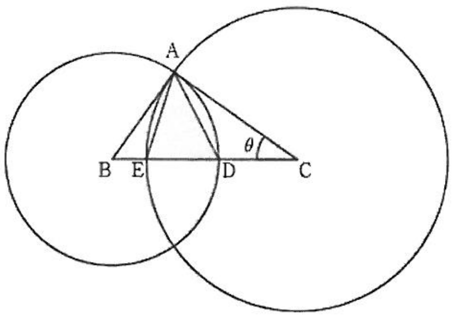
* 2019학년도 사관학교 수학 가형 19번.

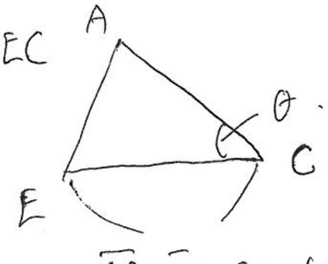


$\overline{BC}=8$, $\angle ACB=\theta$, $\therefore \angle ABC=\frac{\pi}{2}-\theta$.

$\overline{AB}=8\sin\theta$, $\overline{AC}=8\cos\theta$.

$\triangle ABD$ 와 $\triangle AEC$ 는 이등변삼각형.

$\triangle AEC$

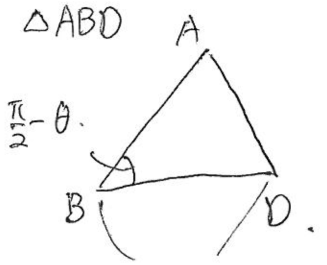


$\overline{AC}=\overline{EC}=8\cos\theta$.

$\angle AEC=\dfrac{\pi-\theta}{2}=\frac{\pi}{2}-\frac{\theta}{2}$.

$\therefore \overline{AE}=2\times 8\cos\theta\times\cos\left(\frac{\pi}{2}-\frac{\theta}{2}\right)=16\cos\theta\cdot\sin\frac{\theta}{2}$.

$\triangle ABD$



$\overline{AB}=\overline{BD}=8\sin\theta$.

$\angle ADB=\dfrac{\pi-\left(\frac{\pi}{2}-\theta\right)}{2}=\frac{\pi}{4}+\frac{\theta}{2}$.

$\therefore \overline{AD}=2\times 8\sin\theta\times\cos\left(\frac{\pi}{4}+\frac{\theta}{2}\right)$

$\angle EAD=\pi-\angle AEC-\angle ADB=\pi-\frac{\pi}{2}+\frac{\theta}{2}-\frac{\pi}{4}-\frac{\theta}{2}=\frac{\pi}{4}$.

$\therefore S(\theta)=\frac{1}{2}\times\overline{AE}\times\overline{AD}\times\sin(\angle EAD)=\frac{1}{2}\times 16\cos\theta\cdot\sin\frac{\theta}{2}\cdot 16\sin\theta\cdot\cos\left(\frac{\pi}{4}+\frac{\theta}{2}\right)\cdot\sin\frac{\pi}{4}$

$$\therefore \lim_{\theta\to 0+}\frac{S(\theta)}{\theta^2}=\lim_{\theta\to 0+}\frac{\sin\frac{\theta}{2}}{\theta}\times\frac{\frac{1}{2}}{\frac{1}{2}}\times\frac{\sin\theta}{\theta}\times\frac{1}{2}\times 16\cos\theta\times 16\times\cos\left(\frac{\pi}{4}+\frac{\theta}{2}\right)\times\frac{\sqrt{2}}{2}$$

$$=\frac{1}{2}\times\frac{1}{2}\times 16\times 16\times\frac{\sqrt{2}}{2}\times\frac{\sqrt{2}}{2}=16\times 2=32$$