



Known Distance for .22LR

Course Instructions

COURSE DESCRIPTION:

This course is designed for shooters with access to a 200 yard range as an advanced course for Rifleman (i.e. Rifleman 102) so that shooters could use the skill set taught at Appleseed on longer-than-25yd ranges. The student will apply the holdover data found in the Grey AS/KD handout. The student will develop a “holdover” skill set using ballistic tables, reticle data, and target information that can later be used with centerfire rifles at ranges out to 400 yards and beyond. The course further serves as an depth study of the range, energy, accuracy, and general information regarding the .22 long rifle. This is for educational use only with Project Appleseed, a not for profit organization.

Many Thanks to SGTROCK for his technical input and MK1765 for her assistance in development of the practical instruction for this project.

SB StevenK, Project Appleseed, July 2017

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The Following is the AAR on application of this material to the first five students and includes more detail on Course Description and Instructions

July 16th, 2017 : Matamoras Rod and Gun Club hosted Project Appleseed's Rifleman Only 200 yd .22 KD. The Course goals were to have shooters take their .22 rifles and stretch them out to 200 yards. Known Distance involves targets set at "known" intermediate ranges; in this course we set targets at 100-125-150-and 200 yards.

Instructor and SB was StevenK, Red Hat for event was MK1765. Thank you to Drifter52 and MK1765 for their assistance all day.

- Participants worked within the limits and capabilities of the .22 round at these distances using reticle information, known distances, and trajectory tables.
- The Course is a scaled version of a larger (800 yard) range – the concept was to teach the shooters to use holdovers without sight adjustment.
- I developed this course over the winter months. This was the first time I had taught this course to students. I initiated the course as a "Rifleman Only" event and this proved to have been a good decision because transmittal of the information to newer students would have been too much for the day.
- All shooters started with .40 grain/1070 FPS ball ammo; this bullet at 200 yards will drop approximately 59 inches with a 25 yard zero; on a Centerfire course, a 223 62 grain projectile at 3200 FPS with a 25 Yd. Zero will drop approximately the same distance at 800 yards.
- All courses of fire were completed from the prone position.
- The only standard item we used was the common starting point of subsonic ammo; this proved to be a good idea. Subsonic rounds have a muzzle velocity of about 1,080 ft/s (330 m/s) and the bullet trajectories for all shooters were similar, within a few MOA - this made for easier instruction.
- Next, all shooters confirmed their zero at 25 yards and within 10 rounds, having pre-zeroed as instructed in the sign up directives.

- We then moved to the 100 yard line and spent time required to the MOA measurement information in everyone's scope. The shooters all used a second focal plane scope with duplex reticle and measured every aspect of these reticles at full magnification to determine MOA using a few devices placed downrange (two 6 foot pole at 100 and 200 yards, painted red and white in 1 foot increments; the poles each had a wind flag). In addition, there was a 4x8 backer downrange and we had also posted the 18x24 fill sized centers for additional reference. The shooters then drew their reticles on a dope sheet and recorded all MOA/measurement information - this sheet was kept separate from all other measurements taken at the event and was used for the entire day.

- Another part of the course material was a subsonic .40 grain bullet drop calculation (BDC) graph. This was also used throughout the day.

- All firing was from the prone position; shifting positions would be best done on a second day of instruction due to time limitations.

COURSE OF FIRE:

The shooters engaged targets at 100, 125, 150, 175, and 200. Each engagement was conducted similar to the others - to illustrate: at 175 yards the BDC indicated a bullet drop of approximately 44 inches. The shooters calculated that 44 inches divided by 1.75 (175 yards) = 25 MOA. The shooters used the measuring pole to determine where 25 MOA indexed on their reticle, recorded that in their DB as the POA in a new reticle drawing, and then we fired for effect; once downrange they determined the difference between the POA v POI and recorded the distance. Returning from downrange they redrew their reticle with the revised POI data, adjusted their POA, then refired the course. All fired to accurate effect and recorded the confirmed data for future use on a completely new sheet.

The shooters had then recorded all their data on new sheets to ready reference and were thus ready to proceed.

Qualification: Initially, in the morning session, the shooters first walked downrange, zeroed 25 yards from the berm, and then (in "shoulder arms") walked back by degrees (100/125/150/175/200 yards) until the aforementioned DOPE had been acquired. However I moved all the targets from the downrange berm now that the shooters were set up at

the 200 yard line – the range was now set up for targets at known distances of 125, 150, 175, and 200. This changed the entire range set up from that they had been comfortable with in the AM, including target identification – this caused some quiet grumbling and individual worry about hitting the targets, but the shooters did very well.

The qualification took place in the afternoon. Temperatures were in the high 80's and we were walking back and forth all day. The weather compelled frequent heat advisory from the Shoot Boss, with regular water drills and frequent breaks called in the shade. The shooters complied and there were no injuries due to heat.

The qualification for this type of course was 40 rounds, at 10 rounds per distance, with a passing score a 80% of hits (min. 32) on the four target lines. All targets had to be engaged within 8 minutes – of the five shooters, 4 qualified with the following scores

Mark 38
Rich 36
Bob 24
Chris 34

Honorable mention goes to Pat with a good score and full points at two distances.

By the days end we were all affected by the heat; we had taken a sensible pace all day given this heat, and after one qualification round we voted to close the day as a safe and successful event. The range clean up and benediction closed at 5:15 and we were off the range by 5:30.

The shooters were quite happy with the process and expressed much enthusiasm about the course. I owe some a full set of course materials which will follow this posting in a PDF. I will repeat the course next season, though with a chronograph on the line with the event held in the early spring and late fall to avoid the severe heat issues we had this day. Thanks to the participants who excelled in their enthusiasm under these difficult conditions.





Known Distance (KD)

- Known Distance involves targets set at “known” intermediate ranges; in this course we will set targets at 100-125-150-and 200 yards.
 - Participants will become familiar with the trajectory, limits, and capabilities of the .22 round at these distances.
 - Participants will use target detection, range estimation, and adjustment of trajectory to hit the targets.
 - Every American should own at least a rim-fire semi auto and be therewith proficient.
 - This course will further familiarize the shooter with the capabilities of their .22 Rifle.
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Much Ado about the .22

- The **.22 Long Rifle** [rimfire](#) (metric: **5.6x15mmR**) [cartridge](#) is a long-established variety of [ammunition](#), and in terms of units sold is still by far the most common in the world today.
- It is one of the few cartridges that are accepted by a large variety of rifles, as well as pistols, and is popular among novice shooters and experts alike.
- Low cost, minimal recoil, and relatively low noise make the .22 LR an ideal cartridge for recreational shooting, initial firearms training, small-game hunting, and pest control.
- Performance varies between barrel length and the type of action.
- The .22 LR is effective to 150 yd (140 m), though practical ranges tend to be less. After 150 yd, the [ballistics](#) of the round are such that it will be difficult to compensate for the large "drop".



Deadly Force of the .22LR

- The cartridge is often underestimated because a .22 LR bullet is less powerful than larger cartridges. However, a .22 LR bullet is capable of inflicting very serious injuries. A .22 LR bullets can easily kill or seriously injure humans.
- As a hunting cartridge, rim-fires are mainly used to kill small game. It is highly effective on squirrels and rabbits at distances closer than 150 yd and on ground hogs, marmots, and foxes closer than 80 yd (73 m).
- Head and chest shots are preferred with the most powerful .22 cartridge the hunter can use.

Specifications and Twist Rate



Specifications	
Parent case	.22 Long
Case type	Rimmed, straight
Bullet diameter	0.223 in (5.7 mm) - 0.2255 in (5.73 mm)
Neck diameter	.226 in (5.7 mm)
Base diameter	.226 in (5.7 mm)
Rim diameter	.278 in (7.1 mm)
Rim thickness	.043 in (1.1 mm)
Case length	.613 in (15.6 mm)
Overall length	1.000 in (25.4 mm)
Rifling twist	1:16"
Primer type	Rimfire



Rifling Twist Rates

Twist Rates describe an element of Rifling - The rifling imparts a spin on the bullet as it travels down the barrel causing it to have a straighter trajectory after exiting. Rifling is measured as a twist rate, the distance in inches it takes for the rifling to make one complete 360 degree revolution inside [the barrel](#).

Due to the constant diameter inside the barrel and the fact that most bullets are manufactured with the same components, the best way to determine the proper twist rate is based on the weight of the bullet (measured in grains). The higher the weight, the longer the bullet, and the faster the twist rate.

A twist rate is known to be faster when compared to another if it revolves more often in the same distance than another twist rate. An example would be that a 1/7 twist rate is faster than a 1/9. Conversely, the 1/9 is a slower twist rate than the 1/7 because it takes a longer distance for a complete 360 degree revolution of the rifling.



Twist Rates for the .22 are as follows:
Standard (ex. Ruger 10/22) 1:16.
Custom rates

- 1:9 Long, [heavy bullet](#). Think 60gr Aguilla SSS
- 1:12-14 40 gr ammunition
- 1:15-16 36 gr ammunition



Performance of the .22 LR

NOTE: Casualty at 59 Foot-Pounds				
Bullet mass/type	Velocity	Energy		
40 gr. (2.6 g) Solid	1,200 ft/s (370 m/s)	104 ft·lb		
38 gr. (2.5 g) Copper-plated HP	1,260 ft/s (380 m/s)	134 ft·lb		
32 gr. (2.1 g) Copper-plated HP	1,430 ft/s (440 m/s)	141 ft·lb		
31 gr. (2.0 g) Copper-plated RN	1,750 ft/s (530 m/s)	204 ft·lb		
30 gr. (1.9 g) Copper-plated HP	1,640 ft/s (500 m/s)	191 ft·lb		



Energy Comparison

Example muzzle energy levels of different types of firearms		
Firearm (except listed air guns)	Caliber	Muzzle energy ft-lbs
air gun spring	.177	15
air gun mag spring	.22	22
air gun PCP	.22	30+
pistol	.22LR	117
pistol	9 mm	383
pistol	.45 ACP	416
pistol	.357 Magnum	640
pistol	10mm	775
rifle	5.56x45 mm	1,325
rifle	7.62x39 mm	1,527
rifle	7.62 x 51 mm	2,802
rifle	.338 Lapua Magnum	4,893
heavy	.50 BMG	11,091
heavy	14.5 x 114 mm	23,744



.22 Long Rifle Round Options

- The variety of .22 LR loads are often divided into four distinct categories, based on nominal velocity:
- **Subsonic**: which also includes "target" or "match" loads, at nominal speeds below 1,100 ft/s (340 m/s)
- **Standard-velocity**: 1,000–1,135 ft/s (305–346 m/s), common velocities are around 1,125 ft/s (343 m/s)
- **High-velocity**: 1,200–1,310 ft/s (370–400 m/s) per second
- **Hyper-velocity, or ultra-velocity**: over 1,400 ft/s (430 m/s)



Supersonic/Subsonic

- Transition of a high-velocity .22LR cartridge projectile from supersonic to subsonic occurs within 100 yd (91 m) at [1115 FPS].
- As the bullet slows, the shock wave caused by supersonic travel overtakes the bullet and can disrupt its flight path, causing minor but measurable inaccuracies.



Subsonic

- **Slightly More Accurate:** Subsonic rounds have a [muzzle velocity](#) of about 1,080 ft/s (330 m/s) or less, less than the [speed of sound](#). These rounds are sometimes equipped with extra-heavy bullets of 46–61-grain (3.0–4.0 g) to improve the [terminal ballistics](#) of the slower projectile. Conversely, these rounds may contain little more than a primer and an extra-light bullet. They are also more quiet.
- **Effect of Cold** - Because the speed of sound in air at 68 °F (20 °C) is about 1,115 ft/s (340 m/s), the subsonic round's muzzle velocity is slightly below the speed of sound under many hunting conditions. However, under cold air conditions at 32 °F (0 °C), the speed of sound drops to 1,088 ft/s (332 m/s), approximately muzzle velocity. Hence, a "subsonic" round used below this temperature may be supersonic, and during the transition from supersonic to subsonic velocity, it may become unstable, reducing accuracy. To counteract this, some cartridge manufacturers have lowered the speed of their subsonic ammunition to 1,030 ft/s (310 m/s) or less.



Standard Velocity/High Velocity

- **Standard velocity**

- Standard-velocity .22 LR rounds vary between manufacturers: some may be slightly supersonic-around 1,125 ft/s (343 m/s); other ammo such as CCI Standard Velocity .22 LR ammunition is rated at 1070 fps.
- Most standard velocity ammo has a bullet weight of 40 gr (2.6 g). Standard-velocity cartridges generate near or slightly supersonic velocities.

- **High velocity**

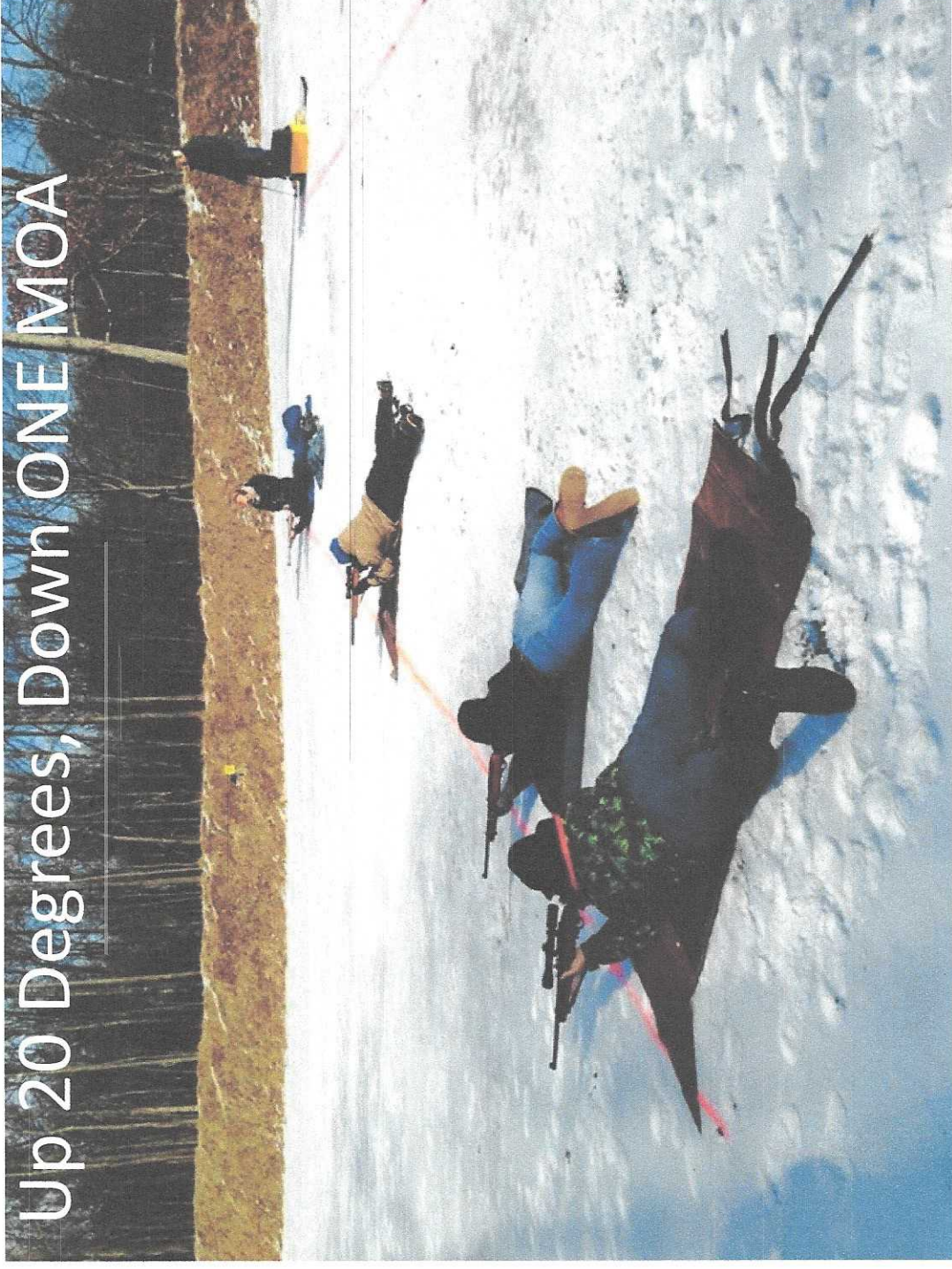
- Smokeless powder loads, called "high speed" or "high velocity", offered by the major ammunition makers are 1,200 feet per second (370 m/s) to 1,300 feet per second (400 m/s)) while still using the standard 40-gr solid or 36-gr hollow-point lead bullet.



Hyper Velocity

- Many .22 LR cartridges use bullets lighter than the standard 40 grain though fired at even higher velocities.
- Hyper-velocity bullets usually weigh around 30 to 32 gr (1.9 to 2.1 g) and can have a muzzle velocity of 1,400 to 1,800 feet per second (430 to 550 m/s). This higher velocity is partially due to the use of lighter bullets.

Temperature?



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Target Detection

- 1.Movement** — shapes moving in a static environment or not moving in a dynamic environment will draw attention.
- 2.Shine** from reflective surfaces — metal, glass, plastic, sweaty skin, etc.
- 3.Shape** — humanoid shapes draw attention. i.e Faces in rock formation, man shaped trees stumps.
- 4.Silhouette** — a contrasting blob against the background.
- 5.Colour and texture** — blue in a green jungle doesn't work, neither does low texture in a high texture environment.
- 6.Shadow** — the mind can calculate probable shapes from the shadows cast — especially human shapes.
- 7.Spacing** — regular spaced objects form a pattern that will draw attention.



MILS and MOA

The Minutes-of-Angle is the standard unit-of-measurement for elevation and windage on most riflescopes in America, while the mil (or milradian) is the unit-of-measurement found in mil-dot reticles.

	One Minute of Angle Equals	One Mil Equals
100 Yards	1.0 Inch	3.6 Inches
200 Yards	2.0 Inches	7.2 Inches
300 Yards	3.0 Inches	10.8 Inches
400 Yards	4.0 Inches	14.4 Inches
500 Yards	5.0 Inches	18.0 Inches
600 Yards	6.0 Inches	21.6 Inches
700 Yards	7.0 Inches	25.2 Inches
800 Yards	8.0 Inches	28.8 Inches
900 Yards	9.0 Inches	32.4 Inches
1000 Yards	10.0 Inches*	36.0 Inches

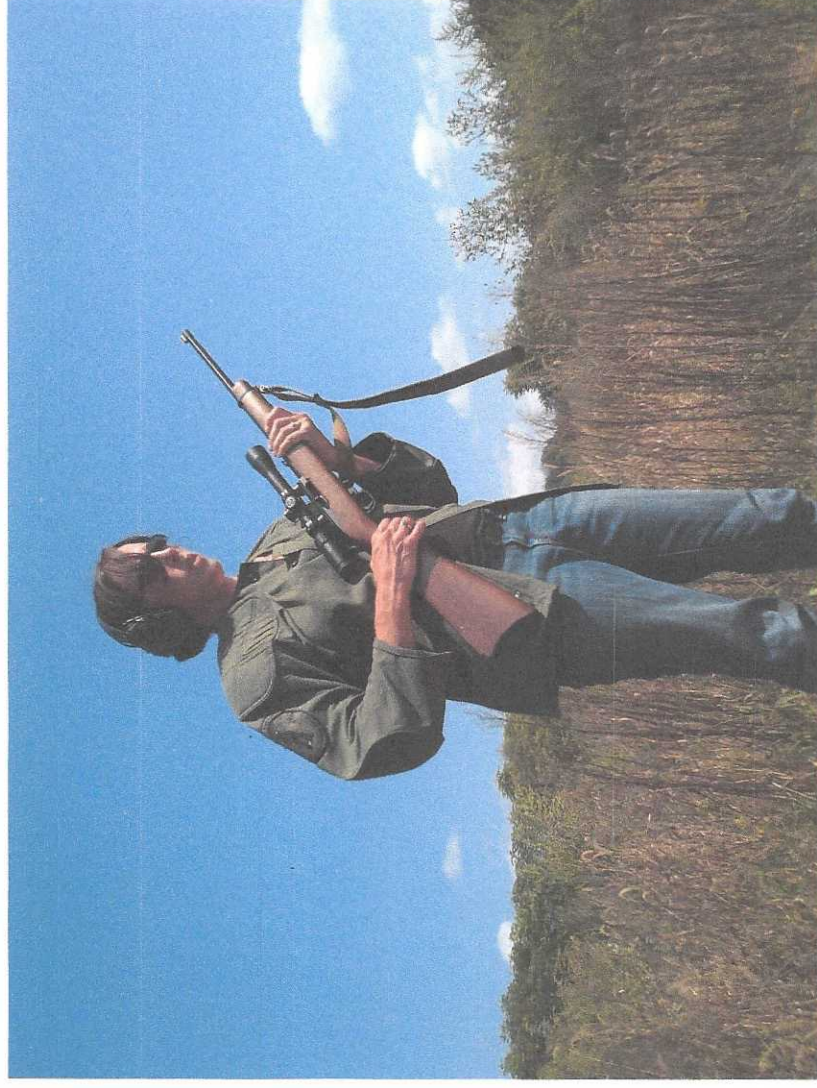
*By the time you reach 1000 yards, an actual Minute of Angle equals 10.47 inches

How Can We Estimate Range?

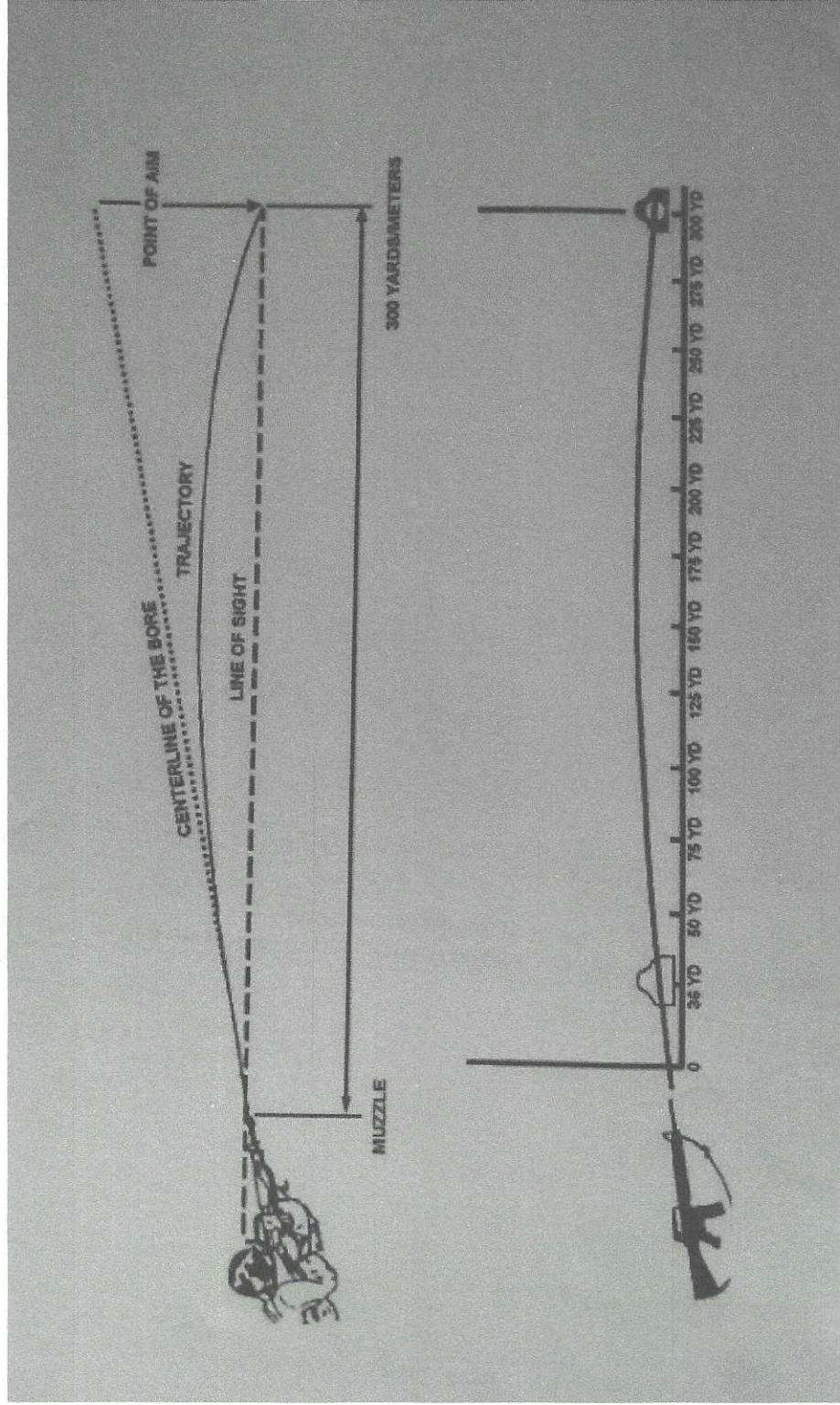
- Eye estimation
- “Football fields”
- Relative size of target
- Front sight / scope reticle
- Laser rangefinder
- Map scale
- Combination of methods



Making the Shot

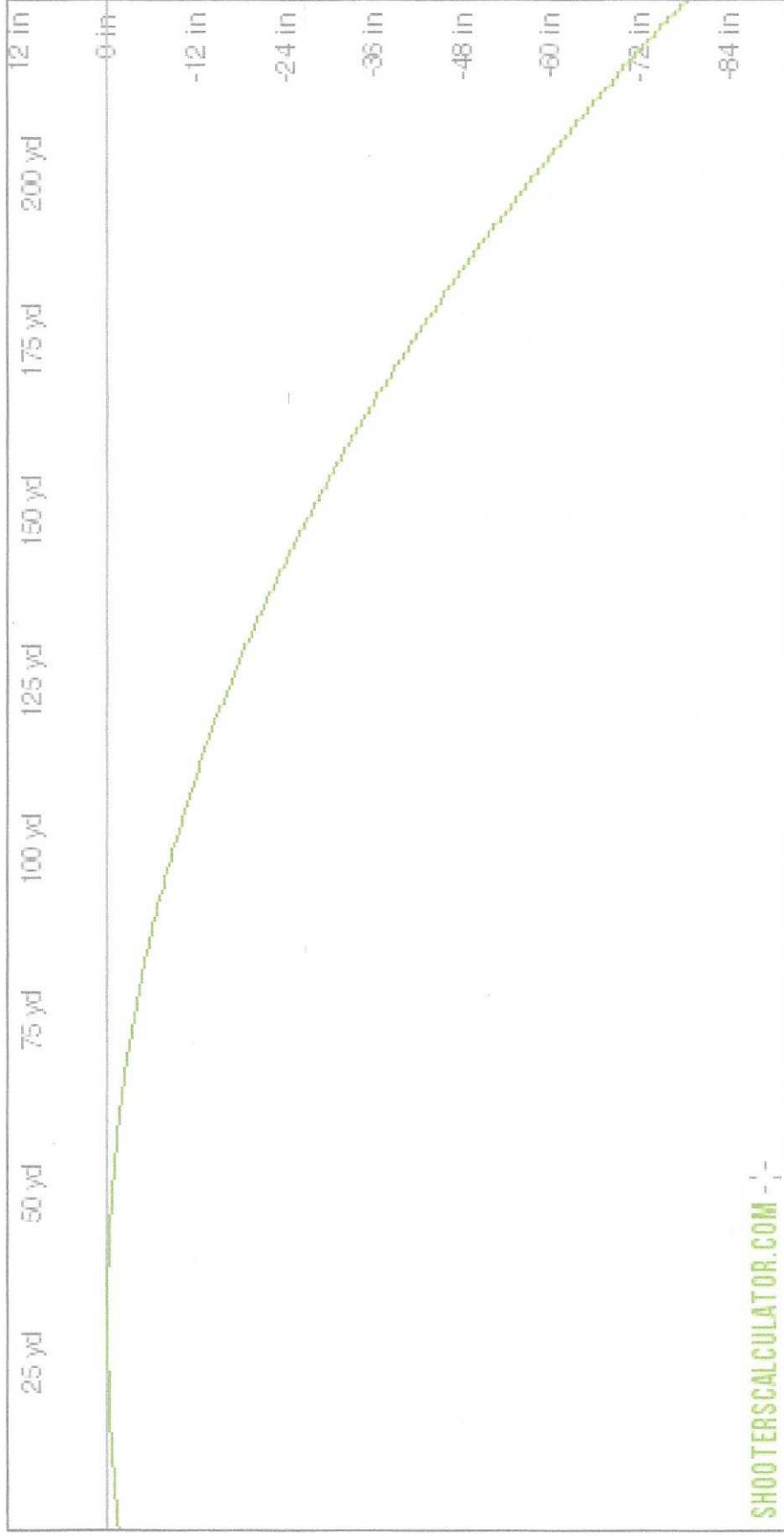


TRAJECTORY



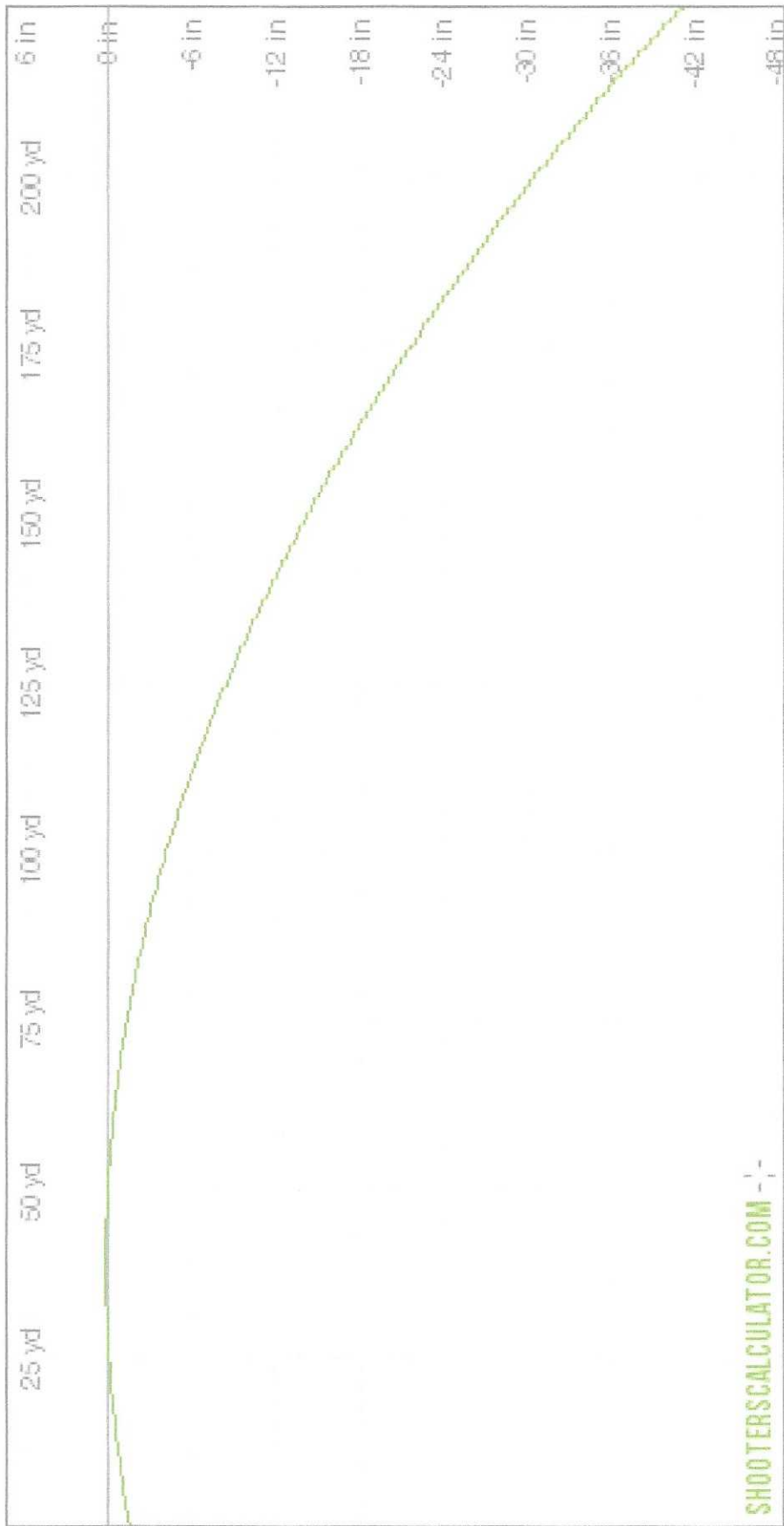


Trajectory of Standard Velocity 40Gr./1080 FPS





Trajectory of 22lr High Velocity 36 Gr. 1260 FPS





Scaled .22 KD Comparable to 800 yard Centerfire Course

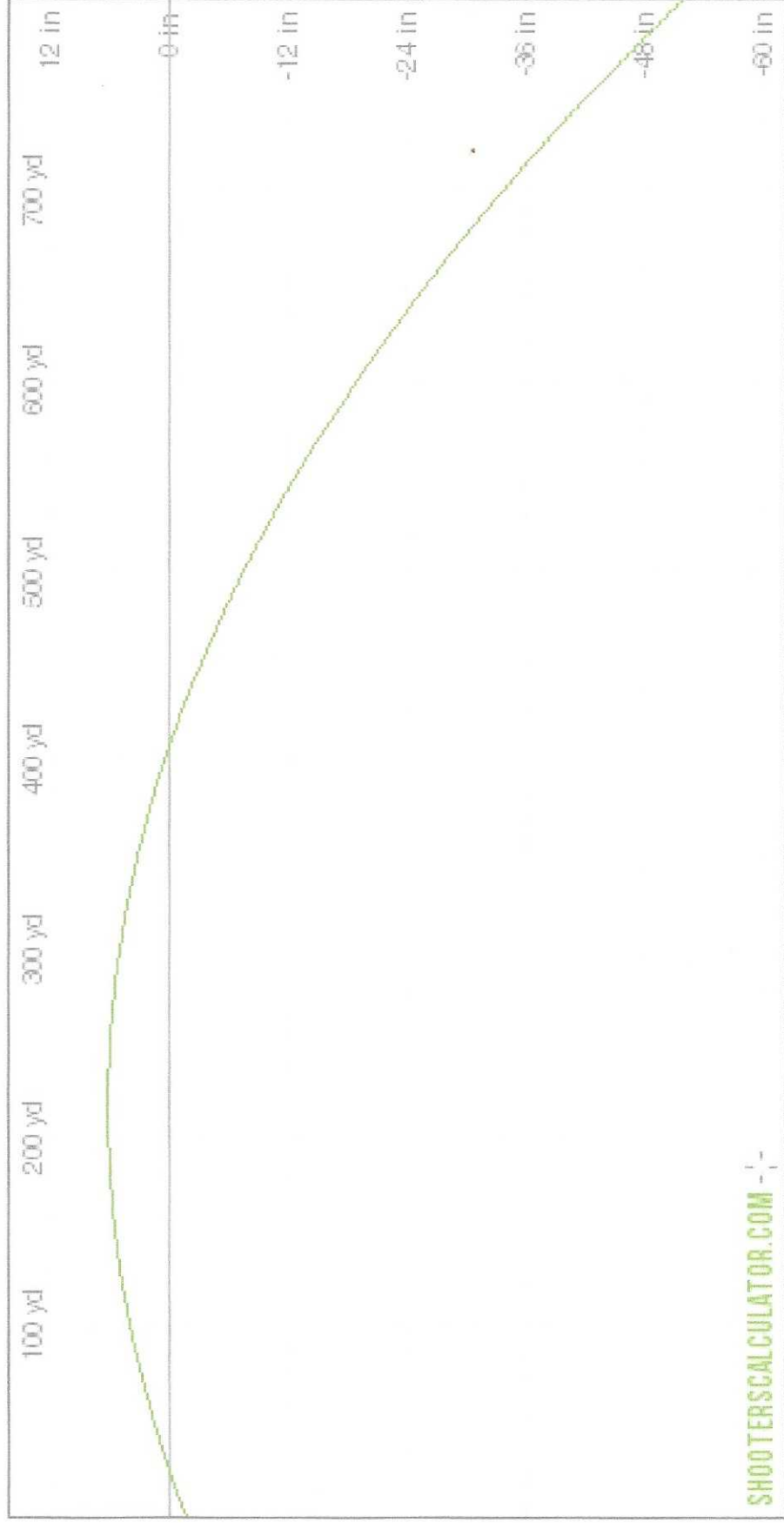


CHART: .223 - 62 grain - 3200 FPS - 25 Yd. Zero




Common .22lr Cartridge/Energy/Trajectory

.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.
<u>.22LR</u> / (C) / Mini Mag	36	.126	1,260	1,003	874	127	80	61	0	-1.8"	-5.6"	-19.9"	-44.1"
<u>.22LR</u> / (C) / Stinger	32	.084	1,640	1,065	857	191	81	52	0	-1.1"	-3.8"	-15.2"	-36.4"
<u>.22LR</u> / (C) / Velocitor	40	.126	1,435	1,084	921	183	104	75	0	-1.3"	-4.3"	-15.9"	-36.4"
<u>.22LR</u> / (R) / C-Bee	33	.084	740	637	550	40	30	22	0	-6.0"	-17.0"	-55.4"	-118.6"
<u>.22LR</u> / (R) / Cyclone	36	.125	1,280	1,010	878	131	82	62	0	-1.8"	-5.5"	-19.4"	-43.4"
<u>.22LR</u> / (R) / Game Load	36	.125	1,280	1,010	878	131	82	62	0	-1.8"	-5.5"	-19.4"	-43.4"
<u>.22LR</u> / (R) / Golden Bullet	40	.139	1,255	1,016	892	140	92	71	0	-1.8"	-5.5"	-19.5"	-43.1"
<u>.22LR</u> / (R) / Golden Bullet	36	.125	1,280	1,010	878	131	82	62	0	-1.8"	-5.5"	-19.4"	-43.4"
<u>.22LR</u> / (R) / Golden Bullet	29	.106	1,095	903	789	77	53	40	0	-2.5"	-7.5"	-25.7"	-56.1"
<u>.22LR</u> / (R) / Sub Sonic	38	.125	1,050	901	803	93	68	54	0	-2.7"	-7.8"	-26.4"	-57.0"
<u>.22LR</u> / (R) / Target	40	.149	1,150	975	872	117	84	67	0	-2.1"	-6.4"	-22.0"	-47.8"
<u>.22LR</u> / (R) / Thunderbolt	40	.139	1,255	1,016	892	140	92	71	0	-1.8"	-5.5"	-19.5"	-43.1"
<u>.22LR</u> / (R) / Viper	36	.117	1,410	1,055	896	159	89	64	0	-1.4"	-4.6"	-16.9"	-38.6"
<u>.22LR</u> / (R) / Yellow Jacket	33	.107	1,500	1,075	895	165	85	59	0	-1.2"	-4.1"	-15.7"	-36.6"
<u>.22LR</u> / (W) / X22LR SUBA	40	.138	1,065	920	826	101	75	61	0	-2.5"	-7.5"	-25.3"	-54.5"
<u>.22LR</u> / (W) / XT22LR	40	.148	1,150	974	870	117	84	67	0	-2.1"	-6.4"	-22.0"	-47.9"
<u>.22LR</u> / (W) / WD22LRB	40	.148	1,150	974	870	117	84	67	0	-2.1"	-6.4"	-22.0"	-47.9"
<u>.22LR</u> / (W) / WW22LR	40	.138	1,255	1,015	891	140	91	71	0	-1.8"	-5.5"	-19.5"	-43.1"
<u>.22LR</u> / (W) / X22LRPP	40	.117	1,280	998	863	146	89	66	0	-1.8"	-5.6"	-19.9"	-44.4"
<u>.22LR</u> / (W) / XT22LRS1	40	.138	1,300	1,036	904	150	95	73	0	-1.6"	-5.1"	-18.4"	-41.0"
<u>.22LR</u> / (W) / X22LRH	37	.128	1,280	1,014	883	135	84	64	0	-1.7"	-5.4"	-19.3"	-43.0"
<u>.22LR</u> / (W) / 22LR222HP	36	.084	1,280	937	787	131	70	49	0	-2.0"	-6.2"	-22.3"	-50.4"
<u>.22LR</u> / (W) / XPERT22	36	.084	1,280	937	787	131	70	49	0	-2.0"	-6.2"	-22.3"	-50.4"
<u>.22LR</u> / (W) / 22LR333HP	36	.084	1,280	937	787	131	70	49	0	-2.0"	-6.2"	-22.3"	-50.4"
<u>.22LR</u> / (W) / S22LRUHV	32	.076	1,640	1,033	827	191	76	49	0	-1.2"	-4.0"	-16.1"	-38.7"
<u>.22LR</u> / (W) / X22LR CBMA	29	.104	770	682	605	38	30	24	0	-5.3"	-15.1"	-48.9"	-103.9"
<u>.22LR</u> / (W) / X22LRHLF	26	.072	1,650	1,019	812	157	60	38	0	-1.2"	-4.1"	-16.5"	-39.7"



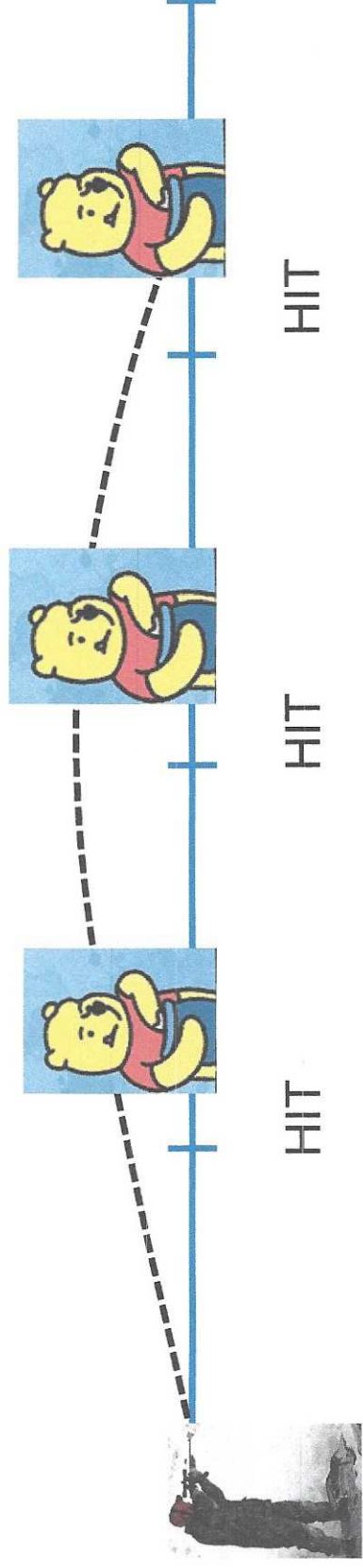
Get a Ruler, a Dope Book, and a couple of different color pens to start.

Date	Time	Location	Target	Wind	Remarks
				W.S. F.M.	100 Yards
Age		14 (NY) (last, first)	Number		total, reg. (this drill) 1
Height			New Record		none
Pistol 2 inches			DOT		Target Score
Scorer	Time	10.00	10.00		
Scorer	Time	10.00	10.00		



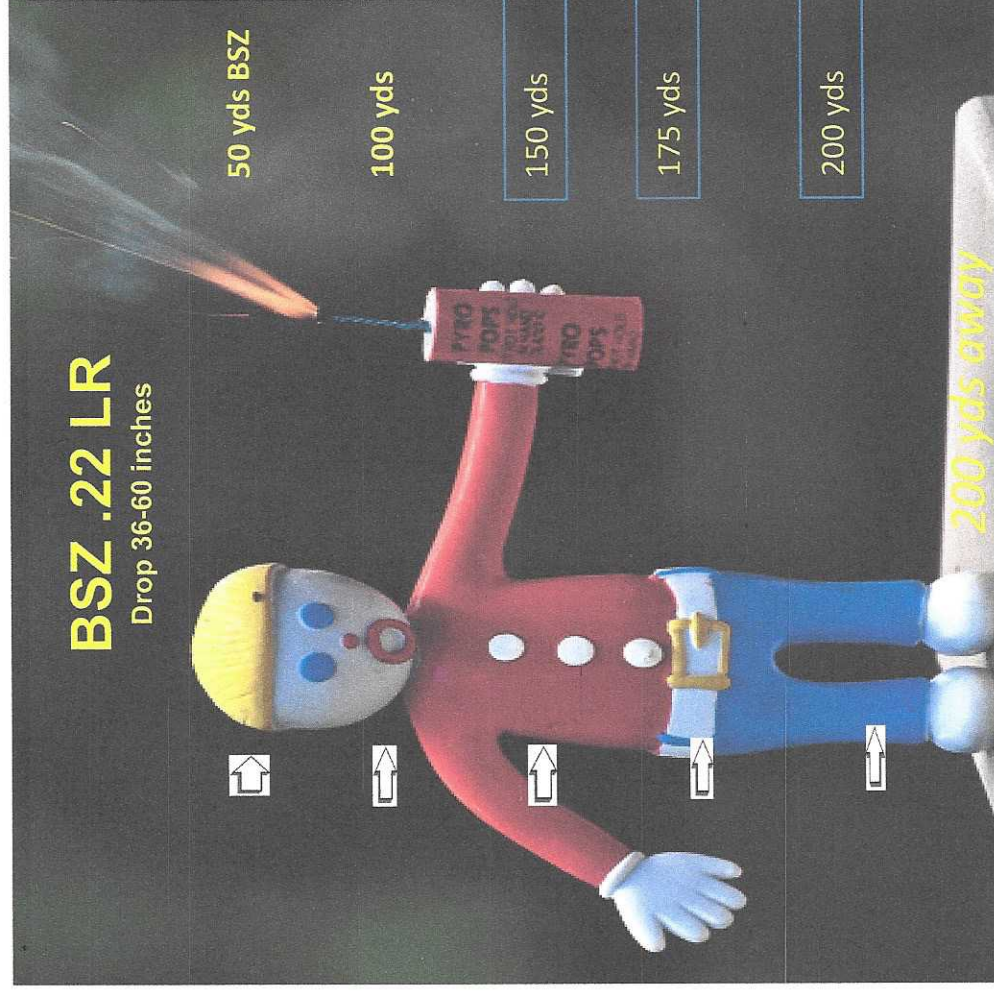
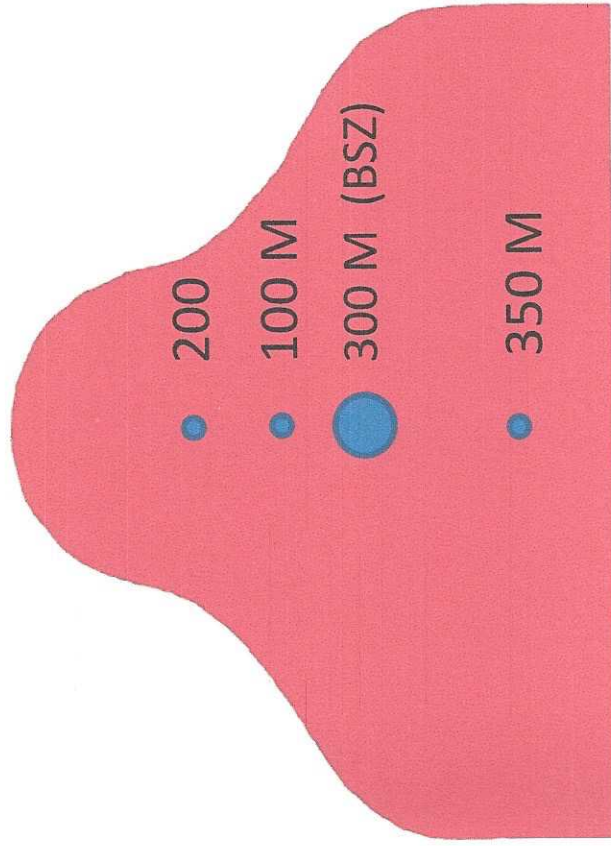
ZEROING and BATTLE SIGHT ZERO

- The Army has developed methods for engaging targets based on the following two scenarios:
 - **Known distance** = Bullet Drop Compensating (BDC) Adjusting sights or changing aimpoint for targets at known distances.
 - **Unknown distance** = Battle Sight Zero (BSZ) Engaging targets without adjusting for distance.
 - To achieve a Battlesight Zero:
 - Zero rifle at 25m
 - Confirm and/or refine zero at 300 meters
 - If possible, engage targets from 100m-300m to confirm point of impact versus point of aim



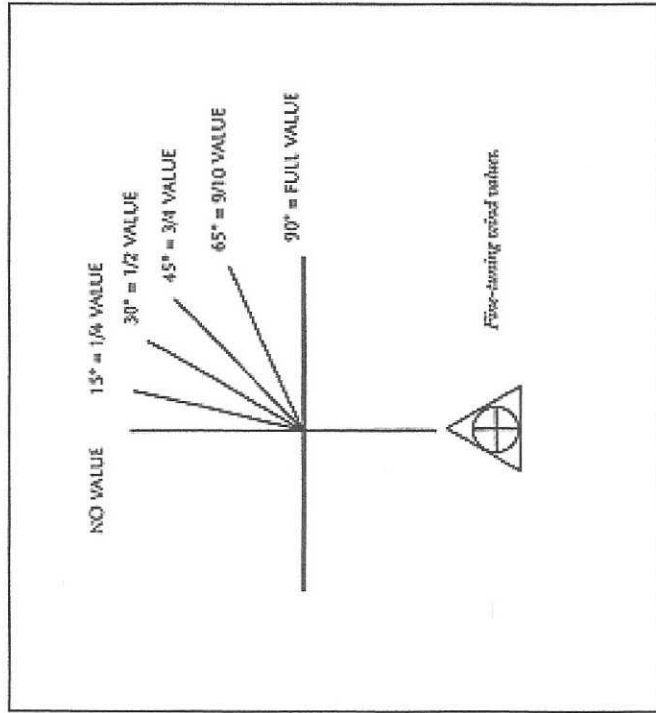
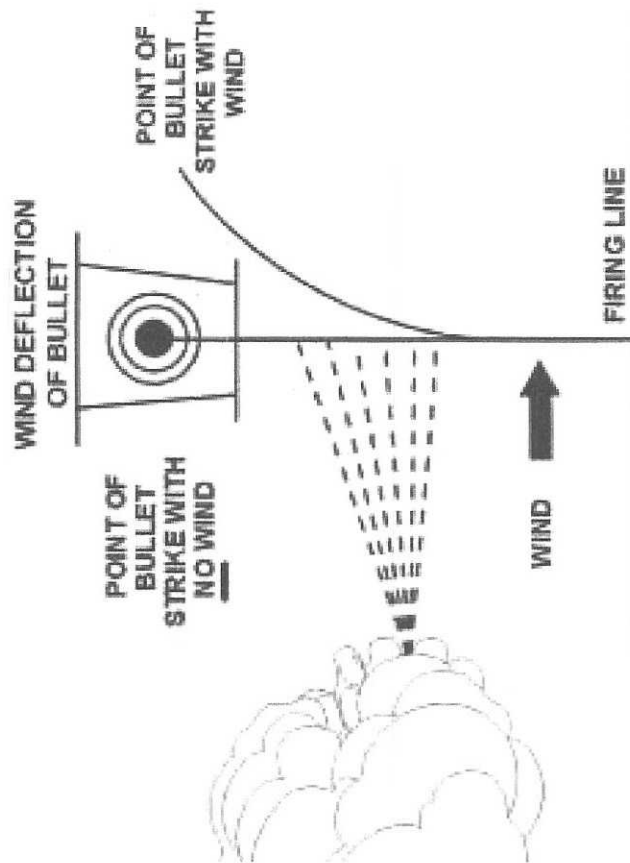
How Do We Find BSZ?

5.56x45mm BSZ = 300 M



For targets beyond BSZ range, apply come-ups

Adjusting for Wind





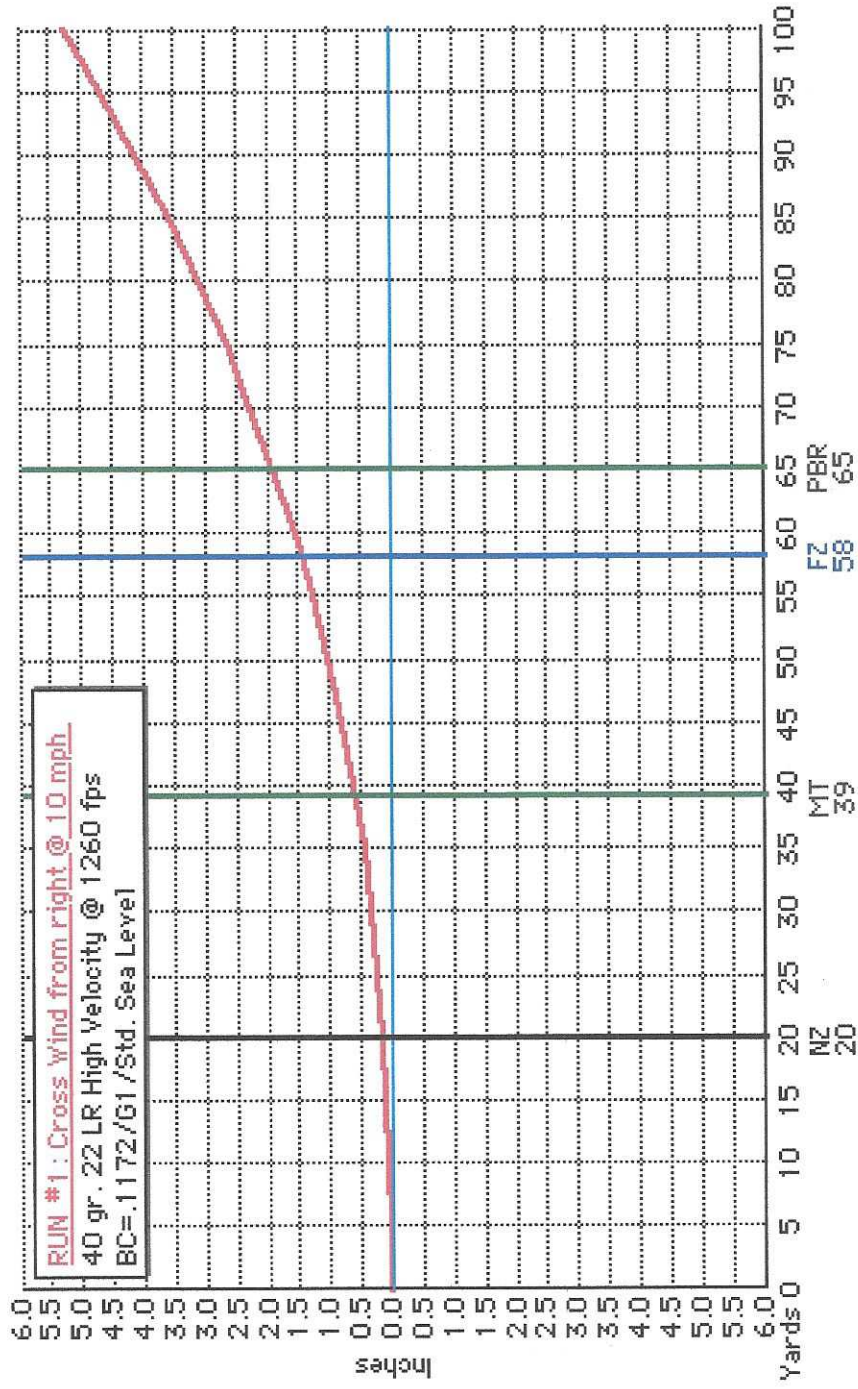
Estimating Wind Speeds with Visual Cues

Beaufort number	Description	Speed	Visual Clues and Damage Effects
0	Calm	Calm	Calm wind. Smoke rises vertically with little if any drift.
1	Light Air	1 to 3 mph	Direction of wind shown by smoke drift, not by wind vanes. Little if any movement with flags. Wind barely moves tree leaves.
2	Light Breeze	4 to 7 mph	Wind felt on face. Leaves rustle and small twigs move. Ordinary wind vanes move.
3	Gentle Breeze	8 to 12 mph	Leaves and small twigs in constant motion. Wind blows up dry leaves from the ground. Flags are extended out.
4	Moderate Breeze	13 to 18 mph	Wind moves small branches. Wind raises dust and loose paper from the ground and drives them along.
5	Fresh Breeze	19 to 24 mph	Large branches and small trees in leaf begin to sway. Crested wavelets form on inland lakes and large rivers.
6	Strong Breeze	25 to 31 mph	Large branches in continuous motion. Whistling sounds heard in overhead or nearby power and telephone lines. Umbrellas used with difficulty.
7	Near Gale	32 to 38 mph	Whole trees in motion. Inconvenience felt when walking against the wind.
8	Gale	39 to 46 mph	*****Shooting Companion blows away in the windTime to Go INDOORS



Wind Drift Data

BULLET DEFLECTION





No Sunshine Patriots

- Shoot in adverse weather. Shooting is experience. No better way exists - *Get out on all-weather days and shoot in the wind. Cover up from the rain.*
- *Watch what the trees are doing, watch the grass, watch the flags downrange (if you are at a range), take note how the wind feels on your face. Pay close attention to detail at what the wind is doing to your surroundings. With time you'll develop a good sense of calling windage.*
- *Be ready, any time, anywhere.*

Mirage Wind Doping

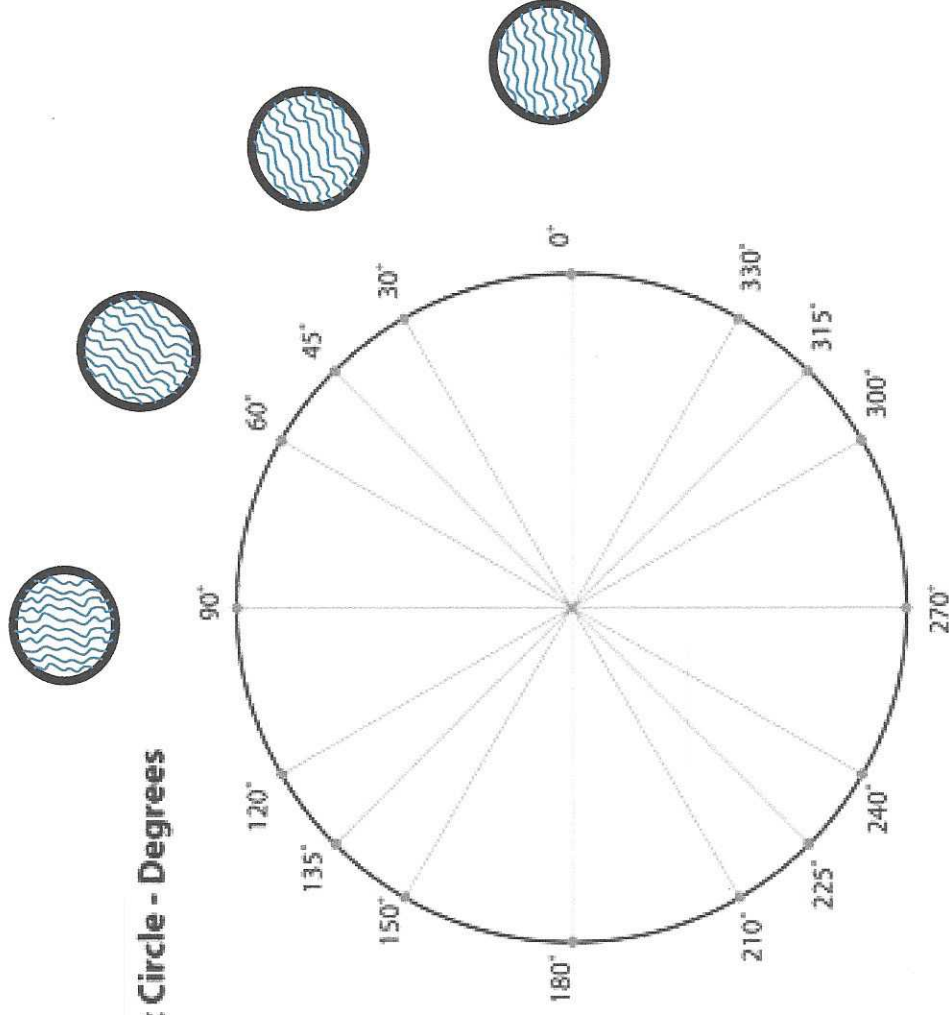


- You can use spotting scopes to estimate wind-speed and direction by observing mirage - shimmering heat waves that rise from the ground and are pushed (almost imperceptibly) by the wind.
- To read mirage, look through your spotting scope toward your target, then slightly unfocus the resolution - focus instead on the shimmering heat waves. The angle at which the wind is pushing the heat waves tells you wind-speed.

Mirage Wind Doping

- (1) When mirage rises straight up, there's no wind;
- (2) when the mirage tips 60 degrees, you have a light 1 - 3 mph wind; tipping even more, to 45 degrees, means a stronger 4 - 7 mph; and by the time it blows parallel to the earth, it's 8 - 12 mph.

The Unit Circle - Degrees



-
- A circular protractor with a scale from 0 to 360 degrees. Major tick marks are labeled every 10 degrees (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350). Minor tick marks are present every 1 degree. A blue arrow originates from the center of the protractor and points to the 45-degree mark.

Treat distance as 192 Yards.

One more thing...



Hold on to your Ar-15s.
Their magic must be very powerful, or they
wouldn't want them



Questions?

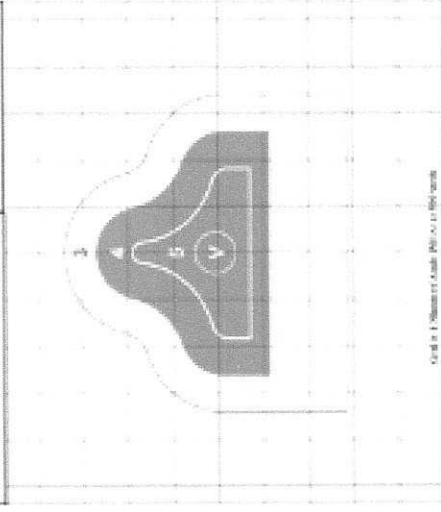
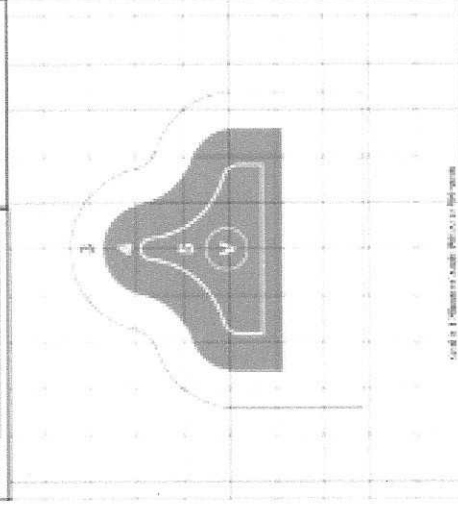
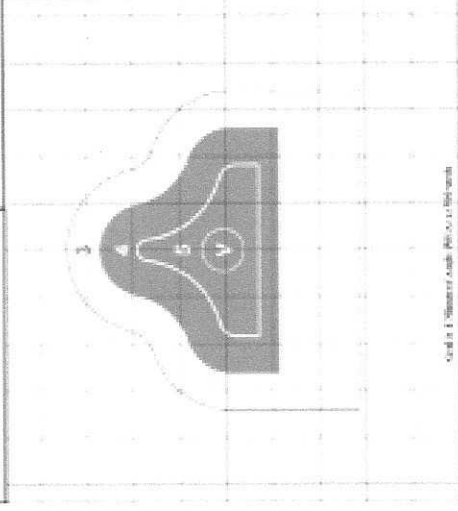


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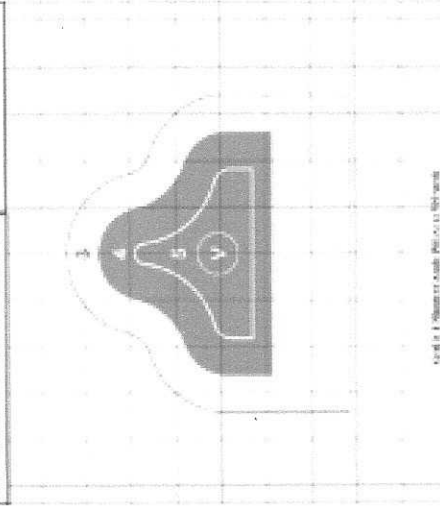
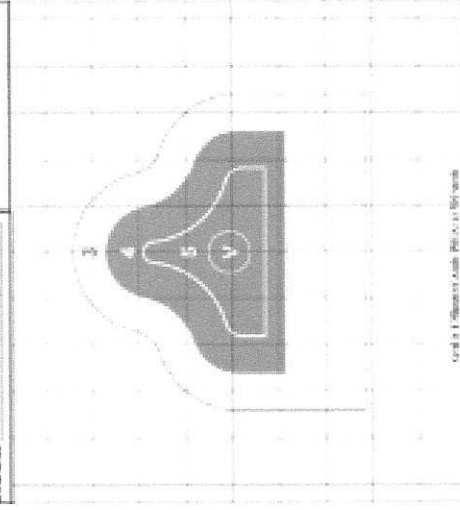
Sheet

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Sheet #

Entity	Time	Knowledge	Percept	Formal	Manager
				9.1	500 "Miles"
Age	20-21	1000 - 1.40	Manager	1000 - 1.40	1000 - 1.40
Place 1 number					
Place 2 number					
Number	1000 - 1.40				
Number	1000 - 1.40				

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