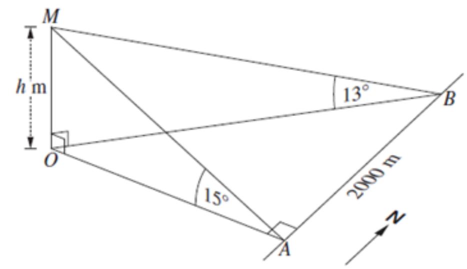
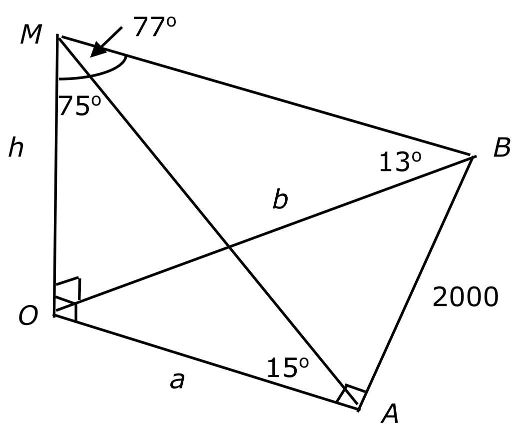
**TG** **5** A person walks 2000 metres due north along a road from point $A$ to point $B$.
The point $A$ is due east of a mountain $OM$, where $M$ is the top of the mountain.
The point $O$ is directly below point $M$ and is on the same horizontal plane as the road.
The height of the mountain above point $O$ is $h$ metres.
From point $A$, the angle of elevation to the top of the mountain is 15°.
From point $B$, the angle of elevation to the top of the mountain is 13°.
Determine the height of the mountain.




In $\Delta OAM$, $\angle OMA = 75°$.

Let $OA = a$: $\frac{a}{h} = \tan 75°$

$a = h\tan 75°$

In $\Delta OAM$, $\angle OMB = 77°$.

Let $OB = b$: $\frac{b}{h} = \tan 77°$

$b = h\tan 77°$

In $\Delta AOB$, using Pythagoras:

$$(h\tan 77°)^2 = (h\tan 75°)^2 + 2000^2$$

$$h^2\tan^2 77° = h^2\tan^2 75° + 2000^2$$

$$h^2\tan^2 77° - h^2\tan^2 75° = 2000^2$$

$$h^2(\tan^2 77° - \tan^2 75°) = 2000^2$$

$$h^2 = \frac{2000^2}{\tan^2 77° - \tan^2 75°}$$

$$h = \frac{2000}{\sqrt{\tan^2 77° - \tan^2 75°}}$$

$$= 909.7038482\ldots$$

$$= 910 \text{ (nearest whole)}$$

$\therefore$ the mountain is 910 m high.

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by NESA.