

**Mathematics 1550H – Introduction to probability**

TRENT UNIVERSITY, Summer 2017

ASSIGNMENT #1

**Ups and Downs**

*Due on Monday, 26 June.*

Meredith works on the 13th floor of a 15-floor building. The only elevator moves continuously through floors 1, 2,  $\dots$ , 15, 14,  $\dots$ , 2, 1, 2,  $\dots$ , except that it stops on a floor on which the button has been pressed. Assume that time spent loading and unloading passengers is very small compared to the travelling time. Meredith complains that at 5 p.m., at the end of the working day, the elevator almost always goes up when it stops on the 13th floor floor.

1. What is the explanation for this? Compute the probability that the elevator is going down when Meredith wants to go home at 5 p.m. [5]
2. Now assume that the building has  $n$  elevators, which move independently. Compute the probability that the first elevator to arrive on Merediths floor at 5 p.m. is moving up. [4]
3. Is there a number  $n$  of elevators (moving independently) such that Meredith has at least an even chance of catching a downward-moving elevator at 5 p.m.? If so, what is it? If not, why not? [1]