

COMPARISON: STEEL VS. LEAD

The chart to the right shows the comparisons between lead and steel shot (grouping "like" loads, with the steel pellets being two shot sizes larger than the lead pellet).

The chart compares velocity three feet from the muzzle, as well as retained per-pellet energy downrange. Note that by using a larger steel shot size, comparable velocity and retained energy at desired yardages are maintained. By carefully studying this chart, you can compare the retained energy for steel and lead shot of the same size (e.g., Steel 2 vs.

Lead 2), and prove to yourself why a larger steel shot size must be used to yield similar retained-energy values.

COMPARATIVE PATTERNING PERFORMANCE* STEEL VS. LEAD

Comparing "like volume" loads, with the steel shot being two shot sizes larger than the lead shot, note that since the steel shot is larger, there are less pellets in each shell. However, since the steel shot is much harder, it stays round, and flies truer to the target. At 40 yards, a higher percentage of steel pellets will be on target (within a 30" circle) than lead loads. At 60 yards, steel shot not only yields higher pattern percentages, but more actual pellets on target as well.

ENERGY COMPARISON: STEEL VS. LEAD

SHOT TYPE/SIZE	3' VELOCITY (F.P.S.)	RETAINED PER-PELLET ENERGY (FOOT POUNDS)			
		30 Yds.	40 Yds.	50 Yds.	60 Yds.
LEAD 7 1/2	1330	1.8	1.3	.9	
STEEL 6	1365	1.8	1.3	.9	
LEAD 6	1330	3.1	2.3	1.8	
STEEL 4	1365	3.5	2.5	1.8	
STEEL 3	1365	4.6	3.4	2.5	
LEAD 4	1330	5.5	4.4	3.4	2.7
STEEL 2	1365	5.9	4.4	3.3	2.6
LEAD 2	1330		7.5	6.1	4.9
STEEL 1	1365		5.7	4.4	3.4
STEEL BB	1365		8.9	7.0	5.6
LEAD BB	1260		13.8	11.4	9.5
STEEL BB8	1300		10.4	8.3	6.7
STEEL T	1300		12.5	10.0	8.0

COMPARABLE 2 3/4" 12-GA. STEEL VS. LEAD

LOADS	IN SHELL PELLET COUNT	40 YARDS PELLET COUNT	60 YARDS PELLET COUNT
1 1/4 OZ #4 LEAD	169	70% AVERAGE 118	30% AVERAGE 51
1 OZ. #2 STEEL	125	82% AVERAGE 103	50% AVERAGE 63
1 1/4 OZ. #6 LEAD	277	74% AVERAGE 204	34% AVERAGE 94
1 OZ. #4 STEEL	189	83% AVERAGE 157	38% AVERAGE 106

* USING PRODUCTION LINE 30" FULL-CHOKE GUNS AND 30" PATTERNING CIRCLE;
LEAD LOADS ARE NON-BUTTERED; 40' & (+ OR -) SEA LEVEL.

SHOT STRING COMPARISON: STEEL VS. LEAD

Lead shot, which is easily deformed upon firing, develops a relatively long, large-diameter shot string. Steel shot, because it is three times harder than lead, stays round, and develops a shot string that is 50-60% shorter and 60-70% narrower than lead. Or, looking at it another way, steel provides a much more precise "hitting zone" than you'd get with lead shot. We recommend that you practice shooting with steel shot so you can get used to its compact, hard-hitting "sweet spot" before hunting season.



Range (Yards)	Velocity (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	Bullet Path (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2900.0	3267.4	-1.5	0.0	0.0	0.0	0.0000
50	2805.2	3057.3	-0.2	-0.4	0.15	0.3	0.0526
100	2712.4	2858.4	0.0	0.0	0.62	0.6	0.1070
150	2621.6	2670.2	-0.98	-0.8	1.42	0.9	0.1632
200	2532.6	2492.0	-3.23	-1.5	2.56	1.2	0.2214
250	2445.3	2323.1	-6.83	-2.6	4.06	1.6	0.2817
300	2359.6	2163.2	-11.89	-3.8	5.95	1.9	0.3442
350	2275.7	2012.1	-18.51	-5.0	8.24	2.2	0.4089
400	2193.5	1869.3	-26.8	-6.4	10.95	2.6	0.4760
450	2112.9	1734.4	-36.91	-7.8	14.11	3.0	0.5457
500	2034.0	1607.4	-48.96	-9.4	17.75	3.4	0.6181
550	1956.9	1487.8	-63.11	-11.0	21.88	3.8	0.6933
600	1881.7	1375.6	-79.53	-12.7	26.53	4.2	0.7714
650	1808.3	1270.4	-98.41	-14.5	31.74	4.7	0.8528
700	1737.0	1172.2	-119.94	-16.4	37.53	5.1	0.9374
750	1667.6	1080.7	-144.38	-18.4	43.94	5.6	1.0255
800	1601.0	995.9	-171.9	-20.5	51.0	6.1	1.1174
850	1536.7	917.4	-202.83	-22.8	58.73	6.6	1.2130
900	1475.0	845.2	-237.45	-25.2	67.17	7.1	1.3127
950	1416.1	779.1	-276.06	-27.7	76.34	7.7	1.4165
1000	1360.3	718.9	-319.01	-30.5	86.26	8.2	1.5246

Muzzle Velocity @ 2800 fps for Item S308175

Range (Yards)	Velocity (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	Bullet Path (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2800.0	3045.9	-1.5	0.0	0.0	0.0	0.0000
50	2707.3	2847.7	-0.16	-0.3	0.16	0.3	0.0545
100	2616.6	2660.0	0.0	0.0	0.65	0.6	0.1108
150	2527.7	2482.3	-1.11	-0.7	1.49	0.9	0.1692
200	2440.5	2313.9	-3.58	-1.7	2.69	1.3	0.2296
250	2354.9	2154.8	-7.52	-2.9	4.27	1.6	0.2921
300	2271.1	2004.0	-13.02	-4.1	6.26	2.0	0.3570
350	2189.0	1861.6	-20.2	-5.5	8.67	2.4	0.4243
400	2108.5	1727.2	-29.2	-7.0	11.53	2.8	0.4941
450	2029.7	1600.5	-40.15	-8.5	14.86	3.2	0.5666
500	1952.7	1481.4	-53.22	-10.2	18.7	3.6	0.6420
550	1877.5	1369.8	-68.56	-11.9	23.06	4.0	0.7203
600	1804.3	1264.8	-86.37	-13.7	27.97	4.5	0.8018
650	1733.1	1166.9	-106.85	-15.7	33.48	4.9	0.8866
700	1664.1	1075.9	-130.22	-17.8	39.6	5.4	0.9750
750	1597.4	991.3	-156.74	-20.0	46.36	5.9	1.0670
800	1533.2	913.2	-186.66	-22.3	53.81	6.4	1.1629
850	1471.6	841.4	-220.28	-24.7	61.96	7.0	1.2628
900	1413.0	775.7	-257.92	-27.4	70.85	7.5	1.3668
950	1357.3	715.8	-299.91	-30.1	80.49	8.1	1.4752
1000	1305.0	661.6	-346.62	-33.1	90.91	8.7	1.5879

Muzzle Velocity @ 2700 fps for Item S308175

Range (Yards)	Velocity (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	Bullet Path (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2700.0	2832.3	-1.5	0.0	0.0	0.0	0.0000
50	2609.4	2645.4	-0.11	-0.2	0.17	0.3	0.0565
100	2520.7	2468.5	0.0	0.0	0.68	0.7	0.1150
150	2433.5	2300.8	-1.28	-0.8	1.57	1.0	0.1756
200	2348.2	2142.2	-3.98	-1.9	2.83	1.4	0.2383
250	2264.5	1992.2	-8.23	-3.2	4.5	1.7	0.3034
300	2182.4	1850.5	-14.28	-4.5	6.6	2.1	0.3708
350	2102.1	1716.7	-22.1	-6.0	9.15	2.5	0.4409
400	2023.4	1590.7	-31.88	-7.6	12.17	2.9	0.5136
450	1946.6	1472.2	-43.79	-9.3	15.7	3.3	0.5892
500	1871.6	1360.9	-58.0	-11.1	19.75	3.8	0.6678
550	1798.5	1256.7	-74.68	-13.0	24.36	4.2	0.7495
600	1727.5	1159.4	-94.06	-15.0	29.57	4.7	0.8347
650	1658.7	1068.8	-116.34	-17.1	35.39	5.2	0.9233
700	1592.2	984.9	-141.79	-19.3	41.86	5.7	1.0156
750	1528.2	907.3	-170.67	-21.7	49.01	6.2	1.1118
800	1466.8	835.9	-203.27	-24.3	56.87	6.8	1.2120
850	1408.4	770.7	-239.91	-27.0	65.48	7.4	1.3164
900	1353.0	711.2	-280.93	-29.8	74.82	7.9	1.4251
950	1301.0	657.6	-326.71	-32.8	84.95	8.5	1.5382
1000	1252.5	609.5	-377.62	-36.1	95.87	9.2	1.6558

Muzzle Velocity @ 2600 fps for Item S308175

Range (Yards)	Velocity (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	Bullet Path (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2600.0	2626.3	-1.5	0.0	0.0	0.0	0.0000
50	2511.4	2450.5	-0.06	-0.1	0.18	0.3	0.0567
100	2424.5	2283.7	0.0	0.0	0.72	0.7	0.1195
150	2339.3	2126.0	-1.42	-0.9	1.65	1.1	0.1825
200	2255.8	1977.0	-4.42	-2.1	2.99	1.4	0.2478
250	2173.9	1836.1	-9.14	-3.5	4.76	1.8	0.3155
300	2093.7	1703.1	-15.69	-5.0	6.98	2.2	0.3858
350	2015.3	1577.9	-24.23	-6.6	9.68	2.6	0.4588
400	1938.6	1460.1	-34.9	-8.3	12.88	3.1	0.5347
450	1863.8	1349.6	-47.89	-10.2	16.62	3.5	0.6137
500	1790.9	1246.1	-63.38	-12.1	20.92	4.0	0.6958
550	1720.1	1149.6	-81.59	-14.2	25.8	4.5	0.7812
600	1651.6	1059.7	-102.73	-16.3	31.32	5.0	0.8702
650	1585.3	976.4	-127.05	-18.7	37.48	5.5	0.9630
700	1521.6	899.5	-154.84	-21.1	44.33	6.0	1.0596
750	1460.6	828.8	-185.38	-23.7	51.89	6.6	1.1602
800	1402.4	764.1	-222.0	-26.5	60.19	7.2	1.2650
850	1347.4	705.3	-262.04	-29.4	69.25	7.8	1.3742
900	1295.7	652.2	-306.87	-32.6	79.08	8.4	1.4878
950	1247.6	604.7	-356.88	-35.9	89.71	9.0	1.6058
1000	1203.4	562.7	-412.48	-39.4	101.11	9.7	1.7283



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22 Long Rifle (.22LR):													
Rimfire Rifle Cartridge / Cartridge Manufacturer / Load Identity	Bullet Weight Grains	Bullet Ballistic Coefficient	Muzzle Velocity Fps.	100 Yds. Velocity Fps.	200 Yds. Velocity Fps.	Muzzle Energy Ft. lbs.	100 Yds. Energy Ft. lbs.	200 Yds. Energy Ft. lbs.	Rifle Zero 50 Yds.	Bullet Drop 75 Yds.	Bullet Drop 100 Yds.	Bullet Drop 150 Yds.	Bullet Drop 200 Yds.
.22LR / (C) / Mini Mag	36	.126	1,280	1003	874	127	80	61	0	- 1.8"	- 5.6"	- 19.9"	- 44.1"
.22LR / (C) / Stinger	32	.084	1,640	1,065	857	191	81	52	0	- 1.1"	- 3.8"	- 15.2"	- 36.4"
.22LR / (C) / Velocitor	40	.126	1,435	1,084	921	183	104	75	0	- 1.3"	- 4.3"	- 15.9"	- 36.4"
.22LR / (R) / C-Bee	33	.084	740	637	550	40	30	22	0	- 6.0"	- 17.0"	- 55.4"	- 118.6"
.22LR / (R) / Cyclone	36	.125	1,280	1010	878	131	82	62	0	- 1.8"	- 5.5"	- 19.4"	- 43.4"
.22LR / (R) / Game Load	36	.125	1,280	1010	878	131	82	62	0	- 1.8"	- 5.5"	- 19.4"	- 43.4"
.22LR / (R) / Golden Bulet	40	.139	1,255	1016	892	140	92	71	0	- 1.8"	- 5.5"	- 19.5"	- 43.1"
.22LR / (R) / Golden Bullet	36	.125	1,280	1010	878	131	82	62	0	- 1.8"	- 5.5"	- 19.4"	- 43.4"
.22LR / (R) / Golden Bullet	29	.106	1,095	903	789	77	53	40	0	- 2.5"	- 7.5"	- 25.7"	- 56.1"
.22LR / (R) / Sub Sonic	38	.125	1,050	901	803	93	68	54	0	- 2.7"	- 7.8"	- 26.4"	- 57.0"
.22LR / (R) / Target	40	.149	1,150	975	872	117	84	67	0	- 2.1"	- 6.4"	- 22.0"	- 47.8"
.22LR / (R) / Thunderbolt	40	.139	1,255	1016	892	140	92	71	0	- 1.8"	- 5.5"	- 19.5"	- 43.1"
.22LR / (R) / Viper	36	.117	1,410	1055	896	159	89	64	0	- 1.4"	- 4.6"	- 16.9"	- 38.6"
.22LR / (R) / Yellow Jacket	33	.107	1,500	1075	895	165	85	59	0	- 1.2"	- 4.1"	- 15.7"	- 36.6"
.22LR / (W) / X22LRSUBA	40	.138	1,065	920	826	101	75	61	0	- 2.5"	- 7.5"	- 25.3"	- 54.5"
.22LR / (W) / XT22LR	40	.148	1,150	974	870	117	84	67	0	- 2.1"	- 6.4"	- 22.0"	- 47.9"
.22LR / (W) / WD22LRB	40	.148	1,150	974	870	117	84	67	0	- 2.1"	- 6.4"	- 22.0"	- 47.9"
.22LR / (W) / WW22LR	40	.138	1,255	1,015	891	140	91	71	0	- 1.8"	- 5.5"	- 19.5"	- 43.1"
.22LR / (W) / X22LRPP	40	.117	1,280	998	863	146	89	66	0	- 1.8"	- 5.6"	- 19.9"	- 44.4"
.22LR / (W) / XT22LRS1	40	.138	1,300	1,036	904	150	95	73	0	- 1.6"	- 5.1"	- 18.4"	- 41.0"
.22LR / (W) / X22LRH	37	.128	1,280	1,014	883	135	84	64	0	- 1.7"	- 5.4"	- 19.3"	- 43.0"
.22LR / (W) / 22LR222HP	36	.084	1,280	937	787	131	70	49	0	- 2.0"	- 6.2"	- 22.3"	- 50.4"
.22LR / (W) / XPRT22	36	.084	1,280	937	787	131	70	49	0	- 2.0"	- 6.2"	- 22.3"	- 50.4"
.22LR / (W) / 22LR333HP	36	.084	1,280	937	787	131	70	49	0	- 2.0"	- 6.2"	- 22.3"	- 50.4"
.22LR / (W) / S22LRUHV	32	.076	1,640	1,033	827	191	76	49	0	- 1.2"	- 4.0"	- 16.1"	- 38.7"
.22LR / (W) / X22LRCBMA	29	.104	770	682	605	38	30	24	0	- 5.3"	- 15.1"	- 48.9"	- 103.9"
.22LR / (W) / X22LRHLF	26	.072	1,650	1,019	812	157	60	38	0	- 1.2"	- 4.1"	- 16.5"	- 39.7"

Lets compare the CCI 22LR Stinger Ballistics to the Remington Golden Bullet 22LR Ballistics!

22LR Bullet Weight: Weight of the bullet in grains, there are 7000 grains in one pound; the abbreviation for grains is gr. There are 437.5 grains in one ounce. The bullet weight of CCI Stinger Ammunition is 32 grains; therefore its bullet weight is .07 ounces. The bullet weight of Remington Golden Bullet Ammunition is 36 grains; therefore its bullet weight is .08 ounces.

22LR Ballistics Coefficient (BC): The ballistic coefficient of a bullet is the drag factor of a bullet. The number is in the form of a decimal. The higher the number the lower the drag of the bullet. It's basically a measure of how streamlined the bullet is. The Bullet Ballistic Coefficient for CCI Stinger Ammo is .084 compared to the BC of the Remington Golden Bullet of .125. The Remington Golden Bullet 36 gr has less drag than the CCI Stinger Ammo. Reference the Bullet Ballistic Coefficient Chart above.

22LR Muzzle Velocity: 22lr muzzle velocity is the speed with which a bullet leaves the barrel measured in feet per second (FPS). As a rule the faster the muzzle velocity the shorter the bullets time in flight and there for a flatter trajectory and less drop. The muzzle velocity of the CCI Stinger Ammo is 1,640 fps compared to the 1,280 fps of the Remington Golden Bullet 36 gr. The 22LR muzzle velocity has a lot to do with the weight of the bullet measured in grains, which is why we see hyper velocity bullets weighing in at 30 gr -32 gr. If you look at the 22lr ballistics table above you will see how the muzzle velocity of 22lr diminishes at 100 yards and 200 yards.

22LR Muzzle Energy: 22lr muzzle energy is measured in foot pounds to determine the destructive potential of the bullet. The 22lr muzzle energy is the kinetic energy of the bullet as it leaves the muzzle. Generally the heavier and faster the bullet the more damage it will do to the intended target. As you

...the **55gr Nosler** bullet is **6.52** inches low

...the **55gr Sierra** bullet is **6.87** inches low

...the **55gr Hornady** bullet is **6.65** inches low

Small difference between all 3 bullets. Only varies by 0.35 inches between highest and lowest bullet path values.

Now, the Nosler 55gr bullet has a BC (ballistic coefficient) of **0.267**, while the Sierra has a BC of **0.237** and the Hornady a BC of **0.255**.

When you consider the 223 Remington produces ballistics that makes it suitable as a medium range varmint cartridge (out to 250 yards), you would do well by choosing to shoot any of these bullets (you'd need to find out which bullet shoots accurately in your gun first) – you would not notice the difference in the field target shooting or sniping at small targets unless you wanted to shoot farther than 250 yards.

223 Ballistics And Extending Your Normal Shooting Distance (beyond 250 yards)

The above 55gr 0.224 inch bullets fired from a 223 Remington at 3200fps allow you to hold dead-on a target with a vital zone of 3 inches (e.g. prairie dog) all the way out to 220 yards (no adjustment for holdover).

To shoot beyond that distance, let's see what elevation adjustment is required.

Below is a Ballistics Report generated by Shoot! ballistics app/software for the Nosler 55gr bullet with a muzzle velocity of 3200fps and zero of 190 yards:

Range	Velocity	Energy	Path	Drop	Drift	TOF	Zero Adj
(Yards)	(FPS)	(FT-LBS)	(Inches)	(Inches)	(Inches)	(Sec)	(Clicks)
0	3200	1250	-1.35	0.00	0.00	0.000	0
50	3014	1109	0.47	-0.45	0.16	0.049	-3
100	2835	982	1.30	-1.85	0.55	0.100	-5
150	2662	865	1.06	-4.34	1.24	0.155	-3
200	2497	761	-0.41	-8.04	2.22	0.213	1
250	2337	667	-3.27	-13.16	3.55	0.275	5
300	2182	581	-7.78	-19.90	5.32	0.342	10
350	2034	505	-14.06	-28.40	7.44	0.413	15
400	1892	437	-22.47	-39.04	10.04	0.489	21

The scope mounted on this 223 Remington has **1/4 MOA clicks** (4 clicks equals 1" of bullet adjustment at 100 yards).



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7.62x39 Ballistics Chart & Coefficient

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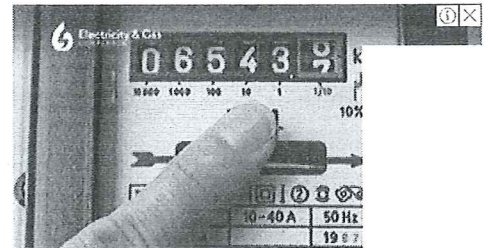
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This is a 7.62x39 ballistics chart (external) generated using our [ballistic trajectory calculator](#). This round is most used in AK-47s and their variants.. The average

7.62x39mm bullet is something like a 123 grain that is fired at an average of at 2,350fps The charting below follows the trajectory all the way to 1000 yards in steps of 50 yard increments. The table below shows the range, drop (based off a 1.5" scope mount although most AKs dont have scopes), current velocity, energy, and time in seconds in relation to the bullets movement through space and time. This chart shows how effects of wind or atmosphere, but if you want to take in to effect these things check out the calculators official page. The Ballistic Coefficient for the 123gr 7.62x39mm is somewhere around .275 (in this example). The 7.62x39mm has a known ballistic coefficient of between .225 (a 123 gr bullet) and .325 (a 150 grain bullet), a very large range in deed.



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Range (yards)	Drop (inches)	Velocity	Energy	Time (seconds)
0	-1.4917	2349	1507	0.00
50	0.1804	2175	1292	0.07
100	0.0106	2008	1101	0.14
150	-2.3203	1849	934	0.22
200	-7.1998	1699	788	0.30
250	-15.0980	1559	664	0.39
300	-26.5812	1430	558	0.49
350	-42.3234	1314	471	0.60
400	-63.1059	1214	402	0.72
450	-89.7903	1131	349	0.85
500	-123.2630	1066	310	0.99
550	-164.3779	1014	281	1.13
600	-213.9368	971	257	1.28
650	-272.6970	935	239	1.44
700	-341.6332	903	223	1.60
750	-421.0045	874	209	1.77
800	-511.7353	847	196	1.95
850	-614.9050	823	185	2.13
900	-730.9633	799	174	2.31
950	-860.2016	778	165	2.50
1000	-1,004.2421	757	156	2.70

Venomous Snake Quiz

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So what does the charting of the 7.62x39mms external ballistics tell us exactly? It says that at around the halfway point of 500 yards the bullet has lost more than 55% of its velocity, lost just under 1,200 ft pounds of energy (now pushing just 310 lbs), and dropped due to gravitational forces some 120 some inches, and all of this in just a fraction of a second (.69