

QUESTION: Sonal Dubey left her residence between 4 and 5 o'clock and returned back between 5 and 6 o'clock. She notices that the hour hand and minute hand of the clock have interchanged their position with what they were when she went out. For how long was she out?

OPTIONS:

- a) $55\frac{5}{13}$ min
- b) $55\frac{5}{11}$ min
- c) 60 min
- d) $54\frac{138}{143}$

SOLUTION:

Rule: When a man goes out between any two consecutive clock hrs 'a' and 'b' and returns between any two consecutive clock hrs. 'b' and 'c' to find the position of minute hand and hour hand exactly interchanged, then

Time at which he went out $(T_0) = [x + (13x - 60)/143]$ minutes past 'a' O'clock.

Time at which he returned $(T_r) = [x + (13x - 720)/143]$ minutes past 'b' O'clock.

Here x represents distance in minute-space between hour hand & minute hand at 'b' O'clock position.

Comparing the given statement with the above formula we get 'a' = 4, 'b' = 5 and 'c' = 6. At 5 O'clock distance between the minute-hand and hour-hand of the clock is 25 minute - space, so $x = 25$.

Time at which this Sonal Dubey out

$$\begin{aligned}(T_0) &= [x + (13x - 60)/143] \text{ minutes past 'a' O' clock.} \\ &= [25 + (325 - 60)/143] \text{ minutes past 4 O' clock} \\ &= [25 + (325/143)] \text{ minutes past 4 O' clock} \\ &= 27\frac{39}{143} \text{ minutes past 4 O'clock}\end{aligned}$$

Time at which she returned

$$\begin{aligned}(T_r) &= [x + (13x - 720)/143] \text{ minutes past 'b' O' clock.} \\ &= [25 + (325 - 720)/143] \text{ minutes past 5 O' clock} \\ &= [25 + (-395/143)] \text{ minutes past 5 O' clock} \\ &= 22 \frac{34}{143} \text{ minutes past 5 O'clock}\end{aligned}$$

She was out for $22 \frac{34}{143}$ minutes past 5 O'clock -

$$\begin{aligned}27 \frac{39}{143} \text{ minutes past 4 O'clock} \\ = 54 \frac{138}{143}\end{aligned}$$