"We've broken the back of it"

In the film The Englishman Who Went Up A Hill But Came Down A Mountain, a group of Welsh villagers are pleased to welcome English cartographers to measure the 'first mountain in Wales' until the results show that it is, in fact, only a hill.

The solution is, of course, to cart a load of soil to the peak and build a 20 foot mound on the very top, then demand a recount…

When the mound reaches a height of 10 feet, some of the workers proudly announce that they have broken the back of the job. How wrong are they? Specifically, what percentage of the job is now completed?

Remember:
- *A pile of soil will naturally take the shape of a cone, and the angle of repose (the natural slope of the earth) will be the same regardless of the size of the pile.*

"We've broken the back of it…"
Solution

The cone of soil already piled up is half the height of the cone required, but these two cones are **similar** since the angle of the sloping side is the same. If the height of the larger cone is twice that of the smaller, the linear scale factor is 2 and the volume scale factor must be 2^3, or 8. So the job is 12.5% complete.