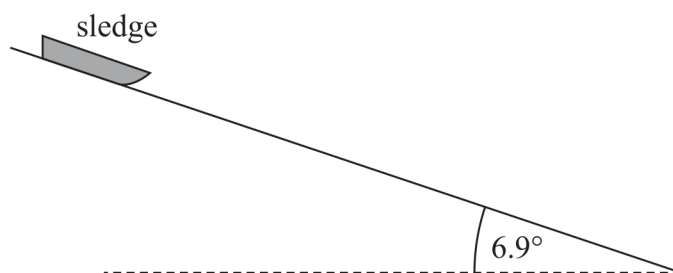13 A sledge accelerates, due to gravity, from rest down a frictionless slope. Air resistance can be ignored. The slope is at an angle of 6.9° to the horizontal, as shown.

(a) Complete the free-body force diagram below for the sledge.

(2)

•

(b) The slope has a total length of 60 m.

(i) Show that the initial acceleration of the sledge along the slope is about $1\,\text{m}\,\text{s}^{-2}$.

(2)

....

....

....

....

(ii) Determine the speed of the sledge at the end of the slope.

(2)

....

....

....

....

Speed at end of slope = ...

(iii) Determine the time taken for the sledge to travel to the end of the slope.

(2)

....

....

....

....

Time taken = ...

(Total for Question 13 = 8 marks)