Exercise 1

Paper 1 style · No calculator

1 7 marks SL 5.8 ●○○ Routine

Two positive numbers x and y have a sum of 12. Let $P = x^2y$.

(a) Show that $P = 12x^2 - x^3$, and write down the possible values of x. **[2]**

(b) Find the value of x for which P is greatest. Justify your answer. **[3]**

(c) Find the greatest value of P. **[2]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$y = 12 - x$, so $P = x^2(12 - x) = 12x^2 - x^3$ **A1**

$0 < x < 12$ **A1**

Total 2 marks

MARKSCHEME (b)

$P'(x) = 24x - 3x^2 = 3x(8 - x) = 0$ **M1**

$x = 8$ $(x = 0$ is not in the domain$)$ **A1**

$P''(8) = 24 - 48 = -24 < 0$, so a maximum **R1**

Total 3 marks

MARKSCHEME (c)

$y = 4,\ P = 64 \times 4$ **(M1)**

256 **A1**

Total 2 marks