7. When purchasing a pair of glasses from an optician, customers are offered insurance to cover accidental damage.

Past records from the optician show that 30% of customers buy insurance when they purchase a pair of glasses.

In a random sample of 40 customers who have purchased a pair of glasses, X represents the number who buy insurance.

(a) State a suitable model for the distribution of X

(1)

(b) State a necessary assumption for the model in part (a) to be valid.

(1)

The probability that fewer than r customers who have purchased a pair of glasses buy insurance is less than 0.05

(c) Find the largest possible value of r

(2)

A second random sample of 200 customers who have purchased a pair of glasses is taken.

Using a normal approximation, the probability that at least t of these 200 customers buy insurance is 0.9474, correct to 4 decimal places.

(d) Find the value of t
You must show your working.

(5)

The optician decided to introduce a special offer in which customers who purchase a pair of glasses get the first three months of insurance free if they buy insurance.

Following this, a random sample of 25 customers who purchase a pair of glasses is taken and 11 of them buy insurance.

(e) Test, at the 10% level of significance, whether or not there is evidence that the proportion of customers who buy insurance when purchasing a pair of glasses has increased. State your hypotheses clearly.

(5)

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TOTAL FOR PAPER IS 75 MARKS

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