10. (i) Given that

- $f(n) = 168n - 119 - 24n^2$
- n is a positive integer less than 7

use proof by exhaustion to show that $f(n)$ is always a perfect square.

(3)

You may use the table on page 30 of the answer book to illustrate your answer.
The first 2 rows have been completed for you.

(ii) Given n is an integer with $n \geqslant r$, use the formula

$$^{n}C_{r} = \frac{n!}{r!(n-r)!}$$

to prove that

$$^{n}C_{r} + {}^{n}C_{r+1} = {}^{n+1}C_{r+1}$$

You must show all stages of your working.

(4)

(Total for Question 10 is 7 marks)

TOTAL FOR PAPER IS 75 MARKS