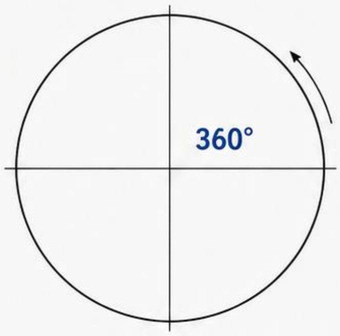
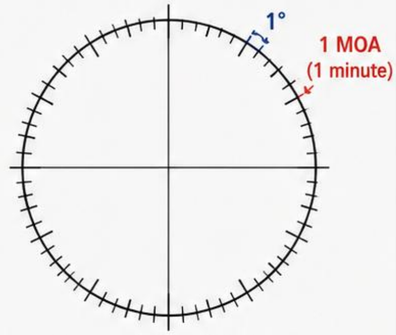
1. A FULL CIRCLE IS 360°



A complete circle contains 360 degrees.

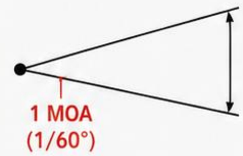
2. EACH DEGREE HAS 60 MINUTES



1 degree (1°) is divided into 60 minutes of angle.

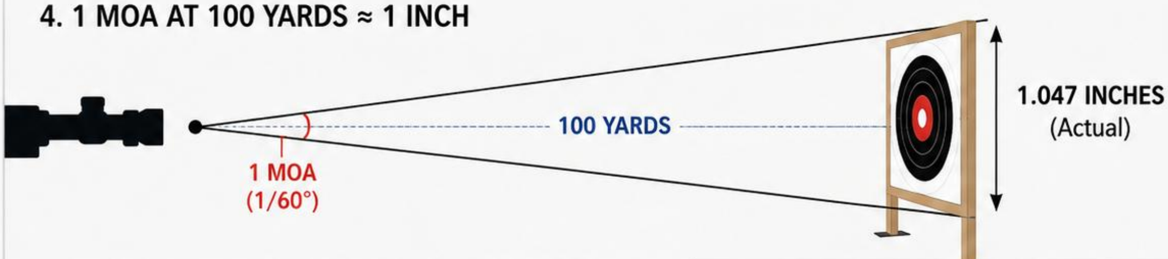
1 MOA = 1 minute of angle = 1/60°

3. WHAT IS A MINUTE OF ANGLE?



This small angle subtends a certain size at a given distance.

4. 1 MOA AT 100 YARDS ≈ 1 INCH



At 100 yards, an angle of 1 MOA subtends 1.047 inches.
For practical purposes in shooting, we say:

1 MOA ≈ 1 inch at 100 yards

Why 1.047 inches?

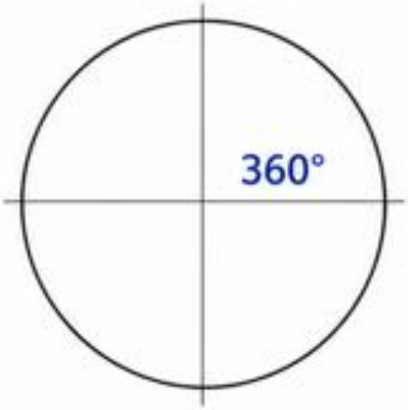
$1 \text{ MOA} = 1/60° = \pi / 10800$ radians
Arc size = distance × angle (in radians)
At 100 yards = 3600 inches:
$3600 \times (\pi / 10800) = \pi / 3 = 1.047$ inches

HOW IT SCALES (approximate)

Distance	1 MOA subtends
100 yards	≈ 1 inch
200 yards	≈ 2 inches
300 yards	≈ 3 inches
500 yards	≈ 5 inches
1000 yards	≈ 10 inches

(More precisely: 1 MOA = 1.047″ at 100 yards
so at any distance: Size (inches) ≈ 1.047 × (yards / 100))

1. A full circle is 360°



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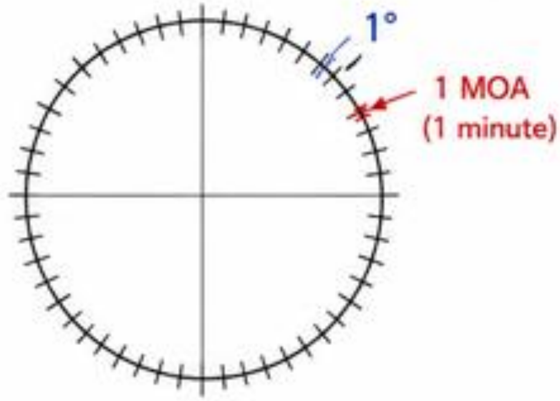


Why arc length ≈ distance × angle (radians)

On a circle of radius r, an angle θ (in radians) subtends an arc length s.

By definition of radian:

$$\boxed{\theta \text{ (radians)} = \frac{\text{arc length } s}{\text{radius } r}}$$

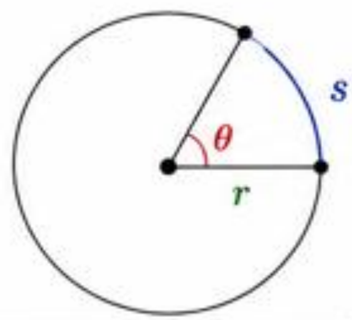
Rearranging gives the exact relationship:

$$s = r\theta$$

For very small angles, the arc is almost a straight line (the chord), so $s \approx$ straight-line opposite, and using $d = r$ (distance to target):

$$\boxed{s \approx d\,\theta}$$

(small-angle approximation)



Example:
If $\theta = 1$ radian, then $s = r$. One radian is the angle that cuts off an arc equal in length to the radius.

3. 1 MOA in degrees and radians

$$1 \text{ MOA} = 1 \text{ minute} = \frac{1}{60}\,^{\circ}$$

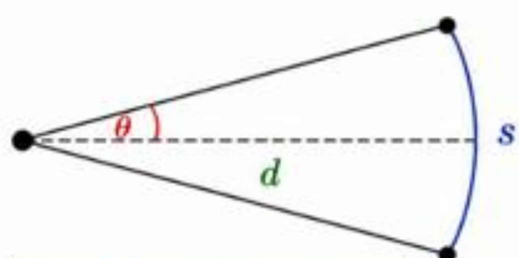
$$1 \text{ degree} = \frac{\pi}{180} \text{ rad}$$

Therefore,

$$1 \text{ MOA} = \frac{1}{60} \times \frac{\pi}{180}$$

$$= \frac{\pi}{10800} \text{ rad}$$

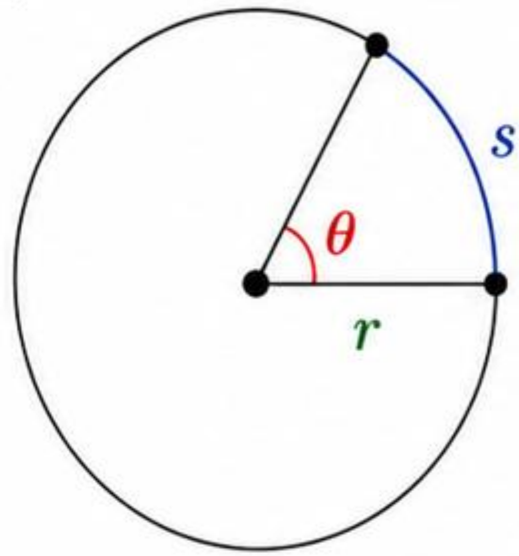
4. Small-angle relationship



When θ is small (in radians), arc length $s \approx d \times \theta$

WHY ARC LENGTH ≈ DISTANCE × ANGLE (RADIANS)

On a circle of radius r, an angle θ (in radians) subtends an arc length s.



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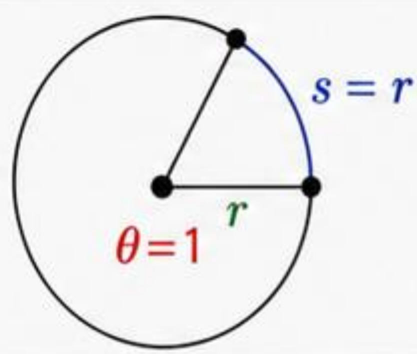


APPLY TO 1 MOA AT 100 YARDS

Angle:

$$\boxed{1 \text{ MOA} = \frac{\pi}{10800} \text{ radians}}$$

Distance:

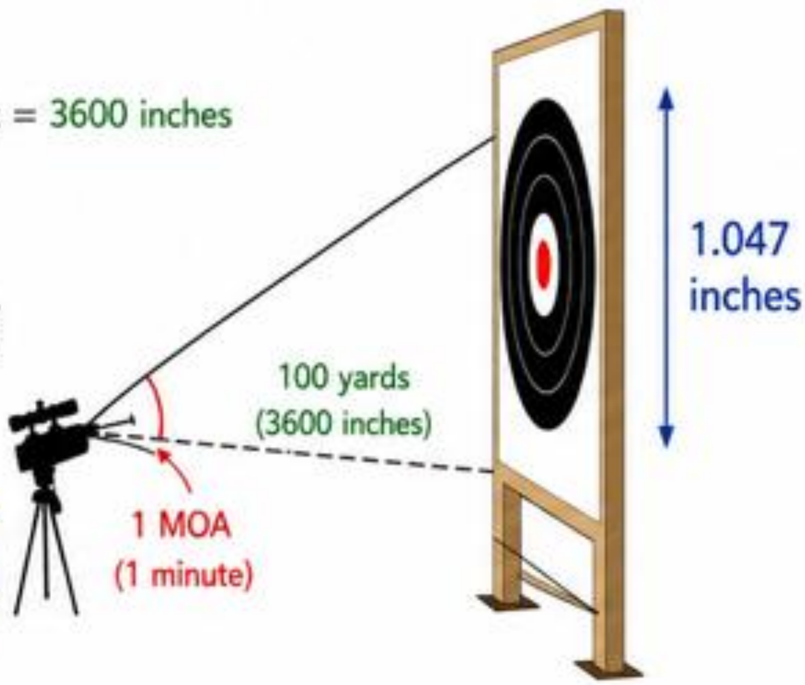
100 yards = 300 feet = 3600 inches

Using $s \approx d\theta$:

$$s \approx 3600 \times \frac{\pi}{10800}$$

$$= \frac{\pi}{3}$$

$$\boxed{= 1.047 \text{ inches}}$$



HOW IT SCALES (Approximately)

Distance (yards):	100	200	300	500	1000
Size for 1 MOA (inches):	1.047"	2.094"	3.141"	5.236"	10.47"

Shooter's Rule of Thumb:

1 MOA ≈ 1 inch at 100 yards

≈ 2 inches at 200 yards

≈ 3 inches at 300 yards

≈ 10 inches at 1000 yards

MOA is very close to 1 inch at 100 yards — more exactly **1.047 inches at 100 yards**.

Step-by-step derivation

A circle has: $360°$

Each degree has: 60 minutes

So one minute of angle is: $1\ \text{MOA} = \frac{1}{60}°$

Convert that angle to radians: $1° = \frac{\pi}{180}$

So: $1\ \text{MOA} = \frac{1}{60} \cdot \frac{\pi}{180} = \frac{\pi}{10800}$ radians

Now use the small-angle relationship: arc length $\approx$ distance $\times$ angle in radians

At 100 yards: $100\ \text{yd} = 300\ \text{ft} = 3600\ \text{inches}$

So: $3600 \times \frac{\pi}{10800} = \frac{\pi}{3}\ = 1.047\ \text{inches}$

So: $1\ \text{MOA at } 100\ \text{yd} = 1.047''$

For practical shooting: $1\ \text{MOA} \approx 1''$ at 100 yd

Then it scales linearly:

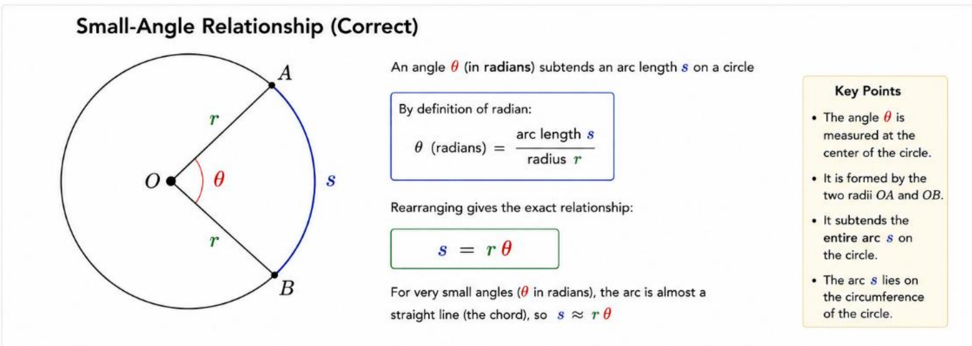
$$1\ \text{MOA} \approx 2''\ \text{at } 200\ \text{yd}$$
$$1\ \text{MOA} \approx 3''\ \text{at } 300\ \text{yd}$$
$$1\ \text{MOA} \approx 10''\ \text{at } 1000\ \text{yd}$$

More exact: $1.047'' \times \frac{\text{yards}}{100}$

So the teaching phrase is:

A minute of angle is an angular measurement. At 100 yards, that angle subtends about 1 inch. At 200 yards, about 2 inches. At 300 yards, about 3 inches.

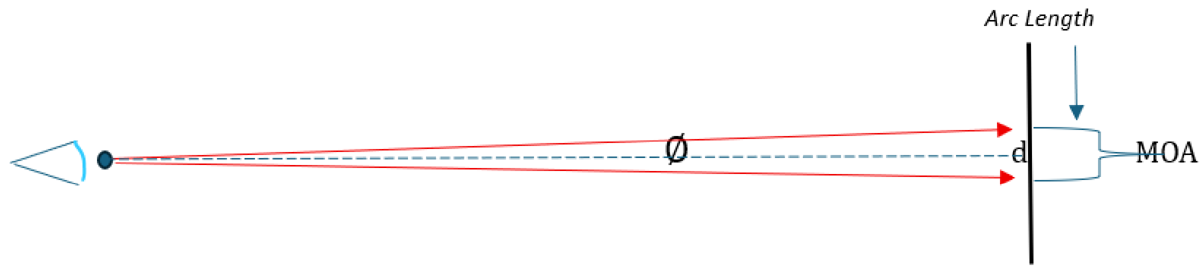
Angle subtends = “spread” in inches.



The exact geometry is $s = r\theta$. Because a minute of angle is so small, the arc, the chord, and the straight-line spread on the target are effectively identical, allowing us to replace the radius with the shooting distance and write

$$\boxed{L \approx d\theta.}$$

It shows that **MOA is not inherently a shooting concept—it is pure circle geometry.** Shooting simply exploits the fact that the angle is so small that the exact circular geometry becomes indistinguishable from ordinary straight-line geometry.



Blue dotted line is "Line of Sight" = distance(d) to target.

The Limbs (red) of Ø subtend a distance (arc length) at the target – "MOA" – usually measured in inches. MOA measured in inches is the "spread" at that distance.

Because the angle of Ø is so small, the limbs ~ = d.

This allows the calculation to approximate the MOA (Arc) length.

Arc Length = d x Ø*(radians).*

The Arc is also so small that it can be estimated as a straight line.

By convention, Arc Length/MOA is calculated in inches.

1 MOA ~ = 1.047" at 100 yds (That is the "spread" in inches at 100 yds).