

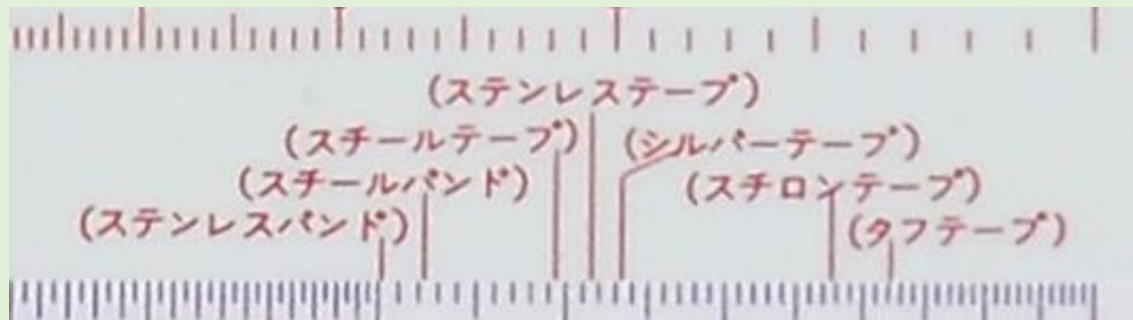
# YAMAYO Measuring Slide Rule



 **YAMAYO** MEASURING TOOLS CO.,LTD.

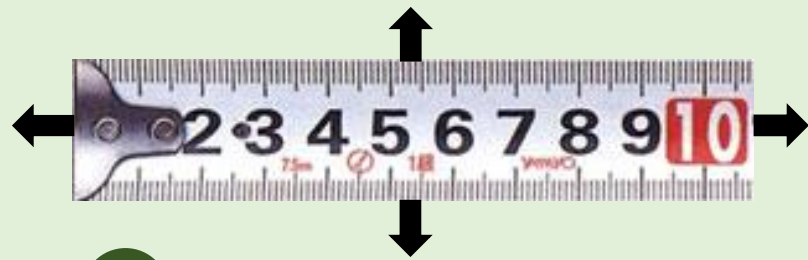


# The Products



(ステンレステープ)	(Stainless tape)
(ステンレスバンド)	(Stainless band)
(スチールテープ)	(Steel tape)
(スチールバンド)	(Steel band)
(シルバーテープ)	(Silver tape)
(タフテープ)	(Tough tape)
(スチロンテープ)	(Stylon tape)

# Measuring...

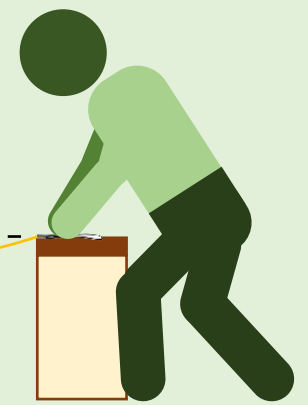


Temperature



Tension

Nominal Conditions: 20 °C, 2 kgf  
(10 kgf)



↓ Weight

# Temperature - Ct


$$Ct = L \cdot Kt \cdot (T - T_0) \text{ (result in mm)}$$


L = measured length (m)

T = measured temperature (°C)

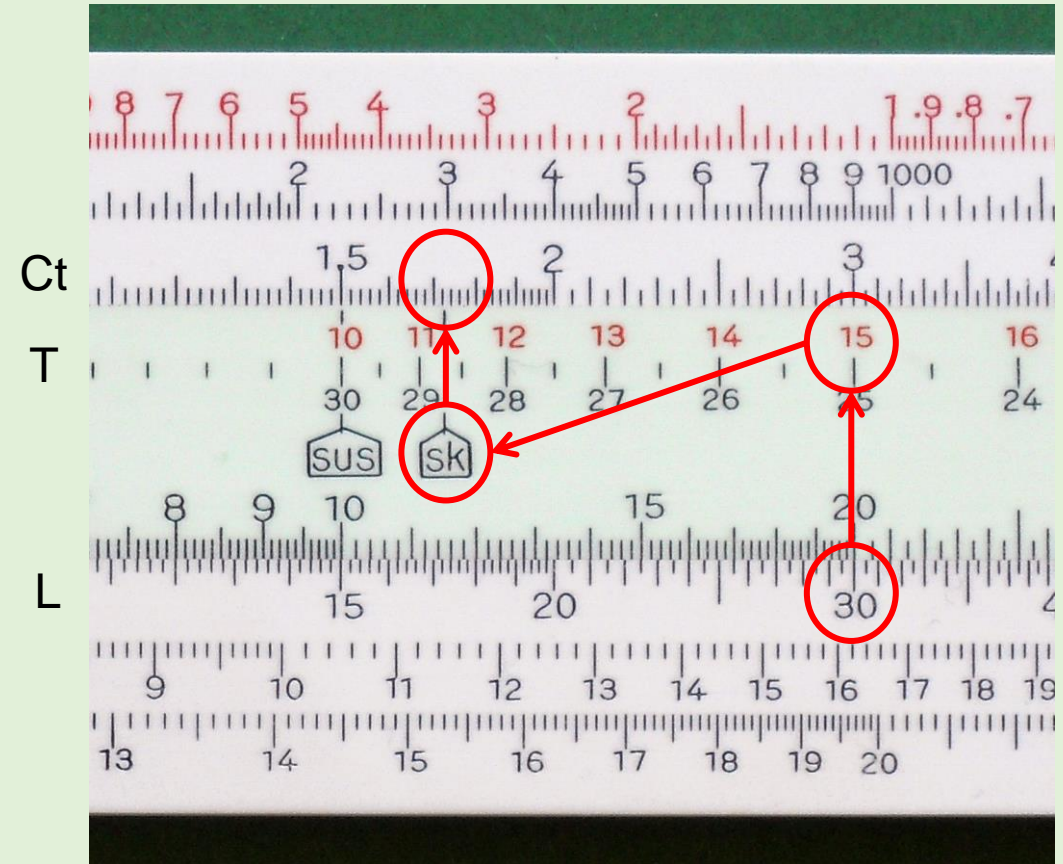
T<sub>0</sub> = nominal temperature (20 °C)

Kt = tape temperature coefficient (mm/m·°C)

 Stainless Steel Kt

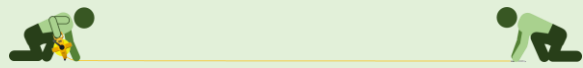
 Steel Kt

Rear side, scales “L”, “T” and “± Ct mm”



Reading of 30 m at 15 °C with steel tape?

# Tension - Cp



$$Cp = L \cdot Kp \cdot (P - P_0) \text{ (result in mm)}$$

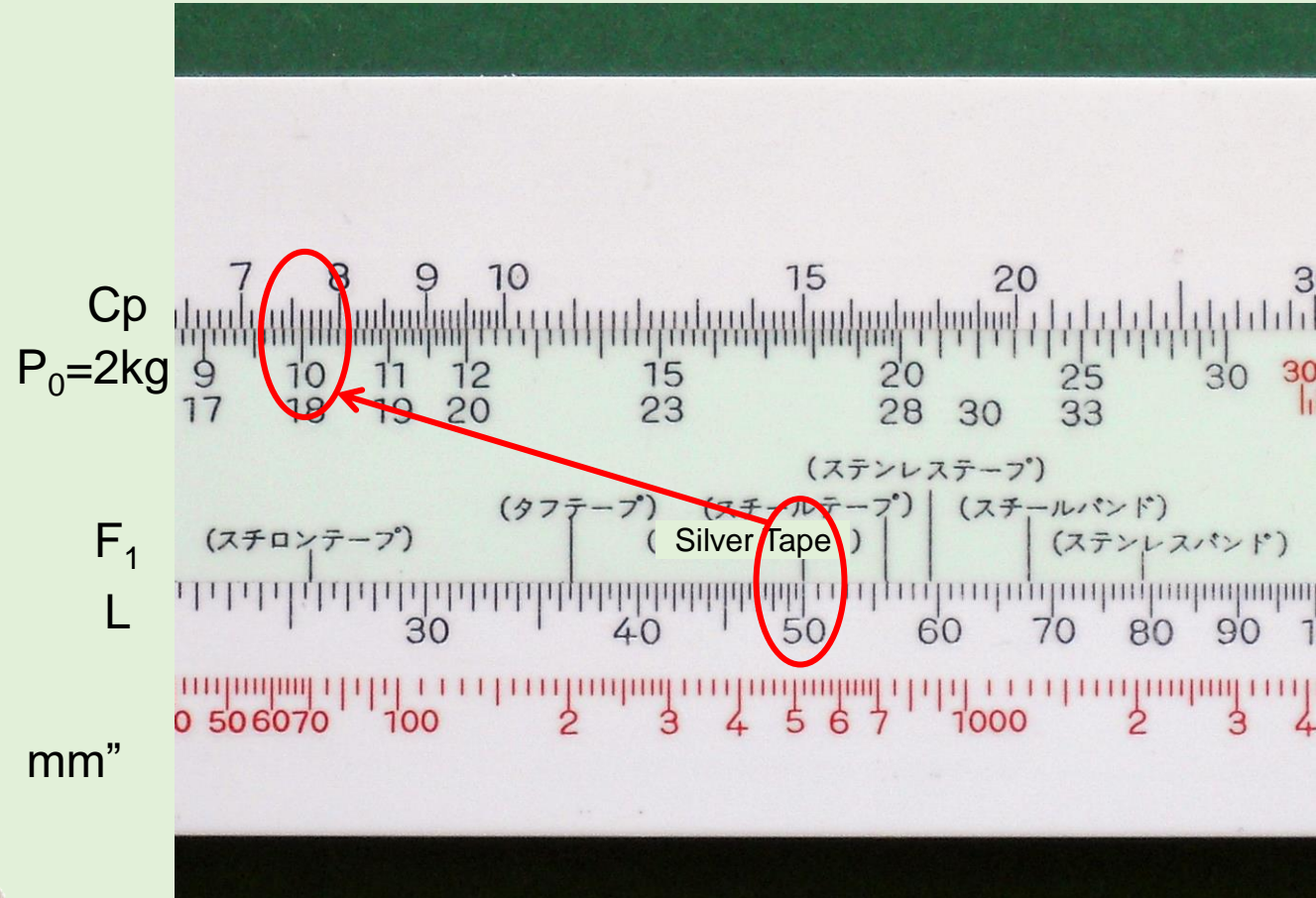
L = measured length (m)

P = tension at measurement (kgf)

P<sub>0</sub> = nominal tension (2 kgf or 10 kgf)

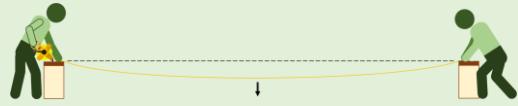
Kp = tape tension coefficient (mm/m·kgf)

Front side, scales “L”, “F<sub>1</sub>”, “P<sub>0</sub>=2kg” and “+ Cp mm”



Reading of 50 m at 10 kgf with silver tape?

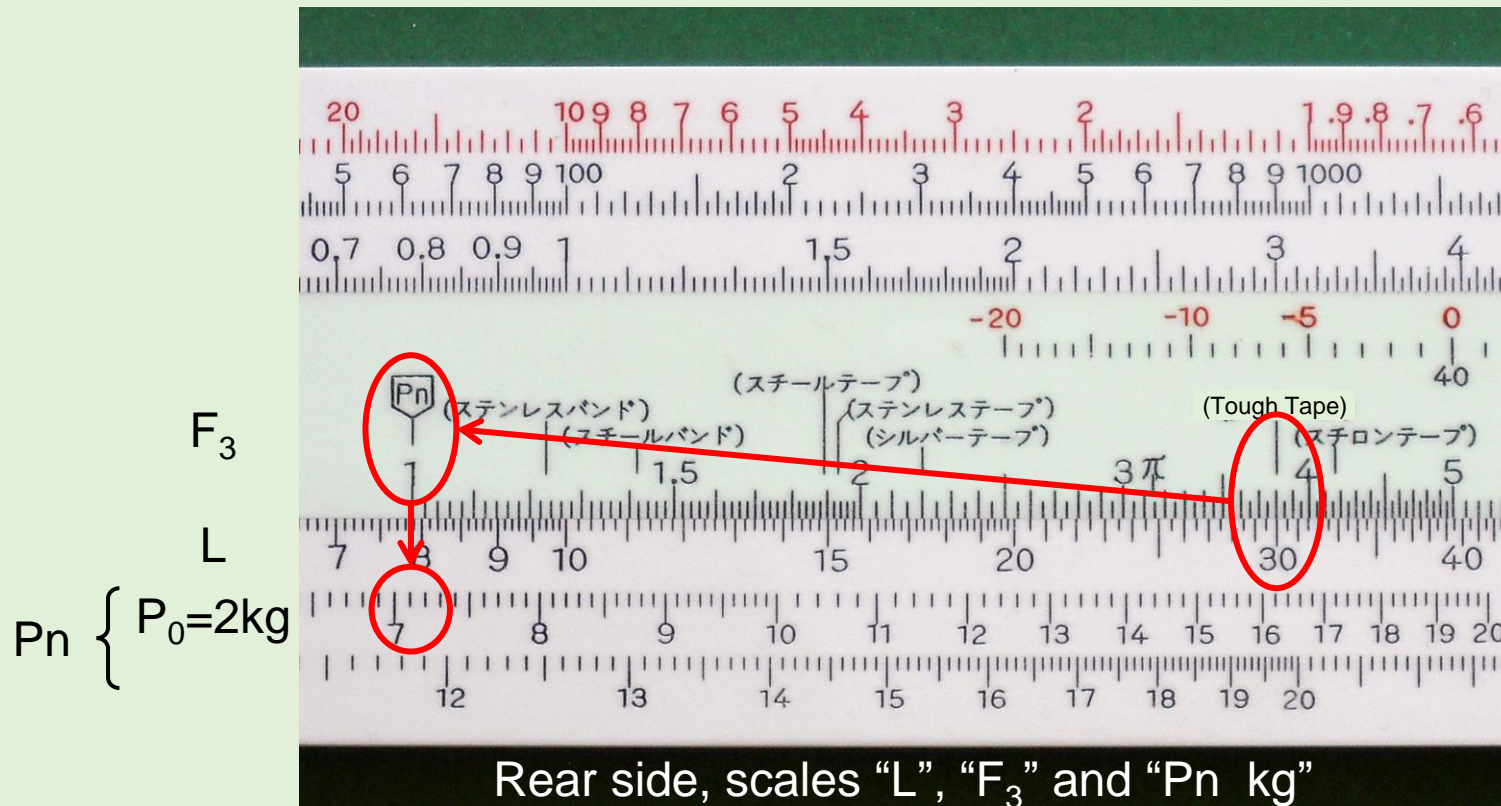




# Positive Tension - Pn

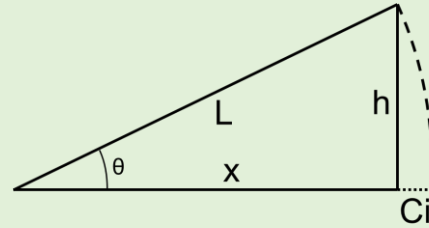
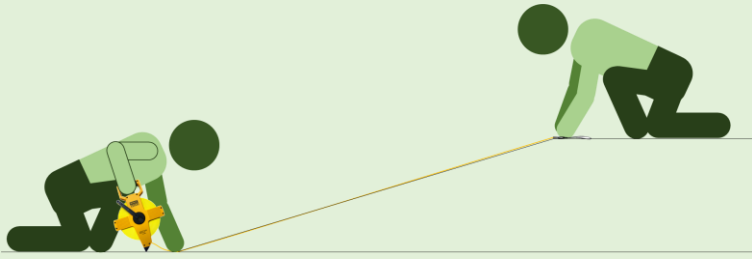
$$L \cdot K_p \cdot (P - P_0) = \frac{w^2 \cdot L^3}{24 \cdot P^2} \Rightarrow K_p \cdot (P - P_0) = \frac{w^2 \cdot L^2}{24 \cdot P^2} \Rightarrow P \cdot \sqrt{P - P_0} = \frac{L}{K_n}$$

Reading 30 m with tough tape?



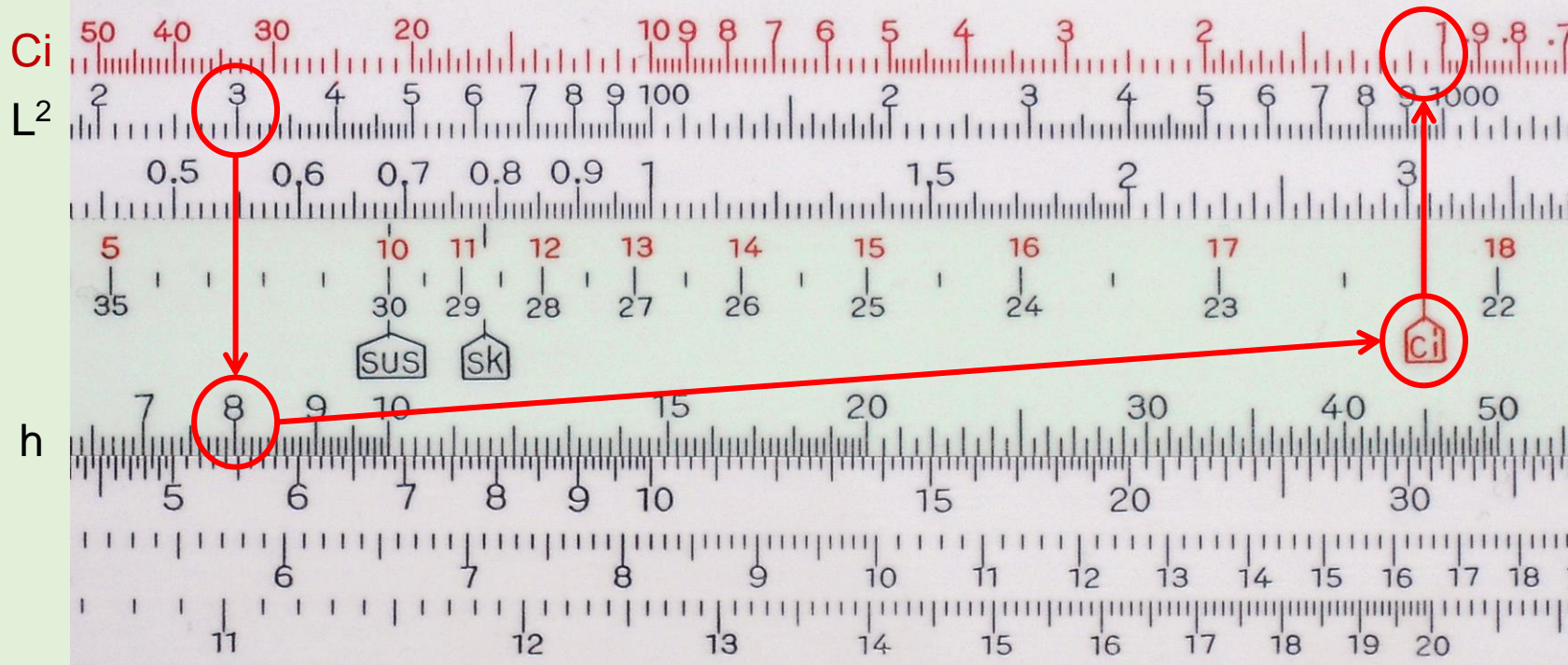


# Inclination - Ci



$$Ci = \frac{h^2}{2 \cdot L}$$

Reading of 30 m with height difference of 8 m?



Rear side, scales "L²", "h" and "- Ci m"

# Compensation Examples

When the results are worth the effort?

Factor		Measurement	Correction	Result
Temperature	Ct	30 m	1.72 mm	29.99828 m
Tension	Cp	50 m	7.6 mm	50.0076 m
Looseness	Cs	50 m	18.1 mm	49.9819 m
Positive Tension	Pn	30 m	7.1 kgf	30 m
Inclination	Ci	30 m	1.05 m	28.95 m

# Scales Standardization

## Front Side

Scale Name	Scale Type
+Cp	A (shifted)
Tension ( $P_0=2\text{kg}$ )/( $P_0=10\text{kg}$ ) P F1 - F2	B* (shifted) 2/3BI BI - 2/3BI
L -Cs	A A <sup>3</sup> (shifted)

## Back Side

Scale Name	Scale Type
-Ci L <sup>2</sup> ±Ct	AI <sup>2</sup> (shifted) A <sup>2</sup> A (shifted)
T (<20°C/>20°C) F <sub>3</sub> h.l.δ	BI* B B
L Pn ( $P_0=2\text{kg}$ ) Pn ( $P_0=10\text{kg}$ )	A “A + D” (shifted) “A + D” (shifted)

(\*: with special numbering)

# Slide Rule Dating

## Yamayo Webpage History Key Milestones

1959: Approved factory for **steel tape with JIS labeling**

1966: **Stylon tape** commercialization

1968: **Silver tape** commercialization

1972: -

1988: **Head office** moved from Nihonbashi to **Adachi**

1989: Release of ready-to-use **surveyor calculator**

1990: Stylon, Million, Pro Series **full model change**

## Slide Rule Manual Data

...”The above table was standardized in February 1972”...

...”Head Office ... Nihonbashi Honcho”...

## Slide Rule Possible Milestones

→ possible starting of slide rule usage

→ Possible starting of model slide rule design

→ Specimen last possible year of manufacture

→ Possible end of slide rule ordering to Fuji

→ Possible end of slide rule commercialization

→ Specimen first possible year of manufacture

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Thank You!

