4. The random variable $X \sim \text{B}(27, 0.35)$

(a) Find   (i) $\text{P}(X = 10)$

           (ii) $\text{P}(12 \leqslant X < 15)$

(3)

Historical records show that the proportion of defective items produced by a machine is 0.12

Following a maintenance service of the machine, a random sample of 60 items is taken and 3 defective items are found.

(b) Carry out a suitable test to determine whether the proportion of defective items produced by the machine has decreased following the maintenance service. You should state your hypotheses clearly and use a 5% level of significance.

(4)

(c) Write down the *p*-value for your test in part (b)

(1)