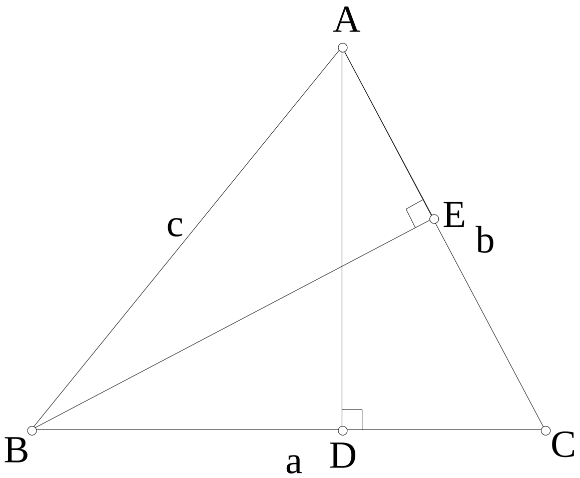
Sine formula



In $\triangle ABC$, let AD, BE be the altitudes.

$AD = c \sin B = b \sin C$

$BE = a \sin C = c \sin A$

$$\Rightarrow \begin{cases} \dfrac{b}{\sin B} = \dfrac{c}{\sin C} \\ \dfrac{a}{\sin A} = \dfrac{c}{\sin C} \end{cases}$$

$$\therefore \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

In fact, $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C} = 2R$, where R is the radius of the circumscribed circle.

For details please read the note circumscribed circle in the section “Geometry”.

Example (ASA) $a = 5$, $\angle B = 60°$, $\angle C = 45°$.Find b.

$\angle A = 75°$ ($\angle$s sum of $\triangle$)

$$\frac{5}{\sin 75^\circ} = \frac{b}{\sin 60^\circ}$$

$b = \dfrac{5 \sin 60^\circ}{\sin 75^\circ}$ = 4.48 (correct to 3 sig. fig.)

Example (SSA) $a = 5$, $b = 6$, $\angle B = 60°$. Find $\angle A$.

$$\frac{5}{\sin A} = \frac{6}{\sin 60^\circ}$$

$\sin A = 0.721687836$

$A = 46.2°$ or $180° - 46.2°$

$A = 46.2°$ or $133.8°$

But when $A = 133.8°$, $A + B = 193.8^\circ > 180°$ $\therefore A = 46.2°$ only.