{H3}=25$  ( $T_{H2}=20$  not required)



$$\text{Velocity Ratio} = (30 \times 20) / (25 \times 15) = \underline{2.5}$$

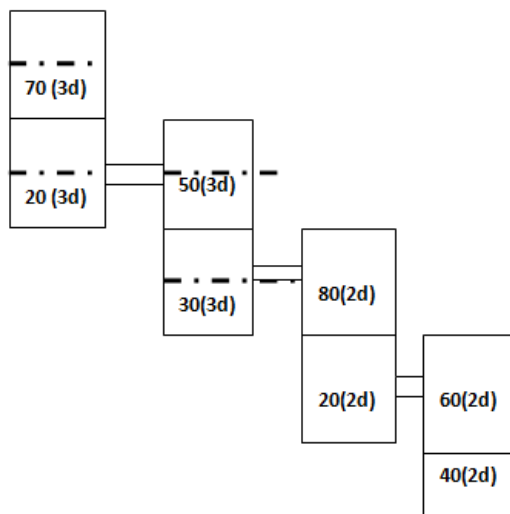
7. There are 5 wheels having 20, 30, 40, 50 and 70 teeth with a diametral pitch of 3 and another set of 4 wheels of diametral pitch of 2 having 20, 40, 60 and 80 teeth. Sketch an arrangement to get **maximum velocity** ratio using maximum number of wheels from the above lot. Also mention the conditions used.

Gears Available 20, 30, **40**, 50 and 70 (Diametral pitch=3)-----

**40 teeth not required to get max velocity ratio**

20, 40, 60 and 80 (Diametral pitch =2)

$$\text{Max. velocity ratio} = \frac{70 \cdot 50 \cdot 80 \cdot 60}{20 \cdot 30 \cdot 20 \cdot 40}$$



$$\underline{\text{Max. velocity ratio} = 35}$$