

(6 marks)

The TDEE of individuals, X , can be modelled by the probability density function

$$f(x) = ke^{(12 - kx - e^{(12 - kx)})}$$

where $k = 0.006$, and $E(X) = 2100$ calories (correct to three significant figures).

- (a) (i) The integral expression $\int_0^{2000} f(x) \, dx$ can be used to approximate $\Pr(X \leq 2000)$.

Using this approximation, calculate $\Pr(X \leq 2000)$.

(1 mark)

- If an individual in the study has a TDEE of 2000, are they considered to be living a sedentary lifestyle, according to the article's categorisation?

Justify your answer.

(2 marks)

- (b) Determine the probability that a randomly chosen individual will have a TDEE less than the population mean.

(1 mark)

Fidgeting is a term used to describe minor movements, typically involving the hands and feet. Observations have led researchers to claim that:

'The population mean TDEE of individuals who fidget is more than 2109.5 calories.'

- (c) Twenty-five randomly chosen individuals who fidget had their TDEE recorded, and a 99% confidence interval was calculated using the data.
- (i) State the smallest possible value of the lower limit of the calculated confidence interval, given that it could be used to support the researchers' claim with 99% confidence.
- Give your answer correct to the nearest calorie.

[illegible]

(1 mark)

Assume that your answer to part (c)(i) was the lower limit of the calculated confidence interval.

- (ii) If the width of the calculated confidence interval was 168, determine the sample mean TDEE of the twenty-five randomly chosen individuals who fidget.

(1 mark)