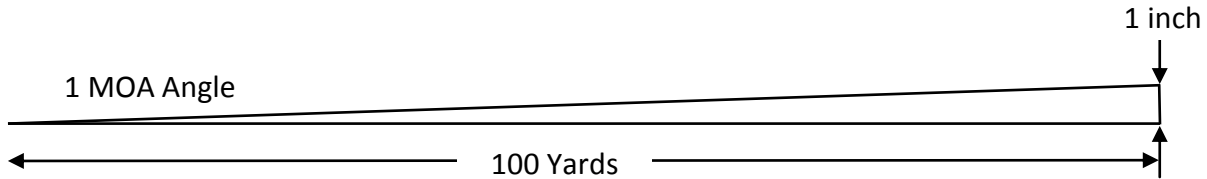


IMC Practice Worksheet

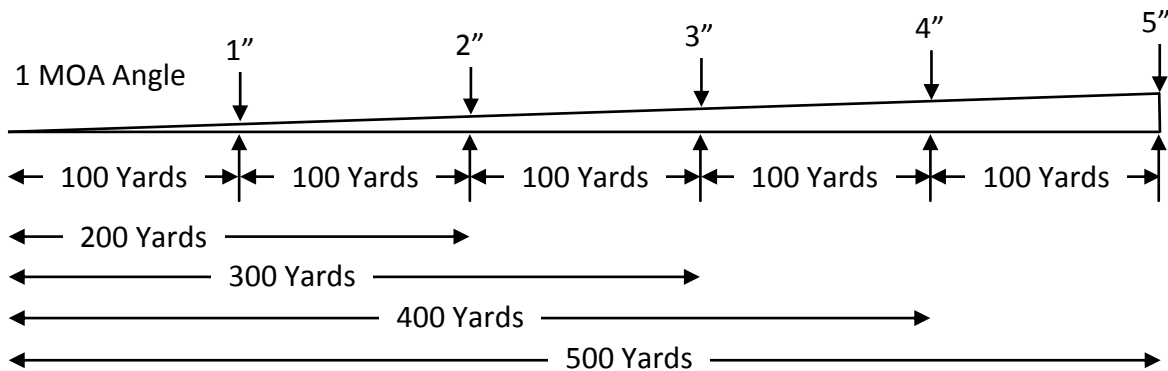
What is MOA and how can we use it?

Definition: One Minute of Angle (MOA) is an angular measurement equal to one 60th of a degree.

If you draw this angle on a right triangle, and make the horizontal leg 100 yards long, the height works out to 1.047". It is still accurate enough for shooting if we round to 1". This gives us units that are convenient to use.



If you multiply the length of one of the legs of a triangle while keeping the angles the same, the other legs will multiply by the same amount. This can be summarized by saying that for the same 1 MOA angle, every 100 yards of range adds an inch to the height covered by that angle.



A shorter way to say this is:

$$1 \text{ MOA} = 1" \text{ per } 100 \text{ yards}$$

To write this out mathematically, note we are looking at how many hundred yards there are (not multiplying range by 100 but dividing range by 100).

$$MOA = \frac{\text{inches}}{(\text{range}/100)} \quad \text{or} \quad MOA = \frac{\text{inches} \times 100}{\text{range}}$$

Applications and Practice:

To find the number of inches that are covered by one MOA at a given range, find how many hundred yards there are. Mathematically this is:

$$\text{Number of inches per 1 MOA} = \frac{\text{range}}{100}$$

Knowns: Range, Angle is 1 MOA

Find: The number of inches on the target

Try it by filling in the blanks:

Range (Yards)	Inches on the Target	MOA
325	3.25"	1
100		1
200		1
300		1
400		1
500		1

$$=325/100$$

$$=100/100$$

Range (Yards)	Inches on the Target	MOA
50		1
25		1
250		1
350		1
1775		1
19		1

To find how many MOA there are for a given range and a given measurement on the target:

First find how many inches are in one MOA at that range (like above), then divide the number of inches on the target by that number of inches in one MOA at that range.

$$\text{Number of MOA} = \frac{\text{inches on the target}}{\text{number of inches per 1 MOA}} = \frac{\text{inches on the target} \times 100}{\text{range}}$$

Knowns: Range, The number of inches on the target

Find: Number of MOA

Try it by filling in the blanks:

Range (Yards)	Inches on the Target	MOA
300	6.75	2.25
200	6	
400	16	
500	15	
200	5	
400	9	

$$=6.75/300/100 = 6.75/3$$

$$=6/200/100 = 6/2$$

To find MOA from a measurement on the target at less than 100 yards:

Remember:

$$\text{Number of MOA} = \frac{\text{inches on the target}}{\text{number of inches per 1 MOA}}$$

While the same math applies for distances less than 100 yards, it is sometimes easier to think about these differently.

Example for 25 yards:

$$\text{Number of inches per 1 MOA} = \frac{\text{range}}{100} = \frac{25}{100} = .25 = \frac{1}{4}$$

Instead of dividing by .25 (or dividing by $\frac{1}{4}$), it is easier to multiply by 4.

Knowns: Range, The number of inches on the target

Find: Number of MOA

Range (Yards)	Inches on the Target	MOA
25	3.25	13
50	4.75	9.5
25	1	
25	3	
25	1.25	
25	2.5	
25	4.5	
50	4	
50	2.5	

$$= 3.25 / (25/100) = 3.25 / (1/4) = 3.25 \times 4$$

$$= 4.75 / (50/100) = 4.75 / (1/2) = 4.75 \times 2$$

$$= 1 / (25/100) = 1 \times 4$$

If you don't know the range, but you can measure the MOA with your sight, and you know the number of inches on the target, we can re-arrange the formula to give us range.

$$\text{number of MOA} = \frac{\text{inches on the target} \times 100}{\text{range}} \quad \Rightarrow \quad \text{range} = \frac{\text{inches on the target} \times 100}{\text{number of MOA}}$$

Putting this into words: the inches on the target divided by the number of MOA tell me how many hundred yards there are to the target.

Try these:

Range (Yards)	Inches on the Target	MOA
300	6	2
	8	2
	12	4
	16	8
	21	7
	20	5

$$= 100 \times 6 / 2$$

One last scenario: What if we know the range, and the number of MOA but we need to know what the measurement will be on the target?

$$\text{number of inches on the target} = \frac{\text{MOA} \times \text{range}}{100}$$

Putting this into words, the number of inches on the target is the number of MOA multiplied by how many hundred yards there are.

Range (Yards)	Inches on the Target	MOA
250	5	2
100		9.5
300		6
500		2
200		4.5
150		4
25		8
25		12
50		6

$$= 2 \times 250 / 100 = 2 \times 2.5$$

$$= 9.5 \times 100 / 100 = 9.5 \times 1$$

Newly learned skills last in your memory up to a week, but if you review a few days after you learn something, then it is much more likely to stick. For extra practice work on these at home.

Range (Yards)	Inches on the Target	MOA
300	6	
200	8	
25	.75	
100	3.5	
400	16	
25	1.5	
500	20	
25	3.25	
50	3.5	
75	4.5	
250	2.5	
400	14	
100	.25	
25	8	
150	6.75	
300	7.5	

Range (Yards)	Inches on the Target	MOA
25		8
400	12	
	3	1
200	5	
	12	4
	9	18
400		4
	15	3
100		1.25
500		5
	42	14
25	2.25	
300		3
	16	4
25		14
300		4.5

Clicks— We look at our target in Inches, riflemen talk about MOA, the rifle adjusts in Clicks. There is one more conversion needed to bring our adjustment from MOA into clicks.

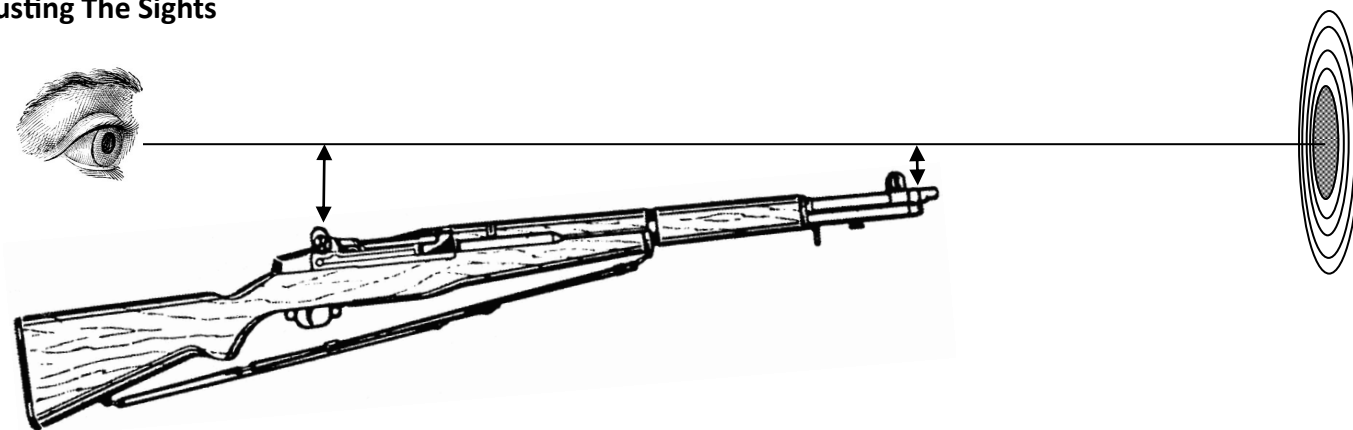
Fill in the blanks:

Correction Needed	Number of Clicks Needed		
	1 MOA per click	1/2 MOA per Click	1/4 MOA per Click
1 MOA	1	2	4
2 MOA			
3 MOA			
4 MOA			
5 MOA			
25 MOA			
2.5 MOA	or		
1.25 MOA		or	
3.75 MOA		or	
Examples of what the label might say:	1 click = 1" @ 100 yards	1 click = 1/2" @ 100 yards 1click = 1" @ 50 yards	1 click = 1/4" @ 100 yards 1/4 MOA per click

Can you come up with examples of sighting systems that use other click values?

- 1/8 MOA per click
- 1/10 milliradian per click (metric scope: approximately 1/3 MOA per click)
- No clicks at all (minute of hammer)
- Odd number that you must round to the nearest useful quantity

Adjusting The Sights



FORS = _____ Sight _____ , _____ Sight _____. This applies to both windage and elevation.

Adjust to move the group onto the target. Is the shooter describing where the rifle is hitting, or the direction it needs to move?

To move the group down on an M-16 A1, you move the front sight post _____.

An M1 Garand is hitting low, the rear sight should be adjusted _____.

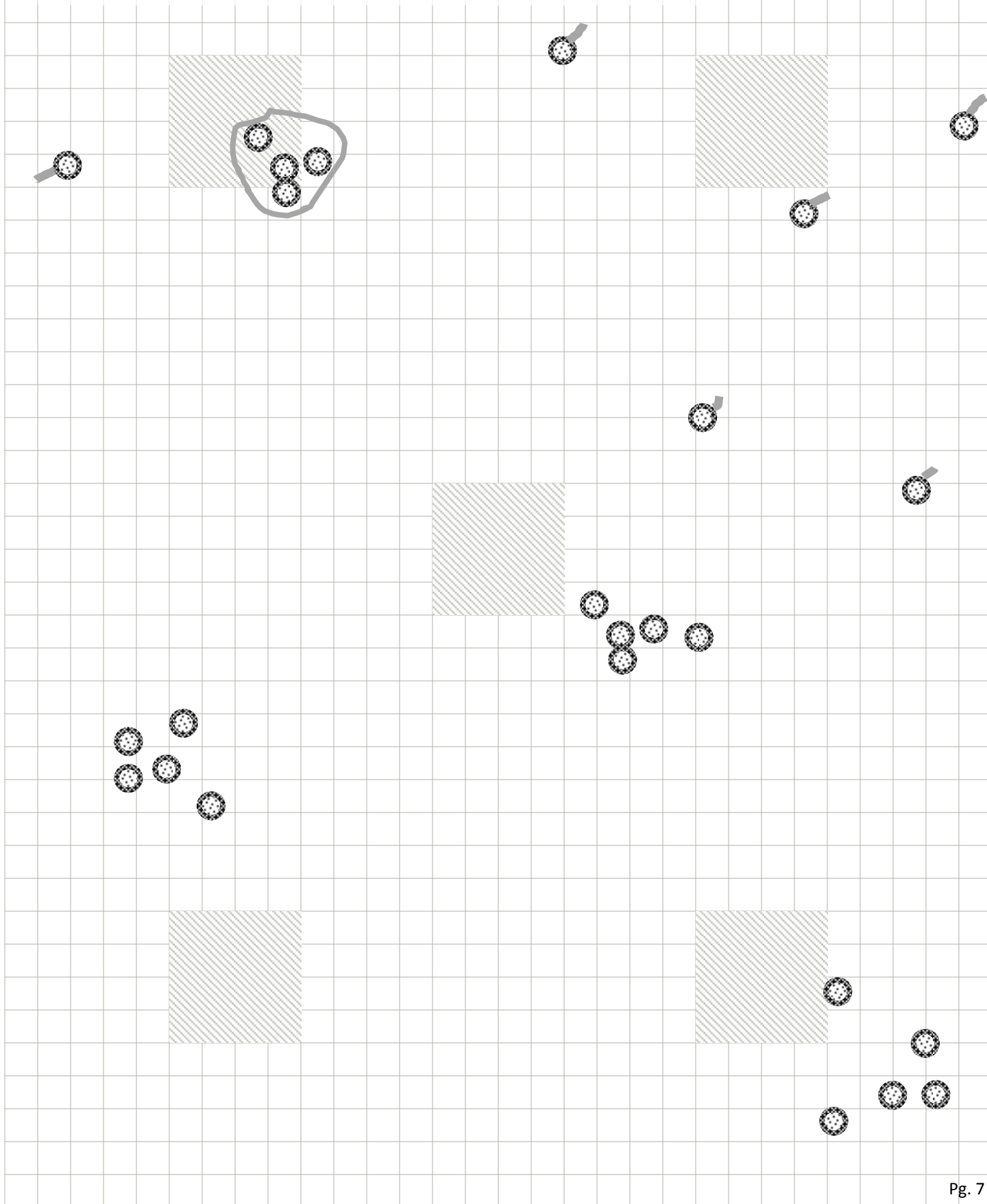
The only windage adjustment on an AK-47 is the front sight, it needs to move right to move the group to the _____.

You can move the rear sight _____ if your group is hitting to the right.

Do IMC for 25 yards with a 1/4 MOA per click scope on the groups below :

Circle groups or mark shots that are too scattered to circle.

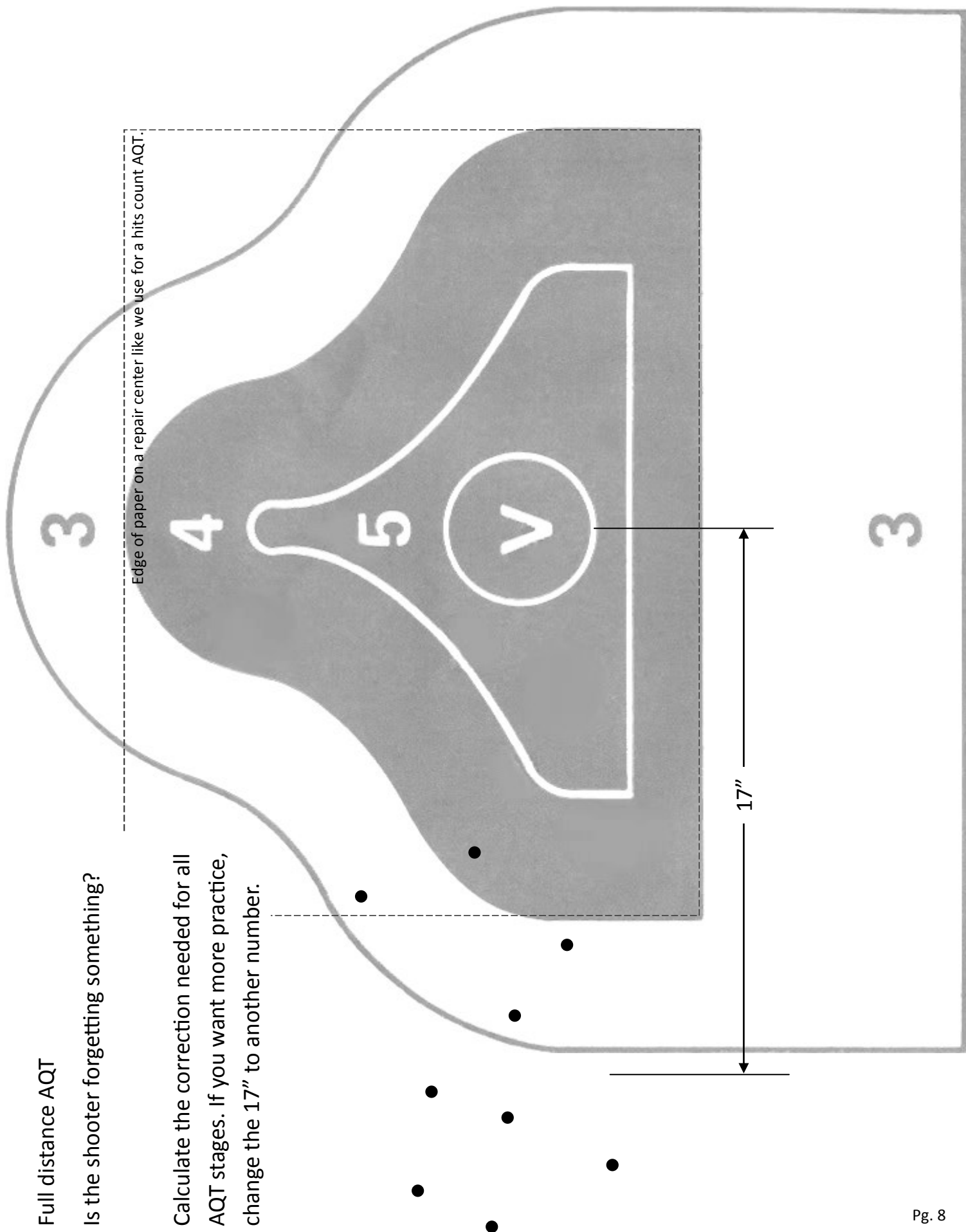
For more practice, turn the paper sideways.



Full distance AQT

Is the shooter forgetting something?

Calculate the correction needed for all AQT stages. If you want more practice, change the 17" to another number.



Answer Key

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Range	Inches	MOA
325	3.25	1
100	1	1
200	2	1
300	3	1
400	4	1
500	5	1

50	1/2	1
25	1/4	1
250	2.5	1
350	3.5	1
1775	17 3/4	1
19	0.19	1

300	6.75	2.25
200	6	3
400	16	4
500	15	3
200	5	2 1/2
400	9	2 1/4

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25	3.25	13
50	4.75	9.5
25	1	4
25	3	12
25	1.25	5
25	2.5	10
25	4.5	18
50	4	8
50	2.5	5

300	6	2
400	8	2
300	12	4
200	16	8
300	21	7
400	20	5

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250	5	2
100	9.5	9.5
300	18	6
500	10	2
200	9	4.5
150	6	4
25	2	8
25	3	12
50	3	6

300	6	2
200	8	4
25	0.75	3
100	3.5	3.5
400	16	4
25	1.5	6
500	20	4
25	3.25	13
50	3.5	7
75	4.5	6
250	2.5	1
400	14	3.5
100	0.25	0.25
25	8	32
150	6.75	4.5
300	7.5	2.5

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25	2	8
400	12	3
300	3	1
200	5	2.5
300	12	4
50	9	18
400	16	4
500	15	3
100	1.25	1.25
500	25	5
300	42	14
25	2.25	9
300	9	3
400	16	4
25	3.5	14
300	13.5	4.5

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	1 MOA clicks	1/2 MOA Clicks	1/4 MOA Clicks
1 MOA	1	2	4
2 MOA	2	4	8
3 MOA	3	6	12
4 MOA	4	8	16
5 MOA	5	10	20
25 MOA	25	50	100
2.5 MOA	2 or 3	5	10
1.25 MOA	1	2 or 3	5
3.75 MOA	4	7 or 8	15

Page 6 FORS = Front Sight Opposite, Rear Sight Same.

To move the group down on an M-16 A1, you move the front sight post up.

An M1 Garand is hitting low, the rear sight should be adjusted up.

The only windage adjustment on an AK-47 is the front sight, it needs to move right to move the group to the left.

You can move the rear sight left if your group is hitting to the right.

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Group 1 (center), 10 up, 16 left

Group 2 (upper left), ignore marked flyer, 5 up, 6 left

Group 3 (upper right), ask shooter which square they were aiming at, make rough correction if it was not this square, practice steady hold factors and six steps.

Group 4 (lower left), 26 down, 8 right

Group 5 (lower right), 12 up, 15 left

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@100y=17MOA / @200=8.5MOA / @300=approx 5.75MOA / @400=4.25MOA

This could be a missed wind call, an inaccurate windage zero, or a lot of other things. Discuss with the shooter.