6. The random variable X has a continuous uniform distribution over the interval $[2a + 3, 4a + 9]$ where a is a constant and $a > -3$
The mean of a random sample of size n, taken from this distribution, is denoted by $\bar{X}$

(a) Show that $\bar{X}$ is a biased estimator of a

(2)

(b) Hence find the bias, in terms of a, when $\bar{X}$ is used as an estimator of a

(1)

Given that $Y = c\bar{X} + d$ is an unbiased estimator of a where c and d are constants.

(c) find the value of c and the value of d

(3)

A random sample of 10 values of X is taken and the results are as follows

4.4 4.7 5.6 6.3 6.7 7.5 8.4 9.4 9.8 10.4

(d) Use the sample mean to estimate the maximum value that X can take.

(3)

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(Total for Question 6 is 9 marks)