

Question 21

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A survey of 250 randomly selected Open University undergraduates on a particular large foundation course was carried out in which each student was asked whether he or she had exclusive use of a personal computer at home. Suppose that 35% of all the students on the course had such use of a computer.

- (a) Write down an appropriate discrete probability model for X , the number of students in the sample who report they have exclusive use of a personal computer at home, and suggest a convenient approximation to this distribution.

$$B(250, 0.35)$$

$$N(87.5, 56.875)$$

- (b) Calculate the approximate probability that X is 100 or more.

[5]

$$B(X \geq 100)$$

$$P(X \geq 99.5)$$

$$= 1 - P(X \leq 99.5) = 1 - 0.2109 = 0.7891$$

$$= 1 - 0.83 = 0.17$$

Question 22

A species of burrowing rodent is spiky-haired, smooth-haired or hairless with respective unknown probabilities θ , 2θ , $1 - 3\theta$. In a sample of size 10, two animals were spiky-haired, three were smooth-haired and the remaining 5 were hairless. Write down the likelihood of θ for this sample.

[2]

$$\theta^2 (2\theta)^3 (1 - 3\theta)^5$$

$$H_0: D = 0$$

$$H_1: D > 0$$

$$t(n-1) \sim \frac{\bar{D}}{S/\sqrt{n}}$$

$$t(9) = 1.833 \sim \bar{D}$$

$$\bar{x} = 13.3$$

$$s = 31.13$$

$$t(14) \sim \frac{\bar{D}}{S/\sqrt{n}}$$

$$1.761 \sim 13.3$$

$$31.13/\sqrt{15}$$

$$1.761 > 1.65$$

test statistic outside rejection region.