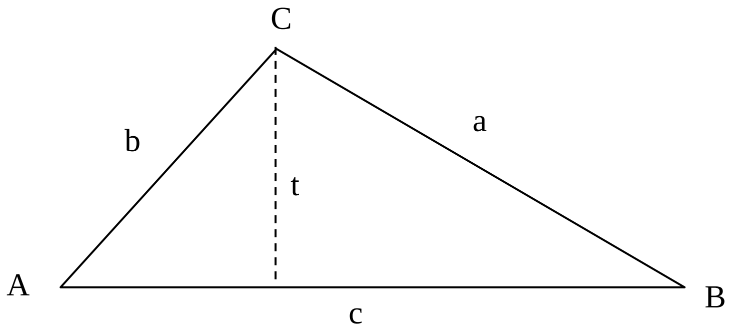
# Rumus Luas Segitiga

**jika diketahui panjang ketiga sisinya**




Dari aturan kosinus $a^2 = b^2 + c^2 - 2bc\cos A$ diperoleh:

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

**……………… (1)**

Dari identitas trigonometri $\sin^2 A + \cos^2 A = 1$, diperoleh:

$$\sin^2 A = 1 - \cos^2 A$$

$$= (1 + \cos A)(1 - \cos A)$$

**…………….. (2)**

**Dari (1) dan (2) kita dapatkan:**

$$\begin{aligned}
\sin^2 A &= (1 + \cos A)(1 - \cos A) \\
&= \left(1 + \frac{b^2 + c^2 - a^2}{2bc}\right)\left(1 - \frac{b^2 + c^2 - a^2}{2bc}\right) \\
&= \left(\frac{2bc + b^2 + c^2 - a^2}{2bc}\right)\left(\frac{2bc - b^2 - c^2 + a^2}{2bc}\right) \\
&= \frac{1}{4b^2c^2}\left(\left(2bc + b^2 + c^2\right) - a^2\right)\left(a^2 - \left(b^2 + c^2 - 2bc\right)\right) \\
&= \frac{1}{4b^2c^2}\left((b+c)^2 - a^2\right)\left(a^2 - (b-c)^2\right) \\
&= \frac{1}{4b^2c^2}\left((b+c-a)(b+c+a)\right)\left((a-b+c)(a+b-c)\right) \\
&= \frac{1}{4b^2c^2}(a+b+c)(-a+b+c)(a-b+c)(a+b-c)
\end{aligned}$$

**Bila** $\boldsymbol{a + b + c = 2s}$**, maka**

- $\boldsymbol{-a + b + c = 2s - 2a}$**,**
- $\boldsymbol{a - b + c = 2s - 2b}$ **dan**
- $\boldsymbol{a + b - c = 2s - 2c}$**, sehingga persamaan tersebut menjadi:**

$$\begin{aligned}
\sin^2 A &= \frac{1}{4b^2c^2}(a+b+c)(-a+b+c)(a-b+c)(a+b-c) \\
&= \frac{1}{4b^2c^2}(2s)(2s-2a)(2s-2b)(2s-2c) \\
&= \frac{1}{4b^2c^2}16s(s-a)(s-b)(s-c) \\
&= \frac{4}{b^2c^2}s(s-a)(s-b)(s-c)
\end{aligned}$$

$$\sin A = \sqrt{\frac{4}{b^2c^2}s(s-a)(s-b)(s-c)}$$

$$\sin A = \frac{2}{bc}\sqrt{s(s-a)(s-b)(s-c)}$$

**Dari segitiga ABC di atas diperoleh:**

$$\sin A = \frac{t}{b} \Rightarrow t = b \cdot \sin A$$

**Sehingga luas segitiga ABC adalah:**

$$\begin{aligned}
L &= \frac{1}{2} \cdot c \cdot t \\
&= \frac{1}{2} \cdot c \cdot b \cdot \sin A \\
&= \frac{1}{2} \cdot c \cdot b \cdot \frac{2}{bc}\sqrt{s(s-a)(s-b)(s-c)} \\
&= \sqrt{s(s-a)(s-b)(s-c)}
\end{aligned}$$

Terbukti bahwa, jika sisi-sisi suatu segitiga adalah *a*, *b*, dan *c* maka luas segitiga tersebut adalah:

$$L = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\text{dengan } s = \frac{1}{2}(a+b+c)$$