

(1) Find the value of p given that:

$$\sum_{r=1}^{p-1} r = 78$$

(2) Show that

$$\sum_{r=1}^{k+1} r(3r-1) = (k+1)^2(k+2)$$

(3) Evaluate

$$\sum_{r=19}^{36} 4r - 3r^3$$

(4) $f(r) = pr + q$ where p and q are constants. Show that the sum given below is a multiple of 9

$$\sum_{r=5}^{40} f(r)$$

(5) Evaluate

$$\sum_{r=1}^{48} \left(\frac{r^3 + r^2 + r + 1}{2} \right)$$

(6) Find the value of k such that

$$\sum_{r=1}^k 3r^2 - \sum_{r=1}^k 17r = 0$$

(7) Find the least value of p such that

$$\sum_{r=1}^p r^3 - r^2 > 0$$

(8) $f(r) = 10r^2 - 29r - 3$

Given that $f(k) = 3417$, show that

$$\sum_{r=1}^k f(r) = 22550$$