

Recall that $S(Q) = Q + 10$

Hence, $\int_0^{50} (Q + 10) dQ$

• As $\int (a+b) dx = a \cdot x + b \cdot x + c$, we get:

• As $\int x^n dx = \frac{x^{n+1}}{n+1}$, we get:

$$\int_0^{50} (Q + 10) dQ = \left[\frac{Q^2}{2} + 10Q \right]_0^{50}$$

• By Barrow's rule, we get:

$$\int_0^{50} (10 + Q) dQ = \frac{(50)^2}{2} + 10(50) = \frac{2500}{2} + 500 = 1250 + 500 = \boxed{1750}$$

$$\text{Hence, producer surplus} = P^* \cdot Q^* - \int_0^{50} (10 + Q) dQ \Rightarrow$$

$$\Rightarrow 3000 - 1750 = \boxed{1250 = \text{producer surplus}}$$