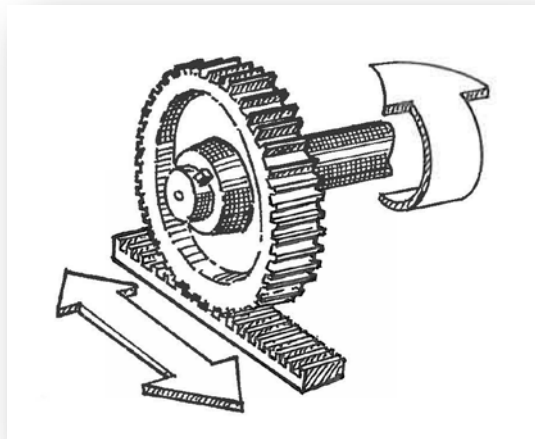


Rack and Pinion

A rack and pinion is used to transform rotary motion into linear motion and vice versa.

The rack and pinion: A rack is a 'flat' gear whose teeth mesh with the teeth of a pinion. If the pinion is rotated about a fixed centre, the rack will move 'sideways' in a straight line. If the Rack is fixed, then when the pinion is rotated it will also move along the rack at the same time.



Velocity ratio (rotary to linear motion)

The ratio between the pinion speed and the linear rack speed for a rack and pinion depends upon three factors.

- The rotary speed of the pinion
- The number of teeth on the pinion
- The number of teeth per centimetre on the rack

A car steering system below uses a rack and pinion

This can be explained by looking at the diagram shown. If the pinion has say 20 teeth then for each complete revolution, 20 pinion teeth will move past this **point** on the diagram. As the rack and pinion are meshed, 20 rack teeth must also move past the point. If the rack has 5 teeth per centimetre then for each rotation of the pinion $20/5 = 4$ cm of rack will move past the point x. If the pinion rotates at say 10rpm, the rack will move in a linear speed of 40cm per minute.

