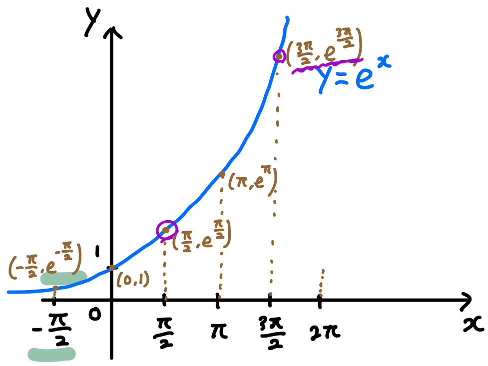
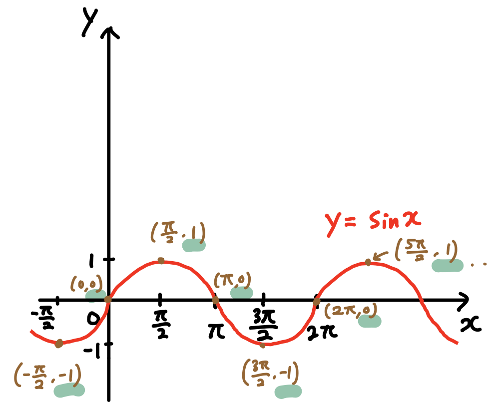
(Section 6.6 Continued)

Ex Sketch the graph of $y = e^x \sin x$.

$(2\pi, e^{2\pi})$

$\left\{ \begin{array}{l} y = e^x \\ y = \sin x. \end{array} \right.$

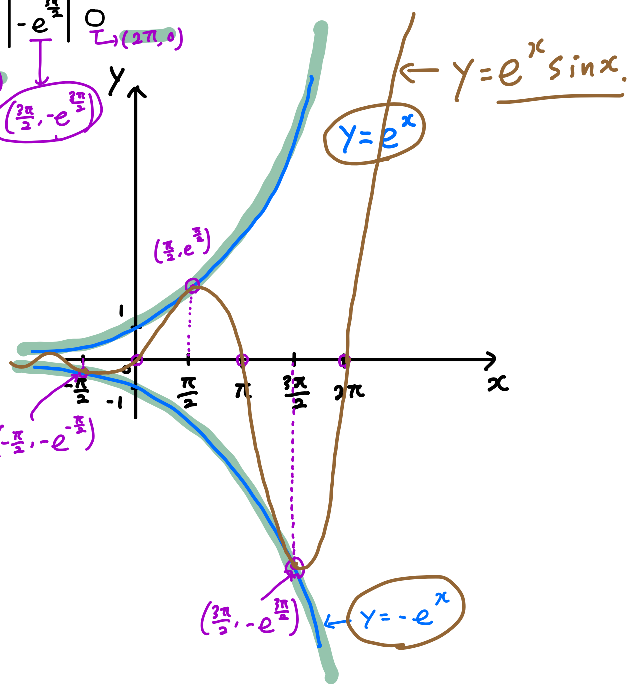




x	$-\frac{\pi}{2}$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
e^x	$e^{-\frac{\pi}{2}}$	1	$e^{\frac{\pi}{2}}$	e^{π}	$e^{\frac{3\pi}{2}}$	$e^{2\pi}$
$\sin x$	-1	0	1	0	-1	0
$e^x \cdot \sin x$	$-e^{-\frac{\pi}{2}}$	0	$e^{\frac{\pi}{2}}$	0	$-e^{\frac{3\pi}{2}}$	0

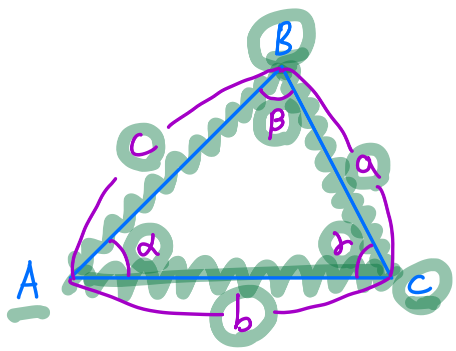
$(-\frac{\pi}{2}, -e^{-\frac{\pi}{2}})$ $(0,0)$ $(\frac{\pi}{2}, e^{\frac{\pi}{2}})$ $(\pi, 0)$ $(\frac{3\pi}{2}, -e^{\frac{3\pi}{2}})$ $(2\pi, 0)$

$\Downarrow$



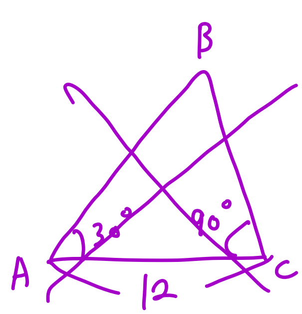
Section 6.7 Applied Problems

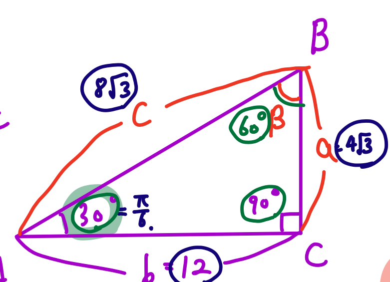
* "Solving the triangles" means find the three angles and the three side lengths.



Ex Solve $\triangle ABC$, given $\gamma = 90^\circ$, $\alpha = 30^\circ$ and $b = 12$.

$\beta = ?$ $\quad a = ?$, $c = ?$





$\boxed{\sin 30^\circ} = \sin\frac{\pi}{6} = \frac{1}{2}$

$\cos 30^\circ$

$\boxed{\tan 30^\circ} = \tan\frac{\pi}{6} = \frac{1}{\sqrt{3}}$

$\left(30^\circ = 30 \times \frac{\pi}{180} = \frac{30\pi}{180} = \frac{\pi}{6} \text{ rad} \right)$

* The sum of three angles of any triangles is 180°

$\beta + 30 + 90 = 180$

$\Downarrow$

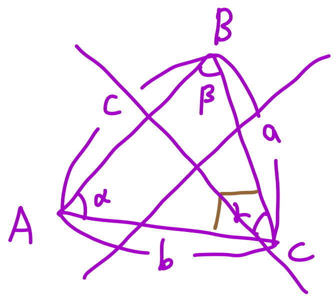
$\boxed{\beta = 60^\circ \text{ or } \frac{\pi}{3} \text{ rad}}$

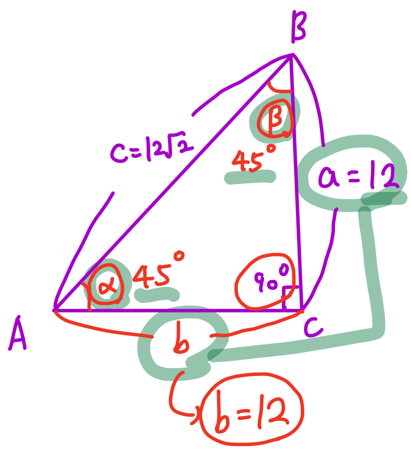
$\underbrace{\tan\frac{\pi}{6}}_{=\frac{1}{\sqrt{3}}} = \frac{(\text{height})}{(\text{base})} = \frac{a}{12} \longrightarrow \frac{a}{12} = \frac{1}{\sqrt{3}}, \quad a = \frac{12}{\sqrt{3}} = \frac{12\cdot\sqrt{3}}{\sqrt{3}\cdot\sqrt{3}} = \frac{12\sqrt{3}}{3} = \boxed{4\sqrt{3}}$

$\underbrace{\sin\frac{\pi}{6}}_{=\frac{1}{2}} = \frac{a}{c} = \frac{4\sqrt{3}}{c} \longrightarrow \frac{4\sqrt{3}}{c} = \frac{1}{2}, \quad \frac{c}{4\sqrt{3}} = 2, \quad \boxed{c = 2\cdot 4\sqrt{3} = 8\sqrt{3}}$

Ex Solve $\triangle ABC$, given $\gamma = 90^\circ$, $a = 12$, and $c = 12\sqrt{2}$.

$\alpha = ?$, $\beta = ?$ $\qquad b = ?$





$$\sin\alpha = \frac{12}{12\sqrt{2}} = \frac{1}{\sqrt{2}}$$

Since α is an acute angle and $\sin\alpha = \frac{1}{\sqrt{2}}$,

we can conclude $\boxed{\alpha = \frac{\pi}{4} \text{ rad}}$

$$\frac{\pi}{4}\text{ rad} = \frac{\pi}{4} \times \frac{180}{\pi} = \frac{180}{4} = \boxed{45^\circ}$$

$$\underbrace{\alpha}_{45^\circ} + \beta + \underbrace{\gamma}_{90^\circ} = 180^\circ$$

$$\Rightarrow \boxed{\beta = 45^\circ}$$

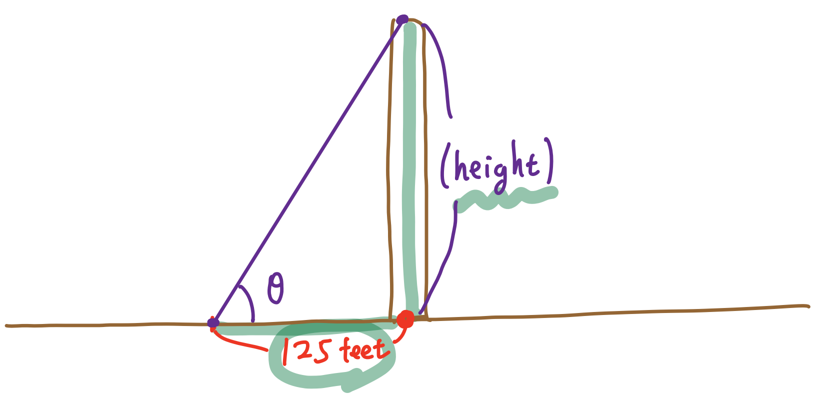
Hence $\alpha = \beta$

$\Rightarrow \triangle ABC$ is an isosceles triangle.

Thus, $a = b$.

Since $a = 12$, $\boxed{b = 12}$

<u>Ex</u> From a point on level ground 125 feet from the base of a tower, the angle of elevation of the top of the tower is θ. Express the height of the tower in terms of θ.



$$\tan\theta = \frac{(\text{height})}{125}$$

$$\downarrow$$

$$\boxed{(\text{height}) = 125 \cdot \tan\theta}$$