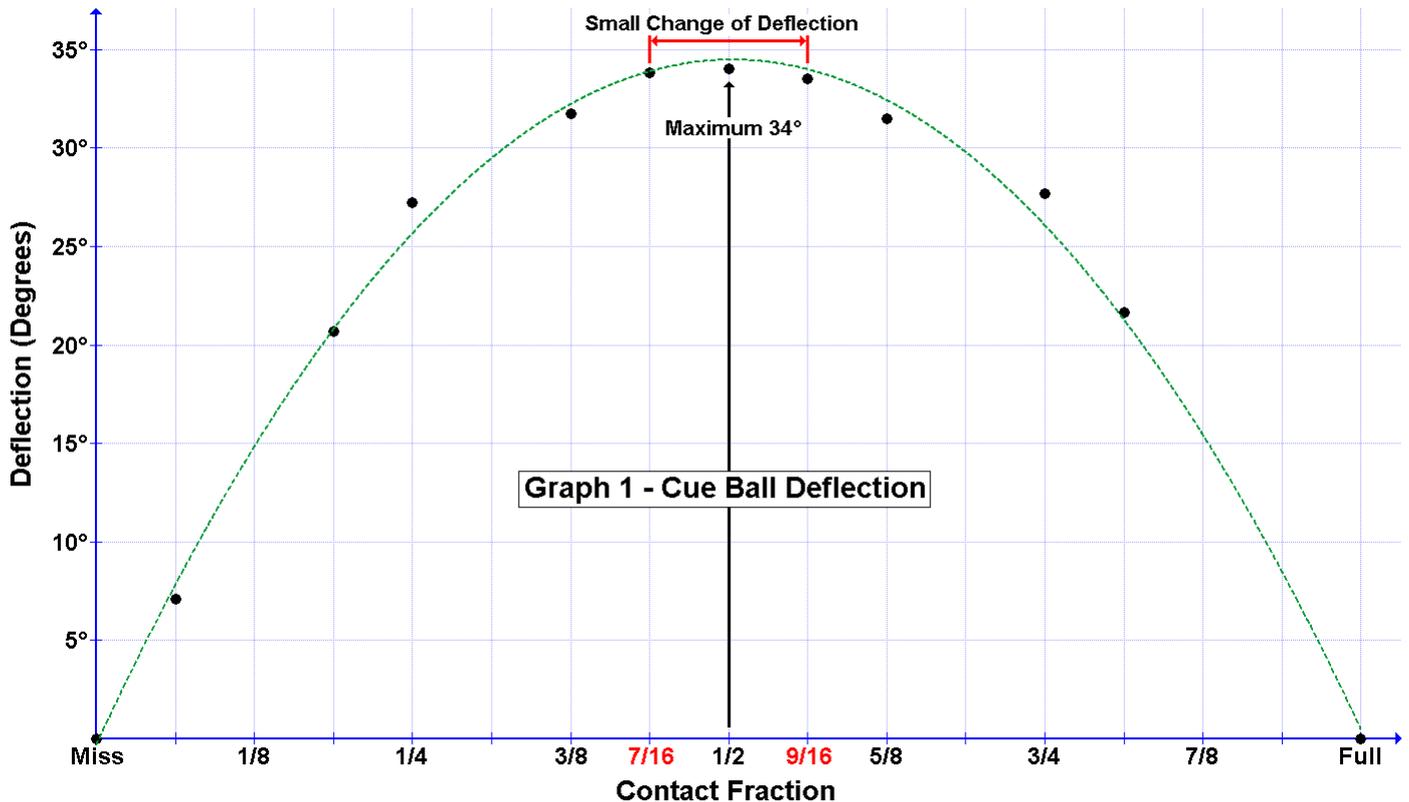# Graphical Representation of Ball to Ball Contacts Assuming Plain Ball Rolling

Graph one: The cue ball

The graph of the cue ball deflection versus contact with the object ball illustrates some important facts which play a large part in break building billiards and snooker.

Small Change of Deflection

35°

Maximum 34°

30°

25°

Deflection (Degrees)

20°

15°

Graph 1 - Cue Ball Deflection

10°

5°

Miss   1/8   1/4   3/8   7/16   1/2   9/16   5/8   3/4   7/8   Full

Contact Fraction

The most important fact is that the half ball (i.e. 8/16th) contact gives maximum deflection (i.e. 34 degrees) and there is very little change of deflection (0.3 degrees) for 7/16th to 9/16th contacts. This means there is a very useful margin of error for half ball in offs.
Put another way, there are three half ball in offs: thin (7/16ths) exact (8/16ths) and thick (9/16ths) resulting in the object ball sent in a range of directions (between 26 to 34 degrees) at a range of speeds.
Using this information you can get the in offs and control the object ball especially for mid pocket in offs and all other in offs close to a pocket. Long losers from the in- hand are not quite so easy.

Graph two: The object ball

The graph of the object ball deflection versus contact with the cue ball is equally informative.

The most obvious fact is that the half ball (i.e. 8/16th) contact results in a 30 degree deflection. However there is a large change in deflection (10 degrees) between 7/16ths and 9/16ths contacts. Also the thinner the contact beyond half ball, the margin for error increases sharply.
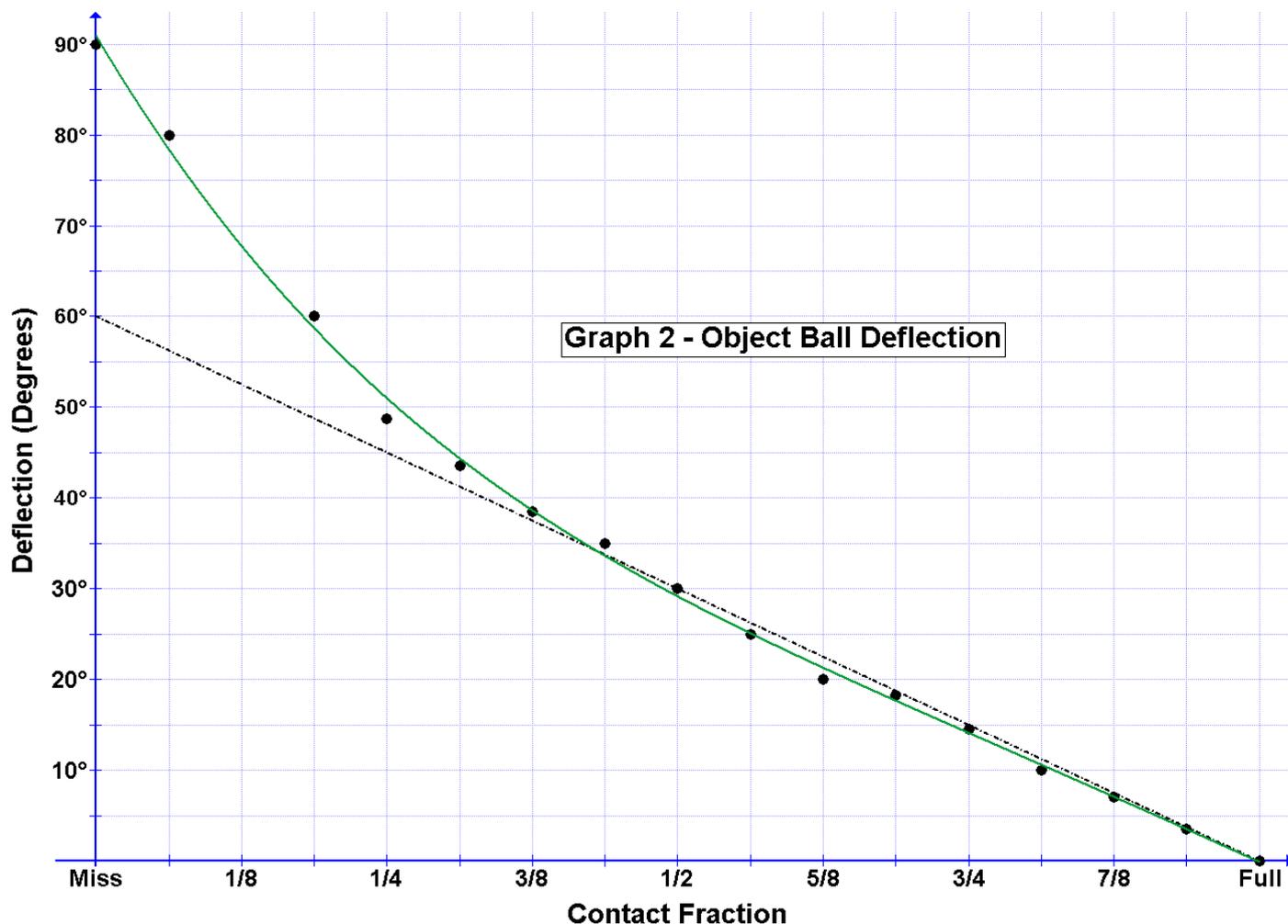
Example	Change	
Full ball	Zero deflection	0
Fifteen sixteenths	3.5 degrees	3.5
Seven eights	7.1 degrees	3.6
Thirteen sixteenths	10.7 degrees	3.6
Three quarter ball	14.5 degrees	3.8
Eleven sixteenths	18.3 degrees	3.8
Five eighths	22.1 degrees	3.8
Nine sixteenths	26.0 degrees	3.9
Half ball	30 degrees	4.0
Seven sixteenths	34.2 degrees	4.2
Three eighths	38.7 degrees	4.5
Five sixteenths	43.6 degrees	4.9
Quarter ball	49 degrees	5.4
Three sixteenths	60 degrees	11
Graze	90 degrees	30
		90

The most important conclusion to draw from all this information is:
The thinner the contact, the less margin for error i.e. the more difficult the pot.
Therefore if you concentrate on achieving ¾ ball pots to increase the margin of error, more effort can be applied to cue ball control.

Of course this is an over simplification of billiards and snooker. For a lot of players their subconscious mind is aware of these facts.

The ultimate in over simplification is to develop the perfect cue delivery and you will not miss a shot.

Reference: Billiards- mathematically treated, 1899 by G.W. Hemming