

Question 18**(11 marks)**

Alex is a beekeeper and has noticed that some of the bees are very sleepy. She takes a random sample of 320 bees and finds that 15 of them are indeed so-called *lullabees* that fall asleep easily.

(a) Calculate the sample proportion of lullabees. (1 mark)

(b) Determine a 90% confidence interval for the true proportion of lullabees, rounded to four decimal places. (3 marks)

(c) What is the margin of error in the above estimate? (2 marks)

It turns out that the true proportion of lullabees is 0.02.

(d) Now that Alex knows this, she decides to take a new sample.

- (i) Suppose a new sample of 290 bees was taken. Given that the true proportion of lullabees is 0.02, what is the probability that the sample proportion in this new sample is at most 0.03? (3 marks)

- (ii) If Alex takes a larger sample, will the above probability increase or decrease? Explain. (2 marks)