

## 3.2.19

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# Question

Two sides of a triangle are of lengths 5cm and 1.5cm. The length of the third side of the triangle cannot be

- a) 3.6 cm
- b) 4.1 cm
- c) 3.8 cm
- d) 3.4 cm

# Theoretical Solution

Assume Triangle ABC with

$\|\mathbf{AC}\| = b = 1.5\text{cm}$ ,  $\|\mathbf{AB}\| = c = 5\text{cm}$ ,  $\|\mathbf{BC}\| = a$

and Angle A =  $\alpha$

Let  $\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

Therefore,  $\mathbf{C} = \begin{pmatrix} b \\ 0 \end{pmatrix} = \begin{pmatrix} 1.5 \\ 0 \end{pmatrix}$  and  $\mathbf{B} = \begin{pmatrix} c \cos \alpha \\ c \sin \alpha \end{pmatrix} = \begin{pmatrix} 5 \cos \alpha \\ 5 \sin \alpha \end{pmatrix}$

By Cosine Law,

$$a^2 = b^2 + c^2 - 2bc \cos \alpha \quad (1)$$

$$a^2 = 27.25 - 15 \cos \alpha \quad (2)$$

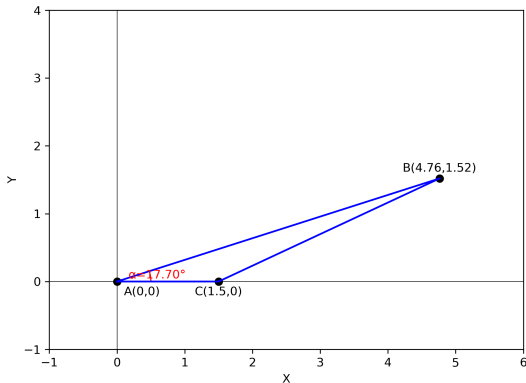
$$\cos \alpha = \frac{27.25 - a^2}{15} \quad (3)$$

# Theoretical Solution

Option (A)  $a = 3.6\text{cm}$

$$\cos \alpha = \frac{27.25 - 12.96}{15} = \frac{14.29}{15} \quad (4)$$

$$\Rightarrow \alpha = 17.7^\circ \quad (5)$$

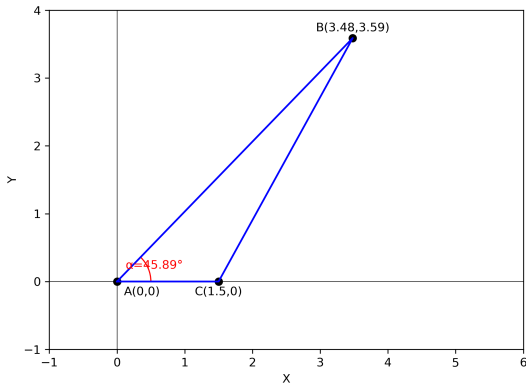


# Theoretical Solution

Option (B)  $a = 4.1\text{cm}$

$$\cos \alpha = \frac{27.25 - 16.81}{15} = \frac{10.44}{15} \quad (6)$$

$$\Rightarrow \alpha = 45.89^\circ \quad (7)$$

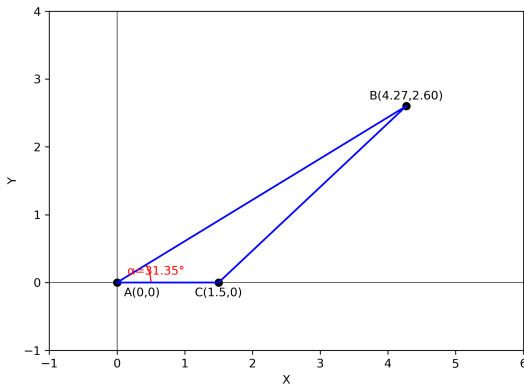


# Theoretical Solution

Option (C)  $a = 3.8\text{cm}$

$$\cos \alpha = \frac{27.25 - 14.44}{15} = \frac{12.81}{15} \quad (8)$$

$$\Rightarrow \alpha = 31.35^\circ \quad (9)$$

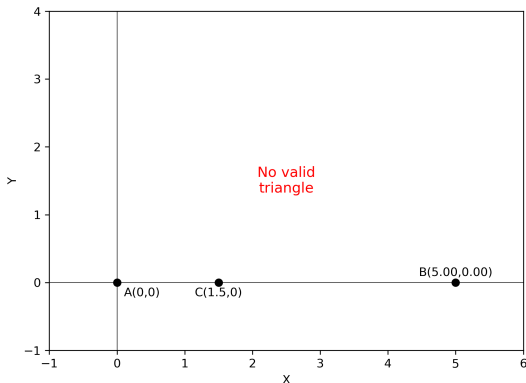


# Theoretical Solution

Option (D)  $a = 3.4\text{cm}$

$$\cos \alpha = \frac{27.25 - 11.56}{15} = \frac{15.69}{15} \quad (10)$$

Here,  $\cos \alpha > 1$  which is not possible (11)



Thus, Option (D) is incorrect.