TOPIC

Mathematics – Section I – Question 10

QUESTION

To find the value of π, a scientist inscribes a n-sided polygon in a circle of diameter 1. The perimeter of the regular polygon is the value of π for $n \to \infty$. The approximate value of π by using a 6-sided regular polygon is

(A) 3.000
(B) 3.142
(C) 3.232
(D) 3.464

HINT

The angle subtended by each side of the polygon is $\varphi = \frac{2\pi}{n}$. The length of each side is $s = 2r\,sin\frac{\varphi}{2}$, where r is the radius of the circle.

SOLUTION

The angle subtended by each side of the regular polygon is

$$\varphi = \frac{2\pi}{n}$$

The length s of each side of the regular polygon then is

$$s = 2r\,sin\frac{\varphi}{2}$$

For $n = 6$,

$$\varphi = \frac{2\pi}{6} = \frac{\pi}{3}$$

and a circle of diameter 1,

$$r = \frac{1}{2}$$

$$s = 2\left(\frac{1}{2}sin\left(\frac{\pi}{6}\right)\right)$$

$$= 0.50000$$

The perimeter of the 6-sided regular polygon is

$$p = ns$$

$$= 6 \times 0.5000$$

$$= 3.000$$

ANSWER

(A)

CONTRIBUTOR

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