BY - “WAAF”

https://www.rekeninstrumenten.nl/workshop/Brian1/index.htm

https://www.computerhistory.org/revolution/calculators/1/44/156

During World War II, British Women's Auxiliary Air Force (WAAF) personnel used large circular slide rules to calculate bomber routes, undertake meteorological forecasting, and plot aircraft positions. 01.01.1940

ATS Kinetheodolite Operators

At an experimental gunnery camp ATS girls do very secret work operating kinetheodolite instruments. These instruments record on a photographic file the burst of AA. Shells. From the photographs they obtain, calculations are made as to the effect of the firing by the gunners. These girls who are good draughtswomen are useful for making slide rules and other A.A. equipment for experiments.

ATS: British Army Auxiliary Territorial Service

Pte. Kathleen Lavery, one-time art student of Pinner, London, designing a special plotter. Kathleen's sister Joan is also in the ATS as a radio mechanic.

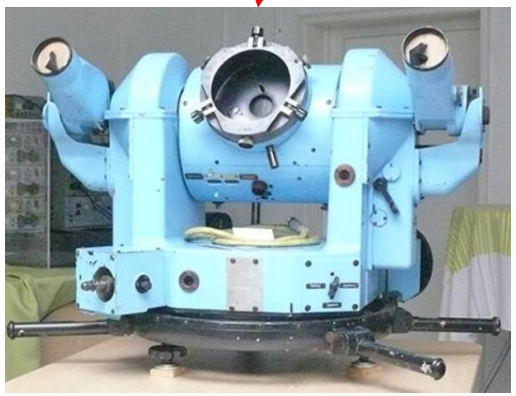
Manorbier.
Taken by Lt. Taylor. 10.10.42

https://www.iwm.org.uk/collections/item/object/205496879

ATS check A.A. Gunfire Accuracy

By means of the **evaluator** (left) which contains the film, and a slide rule, the accuracy of the anti-aircraft fire can be worked out.

Using a **kine-theodolite**, (an instrument which records, on a photographic film, the bursts of A.A. shells), members of the ATS are checking up on the accuracy of the firing of A.A. batteries. From the photographs they obtain, **calculations** are made as to the effect of the firing by the gunners. The whole process of recording is carried out by the ATS.



https://www.cdvandt.org/Askania-Kinotheodolit-11-9'21-1.jpg

At A.A. Training School at Manobier
Taken by Mr. Taylor 29.10.40

https://www.iwm.org.uk/collections/item/object/205474321

https://www.iwm.org.uk/collections/item/object/205496894

ATS
Kinetheodolite operator pupils under instruction. Sgt. Major Bain, the only woman NCO gunnery instructor, shows the class how to work a slide rule.

Manorbier. Lt. Taylor. 10.10.42

Slide Rule for Kine-Theodolite, Mk. 1.

https://www.finn.no/recommerce/forsale/item/475337484

This was used to manually calculate the precise position, altitude and trajectory of experimental rockets, early missiles or anti-aircraft fire. By cross-referencing synchronized angles (Azimuth, Elevation and Apex Angle) photographed on 35mm film from two separate "Kine-Theodolite" camera stations on the ground, this disc solved trigonometric equations.

This is a specially ordered instrument made in a very limited edition for defence and aerospace.

Details and condition:

Materials: Heavy-duty 6-spoke machined aluminium wheel, solid brass radial cursor, and finely engraved logarithmic and trigonometric scales.

Box: Delivered in its original, heavy wooden transport case with brass fittings and solid carrying handle.

Documentation: The original instruction sheet (blueprint/scheme) is glued to the inside of the lid ("Instructions for Setting Base Length"), complete with technical diagram and step-by-step explanation in English.

Condition: The instrument is in fantastically beautiful and authentic condition. The metal has a lovely, original age patina without deep corrosion. All numbers and graduations are perfectly sharp and fully legible. The wooden case is rock solid with normal, charming wear and tear from military service.

INDEX MARK
INSTRUCTIONS FOR SETTING BOX LENGTH
WITH SCREWDRIVER.
SET REQUIRED BASE LENGTH IN
BASE LENGTH SCALE TO INDEX
FACE OF RULE
WHEN REPLACING THE RULE
IN CASE, CARE MUST BE TAKEN
TO HOLD CURSUR ARM IN THE
LOOSE FITTING WHICH IS
SECURED BY THE TURNBUTTON
UNDERSIDE VIEW OF RULE
RULE SLIDE, KINE THEO. SLITE, MK.1

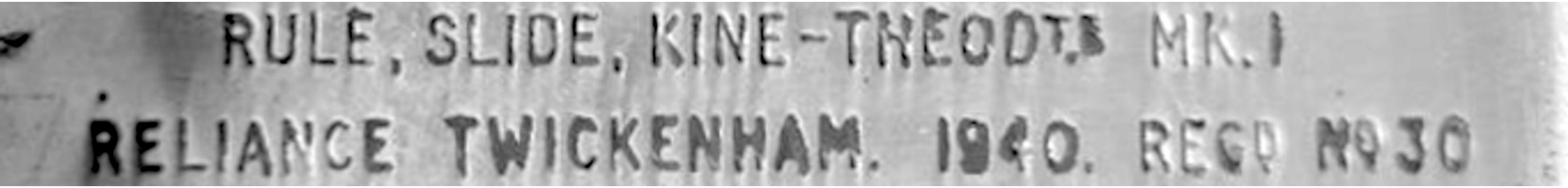
SET BASE
SET CURSOR TO BASE ANGLE
SET APEX ANGLE TO BASE ANGLE
SET CURSOR TO ANGLE OF SIGHT
READ HEIGHT AGAINST ANGLE OF SIGHT
RULE, SLIDE, NINE-THEODOLITE MK I
RELIANCE TWICKENHAM 1943 REV. MK.3D
HEIGHT FEET
BASE ANGLE
APEX ANGLE
ANGLE OF SIGHT

SET BASE
SET CURSOR TO BASE ANGLE
SET APEX ANGLE TO BASE ANGLE
SET CURSOR TO ANGLE OF SIGHT
READ HEIGHT AGAINST ANGLE OF SIGHT

SET RATE TO BASE ANGLE
SET CURSOR TO BASE ANGLE
SET APEX ANGLE TO BASE ANGLE
SET CURSOR TO ANGLE OF RIGHT
HEAD HEIGHT AGAINST ANGLE OF SIGHT
ANGLE OF SIGHT
APEX ANGLE

HEIGHT

The Manufacturer



[Google AI]
Reliance of Twickenham is a vintage British manufacturer known for producing small technical instruments, drafting tools, rulers, protractors, and automotive/dashboard badges (such as for Morris vehicles) during the mid-20th century (c. 1920s to 1940s).

[Perplexity AI]
Reliance Nameplates Ltd. was a company active by the 1920s. “Reliance, Twickenham” was an abbreviated product mark used during the firm’s operation.

1920s: Reliance Nameplates Ltd was reportedly already a major British maker of celluloid-acetate transport tokens.
1940: “Reliance, Twickenham” appears on a reported dated protractor.
1946: A dated trade item uses **“Reliance (Nameplates) Ltd, Richmond Bridge Works, Twickenham, Middlesex.**
1948: A source on British transport tokens reports a factory fire, followed by a move to new premises.
1953: Both the British Museum and a contemporary legal report use formal Reliance Nameplates styles.
1981: The London Gazette still lists **Reliance Nameplates Ltd** at Richmond Bridge Works, Cambridge Road, Twickenham.

The Structure

Radial Cursor
with Glass and Black Hairline

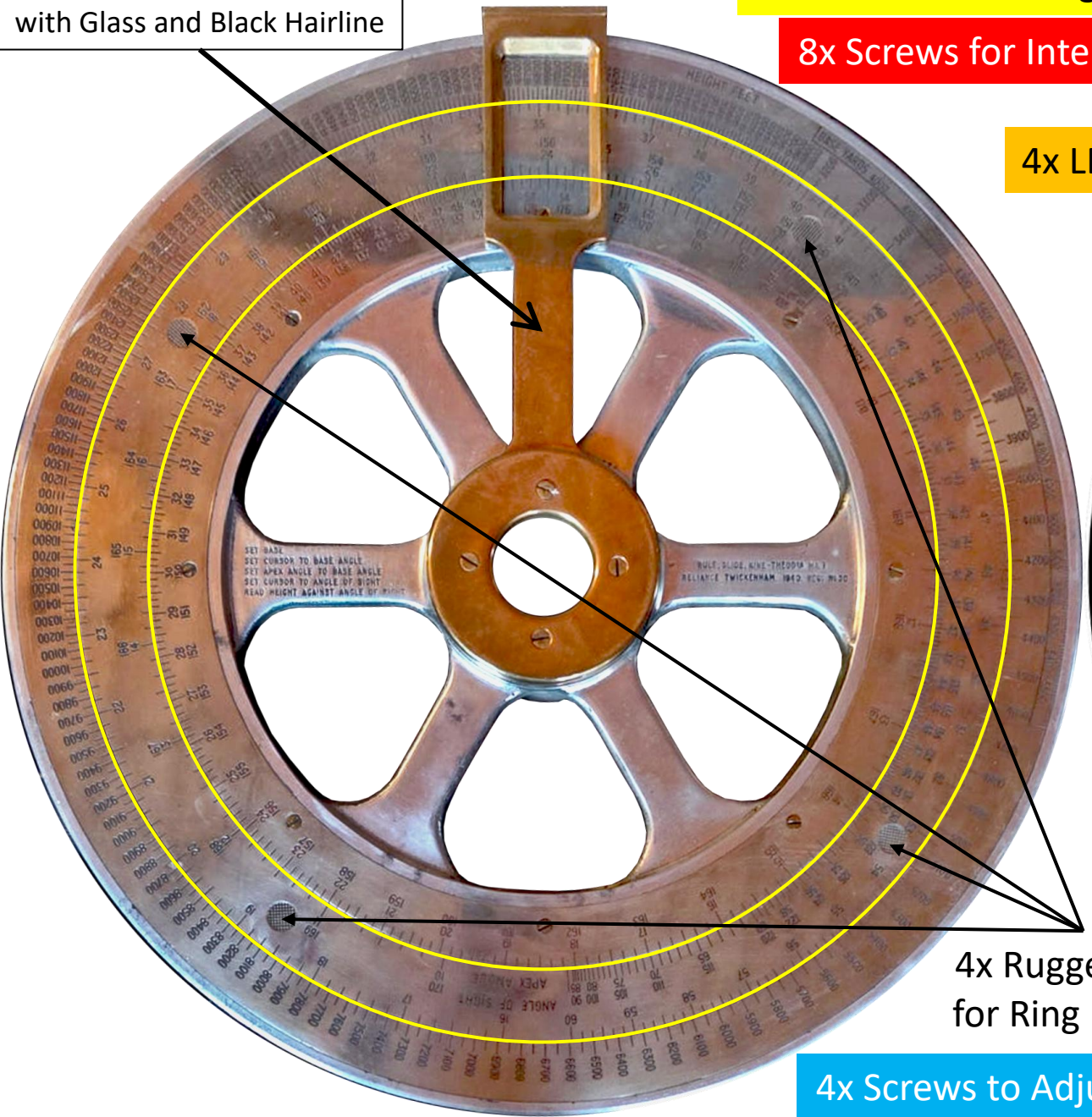
TOP SIDE

Inner Ring Fixed, Middle Ring Movable,
Exterior Ring Adjustable

8x Screws for Interior Ring Fixation

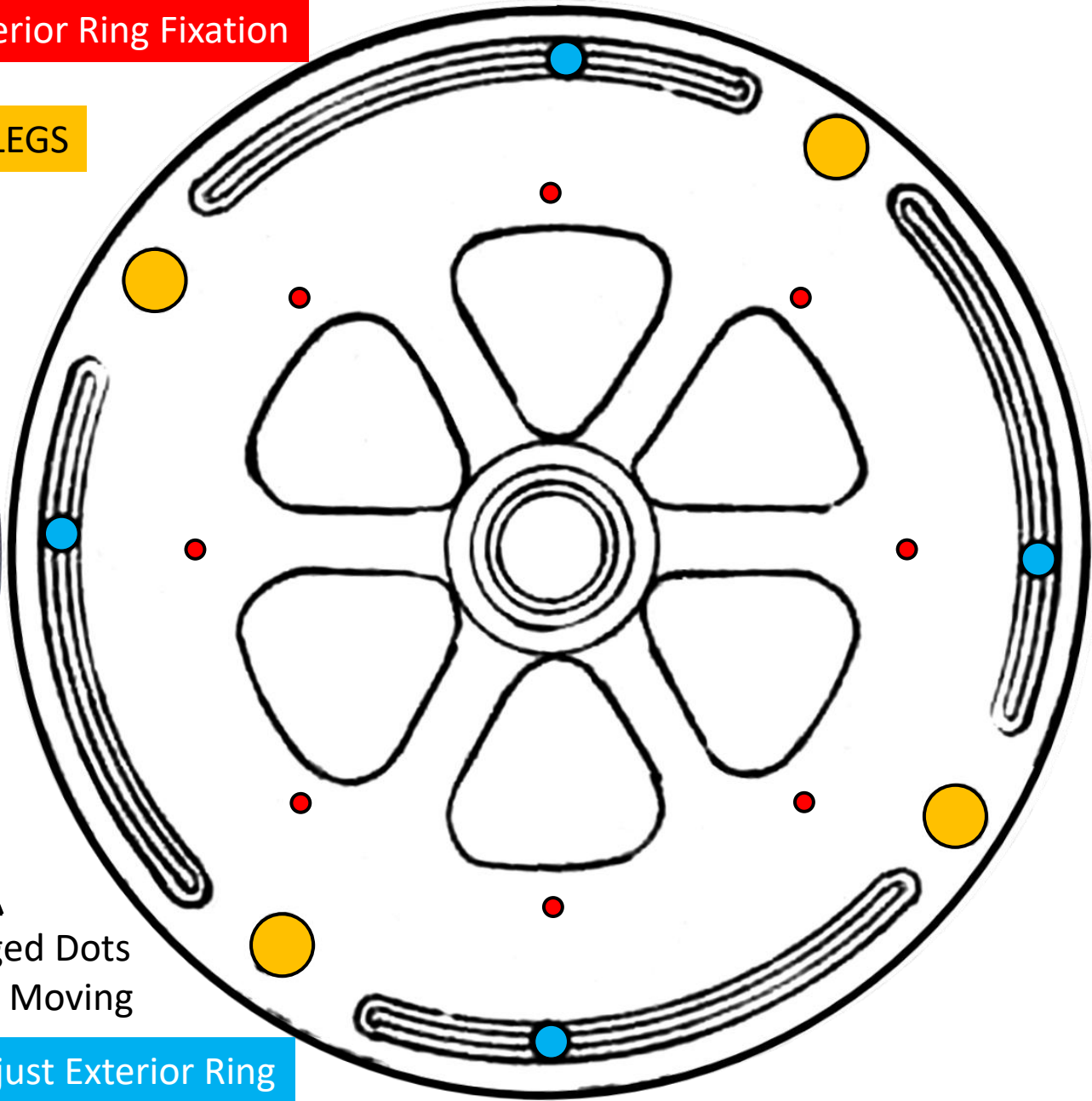
4x LEGS

BOTTOM SIDE



4x Rugged Dots
for Ring Moving

4x Screws to Adjust Exterior Ring



Operating Instructions

Before Operation (setting Base Length)

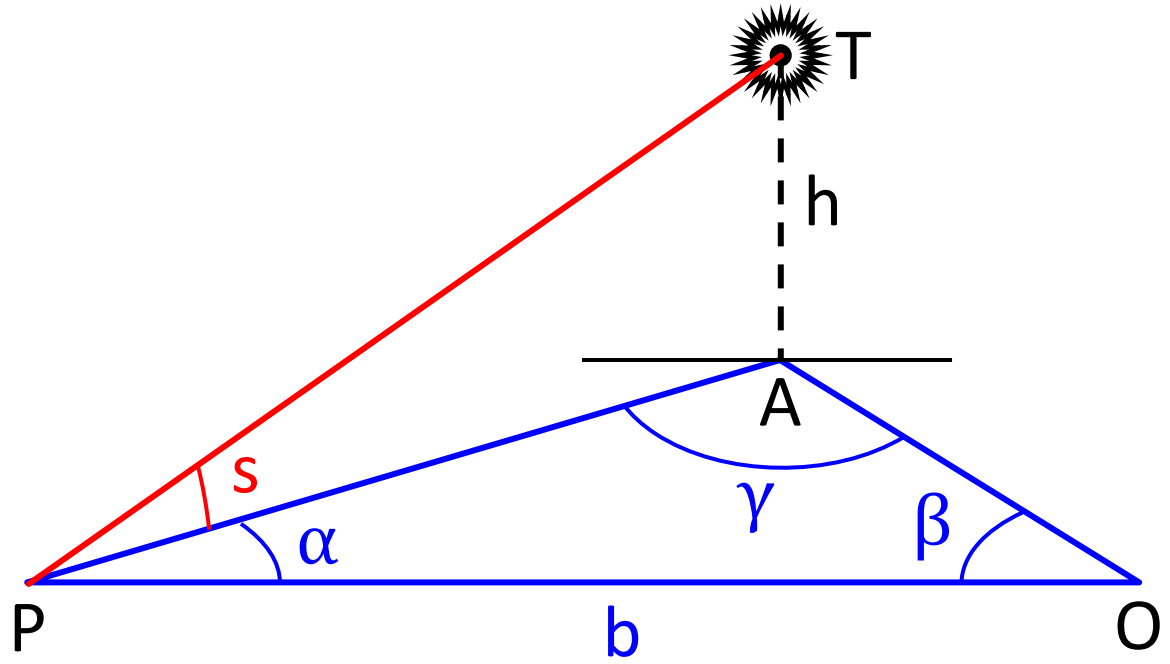
- Loosen 4 nuts on underside of rule with screwdriver.
- Set required Base Length, in yards, on Base Yards scale, to Index Mark on the face of the rule.
- Reclasp the screws.

To Calculate:

- (Set Base Length)
- Set Cursor to Base angle
- Set Apex angle to Base angle
- Set cursor to angle of Sight
- Read Height against angle of Sight

(When **replacing the rule in case**, care must be taken to hold cursor arm in the loose fitting which is secured by the turn button).

The Problem to Calculate



- P and O are the two observation posts, with known length between posts, **b** = PO ("**Base Length**" in yards).
- **A** (**Apex**) is the target position as projected onto the horizontal plane.
- **α** and **β** are the P and O **Base Angles**, measured between the baseline and the horizontal directions to the target apex.
- **γ** is the **Apex Angle** between those two horizontal directions at the target ground projection.
- **s** is the **Angle of Sight** (elevation above the horizontal) from P to the target.
- **h** is the target's **Height** above the observers' level (in feet).

$$\frac{PA}{\sin(\beta)} = \frac{b}{\sin(\gamma)} \Rightarrow PA = b\frac{\sin(\beta)}{\sin(\gamma)}$$

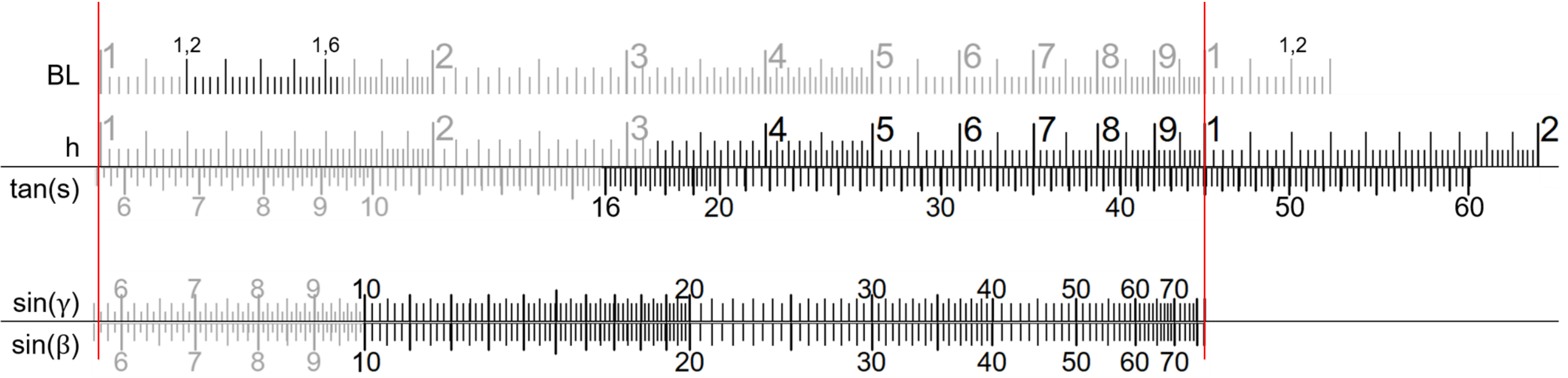
$$tan(s) = \frac{TA}{PA} \Rightarrow h = TA = PA \cdot \tan(s) \Rightarrow \boxed{h = b \cdot \frac{\sin(\beta)}{\sin(\gamma)} \cdot \tan(s)} \Rightarrow \frac{h/b}{\tan(s)} = \frac{\sin(\beta)}{\sin(\gamma)}$$, it is the formula to use

The Scales

Name	Symbol	Range	Logarithmic Scale Type
Base Yards	BL	4.000 to 5.500 yards	numbers
Base Angle	β	10º to 90º	sines
Apex Angle	γ	10º to 90º	sines
Angle of Sight	s	16º to 60º	tangents
Height Feet	h	3.200 to 20.000 feet	numbers

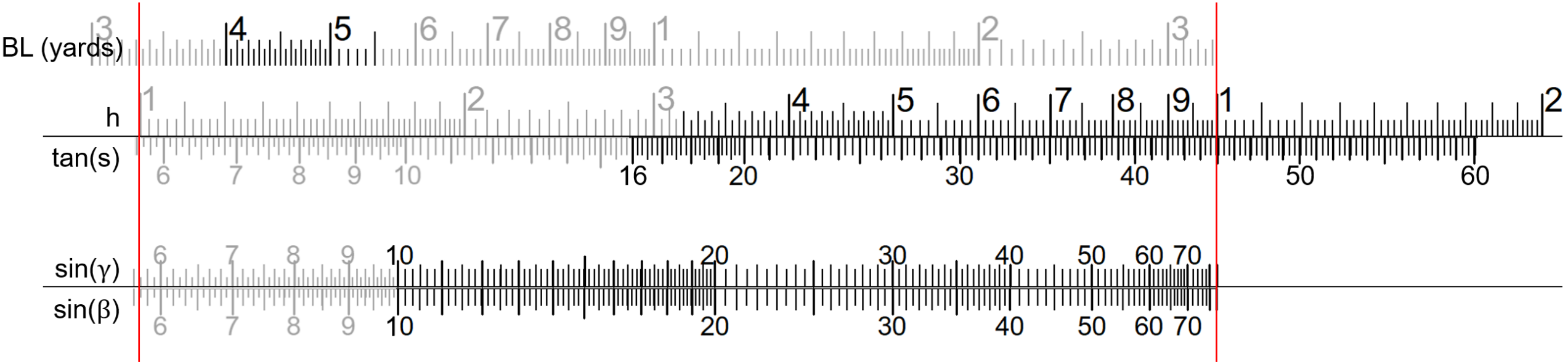
(12.000 to 16.500 feet)

The Graphic Scales Setting:

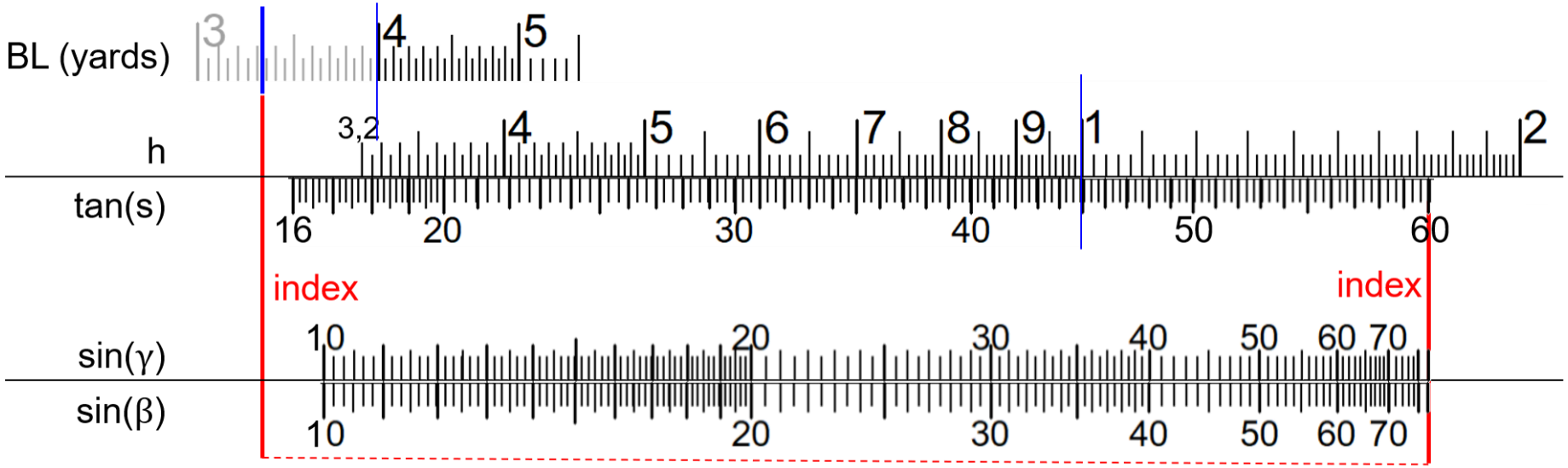


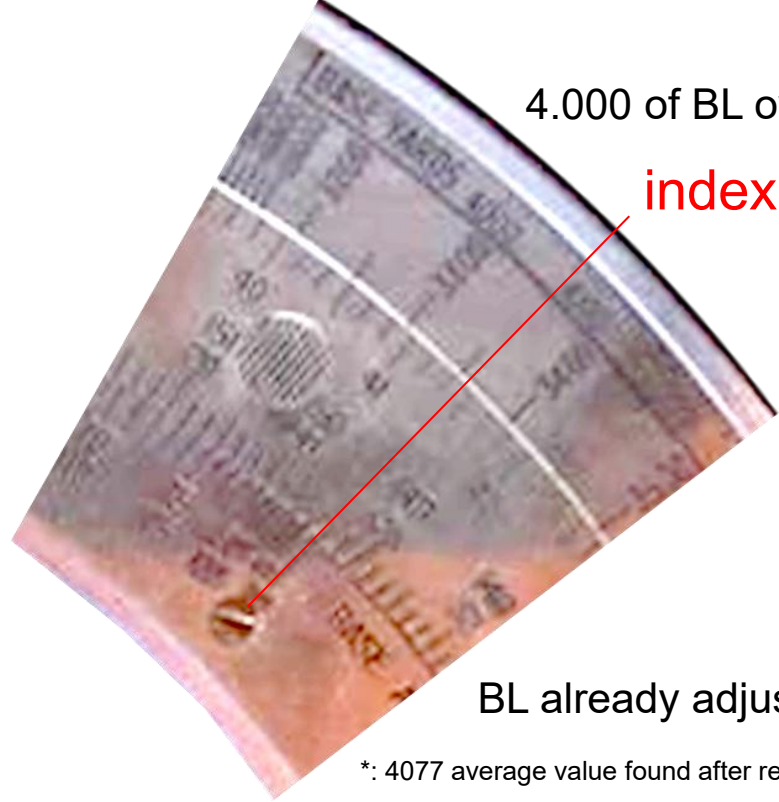
The Scales

Base Length into Yards:



To set the scales in the disc (the required segments): **1-** blank space may be reduced so that 2 in “h” is near to 3,2. **2-** Exterior-edge scales may be moved left to set 60º of tan(s) over 90º of sin(γ). **3-** BL may be moved right to fit its index with 90º of sin(β).



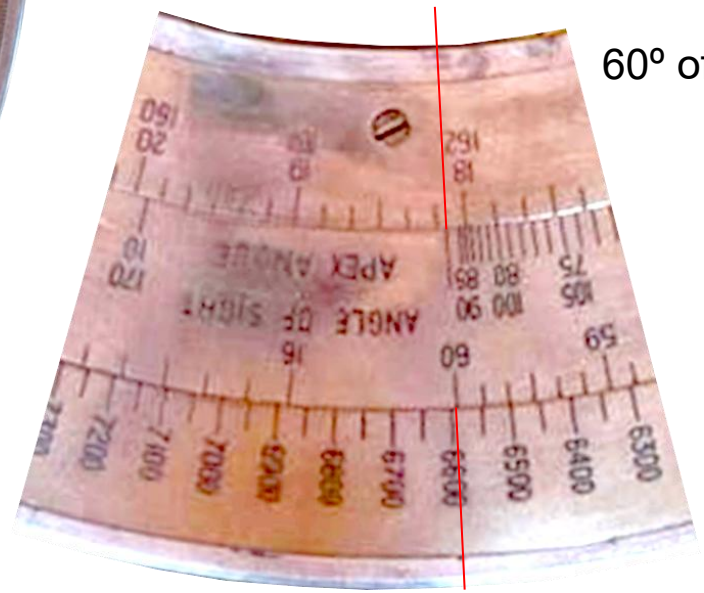


4.000 of BL over ~3.300 of h

index

BL already adjusted to ~4077*

*: 4077 average value found after reading 8 settings in the disc



60º of tan(s) over 90º of sin(γ)