1: **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

A particle P moves along the x-axis.
At time $t = 0$, P is at rest at the origin O.
At time t seconds, $t \geqslant 0$, the acceleration of P, in the positive x direction, is

$$k(3 - t^2)\,\text{m s}^{-2}$$

where k is a positive constant.

Given that when $t = 1.5$, the speed of P is $13.5\,\text{m s}^{-1}$

(a) show that $k = 4$

(3)

The displacement of P from O is s metres in the positive x direction.

(b) Show that

$$s = \frac{1}{3}t^2(18 - t^2)$$

(2)

(c) Find the total distance that P moves before it returns to O.

(4)

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Question 1 continued

(Total for Question 1 is 9 marks)