

9. A research engineer is testing the effectiveness of the braking system of a car when it is driven in wet conditions.

The engineer measures and records the braking distance,  $d$  metres, when the brakes are applied from a speed of  $V$  km h<sup>-1</sup>.

Graphs of  $d$  against  $V$  and  $\log_{10} d$  against  $\log_{10} V$  were plotted.

The results are shown below together with a data point from each graph.

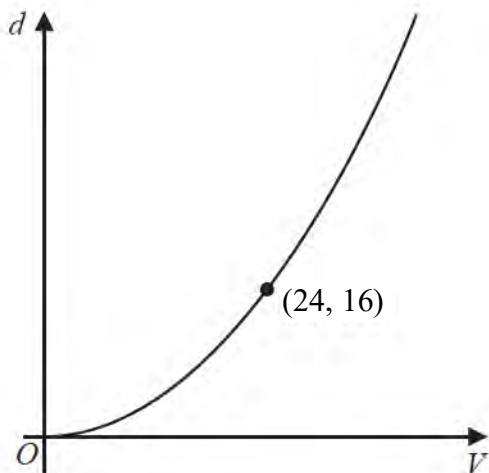


Figure 5

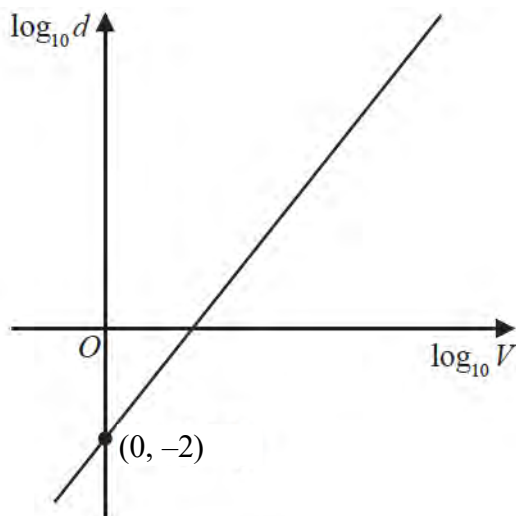


Figure 6

- (a) Explain how Figure 6 would lead the engineer to believe that the braking distance should be modelled by the formula  $d = kV^n$ , where  $k$  and  $n$  are constants to be found.

(2)

Using the information given in Figure 5,

- (b) find a complete equation for the model giving the values of  $k$  and  $n$  to 3 significant figures if necessary.

(4)

Sean is driving this car at 44 km h<sup>-1</sup> in wet conditions when he notices a large puddle in the road 70 m ahead. It takes him 0.8 seconds to react before applying the brakes.

- (c) Use your formula to find out if Sean will be able to stop before reaching the puddle.

(3)

(Total for Question 9 is 9 marks)