



The diagram shows the curve  $y = \sin\left(\frac{1}{2}\sqrt{x-1}\right)$ , for  $1 \leq x \leq 2$ .

- (a) Use rectangles of width 0.25 to find upper and lower bounds for  $\int_1^2 \sin\left(\frac{1}{2}\sqrt{x-1}\right)dx$ . Give your answers correct to 3 significant figures. [4]

- (b) (i) Use the substitution  $t = \sqrt{x-1}$  to show that  $\int \sin\left(\frac{1}{2}\sqrt{x-1}\right)dx = \int 2t \sin\left(\frac{1}{2}t\right)dt$ . [3]

- (ii) Hence show that  $\int_1^2 \sin\left(\frac{1}{2}\sqrt{x-1}\right)dx = 8 \sin \frac{1}{2} - 4 \cos \frac{1}{2}$ . [4]