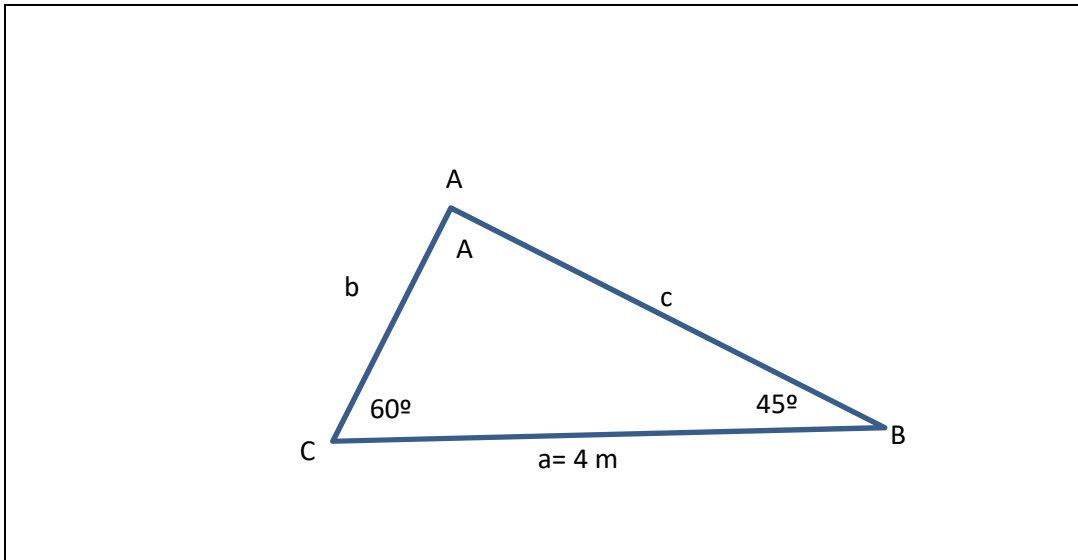


## PROBLEMAS DE TRIGONOMETRÍA

### Problema 203:

En un triángulo, el lado  $a = 4\text{ m}$ , y los ángulos  $B$  y  $C$  miden, respectivamente,  $45^\circ$  y  $60^\circ$ . Resolver el triángulo y hallar su área.

### Solución Problema 203:



Sabemos que el ángulo  $A$  mide:

$$A = 180^\circ - (B + C) = 180 - (45 + 60) = 75^\circ$$

$$\text{sen } 75^\circ = \text{sen}(30^\circ + 45^\circ) = \text{sen}30^\circ \cdot \text{cos}45^\circ + \text{cos}30^\circ \cdot \text{sen}45^\circ =$$

$$= \frac{1}{2} \cdot \frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4} = \frac{\sqrt{2} + \sqrt{6}}{4}$$

Aplicando el teorema del seno:

$$\frac{4}{\text{sen } 75^\circ} = \frac{c}{\text{sen } 60^\circ}$$

$$\frac{4}{\frac{\sqrt{2} + \sqrt{6}}{4}} = \frac{c}{\frac{\sqrt{3}}{2}}$$

$$\frac{16}{\sqrt{2} + \sqrt{6}} = \frac{2c}{\sqrt{3}}$$

$$\begin{aligned}
 c &= \frac{16\sqrt{3}}{2 \cdot (\sqrt{2} + \sqrt{6})} = \frac{8\sqrt{3}}{(\sqrt{2} + \sqrt{6})} = \frac{8\sqrt{3}}{(\sqrt{2} + \sqrt{6})} \cdot \frac{(\sqrt{2} - \sqrt{6})}{(\sqrt{2} - \sqrt{6})} = \\
 &= \frac{8\sqrt{6} - 8\sqrt{18}}{2 - 6} = \frac{8\sqrt{6} - 8\sqrt{18}}{-4} = \frac{8(\sqrt{6} - \sqrt{18})}{-4} = -2(\sqrt{6} - \sqrt{18}) = \\
 &= -2(\sqrt{6} - \sqrt{18}) = -2 \cdot (2,44 - 4,24) = -2 \cdot (-1,8) = 3,6 \text{ m}
 \end{aligned}$$

Luego  $c = 3,6 \text{ m}$

Hallamos el valor de  $b$ :

Aplicando el teorema del seno:

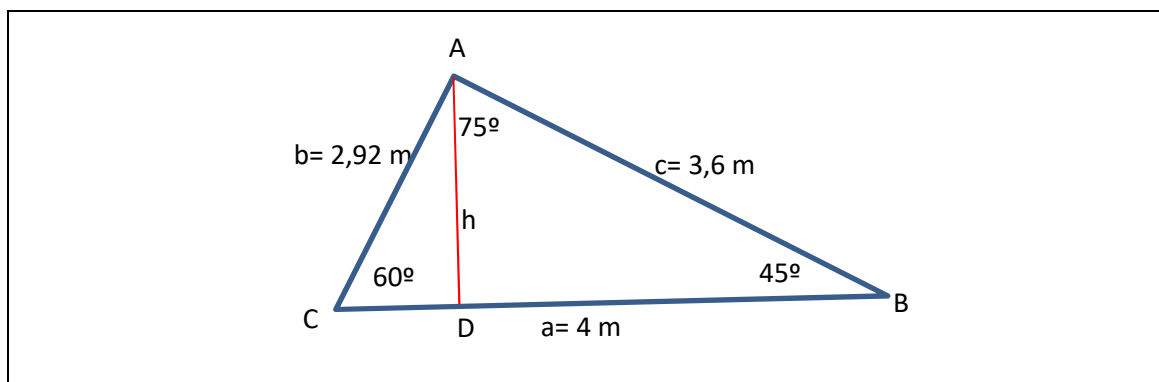
$$\frac{4}{\text{sen } 75^\circ} = \frac{b}{\text{sen } 45^\circ}$$

$$\frac{4}{\frac{\sqrt{2} + \sqrt{6}}{4}} = \frac{b}{\frac{\sqrt{2}}{2}}$$

$$\frac{16}{\sqrt{2} + \sqrt{6}} = \frac{2b}{\sqrt{2}}$$

$$\begin{aligned}
 b &= \frac{16\sqrt{2}}{2 \cdot (\sqrt{2} + \sqrt{6})} = \frac{8\sqrt{2}}{(\sqrt{2} + \sqrt{6})} = \frac{8\sqrt{2}}{(\sqrt{2} + \sqrt{6})} \cdot \frac{(\sqrt{2} - \sqrt{6})}{(\sqrt{2} - \sqrt{6})} = \\
 &= \frac{16 - 16\sqrt{3}}{2 - 6} = \frac{16 - 16\sqrt{3}}{-4} = \frac{16 \cdot (1 - \sqrt{3})}{-4} = -4(1 - \sqrt{3}) = \\
 &= -4(1 - 1,73) = -4(-0,73) = 2,92 \text{ m}
 \end{aligned}$$

Hallamos el área:



En el triángulo rectángulo CDA el ángulo DAB vale:

$$DAB = 90^\circ - 60^\circ = 30^\circ$$

$$\cos 30^\circ = \frac{h}{b}$$

$$h = b \cdot \cos 30^\circ = 2,92 \cdot \frac{\sqrt{3}}{2} = 2,525 \text{ m}$$

El área será:

$$A = \frac{b \cdot h}{2} = \frac{4 \cdot 2,525}{2} = 5,05 \text{ m}^2$$