GEARS & GEAR RATIOS

The GEAR RATIO is the figure obtained from dividing the number of teeth on the pinion into the number of teeth on the spur or crown gear. 7/37 = 5.29:1
Gear ratio is an important part of car set-up as it governs a number of the slot cars parameters in terms of performance namely Acceleration & Braking in addition to ensuring the motor is running at peak efficiency and not overheating.
Generally Lower ratios give Slower acceleration, Higher top speed and Less Brakes – Higher ratios give more acceleration, Less top speed and More Brakes.
Modern slot car motors generally have less mass in the stack of the armature which allows for higher revs, but less torque, so care should be taken to ensure that you do not run a ratio which will cause the motor to overheat because it is not "reving out".

UNDERSTANDING "GEAR PITCH".

OK – So what is Gear Pitch? Put simply, it is the size of the tooth on the gear. The standard accepted method for working this out is known as the pitch diameter and this, simply means by the number of teeth of a consistent form that may be accommodated on a ONE inch gear.
Therefore a 64 pitch gear would have 64 teeth if the gear were 1" in diameter. Similarly an 80 pitch gear would have 80 teeth if that gear were 1" in diameter. It's that simple. So basically, the higher the pitch number, the smaller / finer the form or shape of the gear tooth becomes.

Download Gear ratio chart as a PDF file, click here

AB Slotsport Gear ratio Chart

spur	6t	7t	8t	9t	10t	11t	12t	13t
34	5.67	4.86	4.25	3.78	3.40	3.09	2.83	2.62
35	5.83	5.00	4.37	3.89	3.50	3.18	2.91	2.69
36	6.00	5.14	4.50	4.00	3.60	3.27	3.00	2.77
37	6.17	5.29	4.62	4.11	3.70	3.36	3.08	2.86
38	6.33	5.43	4.75	4.22	3.80	3.45	3.17	2.92
39	6.50	5.57	4.87	4.33	3.90	3.53	3.25	3.00
40	6.67	5.71	5.00	4.44	4.00	3.63	3.33	3.08
41	6.83	5.86	5.12	4.55	4.10	3.72	3.41	3.15
42	7.00	6.00	5.25	4.66	4.20	3.82	3.50	3.23
43	7.16	6.14	5.37	4.77	4.30	3.91	3.58	3.30
44	7.33	6.28	5.50	4.88	4.40	4.00	3.67	3.38
45	7.50	6.43	5.62	5.00	4.50	4.09	3.75	3.46
46	7.66	6.57	5.75	5.11	4.60	4.18	3.83	3.54
47	7.83	6.71	5.87	5.22	4.70	4.27	3.91	3.61

In most types of slotracing gears have been available in 4 standard pitch diameters, namely 48p, 64p, 72p & 80p – 80p being the finest.
Nowadays it is only common to see 48p, 64p & 80p.

So why have different pitch diameters. Well, all sizes have their benefits and indeed, downsides.
48p gears have very large teeth & are strong, but due to their size they do not tend to give the range of ratios required at the diameter required for modern slot racing tyres.
64p gears are probably used more than any other size and give a fair range of ratios for practical sizes of gear (especially now 6t pinions have become available.
80p gears are favoured by many of the top racers as they are a small diameter, considering the number of teeth, therefore small tyre sizes may be used. The downside is that as the teeth of these gears are much finer, they will damage far easier in accidents or general running.

"Mutley" type gears;-
It will be noticed that gears of differing numbers of teeth in any one pitch will vary in size. This has the disadvantage that changing gear ratios easily, without changing the motor angle can be a problem in Sidewinder and anglewinder cars. Thus it was that the 15mm, 64 pitch gear was developed. Known as "Mutley" or 15mm dia, these are available from a number of manufacturers in a number of tooth sizes, usually from 34t – 39t and all 15mm diameter. The advantage of using these gears is that it is possible to change gear ratios without changing the motor angle to accommodate a different diameter gear. However as with everything in engineering one pays a price. To keep the gear at a fixed diameter, the "tooth form" or shape of the gear tooth is fiddled to make it fit into the 15mm diameter. This means that the higher the number of teeth on the gear, the finer the teeth become. Roughly a 36t 64pitch gear is 15mm dia., therfore sizes smaller will have thicker teeth, sizes above thinner teeth. With slotracing as with all sports, reliability is key and it will be found that the higher sizes of these gears (38t & 39t) can have problems in terms of strength or wear due to the fineness of the "fiddled" tooth form.

In general the motor should be geared so the car will rev out a couple of feet before the braking zone on the longest straight of the track. On tight scale circuits it may be preferable to go for a Higher ratio which gives more punch on the shorter straights and improved Braking entering corners. The most important thing is to allow the motor to rev at it's maximum level for at least 30% of the track length so it runs without getting too hot. The easiest way to sport an under-geared car (too low ratio) is that it will run too hot and not generate enough braking effort.

typical gear ratios	
16D	*3.1:1 - 4.2:1*
S16D	3.5:1 - 4.5:1
Contender	3.7:1 - 4.5:1
Hornet	4.5:1 - 5.4:1
G15	3.7:1 - 4.5:1
G12	4.6:1 - 5.8:1
Older Straps	4.6:1 - 5.4:1
Newer Straps	5.0:1 - 6.2:1

Interchanging Gears

As a general rule, most gears from all well known manufacturers will intermesh providing they are of the same Pitch. Spur gears are available in Bronze, Stainless steel and Polymer. The choice is massive and it really is down to personal choice. There are now Angled Pinions on the market in 48p & 64p which improve the quality of mesh considerably on angleewinder cars. As a general rule, if you change the brand of Spur or crown gear you run, you should also change the pinion as even when running Polymer gears, the pinion will adopt a wear pattern to suit the previous gear, which may not identically suit the new spur.