

## Height Achieved from Various Jumping Techniques

Equation:  $h = v^2 / (2g)$ ;  $v$  = jump velocity,  $g$  = gravity

	Jump Height in:						
	Velocity	Gravity	Torque Units	Grid Tiles	Edge Tiles	Marble Diameters	
Normal Jump	7.5	20	1.41	0.70	2.81		3.52
Bumper	15	20	5.63	2.81	11.25		14.06
Jump + Gyrocopter	7.5	5	5.63	2.81	11.25		14.06
Super Jump	20	20	10.00	5.00	20.00		25.00
Jump + Doubled Gyro	7.5	2.5	11.25	5.63	22.50		28.13
Jump + Super Jump	27.5	20	18.91	9.45	37.81		47.27
Bumper** + Gyrocopter	15	5	22.50	11.25	45.00		56.25
Bumper** + Super Jump	35	20	30.63	15.31	61.25		76.56
Doubled Super Jump	40	20	40.00	20.00	80.00		100.00
Super Jump + Gyro	20	5	40.00	20.00	80.00		100.00
Bumper** + Doubled Gyro	15	2.5	45.00	22.50	90.00		112.50
Jump + Doubled SJ	47.5	20	56.41	28.20	112.81		141.02
Bumper** + Doubled SJ	55	20	75.63	37.81	151.25		189.06
Jump + SJ + Gyro	27.5	5	75.63	37.81	151.25		189.06
SJ + Doubled Gyro	20	2.5	80.00	40.00	160.00		200.00
Bumper** + SJ + Gyro*	35	5	115.00	57.50	230.00		287.50
Doubled SJ + Gyro*	40	5	143.13	71.56	286.25		357.81
Jump + SJ + 2x Gyro*	27.5	2.5	150.16	75.08	300.31		375.39
Jump + 2x SJ + Gyro*	47.5	5	187.66	93.83	375.31		469.14
Bumper** + SJ + 2x Gyro*	35	2.5	227.50	113.75	455.00		568.75
Bumper** + 2x SJ + Gyro*	55	5	235.00	117.50	470.00		587.50
2x SJ + 2x Gyro*	40	2.5	280.63	140.31	561.25		701.56
Jump + 2x SJ + 2x Gyro*	47.5	2.5	362.66	181.33	725.31		906.64
Bumper** + 2x SJ + 2x Gyro*	55	2.5	447.50	223.75	895.00		1118.75

\* The standard formula given above doesn't account for the time it takes for the gyrocopter to wear off. The values given assume it does after the standard time (5 seconds for normal, 10 for doubled).

\*\* Bouncy floor also has the same properties as a bumper.

### Bounce Height Ratios

Equation:  $h_f / h_i = r^2$ ; r = restitution (product of marble and floor)

#### Height Ratio using:

	Normal Bounce	Super Bounce	2x Super Bounce	Shock Absorber
Normal Floor	0.25	0.80	0.90	0.00
Random Force	0.25	0.80	0.90	0.00
MBP Ice	0.23	0.72	0.81	0.00
Tarmac	0.12	0.39	0.44	0.00
MBG Grass, Mud, Space	0.06	0.20	0.23	0.00
Oil/Ice Slick	0.06	0.20	0.23	0.00
Rug, Carpet	0.06	0.20	0.23	0.00
MBP Grass	0.03	0.10	0.11	0.00
Sand	0.00	0.01	0.01	0.00
Bumper, Bouncy Floor	0.00	0.00	0.00	0.00
Water	0.00	0.00	0.00	0.00