

5. Past records show that 15% of customers at a shop buy chocolate. The shopkeeper believes that moving the chocolate closer to the till will increase the proportion of customers buying chocolate.

After moving the chocolate closer to the till, a random sample of 30 customers is taken and 8 of them are found to have bought chocolate.

Julie carries out a hypothesis test, at the 5% level of significance, to test the shopkeeper's belief.

Julie's hypothesis test is shown below.

$$H_0 : p = 0.15$$

$$H_1 : p \geq 0.15$$

Let X = the number of customers who buy chocolate.

$$X \sim B(30, 0.15)$$

$$P(X = 8) = 0.0420$$

$$0.0420 < 0.05 \text{ so reject } H_0$$

There is sufficient evidence to suggest that the proportion of customers buying chocolate has increased.

- (a) Identify the first two errors that Julie has made in her hypothesis test. (2)
- (b) Explain whether or not these errors will affect the conclusion of her hypothesis test. Give a reason for your answer. (1)
- (c) Find, using a 5% level of significance, the critical region for a one-tailed test of the shopkeeper's belief. The probability in the tail should be less than 0.05 (2)
- (d) Find the actual level of significance of this test. (1)