(A)

$60 - 2q = 30 \Rightarrow q = 15 \Rightarrow P = 45 \Rightarrow \pi = 45 \times 15 - 30 \times 15 = 225 = PS$

$CS = \dfrac{15 \times 15}{2} = 112.5$, $TS = 225 + 112.5 = 337.5$ $DWL = 112.5$

(B) $60 - q = 30 \Rightarrow q = 30 \Rightarrow \pi = \dfrac{30 \times 30}{2} = 450$

$CS = 0$, $TS = 0 + 450 = 450$, $DWL = 0$

(C)

$\pi = P(q_1) q_1 + P(q_2)(q_2 - q_1) - TC(q_2) = (60 - q_1) q_1 + (60 - q_2)(q_2 - q_1) - 30 q_2$

$= -q_1^2 - q_2^2 + 30 q_2 + q_1 q_2$

$-2q_1 + q_2 = 0$, $-2q_2 + 30 + q_1 = 0$

$q_1 = 10$, $q_2 = 20$

$P_1 = 50$, $P_2 = 40 \Rightarrow \pi = 50 \times 10 + 40 \times (20 - 10) - 30 \times 20 = 300$

$CS = \left(\dfrac{10 \times 10}{2}\right) + \left(\dfrac{10 \times 10}{2}\right) = 100$

$TS = 100 + 50 = 150$

$DWL = 450 - 400 = 50$

(D)

$\pi = P(q_1) q_1 + P(q_2)(q_2 - q_1) + P(q_3)(q_3 - q_2) - TC(q_3)$

$= (60 - q_1) q_1 + (60 - q_2)(q_2 - q_1) + (60 - q_3)(q_3 - q_2) - 30 q_3$

$= -q_1^2 - q_2^2 - q_3^2 + 30 q_3 + q_1 q_2 + q_2 q_3$

$-2q_1 + q_2 = 0$, $-2q_2 + q_1 + q_3 = 0$, $-2q_3 + 30 + q_2 = 0$

$q_1 = 7.5$, $q_2 = 15$, $q_3 = 22.5$

$P_1 = 52.5$, $P_2 = 45$, $P_3 = 52.5$

$\pi = 52.5 \times 7.5 + 45 \times (15 - 7.5) + 37.5 (22.5 - 15) - 30 \times 22.5$

$= 337.5$

$CS = (7.5 \times 7.5 / 2) + (7.5 \times 7.5 / 2) + (7.5 \times 7.5 / 2) = 84.375$

$TS = 84.375 + 337.5 = 421.875$

$DWL = 450 - 421.875 = 28.125$