



Motorcycle Technology

Gearing Ratios

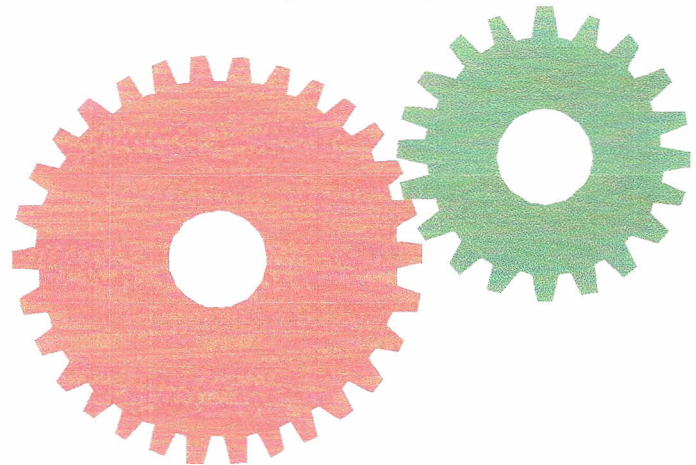
Machines can be used to give us a **Mechanical Advantage**, matching the effort put into a machine to the load. If there is a difference between the size of the effort and the load, there will also be a difference in the distance each moves, this is known as **Velocity Ratio**,

In order to make the most of the power available from the engine, we use mechanisms in the form of gears to change the speed of the Crankshaft's rotation before transmitting it to the back wheel. There are normally **three** stages of change - the **Primary** drive, the **Gearbox** and the **Final** drive. Most of these generally **reduce** the speed of rotation.

Since gearing systems are a type of machine, they will also have a Velocity Ratio, generally referred to as the **Gear Ratio**. Gears are arranged in pairs, and the ratio between any pair of gears can be calculated by the following formula:

$$\text{Gear Ratio} = \frac{\text{No. of teeth on Driven (output) gear}}{\text{No. of teeth on Driving (input) gear}}$$

For example, let's treat the smaller of the two gears shown on the right as the input shaft. This has 20 teeth, whilst the output shaft (larger gear) has 30 teeth. The gear ratio can be worked out as follows:



$$\begin{array}{r} \text{Output} \quad 30 \\ = \\ \text{Input} \quad 20 \end{array} = 1.5 : 1$$

A gear ratio of **greater** than 1:1 indicates that the input is being geared **down**, or made **slower**, whilst a ratio of less than 1:1 (for example, 0.65:1) indicates that the input is being geared **up** or made **faster**.

We can work out **overall** ratios for a whole drive chain by multiplying the individual ratios together.

Primary drive = 12 & 29 teeth Gearbox = 10 & 16 teeth Final drive = 15 & 39 teeth

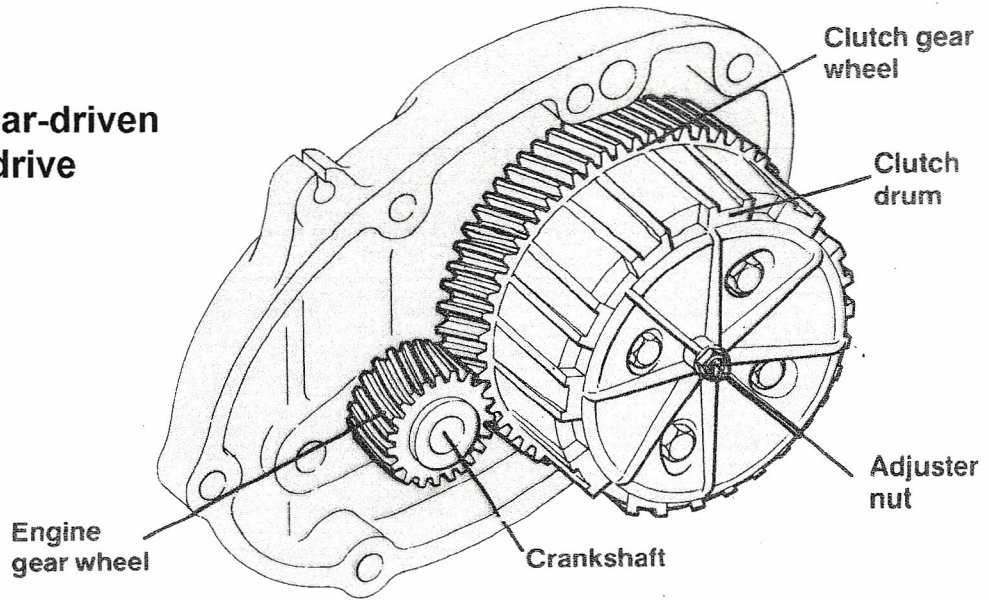
Primary ratio \times Gearbox ratio \times Final ratio = $2.42 \times 1.6 \times 2.6 = 10:1$ (approximately)



C&G 4100 Progression Award – Level 2

Primary drives

Direct gear-driven primary drive



A series of horizontal dotted lines for writing notes.