Harold's Hills

Download this free game on your computer in advance.

Practice a bit (but not too much ☺) before the session just in case. It's an action game: Christmas is since long over but Santa has done a really sloppy job and almost none of the Christmas gifts have reached their destination. Instead they're lying scattered all over the place. It's now up to Harold the Homeboy and his old toboggan to tidy up the mess before all the little children start crying! As usual, Harold wants to do a really fancy job and rack up some great points to impress his friends.

Where's the maths?

Ask the player and the audience to figure out how the score is computed.

Every time the player gains new points, their number is displayed on the screen. There are different rules for different situations, for example, hitting a few tree trunks in very quick succession yields

Hit n	Score gain P(n)
1	10
2	20
3	40
4	80
5	Guess?

The formula for P(n)?

The purpose of the game is to deliver as many presents as possible to houses on the way. The most interesting part is guessing the score gain for each delivery.

Solution: The score gain is a function of two variables:

-How many deliveries (house jumps) have been completed in the game: H

- How many presents in the current delivery: P

$$\text{Score gain} = 50 H + 10P^2.$$

The formula above is hard to notice unless one decides to look at each variable separately:
E.g., collect no presents for a while and see what happens every time one jumps over a house. Alternatively, try to deliver more and more presents to the first house and record the score gain each time. None of these methods it fully helpful on this own, but together they yield the formula.

This method of separating variables: keeping one constant while letting the other vary and vice-versa is the most useful tool when working with 2 or more variables.