

A random sample of 200 observations of the continuous random variable X was taken and the values are summarised in the following table.

Interval	$0 \leq x < 0.5$	$0.5 \leq x < 1$	$1 \leq x < 1.5$	$1.5 \leq x < 2$	$2 \leq x < 2.5$	$2.5 \leq x < 3$
Observed frequency	5	23	40	41	46	45

It is required to test the goodness of fit of the distribution with probability density function f given by

$$f(x) = \begin{cases} \frac{1}{9}x(4-x) & 0 \leq x \leq 3, \\ 0 & \text{otherwise.} \end{cases}$$

Most of the relevant expected frequencies, correct to 2 decimal places, are given in the following table.

Interval	$0 \leq x < 0.5$	$0.5 \leq x < 1$	$1 \leq x < 1.5$	$1.5 \leq x < 2$	$2 \leq x < 2.5$	$2.5 \leq x < 3$
Expected frequency	p	q	37.96	43.52	43.52	37.96

(a) Show that $p = 10.19$ and find the value of q . [3]

(b) Carry out a goodness of fit test, at the 5% significance level, to test whether f is a satisfactory model for the data. [4]