Question 1 **(11 marks)**

A school is hosting a sports carnival to raise funds for charity. The first event is a 400 metre running race between a Year 8 student and a Year 12 student. The Year 12 student will start at the starting line and is expected to run at a speed of 8 metres per second. The Year 8 student will start 100 metres ahead of the starting line and is expected to run at a speed of 6 metres per second. Let n represent the number of seconds after the start of the race.

(a) (i) Write a recursive rule to model the total distance (in metres) the Year 12 student is from the starting line during the race. (2 marks)

(ii) Deduce a rule for the n^{th} term to model the total distance (in metres) the Year 8 student is from the starting line during the race. (2 marks)

(b) Determine how many metres the Year 8 student is ahead of the Year 12 student after 5 seconds. (2 marks)

After 30 seconds, the Year 8 student trips over. This results in a 5-second delay for the Year 8 student.

(c) Determine how much of a lead the Year 8 student will have after the 5-second delay. (3 marks)

(d) Determine who wins the race. Justify your answer. (2 marks)