

In a particular country, large numbers of ducks live on lakes  $A$  and  $B$ . The mass, in kg, of a duck on lake  $A$  is denoted by  $x$  and the mass, in kg, of a duck on lake  $B$  is denoted by  $y$ . A random sample of 8 ducks is taken from lake  $A$  and a random sample of 10 ducks is taken from lake  $B$ . Their masses are summarised as follows.

$$\Sigma x = 10.56 \quad \Sigma x^2 = 14.1775 \quad \Sigma y = 12.39 \quad \Sigma y^2 = 15.894$$

A scientist claims that ducks on lake  $A$  are heavier on average than ducks on lake  $B$ .

- (i) Test, at the 10% significance level, whether the scientist's claim is justified. You should assume that both distributions are normal and that their variances are equal. [9]

A second random sample of 8 ducks is taken from lake  $A$  and their masses are summarised as

$$\Sigma x = 10.24 \quad \text{and} \quad \Sigma (x - \bar{x})^2 = 0.294,$$

where  $\bar{x}$  is the sample mean. The scientist now claims that the population mean mass of ducks on lake  $A$  is greater than  $p$  kg. A test of this claim is carried out at the 10% significance level, using only this second sample from lake  $A$ . This test supports the scientist's claim.

- (ii) Find the greatest possible value of  $p$ . [5]