Task:

The Noble Widget Corporation produces just one product, widgets. The company's new economist has calculated a short-run production function as follows:

$Q = 7V + 0.6V^2 - 0.1V^3$

where Q is the number of widgets produced per day and V is the number of production workers working an 8-hour day.

a. Develop a production schedule with V equaling 1 to 10.

b. Calculate average and marginal products.

c. Draw a graph.

Solution:

A production schedule with a V equaling 1 to 10 is described in the table below:

Table 1 – A production schedule of the Noble Widget Corporation

The number of production workers working an 8-hour day (V)	The number of widgets produced per day (Q)
1	*2*
1	$Q = 7 \cdot 1 + 0.6 \cdot 1^2 - 0.1 \cdot 1^3 = 7.5$
2	$Q = 7 \cdot 2 + 0.6 \cdot 2^2 - 0.1 \cdot 2^3 = 15.6$
3	$Q = 7 \cdot 3 + 0.6 \cdot 3^2 - 0.1 \cdot 3^3 = 23.7$
4	$Q = 7 \cdot 4 + 0.6 \cdot 4^2 - 0.1 \cdot 4^3 = 31.2$
5	$Q = 7 \cdot 5 + 0.6 \cdot 5^2 - 0.1 \cdot 5^3 = 37.5$
6	$Q = 7 \cdot 6 + 0.6 \cdot 6^2 - 0.1 \cdot 6^3 = 42$
7	$Q = 7 \cdot 7 + 0.6 \cdot 7^2 - 0.1 \cdot 7^3 = 44.1$
8	$Q = 7 \cdot 8 + 0.6 \cdot 8^2 - 0.1 \cdot 8^3 = 43.2$
9	$Q = 7 \cdot 9 + 0.6 \cdot 9^2 - 0.1 \cdot 9^3 = 38.7$
10	$Q = 7 \cdot 10 + 0.6 \cdot 10^2 - 0.1 \cdot 10^3 = 30$

Average product:

$Qa = (7.5 + 15.6 + 23.7 + 31.2 + 37.5 + 42 + 44.1 + 43.2 + 38.7 + 30)/10 = 31.35$

Marginal product:

$MPl = \Delta Q / \Delta V$

$MPl_1 = (15.6 - 7.5)/1 = 8.1$

$MPl_2 = (23.7 - 15.6)/1 = 8.1$

$MPl_3 = (31.2 - 23.7)/1 = 7.5$

$MPl_4 = (37.5 - 31.2)/1 = 6.3$

$MPl_5 = (42 - 37.5)/1 = 4.5$

$MPl_6 = (44.1 - 42)/1 = 2.1$

$MPl_7 = (43.2 - 44.1)/1 = -0.9$

$MPl_8 = (38.7 - 43.2)/1 = -4.5$

$MPl_9 = (30 - 38.7)/1 = -8.7$

A dependence of number of widgets produced on the number of production workers

The number of widgets produced per day (Q) vs The number of production workers working an 8-hour day (V)