

MATHEMATICS ENRICHMENT CLUB.  
Solution Sheet 1, May 7, 2013

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1.  $2083\frac{1}{3}$  pro t.
2.  $n = 60 = 2^2 \cdot 3 \cdot 5$ , which means the number of divisors is  $(2 + 1)(1 + 1)(1 + 1) = 12$ . This is the only one, given a prime factorisation  $n = p_1^{m_1} p_2^{m_2} \dots p_k^{m_k}$  the number of divisors is  $(m_1 + 1)(m_2 + 1) \dots (m_k + 1)$ . For  $n$  to be divisible by 1

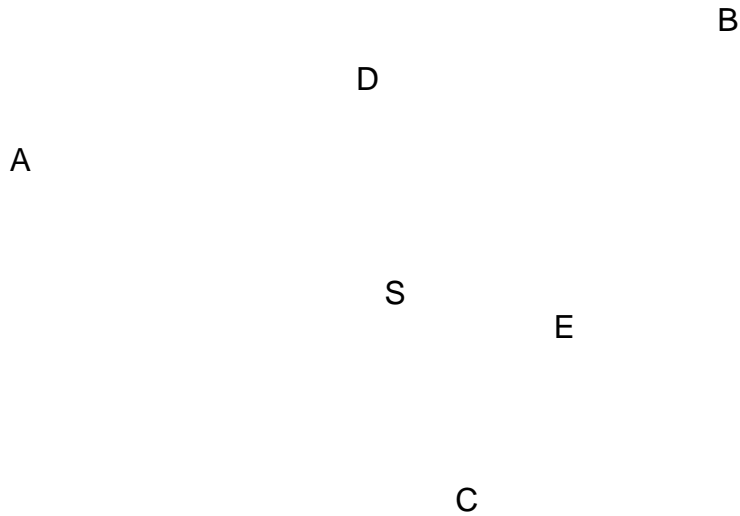


Figure 1: Showing the relevant areas for Question 6

6. Construct the line **SB**. Label the areas of **ADS** and **SEC**, and respectively. Knowing that a cut from the baseline of a triangle to the opposite vertex divides the triangle into two triangles whose areas are in the same ratio as the two baselines, we can label each smaller triangle's area in terms of and as in Figure 6 (shown coloured so that each red block = and each blue block = ). It can then be shown (with **AEC** and **AEB** that = 3 . Thus **ADS** and **ASC** are of equal area and so  $|jDSj| : |jSCj| = 1 : 1$ , and the areas of **ASB** and **BSE** are in the ratio 6 : 2 so  $|jASj| : |jSEj| = 3 : 1$ .
7. (a) Consider an equilateral triangle with side lengths **x**. Since **P** is interior the longest **AP**, **BP** or **CP** can be is **x**, but becat-b