

## ARROW TRAJECTORY MODELLING - TABLE III MAXIMUM RANGES WITH CHANGING ANGLES OF DEPARTURE

Arrow velocities of 180,240 and 300 ft/s are presented.  
Angles of departure of 5, 10, 15, 30, and 45 are used.

arrow velocity (ft/s)	bow angle of departure		rise to apogee	drop from apogee	theoretical gd angle of departure		max range	range from archer
	(degrees)	(radians)	(ft)	(ft)	radians	degrees	(YDS)	(yds)
180	5	0.08727	3.82	8.82	0.13	7.61	88	73
180	10	0.17453	15.18	20.18	0.20	11.55	132	123
180	15	0.26180	33.73	38.73	0.28	16.10	179	173
180	30	0.52360	125.89	130.89	0.53	30.65	294	292
180	45	0.78540	251.77	256.77	0.80	45.57	336	334
240	5	0.08727	6.80	11.80	0.12	6.59	136	120
240	10	0.17453	26.99	31.99	0.19	10.90	222	213
240	15	0.26180	59.97	64.97	0.27	15.63	310	304
240	30	0.52360	223.80	228.80	0.53	30.37	521	518
240	45	0.78540	447.59	452.59	0.79	45.32	597	595
300	5	0.08727	10.62	15.62	0.11	6.07	196	183
300	10	0.17453	42.18	47.18	0.18	10.58	337	328
300	15	0.26180	93.70	98.70	0.27	15.40	478	472
300	30	0.52360	349.68	354.68	0.53	30.24	811	809
300	45	0.78540	699.37	704.37	0.79	45.20	932	931

Calculation of distance traveled (x) to rise to five feet (y).

bow angle of departure (degrees)	arrow velocity (ft/s)	gd angle of departure (radians)	sine	cosine	t (s)	x (ft)	y (ft)	x (yds)
5	180	0.1328	0.1324	0.9912	0.253	45.149	5.000	15.05
10	180	0.2016	0.2002	0.9798	0.149	26.207	5.000	8.74
15	180	0.2810	0.2773	0.9608	0.104	17.920	5.000	5.97
30	180	0.5350	0.5098	0.8603	0.055	8.519	5.000	2.84
45	180	0.7953	0.7141	0.7001	0.039	4.926	5.000	1.64
5	240	0.1151	0.1148	0.9934	0.206	49.186	5.000	16.40
10	240	0.1902	0.1890	0.9820	0.115	27.074	5.000	9.02
15	240	0.2728	0.2694	0.9630	0.079	18.232	5.000	6.08
30	240	0.5300	0.5056	0.8628	0.041	8.580	5.000	2.86
45	240	0.7910	0.7110	0.7031	0.029	4.958	5.000	1.65
5	300	0.1059	0.1324	0.9912	0.133	39.569	5.000	13.19
10	300	0.1847	0.2002	0.9798	0.085	25.040	5.000	8.35
15	300	0.2689	0.2773	0.9608	0.061	17.527	5.000	5.84
30	300	0.5277	0.5098	0.8603	0.033	8.466	5.000	2.82
45	300	0.7890	0.7141	0.7001	0.023	4.910	5.000	1.64

**REMARKS:**

arrow velocity - arrow velocity in feet per second  
bow angle of departure - the upward angle of the arrow on firing  
rise to apogee - the height above the arrow rest that the arrow reaches, the highest point on the trajectory  
drop from apogee - the rise plus five feet (standard shot bow height), this is the distance the arrow falls from the highest point to the ground  
theoretical gd angle of departure - the upward angle at which the arrow would have been launched from the ground behind the target to follow the same trajectory  
max range - the theoretical range that the arrow would travel if launched from the ground behind the archer  
range from archer - the distance from the archer to the point at which the arrow would strike the ground  
sine - the trigonometric sine function of the theoretical ground angle of departure  
cosine - the trigonometric cosine function of the theoretical ground angle of departure  
time - time for which the arrow would be in flight to reach a height of five feet  
x - the distance the arrow would have travelled to reach a height of five feet (the point at which it starts its trajectory at the bow)  
y - the vertical distance the arrow has travelled in time "t", Time "t" has been adjusted until "y" equals five feet to establish the distance "x"