3 Jian owns a large group of shops. She decides to visit a random sample of the shops to check if the stocktaking system is being used incorrectly.

(a) Suggest a suitable sampling frame for Jian to use.

(1)

(b) Identify the sampling units.

(1)

(c) Give one advantage and one disadvantage of taking a sample rather than a census.

(2)

Jian believes that the stocktaking system is being used incorrectly in 40% of the shops.

To investigate her belief, a random sample of 30 of the shops is taken.

(d) Using a 5% level of significance, find the critical region for a two-tailed test of Jian's belief.
You should state the probability in each tail, which should each be as close as possible to 2.5%

(3)

The total number of shops, in the sample of 30, where the stocktaking system is being used incorrectly is 20

(e) Using the critical region from part (d), state what this suggests about Jian's belief. Give a reason for your answer.

(1)

Jian introduces a new, simpler, stocktaking system to all the shops.

She takes a random sample of 150 shops and finds that in 47 of these shops the new stocktaking system is being used incorrectly.

(f) Using a suitable approximation, test, at the 5% level of significance, whether or not there is evidence that the proportion of shops where the stocktaking system is being used incorrectly is now **less than** 0.4
You should state your hypotheses and show your working clearly.

(7)

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(Total for Question 3 is 15 marks)

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