

## STEP II, 2009, Q6

- 6 The Fibonacci sequence  $F_1, F_2, F_3, \dots$  is defined by  $F_1 = 1, F_2 = 1$  and

$$F_{n+1} = F_n + F_{n-1} \quad (n \geq 2).$$

Write down the values of  $F_3, F_4, \dots, F_{10}$ .

$$\text{Let } S = \sum_{i=1}^{\infty} \frac{1}{F_i}.$$

- (i) Show that  $\frac{1}{F_i} > \frac{1}{2F_{i-1}}$  for  $i \geq 4$  and deduce that  $S > 3$ .

Show also that  $S < 3\frac{2}{3}$ .

- (ii) Show further that  $3.2 < S < 3.5$ .



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