3.2.19

AI25BTECH11003 - Bhavesh Gaikwad

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

Solution:

Let a=5 cm, b=1.5 cm, and c be the third side. For each option we test:

$$1.\quad a + b > c, \tag{0.1}$$
$$2.\quad a + c > b, \tag{0.2}$$
$$3.\quad b + c > a. \tag{0.3}$$

If all three hold, the triangle exists; otherwise it does not.

Option (A): c = 3.6 cm

$$5 + 1.5 > 3.6 \quad \Rightarrow \quad 6.5 > 3.6 \quad \checkmark, \tag{0.4}$$
$$5 + 3.6 > 1.5 \quad \Rightarrow \quad 8.6 > 1.5 \quad \checkmark, \tag{0.5}$$
$$1.5 + 3.6 > 5 \quad \Rightarrow \quad 5.1 > 5 \quad \checkmark. \tag{0.6}$$

All conditions satisfied $\Rightarrow$ triangle exists.

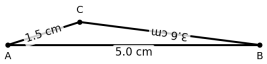

Fig. 0.1: Triangle

Option (B): c = 4.1 cm

$$5 + 1.5 > 4.1 \quad \Rightarrow \quad 6.5 > 4.1 \quad \checkmark, \tag{0.7}$$

$$5 + 4.1 > 1.5 \quad \Rightarrow \quad 9.1 > 1.5 \quad \checkmark, \tag{0.8}$$

$$1.5 + 4.1 > 5 \quad \Rightarrow \quad 5.6 > 5 \quad \checkmark. \tag{0.9}$$

All conditions satisfied $\Rightarrow$ triangle exists.

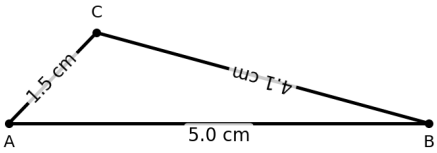

Fig. 0.2: Triangle

Option (C): c = 3.8 cm

$$5 + 1.5 > 3.8 \quad \Rightarrow \quad 6.5 > 3.8 \quad \checkmark, \tag{0.10}$$
$$5 + 3.8 > 1.5 \quad \Rightarrow \quad 8.8 > 1.5 \quad \checkmark, \tag{0.11}$$
$$1.5 + 3.8 > 5 \quad \Rightarrow \quad 5.3 > 5 \quad \checkmark. \tag{0.12}$$

All conditions satisfied $\Rightarrow$ triangle exists.

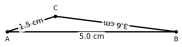

Fig. 0.3: Triangle

Option (D): c = 3.4 cm

$$5 + 1.5 > 3.4 \quad \Rightarrow \quad 6.5 > 3.4 \quad \checkmark, \tag{0.13}$$
$$5 + 3.4 > 1.5 \quad \Rightarrow \quad 8.4 > 1.5 \quad \checkmark, \tag{0.14}$$
$$1.5 + 3.4 > 5 \quad \Rightarrow \quad 4.9 > 5 \quad \times. \tag{0.15}$$

Condition 3 fails $\Rightarrow$ triangle does *not* exist.

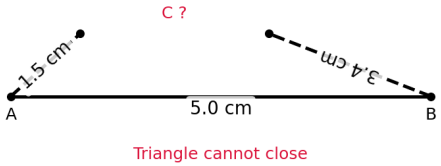

Fig. 0.4: Triangle

$\therefore$ Option D is Incorrect.